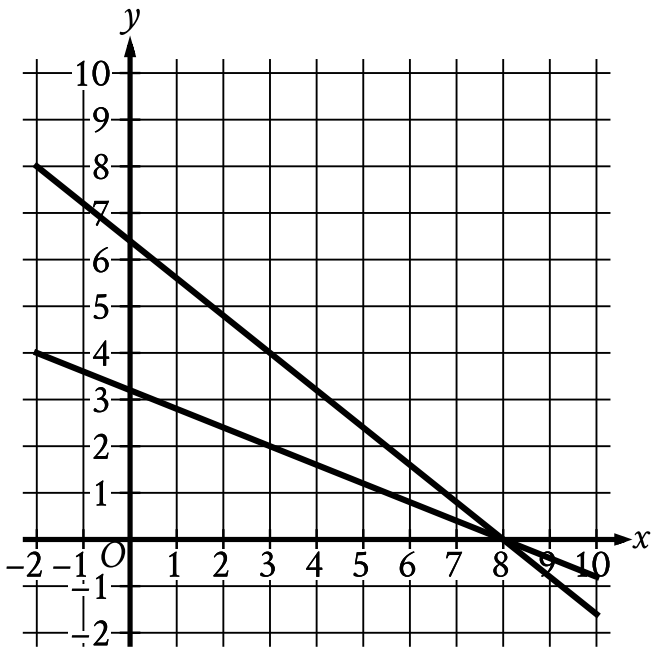
Question ID 3f5a3602

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 3f5a3602



What system of linear equations is represented by the lines shown?

A. $8x + 4y = 32$ $-10x - 4y = -64$

B. $8x - 4y = 32$ $-10x + 4y = -64$

C. $4x - 10y = 32$ $-8x + 10y = -64$

D. $4x + 10y = 32$ $-8x - 10y = -64$

ID: 3f5a3602 Answer

Correct Answer: D

Rationale

Choice D is correct. A line in the *xy*-plane that passes through the points (x_1, y_1) and (x_2, y_2) has slope m, where $m = \frac{y_2 - y_1}{x_2 - x_1}$, and can be defined by an equation of the form $y - y_1 = m(x - x_1)$. One of the lines shown in the graph passes through the points $(8, 0)$ and $(3, 4)$. Substituting 8 for x_1, 0 for y_1, 3 for x_2, and 4 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{4 - 0}{3 - 8}$, or $m = -\frac{4}{5}$. Substituting $-\frac{4}{5}$ for m, 8 for x_1 and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{4}{5}(x - 8)$, which is equivalent to $y = -\frac{4}{5}x + \frac{32}{5}$. Adding $\frac{4}{5}x$ to both sides of this equation yields $\frac{4}{5}x + y = \frac{32}{5}$. Multiplying both sides of this equation by -10 yields $-8x - 10y = -64$. Therefore, an equation of this line is $-8x - 10y = -64$. Similarly, the other line shown in the graph passes through the points $(8, 0)$ and $(3, 2)$. Substituting 8 for x_1, 0 for y_1, 3 for x_2, and 2 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{2 - 0}{3 - 8}$, or $m = -\frac{2}{5}$. Substituting $-\frac{2}{5}$ for m, 8 for x_1, and 0 for y_1 in the equation $y - y_1 = m(x - x_1)$ yields $y - 0 = -\frac{2}{5}(x - 8)$, which is equivalent to $y = -\frac{2}{5}x + \frac{16}{5}$. Adding $\frac{2}{5}x$ to both sides of this equation yields $\frac{2}{5}x + y = \frac{16}{5}$. Multiplying both sides of this equation by 10 yields $4x + 10y = 32$. Therefore, an equation of this line is $4x + 10y = 32$. So, the system of linear equations represented by the lines shown is $4x + 10y = 32$ and $-8x - 10y = -64$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 002dba45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 002dba45

Line k is defined by $y = -\frac{17}{3}x + 5$. Line j is perpendicular to line k in the *xy*-plane. What is the slope of line j?

ID: 002dba45 Answer

Correct Answer: .1764, .1765, 3/17

Rationale

The correct answer is $\frac{3}{17}$. It's given that line j is perpendicular to line k in the *xy*-plane. This means that the slope of line j is the negative reciprocal of the slope of line k. The equation of line k, $y = -\frac{17}{3}x + 5$, is written in slope-intercept form $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept of the line. It follows that the slope of line k is $-\frac{17}{3}$. The negative reciprocal of a number is -1 divided by the number. Therefore, the negative reciprocal of $-\frac{17}{3}$ is $\frac{-1}{-\frac{17}{3}}$, or $\frac{3}{17}$. Thus, the slope of line j is $\frac{3}{17}$. Note that 3/17, .1764, .1765, and 0.176 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID f224df07

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: f224df07

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

A. 2

B. 4

C. 5

D. 6

ID: f224df07 Answer

Correct Answer: C

Rationale

Choice C is correct. Let a equal the number of 120-pound packages, and let b equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality $120a+100b \le 1{,}100$ represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality $a+b \ge 10$ represents this situation. Values of a and b that satisfy these two inequalities represent the allowable numbers of 120-pound packages and 100-pound packages the helicopter can transport. To maximize the number of 120-pound packages, a, in the helicopter, the number of 100-pound packages, b, in the helicopter needs to be minimized. Expressing b in terms of a in the second inequality yields $b \ge 10-a$, so the minimum value of b is equal to $10-a$. Substituting $10-a$ for b in the first inequality results in $120a+100(10-a) \le 1{,}100$. Using the distributive property to rewrite this inequality yields $120a+1{,}000-100a \le 1{,}100$, or $20a+1{,}000 \le 1{,}100$. Subtracting 1,000 from both sides of this inequality yields $20a \le 100$. Dividing both sides of this inequality by 20 results in $a \le 5$. This means that the maximum number of 120-pound packages that the helicopter can carry per trip is 5.

Choices A, B, and D are incorrect and may result from incorrectly creating or solving the system of inequalities.

Question Difficulty: Medium

Question ID fa80893a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: fa80893a

If $2x + 3 = 9$, what is the value of $6x - 1$?

ID: fa80893a Answer

Correct Answer: 17

Rationale

The correct answer is 17. It's given that $2x + 3 = 9$. Multiplying each side of this equation by 3 yields $3(2x + 3) = 3(9)$, or $6x + 9 = 27$. Subtracting 10 from each side of this equation yields $6x + 9 - 10 = 27 - 10$, or $6x - 1 = 17$. Therefore, the value of $6x - 1$ is 17.

Question Difficulty: Easy

Question ID bd9eb2b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: bd9eb2b5

The function f is defined by $f(x) = 8x$. For what value of x does $f(x) = 72$?

A. 8

B. 9

C. 64

D. 80

ID: bd9eb2b5 Answer

Correct Answer: B

Rationale

Choice B is correct. Substituting 72 for $f(x)$ in the given function yields $72 = 8x$. Dividing each side of this equation by 8 yields $9 = x$. Therefore, $f(x) = 72$ when the value of x is 9.

Choice A is incorrect. This is the value of x for which $f(x) = 64$, not $f(x) = 72$.

Choice C is incorrect. This is the value of x for which $f(x) = 512$, not $f(x) = 72$.

Choice D is incorrect. This is the value of x for which $f(x) = 640$, not $f(x) = 72$.

Question Difficulty: Easy

Question ID 3008cfc3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 3008cfc3

x	y
k	13
$k+7$	-15

The table gives the coordinates of two points on a line in the *xy*-plane. The *y*-intercept of the line is $(k-5, b)$, where k and b are constants. What is the value of b?

ID: 3008cfc3 Answer

Correct Answer: 33

Rationale

The correct answer is 33. It's given in the table that the coordinates of two points on a line in the *xy*-plane are $(k, 13)$ and $(k+7, -15)$. The *y*-intercept is another point on the line. The slope computed using any pair of points from the line will be the same. The slope of a line, m, between any two points, (x_1, y_1) and (x_2, y_2), on the line can be calculated using the slope formula, $m = \frac{(y_2-y_1)}{(x_2-x_1)}$. It follows that the slope of the line with the given points from the table, $(k, 13)$ and $(k+7, -15)$, is $m = \frac{-15-13}{k+7-k}$, which is equivalent to $m = \frac{-28}{7}$, or $m = -4$. It's given that the *y*-intercept of the line is $(k-5, b)$. Substituting -4 for m and the coordinates of the points $(k-5, b)$ and $(k, 13)$ into the slope formula yields $-4 = \frac{13-b}{k-(k-5)}$, which is equivalent to $-4 = \frac{13-b}{k-k+5}$, or $-4 = \frac{13-b}{5}$. Multiplying both sides of this equation by 5 yields $-20 = 13 - b$. Subtracting 13 from both sides of this equation yields $-33 = -b$. Dividing both sides of this equation by -1 yields $b = 33$. Therefore, the value of b is 33.

Question Difficulty: Hard

Question ID 0d6ab461

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 0d6ab461

Gabriella deposits $\$35$ in a savings account at the end of each week. At the beginning of the 1st week of a year there was $\$600$ in that savings account. How much money, in dollars, will be in the account at the end of the 4th week of that year?

A. 460

B. 635

C. 639

D. 740

ID: 0d6ab461 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that at the beginning of the 1st week of the year there was $\$600$ in a savings account and Gabriella deposits $\$35$ in that savings account at the end of each week. Therefore, the amount of money, in dollars, in the savings account at the end of the 4th week of that year is $600 + 4(35)$, or 740.

Choice A is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 4th week if Gabriella withdraws, rather than deposits, $\$35$ at the end of each week.

Choice B is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 1st week, not the 4th week.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID d1b66ae6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: d1b66ae6

$$-x+y=-3.5$$
$$x+3y=9.5$$

If (x, y) satisfies the system of equations above, what is the value of y ?

ID: d1b66ae6 Answer

Rationale

The correct answer is $\frac{3}{2}$. One method for solving the system of equations for y is to add corresponding sides of the two equations. Adding the left-hand sides gives $(-x+y)+(x+3y)$, or 4y. Adding the right-hand sides yields $-3.5+9.5=6$. It follows that $4y=6$. Finally, dividing both sides of $4y=6$ by 4 yields $y=\frac{6}{4}$ or $\frac{3}{2}$. Note that 3/2 and 1.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID cb8f449f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: cb8f449f

$$\frac{1}{2}y = 4$$

$$x - \frac{1}{2}y = 2$$

The system of equations above has solution (x, y). What is the value of x ?

A. 3

B. $\frac{7}{2}$

C. 4

D. 6

ID: cb8f449f Answer

Correct Answer: D

Rationale

Choice D is correct. Adding the corresponding sides of the two equations eliminates y and yields $x = 6$, as shown.

$$\begin{array}{r} \frac{1}{2}y = 4 \\ x - \frac{1}{2}y = 2 \\ \hline x + 0 = 6 \end{array}$$

If (x, y) is a solution to the system, then (x, y) satisfies both equations in the system and any equation derived from them. Therefore, $x = 6$.

Choices A, B, and C are incorrect and may be the result of errors when solving the system.

Question Difficulty: Medium

Question ID 520c8177

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 520c8177

A veterinarian recommends that each day a certain rabbit should eat 25 calories per pound of the rabbit's weight, plus an additional 11 calories. Which equation represents this situation, where c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit's weight is x pounds?

A. $c = 25x$

B. $c = 36x$

C. $c = 11x + 25$

D. $c = 25x + 11$

ID: 520c8177 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight, plus an additional 11 calories. If the rabbit's weight is x pounds, then multiplying 25 calories per pound by the rabbit's weight, x pounds, yields $25x$ calories. Adding the additional 11 calories that the rabbit should eat each day yields $25x + 11$ calories. It's given that c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit's weight is x pounds. Therefore, this situation can be represented by the equation $c = 25x + 11$.

Choice A is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight.

Choice B is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat $25 + 11$, or 36, calories per pound of the rabbit's weight.

Choice C is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 11 calories per pound of the rabbit's weight, plus an additional 25 calories.

Question Difficulty: Easy

Question ID 3cdbf026

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 3cdbf026

The graph of the equation $ax + ky = 6$ is a line in the *xy*-plane, where *a* and *k* are constants. If the line contains the points $(-2, -6)$ and $(0, -3)$, what is the value of *k* ?

A. -2

B. -1

C. 2

D. 3

ID: 3cdbf026 Answer

Correct Answer: A

Rationale

Choice A is correct. The value of k can be found using the slope-intercept form of a linear equation, $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept. The equation $ax + ky = 6$ can be rewritten in the form $y = -\frac{ax}{k} + \frac{6}{k}$. One of the given points, $(0, -3)$, is the y-intercept. Thus, the y-coordinate of the y-intercept -3 must be equal to $\frac{6}{k}$. Multiplying both sides by k gives $-3k = 6$. Dividing both sides by -3 gives $k = -2$.

Choices B, C, and D are incorrect and may result from errors made rewriting the given equation.

Question Difficulty: Hard

Question ID 88e13c8c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 88e13c8c

The total cost $f(x)$, in dollars, to lease a car for 36 months from a particular car dealership is given by $f(x) = 36x + 1{,}000$, where x is the monthly payment, in dollars. What is the total cost to lease a car when the monthly payment is $\$400$?

A. $\$13{,}400$

B. $\$13{,}000$

C. $\$15{,}400$

D. $\$37{,}400$

ID: 88e13c8c Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x)$ is the total cost, in dollars, to lease a car from this dealership with a monthly payment of x dollars. Therefore, the total cost, in dollars, to lease the car when the monthly payment is $\$400$ is represented by the value of $f(x)$ when $x = 400$. Substituting 400 for x in the equation $f(x) = 36x + 1{,}000$ yields $f(400) = 36(400) + 1{,}000$, or $f(400) = 15{,}400$. Thus, when the monthly payment is $\$400$, the total cost to lease a car is $\$15{,}400$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID ff501705

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: ff501705

$\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y\ \frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p?

ID: ff501705 Answer

Correct Answer: 6

Rationale

The correct answer is 6. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning $\frac{D}{A} = \frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The first equation in the given system is $\frac{3}{2}y - \frac{1}{4}x = \frac{2}{3} - \frac{3}{2}y$. Multiplying each side of this equation by 12 yields $18y - 3x = 8 - 18y$. Adding $18y$ to each side of this equation yields $36y - 3x = 8$, or $-3x + 36y = 8$. The second equation in the given system is $\frac{1}{2}x + \frac{3}{2} = py + \frac{9}{2}$. Multiplying each side of this equation by 2 yields $x + 3 = 2py + 9$. Subtracting $2py$ from each side of this equation yields $x + 3 - 2py = 9$. Subtracting 3 from each side of this equation yields $x - 2py = 6$. Therefore, the two equations in the given system, written in standard form, are $-3x + 36y = 8$ and $x - 2py = 6$. As previously stated, if this system has no solution, the lines represented by the equations in the *xy*-plane are parallel and distinct, meaning the proportion $\frac{1}{-3} = \frac{-2p}{36}$, or $-\frac{1}{3} = -\frac{p}{18}$, is true and the proportion $\frac{6}{8} = \frac{1}{-3}$ is not true. The proportion $\frac{6}{8} = \frac{1}{-3}$ is not true. Multiplying each side of the true proportion, $-\frac{1}{3} = -\frac{p}{18}$, by -18 yields $6 = p$. Therefore, if the system has no solution, then the value of p is 6.

Question Difficulty: Hard

Question ID 8c5e6702

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 8c5e6702

A window repair specialist charges $\$220$ for the first two hours of repair plus an hourly fee for each additional hour. The total cost for 5 hours of repair is $\$400$. Which function f gives the total cost, in dollars, for x hours of repair, where $x \geq 2$?

A. $f(x) = 60x + 100$

B. $f(x) = 60x + 220$

C. $f(x) = 80x$

D. $f(x) = 80x + 220$

ID: 8c5e6702 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the window repair specialist charges $\$220$ for the first two hours of repair plus an hourly fee for each additional hour. Let n represent the hourly fee for each additional hour after the first two hours. Since it's given that x is the number of hours of repair, it follows that the charge generated by the hourly fee after the first two hours can be represented by the expression $n(x - 2)$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 220 + n(x - 2)$. It's given that the total cost for 5 hours of repair is $\$400$. Substituting 5 for x and 400 for $f(x)$ into the equation $f(x) = 220 + n(x - 2)$ yields $400 = 220 + n(5 - 2)$, or $400 = 220 + 3n$. Subtracting 220 from both sides of this equation yields $180 = 3n$. Dividing both sides of this equation by 3 yields $n = 60$. Substituting 60 for n in the equation $f(x) = 220 + n(x - 2)$ yields $f(x) = 220 + 60(x - 2)$, which is equivalent to $f(x) = 220 + 60x - 120$, or $f(x) = 60x + 100$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 60x + 100$.

Choice B is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges $\$340$, rather than $\$220$, for the first two hours of repair.

Choice C is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges $\$160$, rather than $\$220$, for the first two hours of repair, and an hourly fee of $\$80$, rather than $\$60$, after the first two hours.

Choice D is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges $\$380$, rather than $\$220$, for the first two hours of repair, and an hourly fee of $\$80$, rather than $\$60$, after the first two hours.

Question Difficulty: Hard

Question ID 2937ef4f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 2937ef4f

Hector used a tool called an auger to remove corn from a storage bin at a constant rate. The bin contained 24,000 bushels of corn when Hector began to use the auger. After 5 hours of using the auger, 19,350 bushels of corn remained in the bin. If the auger continues to remove corn at this rate, what is the total number of hours Hector will have been using the auger when 12,840 bushels of corn remain in the bin?

A. 3

B. 7

C. 8

D. 12

ID: 2937ef4f Answer

Correct Answer: D

Rationale

Choice D is correct. After using the auger for 5 hours, Hector had removed 24,000 – 19,350 = 4,650 bushels of corn from the storage bin. During the 5-hour period, the auger removed corn from the bin at a constant rate of $\frac{4,650}{5} = 930$ bushels per hour. Assuming the auger continues to remove corn at this rate, after x hours it will have removed 930x bushels of corn. Because the bin contained 24,000 bushels of corn when Hector started using the auger, the equation 24,000 – 930x = 12,840 can be used to find the number of hours, x, Hector will have been using the auger when 12,840 bushels of corn remain in the bin. Subtracting 12,840 from both sides of this equation and adding 930x to both sides of the equation yields 11,160 = 930x. Dividing both sides of this equation by 930 yields x = 12. Therefore, Hector will have been using the auger for 12 hours when 12,840 bushels of corn remain in the storage bin.

Choice A is incorrect. Three hours after Hector began using the auger, 24,000 – 3(930) = 21,210 bushels of corn remained, not 12,840. Choice B is incorrect. Seven hours after Hector began using the auger, 24,000 – 7(930) = 17,490 bushels of corn will remain, not 12,840. Choice C is incorrect. Eight hours after Hector began using the auger, 24,000 – 8(930) = 16,560 bushels of corn will remain, not 12,840.

Question Difficulty: Hard

Question ID 548a4929

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 548a4929

The function h is defined by $h(x) = 4x + 28$. The graph of $y = h(x)$ in the *xy*-plane has an *x*-intercept at $(a, 0)$ and a *y*-intercept at $(0, b)$, where a and b are constants. What is the value of $a + b$?

A. 21

B. 28

C. 32

D. 35

ID: 548a4929 Answer

Correct Answer: A

Rationale

Choice A is correct. The *x*-intercept of a graph in the *xy*-plane is the point on the graph where $y = 0$. It's given that function h is defined by $h(x) = 4x + 28$. Therefore, the equation representing the graph of $y = h(x)$ is $y = 4x + 28$. Substituting 0 for y in the equation $y = 4x + 28$ yields $0 = 4x + 28$. Subtracting 28 from both sides of this equation yields $-28 = 4x$. Dividing both sides of this equation by 4 yields $-7 = x$. Therefore, the *x*-intercept of the graph of $y = h(x)$ in the *xy*-plane is $(-7, 0)$. It's given that the *x*-intercept of the graph of $y = h(x)$ is $(a, 0)$. Therefore, $a = -7$. The *y*-intercept of a graph in the *xy*-plane is the point on the graph where $x = 0$. Substituting 0 for x in the equation $y = 4x + 28$ yields $y = 4(0) + 28$, or $y = 28$. Therefore, the *y*-intercept of the graph of $y = h(x)$ in the *xy*-plane is $(0, 28)$. It's given that the *y*-intercept of the graph of $y = h(x)$ is $(0, b)$. Therefore, $b = 28$. If $a = -7$ and $b = 28$, then the value of $a + b$ is $-7 + 28$, or 21.

Choice B is incorrect. This is the value of b, not $a + b$.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of $-a + b$, not $a + b$.

Question Difficulty: Medium

Question ID 0adbe034

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 0adbe034

If $4x - 28 = -24$, what is the value of $x - 7$?

A. -24

B. -22

C. -6

D. -1

ID: 0adbe034 Answer

Correct Answer: C

Rationale

Choice C is correct. Dividing all terms in the given equation by 4 yields $\frac{4x}{4} - \frac{28}{4} = -\frac{24}{4}$, or $x - 7 = -6$. Therefore, the value of $x - 7$ is -6.

Choice A is incorrect. This is the value of $4x - 28$, not $x - 7$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 9bbce683

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 9bbce683

x	y
18	130
23	160
26	178

For line h, the table shows three values of x and their corresponding values of y. Line k is the result of translating line h down 5 units in the *xy*-plane. What is the *x*-intercept of line k?

A. $\left(-\frac{26}{3}, 0\right)$

B. $\left(-\frac{9}{2}, 0\right)$

C. $\left(-\frac{11}{3}, 0\right)$

D. $\left(-\frac{17}{6}, 0\right)$

ID: 9bbce683 Answer

Correct Answer: D

Rationale

Choice D is correct. The equation of line h can be written in slope-intercept form $y = mx + b$, where m is the slope of the line and $(0, b)$ is the *y*-intercept of the line. It's given that line h contains the points $(18, 130)$, $(23, 160)$, and $(26, 178)$. Therefore, its slope m can be found as $\frac{160-130}{23-18}$, or 6. Substituting 6 for m in the equation $y = mx + b$ yields $y = 6x + b$. Substituting 130 for y and 18 for x in this equation yields $130 = 6(18) + b$, or $130 = 108 + b$. Subtracting 108 from both sides of this equation yields $22 = b$. Substituting 22 for b in $y = 6x + b$ yields $y = 6x + 22$. Since line k is the result of translating line h down 5 units, an equation of line k is $y = 6x + 22 - 5$, or $y = 6x + 17$. Substituting 0 for y in this equation yields $0 = 6x + 17$. Solving this equation for x yields $x = -\frac{17}{6}$. Therefore, the *x*-intercept of line k is $\left(-\frac{17}{6}, 0\right)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2b15d65f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 2b15d65f

An economist modeled the demand Q for a certain product as a linear function of the selling price P. The demand was 20,000 units when the selling price was $40 per unit, and the demand was 15,000 units when the selling price was $60 per unit. Based on the model, what is the demand, in units, when the selling price is $55 per unit?

A. 16,250

B. 16,500

C. 16,750

D. 17,500

ID: 2b15d65f Answer

Correct Answer: A

Rationale

Choice A is correct. Let the economist's model be the linear function $Q = mP + b$, where Q is the demand, P is the selling price, m is the slope of the line, and b is the y-coordinate of the y-intercept of the line in the xy-plane, where $y = Q$. Two pairs of the selling price P and the demand Q are given. Using the coordinate pairs (P, Q), two points that satisfy the function are $(40, 20{,}000)$ and $(60, 15{,}000)$. The slope m of the function can be found using the formula $m = \frac{Q_2 - Q_1}{P_2 - P_1}$. Substituting the given values into this formula yields $m = \frac{15{,}000 - 20{,}000}{60 - 40}$, or $m = -250$. Therefore, $Q = -250P + b$. The value of b can be found by substituting one of the points into the function. Substituting the values of P and Q from the point $(40, 20{,}000)$ yields $20{,}000 = -250(40) + b$, or $20{,}000 = -10{,}000 + b$. Adding 10,000 to both sides of this equation yields $b = 30{,}000$. Therefore, the linear function the economist used as the model is $Q = -250P + 30{,}000$. Substituting 55 for P yields $Q = -250(55) + 30{,}000 = 16{,}250$. It follows that when the selling price is $55 per unit, the demand is 16,250 units.

Choices B, C, and D are incorrect and may result from calculation or conceptual errors.

Question Difficulty: Hard

Question ID 686b7244

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 686b7244

A certain apprentice has enrolled in 85 hours of training courses. The equation $10x + 15y = 85$ represents this situation, where x is the number of on-site training courses and y is the number of online training courses this apprentice has enrolled in. How many more hours does each online training course take than each on-site training course?

ID: 686b7244 Answer

Correct Answer: 5

Rationale

The correct answer is 5. It's given that the equation $10x + 15y = 85$ represents the situation, where x is the number of on-site training courses, y is the number of online training courses, and 85 is the total number of hours of training courses the apprentice has enrolled in. Therefore, $10x$ represents the number of hours the apprentice has enrolled in on-site training courses, and $15y$ represents the number of hours the apprentice has enrolled in online training courses. Since x is the number of on-site training courses and y is the number of online training courses the apprentice has enrolled in, 10 is the number of hours each on-site course takes and 15 is the number of hours each online course takes. Subtracting these numbers gives $15 - 10$, or 5 more hours each online training course takes than each on-site training course.

Question Difficulty: Hard

Question ID b86123af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: b86123af

Hiro and Sofia purchased shirts and pants from a store. The price of each shirt purchased was the same and the price of each pair of pants purchased was the same. Hiro purchased 4 shirts and 2 pairs of pants for $86, and Sofia purchased 3 shirts and 5 pairs of pants for $166. Which of the following systems of linear equations represents the situation, if x represents the price, in dollars, of each shirt and y represents the price, in dollars, of each pair of pants?

A. $4x+2y=86$
$3x+5y=166$

B. $4x+3y=86$
$2x+5y=166$

C. $4x+2y=166$
$3x+5y=86$

D. $4x+3y=166$
$2x+5y=86$

ID: b86123af Answer

Correct Answer: A

Rationale

Choice A is correct. Hiro purchased 4 shirts and each shirt cost x dollars, so he spent a total of 4x dollars on shirts. Likewise, Hiro purchased 2 pairs of pants, and each pair of pants cost y dollars, so he spent a total of 2y dollars on pants. Therefore, the total amount that Hiro spent was 4x + 2y. Since Hiro spent $86 in total, this can be modeled by the equation 4x + 2y = 86. Using the same reasoning, Sofia bought 3 shirts at x dollars each and 5 pairs of pants at y dollars each, so she spent a total of 3x + 5y dollars on shirts and pants. Since Sofia spent $166 in total, this can be modeled by the equation 3x + 5y = 166.

Choice B is incorrect and may be the result of switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased. Choice C is incorrect and may be the result of switching the total price each person paid. Choice D is incorrect and may be the result of switching the total price each person paid as well as switching the number of shirts Sofia purchased with the number of pairs of pants Hiro purchased.

Question Difficulty: Easy

Question ID 3a3b95df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 3a3b95df

$d = 16 - \frac{x}{30}$

The equation shown gives the estimated amount of diesel d, in gallons, that remains in the gas tank of a truck after being driven x miles, where $0 \leq x \leq 480$. What is the estimated amount of diesel, in gallons, that remains in the gas tank of the truck when $x = 300$?

A. 0

B. 6

C. 14

D. 16

ID: 3a3b95df Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $d = 16 - \frac{x}{30}$ gives the estimated amount of diesel d, in gallons, that remains in the gas tank of the truck after being driven x miles. Substituting 300 for x in the given equation yields $d = 16 - \frac{300}{30}$, which is equivalent to $d = 16 - 10$, or $d = 6$. Therefore, the estimated amount of diesel that remains in the gas tank of the truck when $x = 300$ is 6 gallons.

Choice A is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 480$, not when $x = 300$.

Choice C is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 60$, not when $x = 300$.

Choice D is incorrect. This is the estimated amount of diesel, in gallons, that will remain in the gas tank of the truck when $x = 0$, not when $x = 300$.

Question Difficulty: Easy

Question ID 1b1deebe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 1b1deebe

$ax + by = 72$ $6x + 2by = 56$

In the given system of equations, a and b are constants. The graphs of these equations in the *xy*-plane intersect at the point $(4, y)$. What is the value of a?

A. 3

B. 4

C. 6

D. 14

ID: 1b1deebe Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the graphs of the given system of equations intersect at the point $(4, y)$. Therefore, $(4, y)$ is the solution to the given system. Multiplying the first equation in the given system by -2 yields $-2ax - 2by = -144$. Adding this equation to the second equation in the system yields $(-2a + 6)x + (-2b + 2b)y = (-144 + 56)$, or $(-2a + 6)x = -88$. Since $(4, y)$ is the solution to the system, the value of a can be found by substituting 4 for x in this equation, which yields $(-2a + 6)(4) = -88$. Dividing both sides of this equation by 4 yields $-2a + 6 = -22$. Subtracting 6 from both sides of this equation yields $-2a = -28$. Dividing both sides of this equation by -2 yields $a = 14$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID ee846db7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: ee846db7

A store sells two different-sized containers of a certain Greek yogurt. The store's sales of this Greek yogurt totaled $1{,}277.94$ dollars last month. The equation $5.48x + 7.30y = 1{,}277.94$ represents this situation, where x is the number of smaller containers sold and y is the number of larger containers sold. According to the equation, which of the following represents the price, in dollars, of each smaller container?

A. 5.48

B. $7.30y$

C. 7.30

D. $5.48x$

ID: ee846db7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the store's sales of a certain Greek yogurt totaled $1{,}277.94$ dollars last month. It's also given that the equation $5.48x + 7.30y = 1{,}277.94$ represents this situation, where x is the number of smaller containers sold and y is the number of larger containers sold. Since x represents the number of smaller containers of yogurt sold, the expression $5.48x$ represents the total sales, in dollars, from smaller containers of yogurt. This means that x smaller containers of yogurt were sold at a price of 5.48 dollars each. Therefore, according to the equation, 5.48 represents the price, in dollars, of each smaller container.

Choice B is incorrect. This expression represents the total sales, in dollars, from selling y larger containers of yogurt.

Choice C is incorrect. This value represents the price, in dollars, of each larger container of yogurt.

Choice D is incorrect. This expression represents the total sales, in dollars, from selling x smaller containers of yogurt.

Question Difficulty: Easy

Question ID baca4a4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: baca4a4c

$7(2x - 3) = 63$ Which equation has the same solution as the given equation?

A. $2x - 3 = 9$

B. $2x - 3 = 56$

C. $2x - 21 = 63$

D. $2x - 21 = 70$

ID: baca4a4c Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing each side of the given equation by 7 yields $\frac{7(2x-3)}{7} = \frac{63}{7}$, or $2x - 3 = 9$. Therefore, the equation $2x - 3 = 9$ is equivalent to the given equation and has the same solution.

Choice B is incorrect. This equation is equivalent to $7(2x - 3) = 392$, not $7(2x - 3) = 63$.

Choice C is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 63$.

Choice D is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 70$.

Question Difficulty: Easy

Question ID 5b8a8475

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 5b8a8475

Line k is defined by $y = 3x + 15$. Line j is perpendicular to line k in the *xy*-plane. What is the slope of line j?

A. $-\frac{1}{3}$

B. $-\frac{1}{12}$

C. $-\frac{1}{18}$

D. $-\frac{1}{45}$

ID: 5b8a8475 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that line j is perpendicular to line k in the *xy*-plane. It follows that the slope of line j is the opposite reciprocal of the slope of line k. The equation for line k is written in slope-intercept form $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept of the line. It follows that the slope of line k is 3. The opposite reciprocal of a number is -1 divided by the number. Thus, the opposite reciprocal of 3 is $-\frac{1}{3}$. Therefore, the slope of line j is $-\frac{1}{3}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID cfe67646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: cfe67646

The point $(8, 2)$ in the *xy*-plane is a solution to which of the following systems of inequalities?

A. $x > 0\, y > 0$

B. $x > 0\, y < 0$

C. $x < 0\, y > 0$

D. $x < 0\, y < 0$

ID: cfe67646 Answer

Correct Answer: A

Rationale

Choice A is correct. The given point, $(8, 2)$, is located in the first quadrant in the *xy*-plane. The system of inequalities in choice A represents all the points in the first quadrant in the *xy*-plane. Therefore, $(8, 2)$ is a solution to the system of inequalities in choice A.

Alternate approach: Substituting 8 for x in the first inequality in choice A, $x > 0$, yields $8 > 0$, which is true. Substituting 2 for y in the second inequality in choice A, $y > 0$, yields $2 > 0$, which is true. Since the coordinates of the point $(8, 2)$ make the inequalities $x > 0$ and $y > 0$ true, the point $(8, 2)$ is a solution to the system of inequalities consisting of $x > 0$ and $y > 0$.

Choice B is incorrect. This system of inequalities represents all the points in the fourth quadrant, not the first quadrant, in the *xy*-plane.

Choice C is incorrect. This system of inequalities represents all the points in the second quadrant, not the first quadrant, in the *xy*-plane.

Choice D is incorrect. This system of inequalities represents all the points in the third quadrant, not the first quadrant, in the *xy*-plane.

Question Difficulty: Easy

Question ID 608eeb6e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 608eeb6e

$5x = 15$ $-4x + y = -2$ The solution to the given system of equations is (x, y). What is the value of $x + y$?

A. -17

B. -13

C. 13

D. 17

ID: 608eeb6e Answer

Correct Answer: C

Rationale

Choice C is correct. Adding the second equation of the given system to the first equation yields $5x + (-4x + y) = 15 + (-2)$, which is equivalent to $x + y = 13$. So the value of $x + y$ is 13.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of $-(x + y)$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID be9cb6a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: be9cb6a2

The cost of renting a backhoe for up to 10 days is $\$270$ for the first day and $\$135$ for each additional day. Which of the following equations gives the cost y, in dollars, of renting the backhoe for x days, where x is a positive integer and $x \leq 10$?

A. $y = 270x - 135$

B. $y = 270x + 135$

C. $y = 135x + 270$

D. $y = 135x + 135$

ID: be9cb6a2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the cost of renting a backhoe for up to 10 days is $\$270$ for the first day and $\$135$ for each additional day. Therefore, the cost y, in dollars, for x days, where $x \leq 10$, is the sum of the cost for the first day, $\$270$, and the cost for the additional $x - 1$ days, $\$135(x - 1)$. It follows that $y = 270 + 135(x - 1)$, which is equivalent to $y = 270 + 135x - 135$, or $y = 135x + 135$.

Choice A is incorrect. This equation represents a situation where the cost of renting a backhoe is $\$135$ for the first day and $\$270$ for each additional day.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 097e10f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 097e10f5

What value of p satisfies the equation $5p + 180 = 250$?

A. 14

B. 65

C. 86

D. 250

ID: 097e10f5 Answer

Correct Answer: A

Rationale

Choice A is correct. Subtracting 180 from both sides of the given equation yields $5p = 70$. Dividing both sides of this equation by 5 yields $p = 14$. Therefore, the value of p that satisfies the equation $5p + 180 = 250$ is 14.

Choice B is incorrect. This value of p satisfies the equation $5p + 180 = 505$.

Choice C is incorrect. This value of p satisfies the equation $5p + 180 = 610$.

Choice D is incorrect. This value of p satisfies the equation $5p + 180 = 1{,}430$.

Question Difficulty: Easy

Question ID 84664a7c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 84664a7c

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height *h*, in feet, of the front of the roller-coaster car *s* seconds after it starts up the hill?

A. $h = 8s + 15$

B. $h = 15s + \frac{335}{8}$

C. $h = 8s + \frac{335}{15}$

D. $h = 15s + 8$

ID: 84664a7c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the front of the roller-coaster car starts rising when it's 15 feet above the ground. This initial height of 15 feet can be represented by a constant term, 15, in an equation. Each second, the front of the roller-coaster car rises 8 feet, which can be represented by 8s. Thus, the equation $h = 8s + 15$ gives the height, in feet, of the front of the roller-coaster car s seconds after it starts up the hill.

Choices B and C are incorrect and may result from conceptual errors in creating a linear equation. Choice D is incorrect and may result from switching the rate at which the roller-coaster car rises with its initial height.

Question Difficulty: Easy

Question ID e62cfe5f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: e62cfe5f

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams. According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

ID: e62cfe5f Answer

Rationale

The correct answer is 2.6. According to the model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to 4 times the body weight, in grams, of the bee. Let x represent the body weight, in grams, of a worker bumblebee and let y represent the head width, in millimeters. Translating the verbal description of the model into an equation yields $y = 0.6 + 4x$. Substituting 0.5 grams for x in this equation yields $y = 0.6 + 4(0.5)$, or $y = 2.6$.

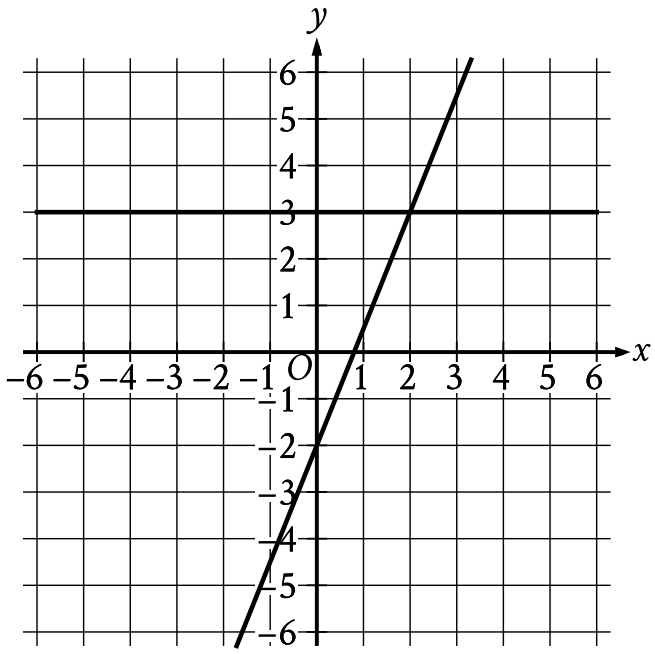
Therefore, a worker bumblebee with a body weight of 0.5 grams has an estimated head width of 2.6 millimeters. Note that 2.6 and 13/5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID b0fc3166

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: b0fc3166



The graph of a system of linear equations is shown. What is the solution (x, y) to the system?

A. $(0, 3)$

B. $(1, 3)$

C. $(2, 3)$

D. $(3, 3)$

ID: b0fc3166 Answer

Correct Answer: C

Rationale

Choice C is correct. The solution to this system of linear equations is represented by the point that lies on both lines shown, or the point of intersection of the two lines. According to the graph, the point of intersection occurs when $x = 2$ and $y = 3$, or at the point $(2, 3)$. Therefore, the solution (x, y) to the system is $(2, 3)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID db422e7f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: db422e7f

Line p is defined by $4y + 8x = 6$. Line r is perpendicular to line p in the *xy*-plane. What is the slope of line r?

ID: db422e7f Answer

Correct Answer: .5, 1/2

Rationale

The correct answer is $\frac{1}{2}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line in the *xy*-plane defined by this equation. It's given that line p is defined by $4y + 8x = 6$. Subtracting $8x$ from both sides of this equation yields $4y = -8x + 6$. Dividing both sides of this equation by 4 yields $y = -\frac{8}{4}x + \frac{6}{4}$, or $y = -2x + \frac{3}{2}$. Thus, the slope of line p is -2. If line r is perpendicular to line p, then the slope of line r is the negative reciprocal of the slope of line p. The negative reciprocal of -2 is $-\frac{1}{(-2)} = \frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 590f2187

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 590f2187

If $3x - 27 = 24$, what is the value of $x - 9$?

A. 1

B. 8

C. 24

D. 35

ID: 590f2187 Answer

Correct Answer: B

Rationale

Choice B is correct. Dividing each side of the given equation by 3 yields $x - 9 = 8$. Therefore, the value of $x - 9$ is 8.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of $3x - 27$, not $x - 9$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 01682aa5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 01682aa5

Line p is defined by $2y + 18x = 9$. Line r is perpendicular to line p in the *xy*-plane. What is the slope of line r?

A. -9

B. $-\frac{1}{9}$

C. $\frac{1}{9}$

D. 9

ID: 01682aa5 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that line r is perpendicular to line p in the *xy*-plane. This means that the slope of line r is the negative reciprocal of the slope of line p. If the equation for line p is rewritten in slope-intercept form $y = mx + b$, where m and b are constants, then m is the slope of the line and $(0, b)$ is its *y*-intercept. Subtracting $18x$ from both sides of the equation $2y + 18x = 9$ yields $2y = -18x + 9$. Dividing both sides of this equation by 2 yields $y = -9x + \frac{9}{2}$. It follows that the slope of line p is -9. The negative reciprocal of a number is -1 divided by the number. Therefore, the negative reciprocal of -9 is $\frac{-1}{-9}$, or $\frac{1}{9}$. Thus, the slope of line r is $\frac{1}{9}$.

Choice A is incorrect. This is the slope of line p, not line r.

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of the slope of line p.

Choice D is incorrect. This is the negative, not the negative reciprocal, of the slope of line p.

Question Difficulty: Medium

Question ID f2b63f49

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: f2b63f49

$8x - 7x + 130 = 260$ What value of x is the solution to the given equation?

ID: f2b63f49 Answer

Correct Answer: 130

Rationale

The correct answer is 130. It's given that $8x - 7x + 130 = 260$. Combining like terms on the left-hand side of this equation yields $x + 130 = 260$. Subtracting 130 from each side of this equation yields $x = 130$. Therefore, the value of x that's the solution to the given equation is 130.

Question Difficulty: Easy

Question ID 45cfb9de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 45cfb9de

Adam's school is a 20-minute walk or a 5-minute bus ride away from his house. The bus runs once every 30 minutes, and the number of minutes, *w*, that Adam waits for the bus varies between 0 and 30. Which of the following inequalities gives the values of *w* for which it would be faster for Adam to walk to school?

A. $w-5<20$

B. $w-5>20$

C. $w+5<20$

D. $w+5>20$

ID: 45cfb9de Answer

Correct Answer: D

Rationale

Choice D is correct. It is given that w is the number of minutes that Adam waits for the bus. The total time it takes Adam to get to school on a day he takes the bus is the sum of the minutes, w, he waits for the bus and the 5 minutes the bus ride takes; thus, this time, in minutes, is w + 5. It is also given that the total amount of time it takes Adam to get to school on a day that he walks is 20 minutes. Therefore, w + 5 > 20 gives the values of w for which it would be faster for Adam to walk to school.

Choices A and B are incorrect because w − 5 is not the total length of time for Adam to wait for and then take the bus to school. Choice C is incorrect because the inequality should be true when walking 20 minutes is faster than the time it takes Adam to wait for and ride the bus, not less.

Question Difficulty: Hard

Question ID 06fc1726

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 06fc1726

If f is the function defined by $f(x)=\frac{2x-1}{3}$, what is the value of $f(5)$?

A. $\frac{4}{3}$

B. $\frac{7}{3}$

C. 3

D. 9

ID: 06fc1726 Answer

Correct Answer: C

Rationale

Choice C is correct. If $f(x)=\frac{2x-1}{3}$, then $f(5)=\frac{2(5)-1}{3}=\frac{10-1}{3}=\frac{9}{3}=3$.

Choice A is incorrect and may result from not multiplying x by 2 in the numerator. Choice B is incorrect and may result from dividing 2x by 3 and then subtracting 1. Choice D is incorrect and may result from evaluating only the numerator 2x – 1.

Question Difficulty: Easy

Question ID e723bd67

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: e723bd67

$2x - y > 883$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given inequality?

A.

x	y
440	0
441	-2
442	-4

B.

x	y
440	0
442	-2
441	-4

C.

x	y
442	0
440	-2
441	-4

D.

x	y
442	0
441	-2
440	-4

ID: e723bd67 Answer

Correct Answer: D

Rationale

Choice D is correct. All the tables in the choices have the same three values of x, 440, 441, and 442, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 440 for x in the given inequality yields $2(440) - y > 883$, or $880 - y > 883$. Subtracting 880 from both sides of this inequality yields $-y > 3$. Dividing both sides of this inequality by -1 yields $y < -3$. Therefore, when $x = 440$, the corresponding value of y must be less than -3. Substituting 441 for x in the given inequality yields $2(441) - y > 883$, or $882 - y > 883$. Subtracting 882 from both sides of this inequality yields $-y > 1$. Dividing both sides of this inequality by -1 yields $y < -1$. Therefore, when $x = 441$, the corresponding value of y must be less than -1. Substituting 442 for x in the given inequality yields $2(442) - y > 883$, or $884 - y > 883$. Subtracting 884 from both sides of this inequality yields $-y > -1$. Dividing both sides of this inequality by -1 yields $y < 1$. Therefore, when $x = 442$, the corresponding value of y must be less than 1. For the table in choice D, when $x = 440$, the corresponding value of y is -4, which is less than -3; when $x = 441$, the corresponding value of y is -2, which is less than -1; when $x = 442$, the corresponding value of y is 0, which is less than 1. Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. When $x = 440$, the corresponding value of y in this table is 0, which isn't less than -3.

Choice B is incorrect. When $x = 440$, the corresponding value of y in this table is 0, which isn't less than -3.

Choice C is incorrect. When $x = 440$, the corresponding value of y in this table is -2, which isn't less than -3.

Question Difficulty: Medium

Question ID 6863c7ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 6863c7ce

$d = 16t$

The given equation represents the distance d, in inches, where t represents the number of seconds since an object started moving. Which of the following is the best interpretation of 16 in this context?

A. The object moved a total of 16 inches.

B. The object moved a total of $16t$ inches.

C. The object is moving at a rate of 16 inches per second.

D. The object is moving at a rate of $\frac{1}{16}$ inches per second.

ID: 6863c7ce Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that in the equation $d = 16t$, d represents the distance, in inches, and t represents the number of seconds since an object started moving. In this equation, t is being multiplied by 16. This means that the object's distance increases by 16 inches each second. Therefore, the best interpretation of 16 in this context is that the object is moving at a rate of 16 inches per second.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect. This is the best interpretation of $16t$, rather than 16, in this context.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 51aabd93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 51aabd93

$(p+3)+8=10$ What value of p is the solution to the given equation?

A. -1

B. 5

C. 15

D. 21

ID: 51aabd93 Answer

Correct Answer: A

Rationale

Choice A is correct. Subtracting 8 from both sides of the given equation yields $p+3=2$. Subtracting 3 from both sides of this equation yields $p=-1$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a5834ea4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: a5834ea4

$f(x) = 39$ For the given linear function f, which table gives three values of x and their corresponding values of $f(x)$?

A.

x	$f(x)$
0	0
1	0
2	0

B.

x	$f(x)$
0	39
1	39
2	39

C.

x	$f(x)$
0	0
1	39
2	78

D.

x	$f(x)$
0	39
1	0
2	-39

ID: a5834ea4 Answer

Correct Answer: B

Rationale

Choice B is correct. For the given linear function f, $f(x)$ must equal 39 for all values of x. Of the given choices, only choice B gives three values of x and their corresponding values of $f(x)$ for the given linear function f.

Choice A is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID b52e5b6f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b52e5b6f

A mixture consisting of only vitamin D and calcium has a total mass of 150 grams. The mass of vitamin D in the mixture is 50 grams. What is the mass, in grams, of calcium in the mixture?

A. 200

B. 150

C. 100

D. 50

ID: b52e5b6f Answer

Correct Answer: C

Rationale

Choice C is correct. Let d represent the mass, in grams, of vitamin D in the mixture, and let c represent the mass, in grams, of calcium in the mixture. It's given that the mixture consists of only vitamin D and calcium and that the total mass of the mixture is 150 grams. Therefore, the equation $d + c = 150$ represents this situation. It's also given that the mass of vitamin D in the mixture is 50 grams. Substituting 50 for d in the equation $d + c = 150$ yields $50 + c = 150$. Subtracting 50 from both sides of this equation yields $c = 100$. Therefore, the mass of calcium in the mixture is 100 grams.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the total mass, in grams, of the mixture, not the mass, in grams, of calcium in the mixture.

Choice D is incorrect. This is the mass, in grams, of vitamin D in the mixture, not the mass, in grams, of calcium in the mixture.

Question Difficulty: Easy

Question ID 0b332f00

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 0b332f00

The function g is defined by $g(x) = 6x$. For what value of x is $g(x) = 54$?

ID: 0b332f00 Answer

Correct Answer: 9

Rationale

The correct answer is 9. It's given that $g(x) = 6x$. Substituting 54 for $g(x)$ in the given function yields $54 = 6x$. Dividing both sides of this equation by 6 yields $x = 9$. Therefore, the value of x when $g(x) = 54$ is 9.

Question Difficulty: Easy

Question ID 349a5bc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 349a5bc1

$4x + 5 = 165$ What is the solution to the given equation?

ID: 349a5bc1 Answer

Correct Answer: 40

Rationale

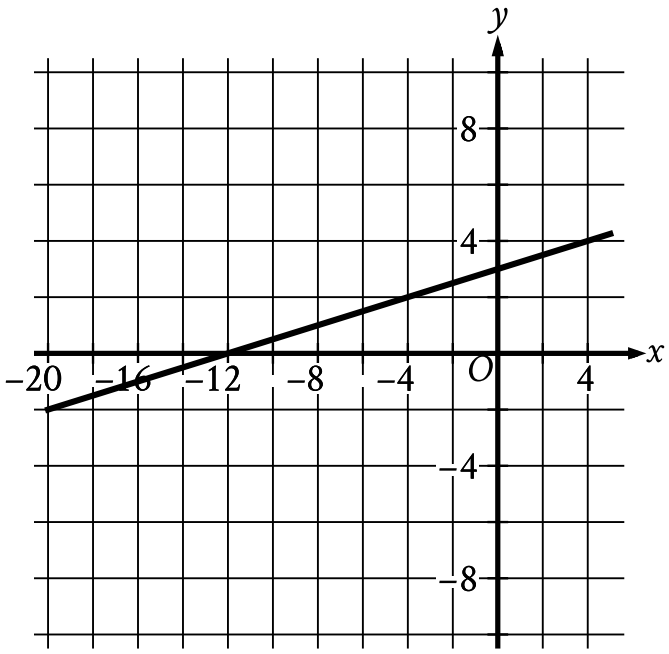
The correct answer is 40. Subtracting 5 from both sides of the given equation yields $4x = 160$. Dividing both sides of this equation by 4 yields $x = 40$. Therefore, the solution to the given equation is 40.

Question Difficulty: Easy

Question ID c10ad793

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: c10ad793



The graph of the linear function f is shown, where $y = f(x)$. What is the *x*-intercept of the graph of f?

A. $(-12, 0)$

B. $(0, 0)$

C. $(\frac{1}{4}, 0)$

D. $(12, 0)$

ID: c10ad793 Answer

Correct Answer: A

Rationale

Choice A is correct. The *x*-intercept of a graph is the point where the graph intersects the *x*-axis. The graph of function f, where $y = f(x)$, intersects the *x*-axis at $(-12, 0)$. Therefore, the *x*-intercept of the graph of f is $(-12, 0)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID bf4a8b6a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: bf4a8b6a

A company that provides whale-watching tours takes groups of 21 people at a time. The company's revenue is 80 dollars per adult and 60 dollars per child. If the company's revenue for one group consisting of adults and children was $1{,}440$ dollars, how many people in the group were children?

A. 3

B. 9

C. 12

D. 18

ID: bf4a8b6a Answer

Correct Answer: C

Rationale

Choice C is correct. Let x represent the number of children in a whale-watching tour group. Let y represent the number of adults in this group. Because it's given that 21 people are in a group and the group consists of adults and children, it must be true that $x + y = 21$. Since the company's revenue is 60 dollars per child, the total revenue from x children in this group was $60x$ dollars. Since the company's revenue is 80 dollars per adult, the total revenue from y adults in this group was $80y$ dollars. Because it's given that the total revenue for this group was $1{,}440$ dollars, it must be true that $60x + 80y = 1{,}440$. The equations $x + y = 21$ and $60x + 80y = 1{,}440$ form a linear system of equations that can be solved to find the value of x, which represents the number of children in the group, using the elimination method. Multiplying both sides of the equation $x + y = 21$ by 80 yields $80x + 80y = 1{,}680$. Subtracting $60x + 80y = 1{,}440$ from $80x + 80y = 1{,}680$ yields $(80x + 80y) - (60x + 80y) = 1{,}680 - 1{,}440$, which is equivalent to $80x - 60x + 80y - 80y = 240$, or $20x = 240$. Dividing both sides of this equation by 20 yields $x = 12$. Therefore, 12 people in the group were children.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the number of adults in the group, not the number of children in the group.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 797a81fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 797a81fb

$-12x + 14y = 36$ $-6x + 7y = -18$ How many solutions does the given system of equations have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 797a81fb Answer

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations in two variables, x and y, has zero solutions if the lines representing the equations in the *xy*-plane are distinct and parallel. Two lines are distinct and parallel if they have the same slope but different *y*-intercepts. Each equation in the given system can be written in slope-intercept form $y = mx + b$, where m is the slope of the line representing the equation in the *xy*-plane and $(0, b)$ is the *y*-intercept. Adding $12x$ to both sides of the first equation in the given system of equations, $-12x + 14y = 36$, yields $14y = 12x + 36$. Dividing both sides of this equation by 14 yields $y = \frac{6}{7}x + \frac{18}{7}$. It follows that the first equation in the given system of equations has a slope of $\frac{6}{7}$ and a *y*-intercept of $\left(0, \frac{18}{7}\right)$. Adding $6x$ to both sides of the second equation in the given system of equations, $-6x + 7y = -18$, yields $7y = 6x - 18$. Dividing both sides of this equation by 7 yields $y = \frac{6}{7}x - \frac{18}{7}$. It follows that the second equation in the given system of equations has a slope of $\frac{6}{7}$ and a *y*-intercept of $\left(0, -\frac{18}{7}\right)$. Since the slopes of these lines are the same and the *y*-intercepts are different, it follows that the given system of equations has zero solutions.

Alternate approach: To solve the system by elimination, multiplying the second equation in the given system of equations, $-6x + 7y = -18$, by -2 yields $12x - 14y = 36$. Adding this equation to the first equation in the given system of equations, $-12x + 14y = 36$, yields $(-12x + 12x) + (-14y + 14y) = 36 + 36$, or $0 = 72$. Since this equation isn't true, the given system of equations has zero solutions.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 7e3f8363

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 7e3f8363

In the *xy*-plane, the graph of the linear function f contains the points $(0, 3)$ and $(7, 31)$. Which equation defines f, where $y = f(x)$?

A. $f(x) = 28x + 34$

B. $f(x) = 3x + 38$

C. $f(x) = 4x + 3$

D. $f(x) = 7x + 3$

ID: 7e3f8363 Answer

Correct Answer: C

Rationale

Choice C is correct. In the *xy*-plane, an equation of the graph of a linear function can be written in the form $f(x) = mx + b$, where m represents the slope and $(0, b)$ represents the *y*-intercept of the graph of $y = f(x)$. It's given that the graph of the linear function f, where $y = f(x)$, in the *xy*-plane contains the point $(0, 3)$. Thus, $b = 3$. The slope of the graph of a line containing any two points (x_1, y_1) and (x_2, y_2) can be found using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since it's given that the graph of the linear function f contains the points $(0, 3)$ and $(7, 31)$, it follows that the slope of the graph of the line containing these points is $m = \frac{31 - 3}{7 - 0}$, or $m = 4$. Substituting 4 for m and 3 for b in $f(x) = mx + b$ yields $f(x) = 4x + 3$.

Choice A is incorrect. This function represents a graph with a slope of 28 and a *y*-intercept of $(0, 34)$.

Choice B is incorrect. This function represents a graph with a slope of 3 and a *y*-intercept of $(0, 38)$.

Choice D is incorrect. This function represents a graph with a slope of 7 and a *y*-intercept of $(0, 3)$.

Question Difficulty: Medium

Question ID cdec4c87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: cdec4c87

$y = 12x - 20$ $y = 28$ What is the solution (x, y) to the given system of equations?

A. $(4, 28)$

B. $(20, 28)$

C. $(28, 4)$

D. $(28, 20)$

ID: cdec4c87 Answer

Correct Answer: A

Rationale

Choice A is correct. The second equation in the given system is $y = 28$. Substituting 28 for y in the first equation in the given system yields $28 = 12x - 20$. Adding 20 to both sides of this equation yields $48 = 12x$. Dividing both sides of this equation by 12 yields $4 = x$. Therefore, the solution (x, y) to the given system of equations is $(4, 28)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the solution (y, x), not (x, y), to the given system of equations.

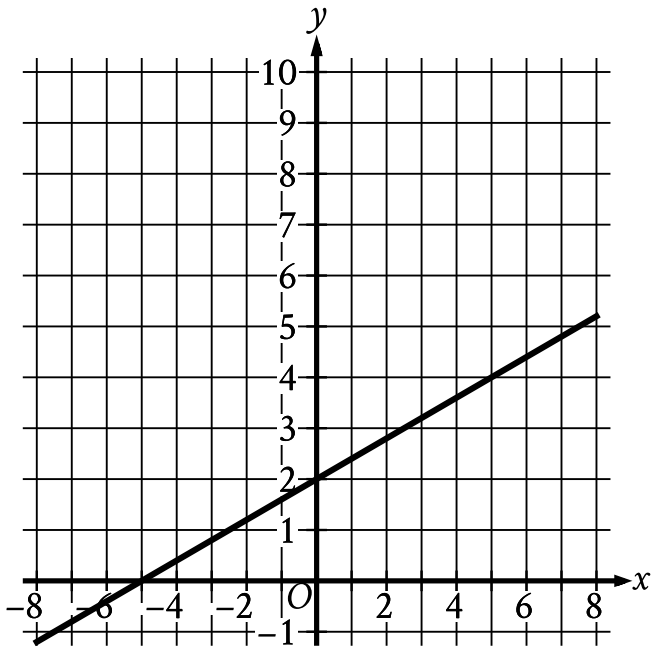
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID d11910d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: d11910d6



The graph of the linear function f is shown. What is the *y*-intercept of the graph of $y = f(x)$?

A. $(-5, 0)$

B. $(2, 0)$

C. $(0, 2)$

D. $(0, -5)$

ID: d11910d6 Answer

Correct Answer: C

Rationale

Choice C is correct. The *y*-intercept of a graph is the point where the graph intersects the *y*-axis. The graph of $y = f(x)$ shown intersects the *y*-axis at the point $(0, 2)$. Therefore, the *y*-intercept of the graph of $y = f(x)$ is $(0, 2)$.

Choice A is incorrect. This is the *x*-intercept, not the *y*-intercept, of the graph of $y = f(x)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 0eae6be1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 0eae6be1

The number y is 84 less than the number x. Which equation represents the relationship between x and y?

A. $y = x + 84$

B. $y = \frac{1}{84}x$

C. $y = 84x$

D. $y = x - 84$

ID: 0eae6be1 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the number y is 84 less than the number x. A number that's 84 less than the number x is equivalent to 84 subtracted from the number x, or $x - 84$. Therefore, the equation $y = x - 84$ represents the relationship between x and y.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 361f97c7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 361f97c7

The function f is defined by $f(x) = 4x - 3$. What is the value of $f(10)$?

A. -30

B. 37

C. 40

D. 43

ID: 361f97c7 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the function f is defined by $f(x) = 4x - 3$. Substituting 10 for x in the given function yields $f(10) = 4(10) - 3$, which is equivalent to $f(10) = 40 - 3$, or $f(10) = 37$. Therefore, the value of $f(10)$ is 37.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x$, not $f(x) = 4x - 3$.

Choice D is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x + 3$, not $f(x) = 4x - 3$.

Question Difficulty: Easy

Question ID 447fa970

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 447fa970

The function f is defined by the equation $f(x) = 7x + 2$. What is the value of $f(x)$ when $x = 4$?

ID: 447fa970 Answer

Correct Answer: 30

Rationale

The correct answer is 30. The value of $f(x)$ when $x = 4$ can be found by substituting 4 for x in the given equation $f(x) = 7x + 2$. This yields $f(4) = 7(4) + 2$, or $f(4) = 30$. Therefore, when $x = 4$, the value of $f(x)$ is 30.

Question Difficulty: Easy

Question ID 0dd6227f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 0dd6227f

At how many points do the graphs of the equations $y = x + 20$ and $y = 8x$ intersect in the *xy*-plane?

A. 0

B. 1

C. 2

D. 8

ID: 0dd6227f Answer

Correct Answer: B

Rationale

Choice B is correct. Each given equation is written in slope-intercept form, $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of the equation in the *xy*-plane. The graphs of two lines that have different slopes will intersect at exactly one point. The graph of the first equation is a line with slope 1. The graph of the second equation is a line with slope 8. Since the graphs are lines with different slopes, they will intersect at exactly one point.

Choice A is incorrect because two graphs of linear equations have 0 intersection points only if they are parallel and therefore have the same slope.

Choice C is incorrect because two graphs of linear equations in the *xy*-plane can have only 0, 1, or infinitely many points of intersection.

Choice D is incorrect because two graphs of linear equations in the *xy*-plane can have only 0, 1, or infinitely many points of intersection.

Question Difficulty: Medium

Question ID b1228811

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: b1228811

Marisa needs to hire at least 10 staff members for an upcoming project. The staff members will be made up of junior directors, who will be paid $640 per week, and senior directors, who will be paid $880 per week. Her budget for paying the staff members is no more than $9,700 per week. She must hire at least 3 junior directors and at least 1 senior director. Which of the following systems of inequalities represents the conditions described if x is the number of junior directors and y is the number of senior directors?

A. $640x + 880y \geq 9{,}700$
$x + y \leq 10$
$x \geq 3$
$y \geq 1$

B. $640x + 880y \leq 9{,}700$
$x + y \geq 10$
$x \geq 3$
$y \geq 1$

C. $640x + 880y \geq 9{,}700$
$x + y \geq 10$
$x \leq 3$
$y \leq 1$

D. $640x + 880y \leq 9{,}700$
$x + y \leq 10$
$x \leq 3$
$y \leq 1$

ID: b1228811 Answer

Correct Answer: B

Rationale

Choice B is correct. Marisa will hire x junior directors and y senior directors. Since she needs to hire at least 10 staff members, $x + y \geq 10$. Each junior director will be paid $640 per week, and each senior director will be paid $880 per week. Marisa's budget for paying the new staff is no more than $9,700 per week; in terms of x and y, this condition is $640x + 880y \leq 9{,}700$. Since Marisa must hire at least 3 junior directors and at least 1 senior director, it follows that $x \geq 3$ and $y \geq 1$. All four of these conditions are represented correctly in choice B.

Choices A and C are incorrect. For example, the first condition, $640x + 880y \geq 9{,}700$, in each of these options implies that Marisa can pay the new staff members more than her budget of $9,700. Choice D is incorrect because Marisa needs to hire at least 10 staff members, not at most 10 staff members, as the inequality $x + y \leq 10$ implies.

Question Difficulty: Medium

Question ID 9e5863bd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 9e5863bd

For a snowstorm in a certain town, the minimum rate of snowfall recorded was 0.6 inches per hour, and the maximum rate of snowfall recorded was 1.8 inches per hour. Which inequality is true for all values of s, where s represents a rate of snowfall, in inches per hour, recorded for this snowstorm?

A. $s \geq 2.4$

B. $s \geq 1.8$

C. $0 \leq s \leq 0.6$

D. $0.6 \leq s \leq 1.8$

ID: 9e5863bd Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that for a snowstorm in a certain town, the minimum rate of snowfall recorded was 0.6 inches per hour, the maximum rate of snowfall recorded was 1.8 inches per hour, and s represents a rate of snowfall, in inches per hour, recorded for this snowstorm. It follows that the inequality $0.6 \leq s \leq 1.8$ is true for all values of s.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 842cec4d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 842cec4d

During a portion of a flight, a small airplane's cruising speed varied between 150 miles per hour and 170 miles per hour. Which inequality best represents this situation, where s is the cruising speed, in miles per hour, during this portion of the flight?

A. $s \leq 20$

B. $s \leq 150$

C. $s \leq 170$

D. $150 \leq s \leq 170$

ID: 842cec4d Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that during a portion of a flight, a small airplane's cruising speed varied between 150 miles per hour and 170 miles per hour. It's also given that s represents the cruising speed, in miles per hour, during this portion of the flight. It follows that the airplane's cruising speed, in miles per hour, was at least 150, which means $s \geq 150$, and was at most 170, which means $s \leq 170$. Therefore, the inequality that best represents this situation is $150 \leq s \leq 170$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 6105234d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 6105234d

John paid a total of $\$165$ for a microscope by making a down payment of $\$37$ plus p monthly payments of $\$16$ each. Which of the following equations represents this situation?

A. $16p - 37 = 165$

B. $37p - 16 = 165$

C. $16p + 37 = 165$

D. $37p + 16 = 165$

ID: 6105234d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that John made a $\$16$ payment each month for p months. The total amount of these payments can be represented by the expression $16p$. The down payment can be added to that amount to find the total amount John paid, yielding the expression $16p + 37$. It's given that John paid a total of $\$165$. Therefore, the expression for the total amount John paid can be set equal to that amount, yielding the equation $16p + 37 = 165$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7efe5495

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 7efe5495

$y = 3x$ $2x + y = 12$ The solution to the given system of equations is (x, y). What is the value of $5x$?

A. 24

B. 15

C. 12

D. 5

ID: 7efe5495 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given by the first equation in the system that $y = 3x$. Substituting $3x$ for y in the equation $2x + y = 12$ yields $2x + 3x = 12$, or $5x = 12$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 2c121b25

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 2c121b25

Valentina bought two containers of beads. In the first container 30% of the beads are red, and in the second container 70% of the beads are red. Together, the containers have at least 400 red beads. Which inequality shows this relationship, where x is the total number of beads in the first container and y is the total number of beads in the second container?

A. $0.3x + 0.7y \geq 400$

B. $0.7x + 0.3y \leq 400$

C. $\frac{x}{3} + \frac{y}{7} \leq 400$

D. $30x + 70y \geq 400$

ID: 2c121b25 Answer

Correct Answer: A

Rationale

Choice A is correct. It is given that x is the total number of beads in the first container and that 30% of those beads are red; therefore, the expression 0.3x represents the number of red beads in the first container. It is given that y is the total number of beads in the second container and that 70% of those beads are red; therefore, the expression 0.7y represents the number of red beads in the second container. It is also given that, together, the containers have at least 400 red beads, so the inequality that shows this relationship is $0.3x + 0.7y \geq 400$.

Choice B is incorrect because it represents the containers having a total of at most, rather than at least, 400 red beads. Choice C is incorrect and may be the result of misunderstanding how to represent a percentage of beads in each container. Also, the inequality shows the containers having a combined total of at most, rather than at least, 400 red beads. Choice D is incorrect because the percentages were not converted to decimals.

Question Difficulty: Easy

Question ID 83f2c3bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 83f2c3bf

$y = x + 4$ Which table gives three values of x and their corresponding values of y for the given equation?

A.

x	y
0	4
1	5
2	6

B.

x	y
0	6
1	5
2	4

C.

x	y
0	2
1	1
2	0

D.

x	y
0	0
1	1
2	2

ID: 83f2c3bf Answer

Correct Answer: A

Rationale

Choice A is correct. Substituting 0 for x into the given equation yields $y = 0 + 4$, or $y = 4$. Therefore, when $x = 0$, the corresponding value of y for the given equation is 4. Substituting 1 for x into the given equation yields $y = 1 + 4$, or $y = 5$. Therefore, when $x = 1$, the corresponding value of y for the given equation is 5. Substituting 2 for x into the given equation yields $y = 2 + 4$, or $y = 6$. Therefore, when $x = 2$, the corresponding value of y for the given equation is 6. Of the choices given, only the table in choice A gives these three values of x and their corresponding values of y for the given equation.

Choice B is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = -x + 6$.

Choice C is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = -x + 2$.

Choice D is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = x$.

Question Difficulty: Easy

Question ID 27198699

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 27198699

As part of a science project on evaporation, Amaya measured the height of a liquid in a container over a period of time. The function $f(x) = 33 - 0.18x$ gives the estimated height, in centimeters (cm), of the liquid in the container x days after the start of the project. Which of the following is the best interpretation of 33 in this context?

A. The estimated height, in cm, of the liquid at the start of the project

B. The estimated height, in cm, of the liquid at the end of the project

C. The estimated change in the height, in cm, of the liquid each day

D. The estimated number of days for all of the liquid to evaporate

ID: 27198699 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function $f(x) = 33 - 0.18x$ gives the estimated height, in centimeters (cm), of the liquid in the container x days after the start of the project. For a linear function in the form $f(x) = a + bx$, where a and b are constants, a represents the value of $f(0)$ and b represents the rate of change of the function. It follows that in the given function, 33 represents the value of $f(0)$. Therefore, the best interpretation of 33 in this context is the estimated height, in cm, of the liquid at the start of the project.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. The estimated change in the height, in cm, of the liquid each day is 0.18, not 33.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID b5f62071

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: b5f62071

$48x - 64y = 48y + 24$ $ry = \frac{1}{8} - 12x$

In the given system of equations, r is a constant. If the system has no solution, what is the value of r?

ID: b5f62071 Answer

Correct Answer: -28

Rationale

The correct answer is -28. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in the form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients for x and y in the other equation. The first equation in the given system, $48x - 64y = 48y + 24$, can be written in the form $Ax + By = C$ by subtracting $48y$ from both sides of the equation to yield $48x - 112y = 24$. The second equation in the given system, $ry = \frac{1}{8} - 12x$, can be written in the form $Ax + By = C$ by adding $12x$ to both sides of the equation to yield $12x + ry = \frac{1}{8}$. The coefficient of x in the second equation is $\frac{1}{4}$ times the coefficient of x in the first equation. That is, $48\left(\frac{1}{4}\right) = 12$. For the lines to be parallel, the coefficient of y in the second equation must also be $\frac{1}{4}$ times the coefficient of y in the first equation. Therefore, $-112\left(\frac{1}{4}\right) = r$, or $-28 = r$. Thus, if the given system has no solution, the value of r is -28.

Question Difficulty: Hard

Question ID c50ede6d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: c50ede6d

The total cost, in dollars, to rent a surfboard consists of a $\$25$ service fee and a $\$10$ per hour rental fee. A person rents a surfboard for t hours and intends to spend a maximum of $\$75$ to rent the surfboard. Which inequality represents this situation?

A. $10t \leq 75$

B. $10 + 25t \leq 75$

C. $25t \leq 75$

D. $25 + 10t \leq 75$

ID: c50ede6d Answer

Correct Answer: D

Rationale

Choice D is correct. The cost of the rental fee depends on the number of hours the surfboard is rented. Multiplying t hours by 10 dollars per hour yields a rental fee of $10t$ dollars. The total cost of the rental consists of the rental fee plus the 25 dollar service fee, which yields a total cost of $25 + 10t$ dollars. Since the person intends to spend a maximum of 75 dollars to rent the surfboard, the total cost must be at most 75 dollars. Therefore, the inequality $25 + 10t \leq 75$ represents this situation.

Choice A is incorrect. This represents a situation where the rental fee, not the total cost, is at most 75 dollars.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c1bd5301

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: c1bd5301

A model predicts that a certain animal weighed 241 pounds when it was born and that the animal gained 3 pounds per day in its first year of life. This model is defined by an equation in the form $f(x) = a + bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. What is the value of a?

ID: c1bd5301 Answer

Correct Answer: 241

Rationale

The correct answer is 241. For a certain animal, it's given that a model predicts the animal weighed 241 pounds when it was born and gained 3 pounds per day in its first year of life. It's also given that this model is defined by an equation in the form $f(x) = a + bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. It follows that a represents the predicted weight, in pounds, of the animal when it was born and b represents the predicted rate of weight gain, in pounds per day, in its first year of life. Thus, the value of a is 241.

Question Difficulty: Medium

Question ID b23bba4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b23bba4c

$3a+4b=25$

A shipping company charged a customer $25 to ship some small boxes and some large boxes. The equation above represents the relationship between *a*, the number of small boxes, and *b*, the number of large boxes, the customer had shipped. If the customer had 3 small boxes shipped, how many large boxes were shipped?

A. 3

B. 4

C. 5

D. 6

ID: b23bba4c Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that a represents the number of small boxes and b represents the number of large boxes the customer had shipped. If the customer had 3 small boxes shipped, then $a=3$. Substituting 3 for a in the equation $3a+4b=25$ yields $3(3)+4b=25$ or $9+4b=25$. Subtracting 9 from both sides of the equation yields $4b=16$. Dividing both sides of this equation by 4 yields $b=4$. Therefore, the customer had 4 large boxes shipped.

Choices A, C, and D are incorrect. If the number of large boxes shipped is 3, then $b=3$. Substituting 3 for b in the given equation yields $3a+4(3)=25$ or $3a+12=25$. Subtracting 12 from both sides of the equation and then dividing by 3 yields $a=\frac{13}{3}$. However, it's given that the number of small boxes shipped, a, is 3, not $\frac{13}{3}$, so b cannot equal 3. Similarly, if $b=5$ or $b=6$, then $a=\frac{5}{3}$ or $a=\frac{1}{3}$, respectively, which is also not true.

Question Difficulty: Easy

Question ID 24854644

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 24854644

What is the equation of the line that passes through the point $(0, 5)$ and is parallel to the graph of $y = 7x + 4$ in the *xy*-plane?

A. $y = 5x$

B. $y = 7x + 5$

C. $y = 7x$

D. $y = 5x + 7$

ID: 24854644 Answer

Correct Answer: B

Rationale

Choice B is correct. The equation of a line in the *xy*-plane can be written in slope-intercept form $y = mx + b$, where m is the slope of the line and $(0, b)$ is its *y*-intercept. It's given that the line passes through the point $(0, 5)$. Therefore, $b = 5$. It's also given that the line is parallel to the graph of $y = 7x + 4$, which means the line has the same slope as the graph of $y = 7x + 4$. The slope of the graph of $y = 7x + 4$ is 7. Therefore, $m = 7$. Substituting 7 for m and 5 for b in the equation $y = mx + b$ yields $y = 7x + 5$.

Choice A is incorrect. The graph of this equation passes through the point $(0, 0)$, not $(0, 5)$, and has a slope of 5, not 7.

Choice C is incorrect. The graph of this equation passes through the point $(0, 0)$, not $(0, 5)$.

Choice D is incorrect. The graph of this equation passes through the point $(0, 7)$, not $(0, 5)$, and has a slope of 5, not 7.

Question Difficulty: Easy

Question ID 71189542

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 71189542

A group of 202 people went on an overnight camping trip, taking 60 tents with them. Some of the tents held 2 people each, and the rest held 4 people each. Assuming all the tents were filled to capacity and every person got to sleep in a tent, exactly how many of the tents were 2-person tents?

A. 30

B. 20

C. 19

D. 18

ID: 71189542 Answer

Correct Answer: C

Rationale

Choice C is correct. Let x represent the number of 2-person tents and let y represent the number of 4-person tents. It is given that the total number of tents was 60 and the total number of people in the group was 202. This situation can be expressed as a system of two equations, $x+y=60$ and $2x+4y=202$. The first equation can be rewritten as $y=-x+60$. Substituting $-x+60$ for y in the equation $2x+4y=202$ yields $2x+4(-x+60)=202$. Distributing and combining like terms gives $-2x+240=202$. Subtracting 240 from both sides of $-2x+240=202$ and then dividing both sides by -2 gives $x=19$. Therefore, the number of 2-person tents is 19.

Alternate approach: If each of the 60 tents held 4 people, the total number of people that could be accommodated in tents would be 240. However, the actual number of people who slept in tents was 202. The difference of 38 accounts for the 2-person tents. Since each of these tents holds 2 people fewer than a 4-person tent, $\frac{38}{2}=19$ gives the number of 2-person tents.

Choice A is incorrect. This choice may result from assuming exactly half of the tents hold 2 people. If that were true, then the total number of people who slept in tents would be $2(30)+4(30)=180$; however, the total number of people who slept in tents was 202, not 180. Choice B is incorrect. If 20 tents were 2-person tents, then the remaining 40 tents would be 4-person tents. Since all the tents were filled to capacity, the total number of people who slept in tents would be $2(20)+4(40)=40+160=200$; however, the total number of people who slept in tents was 202, not 200. Choice D is incorrect. If 18 tents were 2-person tents, then the remaining 42 tents would be 4-person tents. Since all the tents were filled to capacity, the total number of people who slept in tents would be $2(18)+4(42)=36+168=204$; however, the total number of people who slept in tents was 202, not 204.

Question Difficulty: Medium

Question ID dba8d38a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: dba8d38a

A petting zoo sells two types of tickets. The standard ticket, for admission only, costs $5. The premium ticket, which includes admission and food to give to the animals, costs $12. One Saturday, the petting zoo sold a total of 250 tickets and collected a total of $2,300 from ticket sales. Which of the following systems of equations can be used to find the number of standard tickets, s, and premium tickets, p, sold on that Saturday?

A. $\begin{aligned} s+p&=250 \\ 5s+12p&=2{,}300 \end{aligned}$

B. $\begin{aligned} s+p&=250 \\ 12s+5p&=2{,}300 \end{aligned}$

C. $\begin{aligned} 5s+12p&=250 \\ s+p&=2{,}300 \end{aligned}$

D. $\begin{aligned} 12s+5p&=250 \\ s+p&=2{,}300 \end{aligned}$

ID: dba8d38a Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the petting zoo sells two types of tickets, standard and premium, and that s represents the number of standard tickets sold and p represents the number of premium tickets sold. It's also given that the petting zoo sold 250 tickets on one Saturday; thus, $s+p=250$. It's also given that each standard ticket costs $5 and each premium ticket costs $12. Thus, the amount collected in ticket sales can be represented by $5s$ for standard tickets and $12p$ for premium tickets. On that Saturday the petting zoo collected a total of $2,300 from ticket sales; thus, $5s+12p=2{,}300$. These two equations are correctly represented in choice A.

Choice B is incorrect. The second equation in the system represents the cost per standard ticket as $12, not $5, and the cost per premium ticket as $5, not $12. Choices C and D are incorrect. The equations represent the total collected from standard and premium ticket sales as $250, not $2,300, and the total number of standard and premium tickets sold as $2,300, not $250. Additionally, the first equation in choice D represents the cost per standard ticket as $12, not $5, and the cost per premium ticket as $5, not $12.

Question Difficulty: Easy

Question ID 64c85440

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 64c85440

In North America, the standard width of a parking space is at least 7.5 feet and no more than 9.0 feet. A restaurant owner recently resurfaced the restaurant's parking lot and wants to determine the number of parking spaces, n, in the parking lot that could be placed perpendicular to a curb that is 135 feet long, based on the standard width of a parking space. Which of the following describes all the possible values of n ?

A. $18 \leq n \leq 135$

B. $7.5 \leq n \leq 9$

C. $15 \leq n \leq 135$

D. $15 \leq n \leq 18$

ID: 64c85440 Answer

Correct Answer: D

Rationale

Choice D is correct. Placing the parking spaces with the minimum width of 7.5 feet gives the maximum possible number of parking spaces. Thus, the maximum number that can be placed perpendicular to a 135-foot-long curb is $\frac{135}{7.5} = 18$. Placing the parking spaces with the maximum width of 9 feet gives the minimum number of parking spaces. Thus, the minimum number that can be placed perpendicular to a 135-foot-long curb is $\frac{135}{9} = 15$. Therefore, if n is the number of parking spaces in the lot, the range of possible values for n is $15 \leq n \leq 18$.

Choices A and C are incorrect. These choices equate the length of the curb with the maximum possible number of parking spaces. Choice B is incorrect. This is the range of possible values for the width of a parking space instead of the range of possible values for the number of parking spaces.

Question Difficulty: Medium

Question ID 0c541d87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 0c541d87

Two customers purchased the same kind of bread and eggs at a store. The first customer paid 12.45 dollars for 1 loaf of bread and 2 dozen eggs. The second customer paid 19.42 dollars for 4 loaves of bread and 1 dozen eggs. What is the cost, in dollars, of 1 dozen eggs?

A. 3.77

B. 3.88

C. 4.15

D. 4.34

ID: 0c541d87 Answer

Correct Answer: D

Rationale

Choice D is correct. Let ℓ represent the cost, in dollars, of 1 loaf of bread, and let d represent the cost, in dollars, of 1 dozen eggs. It's given that the first customer paid 12.45 dollars for 1 loaf of bread and 2 dozen eggs. Therefore, the first customer's purchase can be represented by the equation $\ell + 2d = 12.45$. It's also given that the second customer paid 19.42 dollars for 4 loaves of bread and 1 dozen eggs. Therefore, the second customer's purchase can be represented by the equation $4\ell + d = 19.42$. The equations $\ell + 2d = 12.45$ and $4\ell + d = 19.42$ form a system of linear equations, which can be solved by elimination to find the value of d. Multiplying the first equation in the system by -4 yields $-4\ell - 8d = -49.8$. Adding $-4\ell - 8d = -49.8$ to the second equation, $4\ell + d = 19.42$, yields $(-4\ell + 4\ell) + (-8d + d) = (-49.8 + 19.42)$, which is equivalent to $-7d = -30.38$. Dividing both sides of this equation by -7 yields $d = 4.34$. Therefore, the cost, in dollars, of 1 dozen eggs is 4.34.

Choice A is incorrect. This is the cost, in dollars, of 1 loaf of bread.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 87322577

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 87322577

$x + y = 75$

The equation above relates the number of minutes, x, Maria spends running each day and the number of minutes, y, she spends biking each day. In the equation, what does the number 75 represent?

A. The number of minutes spent running each day

B. The number of minutes spent biking each day

C. The total number of minutes spent running and biking each day

D. The number of minutes spent biking for each minute spent running

ID: 87322577 Answer

Correct Answer: C

Rationale

Choice C is correct. Maria spends x minutes running each day and y minutes biking each day. Therefore, $x + y$ represents the total number of minutes Maria spent running and biking each day. Because $x + y = 75$, it follows that 75 is the total number of minutes that Maria spent running and biking each day.

Choices A and B are incorrect. The number of minutes Maria spent running each day is represented by x and need not be 75. Similarly, the number of minutes that Maria spends biking each day is represented by y and need not be 75. The number of minutes Maria spends running each day and biking each day may vary; however, the total number of minutes she spends each day on these activities is constant and equal to 75. Choice D is incorrect. The number of minutes Maria spent biking for each minute spent running cannot be determined from the information provided.

Question Difficulty: Easy

Question ID 5c94e6fa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 5c94e6fa

$3x + 21 = 3x + k$

In the given equation, k is a constant. The equation has infinitely many solutions. What is the value of k?

ID: 5c94e6fa Answer

Correct Answer: 21

Rationale

The correct answer is 21. It's given that the equation $3x + 21 = 3x + k$ has infinitely many solutions. If an equation in one variable has infinitely many solutions, then the equation is true for any value of the variable. Subtracting $3x$ from both sides of the given equation yields $k = 21$. Since this equation must be true for any value of x, the value of k is 21.

Question Difficulty: Easy

Question ID a130fcdc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a130fcdc

$g(x) = 11x + 4$

For the given linear function g, which table shows three values of x and their corresponding values of $g(x)$?

A.

x	$g(x)$
-1	7
0	11
1	15

B.

x	$g(x)$
-1	-4
0	0
1	4

C.

x	$g(x)$
-1	-7
0	4
1	15

D.

x	$g(x)$
-1	-11
0	0
1	11

ID: a130fcdc Answer

Correct Answer: C

Rationale

Choice C is correct. Each of the tables shows the same three values of x: -1, 0, and 1. Substituting -1 for x in the given function yields $g(-1) = 11(-1) + 4$, or $g(-1) = -7$. Therefore, when $x = -1$, the corresponding value of $g(x)$ is -7. Substituting 0 for x in the given function yields $g(0) = 11(0) + 4$, or $g(0) = 4$. Therefore, when $x = 0$, the corresponding value of $g(x)$ is 4. Substituting 1 for x in the given function yields $g(1) = 11(1) + 4$, or $g(1) = 15$. Therefore, when $x = 1$, the corresponding value of $g(x)$ is 15. The table in choice C shows -7, 4, and 15 as the corresponding value of $g(x)$ for *x*-values of -1, 0, and 1, respectively. Therefore, the table in choice C shows three values of x and their corresponding values of $g(x)$.

Choice A is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 4x + 11$.

Choice B is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 4x$.

Choice D is incorrect. This table shows three values of x and their corresponding values of $g(x)$ for the linear function $g(x) = 11x$.

Question Difficulty: Easy

Question ID 7a5a74a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 7a5a74a6

$$3(2x-6)-11=4(x-3)+6$$

If x is the solution to the equation above, what is the value of $x-3$?

A. $\frac{23}{2}$

B. $\frac{17}{2}$

C. $\frac{15}{2}$

D. $-\frac{15}{2}$

ID: 7a5a74a6 Answer

Correct Answer: B

Rationale

Choice B is correct. Because 2 is a factor of both $2x$ and 6, the expression $2x-6$ can be rewritten as $2(x-3)$. Substituting $2(x-3)$ for $(2x-6)$ on the left-hand side of the given equation yields $3(2)(x-3)-11=4(x-3)+6$, or $6(x-3)-11=4(x-3)+6$. Subtracting $4(x-3)$ from both sides of this equation yields $2(x-3)-11=6$. Adding 11 to both sides of this equation yields $2(x-3)=17$. Dividing both sides of this equation by 2 yields $x-3=\frac{17}{2}$.

Alternate approach: Distributing 3 to the quantity $(2x-6)$ on the left-hand side of the given equation and distributing 4 to the quantity $(x-3)$ on the right-hand side yields $6x-18-11=4x-12+6$, or $6x-29=4x-6$. Subtracting $4x$ from both sides of this equation yields $2x-29=-6$. Adding 29 to both sides of this equation yields $2x=23$. Dividing both sides of this equation by 2 yields $x=\frac{23}{2}$. Therefore, the value of $x-3$ is $\frac{23}{2}-3$, or $\frac{17}{2}$.

Choice A is incorrect. This is the value of x, not $x-3$. Choices C and D are incorrect. If the value of $x-3$ is $\frac{15}{2}$ or $-\frac{15}{2}$, it follows that the value of x is $\frac{21}{2}$ or $-\frac{9}{2}$, respectively. However, solving the given equation for x yields $x=\frac{23}{2}$. Therefore, the value of $x-3$ can't be $\frac{15}{2}$ or $-\frac{15}{2}$.

Question Difficulty: Medium

Question ID f5563c26

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: f5563c26

$y = 4$ $x = y + 6$ The solution to the given system of equations is (x, y). What is the value of x?

A. 10

B. 6

C. 4

D. 2

ID: f5563c26 Answer

Correct Answer: A

Rationale

Choice A is correct. According to the first equation in the given system, $y = 4$. Substituting 4 for y in the second equation in the given system yields $x = 4 + 6$, or $x = 10$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of y, not x.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 38bf4e04

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 38bf4e04

A factory makes 9-inch, 7-inch, and 4-inch concrete screws. During a certain day, the number of 9-inch concrete screws that the factory makes is 5 times the number n of 7-inch concrete screws, and the number of 4-inch concrete screws is 22. During this day, the factory makes 100 concrete screws total. Which equation represents this situation?

A. $9(5n) + 7n + 4(22) = 100$

B. $9n + 7n + 4n = 100$

C. $5n + 22 = 100$

D. $6n + 22 = 100$

ID: 38bf4e04 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that during a certain day at a factory, the number of 7-inch concrete screws the factory makes is n and the number of 4-inch concrete screws the factory makes is 22. It's also given that during this day the number of 9-inch concrete screws the factory makes is 5 times the number of 7-inch concrete screws, or $5n$. Therefore, the total number of 7-inch, 9-inch, and 4-inch concrete screws is $n + 5n + 22$, or $6n + 22$. It's given that during this day, the factory makes 100 concrete screws total. Thus, the equation $6n + 22 = 100$ represents this situation.

Choice A is incorrect. This equation represents a situation where the total length, in inches, of all the concrete screws, rather than the total number of concrete screws, is 100.

Choice B is incorrect and may result from conceptual or calculation errors.

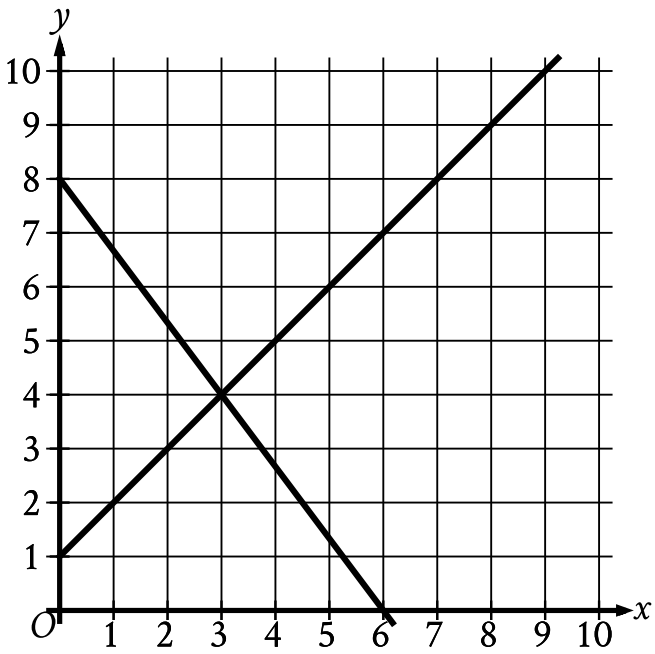
Choice C is incorrect. This equation represents a situation where the total number of 9-inch concrete screws and 4-inch concrete screws, not including the 7-inch concrete screws, is 100.

Question Difficulty: Hard

Question ID e6545fa8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: e6545fa8



The graph of a system of linear equations is shown. What is the solution (x, y) to the system?

A. $(2, 3)$

B. $(3, 4)$

C. $(4, 5)$

D. $(5, 6)$

ID: e6545fa8 Answer

Correct Answer: B

Rationale

Choice B is correct. If a point (x, y) lies on both lines in the graph of a system of two linear equations, the ordered pair (x, y) is a solution to the system. The graph shown is the graph of a system of two linear equations, where the two lines in the graph intersect at the point $(3, 4)$. Therefore, the point $(3, 4)$ lies on both lines, so the ordered pair $(3, 4)$ is the solution to the system.

Choice A is incorrect. The point $(2, 3)$ lies on one, not both, of the lines in the graph shown.

Choice C is incorrect. The point $(4, 5)$ lies on one, not both, of the lines in the graph shown.

Choice D is incorrect. The point $(5, 6)$ lies on one, not both, of the lines in the graph shown.

Question Difficulty: Easy

Question ID b7e6394d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: b7e6394d

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, *m*, he should drive each week?

A. $\frac{25}{4}m = 95$

B. $\frac{25}{4}m = 5$

C. $\frac{4}{25}m = 95$

D. $\frac{4}{25}m = 5$

ID: b7e6394d Answer

Correct Answer: D

Rationale

Choice D is correct. Since gasoline costs $4 per gallon, and since Alan's car travels an average of 25 miles per gallon, the expression $\frac{4}{25}$ gives the cost, in dollars per mile, to drive the car. Multiplying $\frac{4}{25}$ by m gives the cost for Alan to drive m miles in his car. Alan wants to reduce his weekly spending by $5, so setting $\frac{4}{25}$ m equal to 5 gives the number of miles, m, by which he must reduce his driving.

Choices A, B, and C are incorrect. Choices A and B transpose the numerator and the denominator in the fraction. The fraction $\frac{25}{4}$ would result in the unit miles per dollar, but the question requires a unit of dollars per mile. Choices A and C set the expression equal to 95 instead of 5, a mistake that may result from a misconception that Alan wants to reduce his driving by 5 miles each week; instead, the question says he wants to reduce his weekly expenditure by $5.

Question Difficulty: Hard

Question ID 95cad55f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 95cad55f

A laundry service is buying detergent and fabric softener from its supplier. The supplier will deliver no more than 300 pounds in a shipment. Each container of detergent weighs 7.35 pounds, and each container of fabric softener weighs 6.2 pounds. The service wants to buy at least twice as many containers of detergent as containers of fabric softener. Let d represent the number of containers of detergent, and let s represent the number of containers of fabric softener, where d and s are nonnegative integers. Which of the following systems of inequalities best represents this situation?

A. $7.35d + 6.2s \leq 300$
$d \geq 2s$

B. $7.35d + 6.2s \leq 300$
$2d \geq s$

C. $14.7d + 6.2s \leq 300$
$d \geq 2s$

D. $14.7d + 6.2s \leq 300$
$2d \geq s$

ID: 95cad55f Answer

Correct Answer: A

Rationale

Choice A is correct. The number of containers in a shipment must have a weight less than or equal to 300 pounds. The total weight, in pounds, of detergent and fabric softener that the supplier delivers can be expressed as the weight of each container multiplied by the number of each type of container, which is 7.35d for detergent and 6.2s for fabric softener. Since this total cannot exceed 300 pounds, it follows that $7.35d + 6.2s \leq 300$. Also, since the laundry service wants to buy at least twice as many containers of detergent as containers of fabric softener, the number of containers of detergent should be greater than or equal to two times the number of containers of fabric softener. This can be expressed by the inequality $d \geq 2s$.

Choice B is incorrect because it misrepresents the relationship between the numbers of each container that the laundry service wants to buy. Choice C is incorrect because the first inequality of the system incorrectly doubles the weight per container of detergent. The weight of each container of detergent is 7.35, not 14.7 pounds. Choice D is incorrect because it doubles the weight per container of detergent and transposes the relationship between the numbers of containers.

Question Difficulty: Hard

Question ID bf36c815

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: bf36c815

The function g is defined by $g(x) = -x + 8$.

What is the value of $g(0)$?

A. -8

B. 0

C. 4

D. 8

ID: bf36c815 Answer

Correct Answer: D

Rationale

Choice D is correct. The value of $g(0)$ is found by substituting 0 for x in the function g. This yields $g(0) = -0 + 8$, which can be rewritten as $g(0) = 8$.

Choice A is incorrect and may result from misinterpreting the equation as $g(x) = x + (-8)$ instead of $g(x) = -x + 8$. Choice B is incorrect. This is the value of x, not $g(x)$. Choice C is incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID 968e9e51

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 968e9e51

$y \leq xy \leq -x$

Which of the following ordered pairs (x,y) is a solution to the system of inequalities above?

A. $(1,0)$

B. $(-1,0)$

C. $(0,1)$

D. $(0,-1)$

ID: 968e9e51 Answer

Correct Answer: D

Rationale

Choice D is correct. The solutions to the given system of inequalities is the set of all ordered pairs (x,y) that satisfy both inequalities in the system. For an ordered pair to satisfy the inequality $y \leq x$, the value of the ordered pair's y-coordinate must be less than or equal to the value of the ordered pair's x-coordinate. This is true of the ordered pair $(0,-1)$, because $-1 \leq 0$. To satisfy the inequality $y \leq -x$, the value of the ordered pair's y-coordinate must be less than or equal to the value of the additive inverse of the ordered pair's x-coordinate. This is also true of the ordered pair $(0,-1)$. Because 0 is its own additive inverse, $-1 \leq -(0)$ is the same as $-1 \leq 0$. Therefore, the ordered pair $(0,-1)$ is a solution to the given system of inequalities.

Choice A is incorrect. This ordered pair satisfies only the inequality $y \leq x$ in the given system, not both inequalities. Choice B incorrect. This ordered pair satisfies only the inequality $y \leq -x$ in the system, but not both inequalities. Choice C is incorrect. This ordered pair satisfies neither inequality.

Question Difficulty: Medium

Question ID 9f3cb472

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 9f3cb472

Line t in the *xy*-plane has a slope of $-\frac{1}{3}$ and passes through the point $(9, 10)$. Which equation defines line t?

A. $y = 13x - \frac{1}{3}$

B. $y = 9x + 10$

C. $y = -\frac{x}{3} + 10$

D. $y = -\frac{x}{3} + 13$

ID: 9f3cb472 Answer

Correct Answer: D

Rationale

Choice D is correct. The equation that defines line t in the *xy*-plane can be written in slope-intercept form $y = mx + b$, where m is the slope of line t and $(0, b)$ is its *y*-intercept. It's given that line t has a slope of $-\frac{1}{3}$. Therefore, $m = -\frac{1}{3}$. Substituting $-\frac{1}{3}$ for m in the equation $y = mx + b$ yields $y = -\frac{1}{3}x + b$, or $y = -\frac{x}{3} + b$. It's also given that line t passes through the point $(9, 10)$. Substituting 9 for x and 10 for y in the equation $y = -\frac{x}{3} + b$ yields $10 = -\frac{9}{3} + b$, or $10 = -3 + b$. Adding 3 to both sides of this equation yields $13 = b$. Substituting 13 for b in the equation $y = -\frac{x}{3} + b$ yields $y = -\frac{x}{3} + 13$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This equation defines a line that has a slope of 9, not $-\frac{1}{3}$, and passes through the point $(0, 10)$, not $(9, 10)$.

Choice C is incorrect. This equation defines a line that passes through the point $(0, 10)$, not $(9, 10)$.

Question Difficulty: Medium

Question ID aa85b138

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: aa85b138

$2n+6=14$

A tree had a height of 6 feet when it was planted. The equation above can be used to find how many years n it took the tree to reach a height of 14 feet. Which of the following is the best interpretation of the number 2 in this context?

A. The number of years it took the tree to double its height

B. The average number of feet that the tree grew per year

C. The height, in feet, of the tree when the tree was 1 year old

D. The average number of years it takes similar trees to grow 14 feet

ID: aa85b138 Answer

Correct Answer: B

Rationale

Choice B is correct. The height of the tree at a given time is equal to its height when it was planted plus the number of feet that the tree grew. In the given equation, 14 represents the height of the tree at the given time, and 6 represents the height of the tree when it was planted. It follows that $2n$ represents the number of feet the tree grew from the time it was planted until the time it reached a height of 14 feet. Since n represents the number of years between the given time and the time the tree was planted, 2 must represent the average number of feet the tree grew each year.

Choice A is incorrect and may result from interpreting the coefficient 2 as doubling instead of as increasing by 2 each year. Choice C is incorrect. The height of the tree when it was 1 year old was $2(1)+6=8$ feet, not 2 feet. Choice D is incorrect. No information is given to connect the growth of one particular tree to the growth of similar trees.

Question Difficulty: Medium

Question ID 15daa8d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 15daa8d6

$2x + 16 = a(x + 8)$

In the given equation, a is a constant. If the equation has infinitely many solutions, what is the value of a?

ID: 15daa8d6 Answer

Correct Answer: 2

Rationale

The correct answer is 2. An equation with one variable, x, has infinitely many solutions only when both sides of the equation are equal for any defined value of x. It's given that $2x + 16 = a(x + 8)$, where a is a constant. This equation can be rewritten as $2(x + 8) = a(x + 8)$. If this equation has infinitely many solutions, then both sides of this equation are equal for any defined value of x. Both sides of this equation are equal for any defined value of x when $2 = a$. Therefore, if the equation has infinitely many solutions, the value of a is 2.

Alternate approach: If the given equation, $2x + 16 = a(x + 8)$, has infinitely many solutions, then both sides of this equation are equal for any value of x. If $x = 0$, then substituting 0 for x in $2x + 16 = a(x + 8)$ yields $2(0) + 16 = a(0 + 8)$, or $16 = 8a$. Dividing both sides of this equation by 8 yields $2 = a$.

Question Difficulty: Medium

Question ID d7c8ba0b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: d7c8ba0b

In the *xy*-plane, line t passes through the points $(0, 9)$ and $(1, 17)$. Which equation defines line t?

A. $y = \frac{1}{8}x + 9$

B. $y = x + \frac{1}{8}$

C. $y = x + 8$

D. $y = 8x + 9$

ID: d7c8ba0b Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining a line in the *xy*-plane can be written in the form $y = mx + b$, where m represents the slope and $(0, b)$ represents the *y*-intercept of the line. It's given that line t passes through the point $(0, 9)$; therefore, $b = 9$. The slope, m, of a line can be found using any two points on the line, (x_1, y_1) and (x_2, y_2), and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(0, 9)$ and $(1, 17)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{17 - 9}{1 - 0}$, or $m = 8$. Substituting 8 for m and 9 for b in the equation $y = mx + b$ yields $y = 8x + 9$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 2f0a43b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 2f0a43b2

If $\frac{x}{8} = 5$, what is the value of $\frac{8}{x}$?

ID: 2f0a43b2 Answer

Correct Answer: .2, 1/5

Rationale

The correct answer is $\frac{1}{5}$. Since the number 5 can also be written as $\frac{5}{1}$, the given equation can also be written as $\frac{x}{8} = \frac{5}{1}$. This equation is equivalent to $\frac{8}{x} = \frac{1}{5}$. Therefore, the value of $\frac{8}{x}$ is $\frac{1}{5}$. Note that 1/5 and .2 are examples of ways to enter a correct answer.

Alternate approach: Multiplying both sides of the equation $\frac{x}{8} = 5$ by 8 yields $x = 40$. Substituting 40 for x into the expression $\frac{8}{x}$ yields $\frac{8}{40}$, or $\frac{1}{5}$.

Question Difficulty: Easy

Question ID ebf8d2b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: ebf8d2b7

A machine makes large boxes or small boxes, one at a time, for a total of 700 minutes each day. It takes the machine 10 minutes to make a large box or 5 minutes to make a small box. Which equation represents the possible number of large boxes, x, and small boxes, y, the machine can make each day?

A. $5x + 10y = 700$

B. $10x + 5y = 700$

C. $(x + y)(10 + 5) = 700$

D. $(10 + x)(5 + y) = 700$

ID: ebf8d2b7 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that it takes the machine 10 minutes to make a large box. It's also given that x represents the possible number of large boxes the machine can make each day. Multiplying 10 by x gives $10x$, which represents the amount of time spent making large boxes. It's given that it takes the machine 5 minutes to make a small box. It's also given that y represents the possible number of small boxes the machine can make each day. Multiplying 5 by y gives $5y$, which represents the amount of time spent making small boxes. Combining the amount of time spent making x large boxes and y small boxes yields $10x + 5y$. It's given that the machine makes boxes for a total of 700 minutes each day. Therefore $10x + 5y = 700$ represents the possible number of large boxes, x, and small boxes, y, the machine can make each day.

Choice A is incorrect and may result from associating the time of 10 minutes with small, rather than large, boxes and the time of 5 minutes with large, rather than small, boxes.

Choice C is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 997bec28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 997bec28

The perimeter of an isosceles triangle is 83 inches. Each of the two congruent sides of the triangle has a length of 24 inches. What is the length, in inches, of the third side?

ID: 997bec28 Answer

Correct Answer: 35

Rationale

The correct answer is 35. It's given that the perimeter of an isosceles triangle is 83 inches and that each of the two congruent sides has a length of 24 inches. The perimeter of a triangle is the sum of the lengths of its three sides. The equation $24 + 24 + x = 83$ can be used to represent this situation, where x is the length, in inches, of the third side. Combining like terms on the left-hand side of this equation yields $48 + x = 83$. Subtracting 48 from both sides of this equation yields $x = 35$. Therefore, the length, in inches, of the third side is 35.

Question Difficulty: Easy

Question ID 40ba6288

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 40ba6288

If $3x = 30$, what is the value of $3x - 12$?

A. -2

B. 18

C. 22

D. 42

ID: 40ba6288 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 12 from each side of the given equation yields $3x - 12 = 30 - 12$, or $3x - 12 = 18$. Therefore, the value of $3x - 12$ is 18.

Choice A is incorrect. This is the value of $x - 12$, not $3x - 12$.

Choice C is incorrect. This is the value of $x + 12$, not $3x - 12$.

Choice D is incorrect. This is the value of $3x + 12$, not $3x - 12$.

Question Difficulty: Easy

Question ID 12ee1edc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 12ee1edc

$(b-2)x=8$

In the given equation, *b* is a constant. If the equation has no solution, what is the value of *b* ?

A. 2

B. 4

C. 6

D. 10

ID: 12ee1edc Answer

Correct Answer: A

Rationale

Choice A is correct. This equation has no solution when there is no value of x that produces a true statement. Solving the given equation for x by dividing both sides by $(b-2)$ gives $x=\frac{8}{(b-2)}$. When $(b-2)=0$, the right-hand side of this equation will be undefined, and the equation will have no solution. Therefore, when $b=2$, there is no value of x that satisfies the given equation.

Choices B, C, and D are incorrect. Substituting 4, 6, and 10 for b in the given equation yields exactly one solution, rather than no solution, for x. For example, substituting 4 for b in the given equation yields $(4-2)x=8$, or $2x=8$. Dividing both sides of $2x=8$ by 2 yields $x=4$. Similarly, if $b=6$ or $b=10$, $x=2$ and $x=1$, respectively.

Question Difficulty: Medium

Question ID 6fa1dc0f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 6fa1dc0f

Line r in the *xy*-plane has a slope of 4 and passes through the point $(0, 6)$. Which equation defines line r?

A. $y = -6x + 4$

B. $y = 6x + 4$

C. $y = 4x - 6$

D. $y = 4x + 6$

ID: 6fa1dc0f Answer

Correct Answer: D

Rationale

Choice D is correct. A line in the *xy*-plane with a slope of m and a *y*-intercept of $(0, b)$ can be defined by an equation in the form $y = mx + b$. It's given that line r has a slope of 4 and passes through the point $(0, 6)$. It follows that $m = 4$ and $b = 6$. Substituting 4 for m and 6 for b in the equation $y = mx + b$ yields $y = 4x + 6$. Therefore, the equation $y = 4x + 6$ defines line r.

Choice A is incorrect. This equation defines a line that has a slope of -6, not 4, and passes through the point $(0, 4)$, not $(0, 6)$.

Choice B is incorrect. This equation defines a line that has a slope of 6, not 4, and passes through the point $(0, 4)$, not $(0, 6)$.

Choice C is incorrect. This equation defines a line that passes through the point $(0, -6)$, not $(0, 6)$.

Question Difficulty: Easy

Question ID c6b151d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: c6b151d4

A total of 364 paper straws of equal length were used to construct two types of polygons: triangles and rectangles. The triangles and rectangles were constructed so that no two polygons had a common side. The equation $3x + 4y = 364$ represents this situation, where x is the number of triangles constructed and y is the number of rectangles constructed. What is the best interpretation of $(x, y) = (24, 73)$ in this context?

A. If 24 triangles were constructed, then 73 rectangles were constructed.

B. If 24 triangles were constructed, then 73 paper straws were used.

C. If 73 triangles were constructed, then 24 rectangles were constructed.

D. If 73 triangles were constructed, then 24 paper straws were used.

ID: c6b151d4 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that 364 paper straws of equal length were used to construct triangles and rectangles, where no two polygons had a common side. It's also given that the equation $3x + 4y = 364$ represents this situation, where x is the number of triangles constructed and y is the number of rectangles constructed. The equation $(x, y) = (24, 73)$ means that if $x = 24$, then $y = 73$. Substituting 24 for x and 73 for y in $3x + 4y = 364$ yields $3(24) + 4(73) = 364$, or $364 = 364$, which is true. Therefore, in this context, the equation $(x, y) = (24, 73)$ means that if 24 triangles were constructed, then 73 rectangles were constructed.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 0d391910

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 0d391910

The function f is defined by $f(x) = 4x$. For what value of x does $f(x) = 8$?

ID: 0d391910 Answer

Correct Answer: 2

Rationale

The correct answer is 2. Substituting 8 for $f(x)$ in the given equation yields $8 = 4x$. Dividing the left- and right-hand sides of this equation by 4 yields $x = 2$. Therefore, the value of x is 2 when $f(x) = 8$.

Question Difficulty: Easy

Question ID ee439cff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: ee439cff

On a car trip, Rhett and Jessica each drove for part of the trip, and the total distance they drove was under 220 miles. Rhett drove at an average speed of 35 miles per hour (mph), and Jessica drove at an average speed of 40 mph. Which of the following inequalities represents this situation, where r is the number of hours Rhett drove and j is the number of hours Jessica drove?

A. $35r + 40j > 220$

B. $35r + 40j < 220$

C. $40r + 35j > 220$

D. $40r + 35j < 220$

ID: ee439cff Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that Rhett drove at an average speed of 35 miles per hour and that he drove for r hours. Multiplying 35 miles per hour by r hours yields $35r$ miles, or the distance that Rhett drove. It's also given that Jessica drove at an average speed of 40 miles per hour and that she drove for j hours. Multiplying 40 miles per hour by j hours yields $40j$ miles, or the distance that Jessica drove. The total distance, in miles, that Rhett and Jessica drove can be represented by the expression $35r + 40j$. It's given that the total distance they drove was under 220 miles. Therefore, the inequality $35r + 40j < 220$ represents this situation.

Choice A is incorrect. This inequality represents a situation in which the total distance Rhett and Jessica drove was over, rather than under, 220 miles.

Choice C is incorrect. This inequality represents a situation in which Rhett drove at an average speed of 40, rather than 35, miles per hour, Jessica drove at an average speed of 35, rather than 40, miles per hour, and the total distance they drove was over, rather than under, 220 miles.

Choice D is incorrect. This inequality represents a situation in which Rhett drove at an average speed of 40, rather than 35, miles per hour, and Jessica drove at an average speed of 35, rather than 40, miles per hour.

Question Difficulty: Easy

Question ID ee2f611f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: ee2f611f

A local transit company sells a monthly pass for $95 that allows an unlimited number of trips of any length. Tickets for individual trips cost $1.50, $2.50, or $3.50, depending on the length of the trip. What is the minimum number of trips per month for which a monthly pass could cost less than purchasing individual tickets for trips?

ID: ee2f611f Answer

Rationale

The correct answer is 28. The minimum number of individual trips for which the cost of the monthly pass is less than the cost of individual tickets can be found by assuming the maximum cost of the individual tickets, $3.50. If n tickets costing $3.50 each are purchased in one month, the inequality $95 < 3.50n$ represents this situation. Dividing both sides of the inequality by 3.50 yields $27.14 < n$, which is equivalent to $n > 27.14$. Since only a whole number of tickets can be purchased, it follows that 28 is the minimum number of trips.

Question Difficulty: Hard

Question ID 8c98c834

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 8c98c834

The equation $y = 0.1x$ models the relationship between the number of different pieces of music a certain pianist practices, *y*, during an *x*-minute practice session. How many pieces did the pianist practice if the session lasted 30 minutes?

A. 1

B. 3

C. 10

D. 30

ID: 8c98c834 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $y = 0.1x$ models the relationship between the number of different pieces of music a certain pianist practices, y, and the number of minutes in a practice session, x. Since it's given that the session lasted 30 minutes, the number of pieces the pianist practiced can be found by substituting 30 for x in the given equation, which yields $y = 0.1(30)$, or $y = 3$.

Choices A and C are incorrect and may result from misinterpreting the values in the equation. Choice D is incorrect. This is the given value of x, not the value of y.

Question Difficulty: Easy

Question ID 563407e5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 563407e5

A bakery sells trays of cookies. Each tray contains at least 50 cookies but no more than 60. Which of the following could be the total number of cookies on 4 trays of cookies?

A. 165

B. 205

C. 245

D. 285

ID: 563407e5 Answer

Correct Answer: B

Rationale

Choice B is correct. If each tray contains the least number of cookies possible, 50 cookies, then the least number of cookies possible on 4 trays is 50 × 4 = 200 cookies. If each tray contains the greatest number of cookies possible, 60 cookies, then the greatest number of cookies possible on 4 trays is 60 × 4 = 240 cookies. If the least number of cookies on 4 trays is 200 and the greatest number of cookies is 240, then 205 could be the total number of cookies on these 4 trays of cookies because $200 \leq 205 \leq 240$.

Choices A, C, and D are incorrect. The least number of cookies on 4 trays is 200 cookies, and the greatest number of cookies on 4 trays is 240 cookies. The choices 165, 245, and 285 are each either less than 200 or greater than 240; therefore, they cannot represent the total number of cookies on 4 trays.

Question Difficulty: Easy

Question ID 25e1cfed

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 25e1cfed

How many solutions does the equation $10(15x - 9) = -15(6 - 10x)$ have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 25e1cfed Answer

Correct Answer: C

Rationale

Choice C is correct. Applying the distributive property to each side of the given equation yields $150x - 90 = -90 + 150x$. Applying the commutative property of addition to the right-hand side of this equation yields $150x - 90 = 150x - 90$. Since the two sides of the equation are equivalent, this equation is true for any value of x. Therefore, the given equation has infinitely many solutions.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

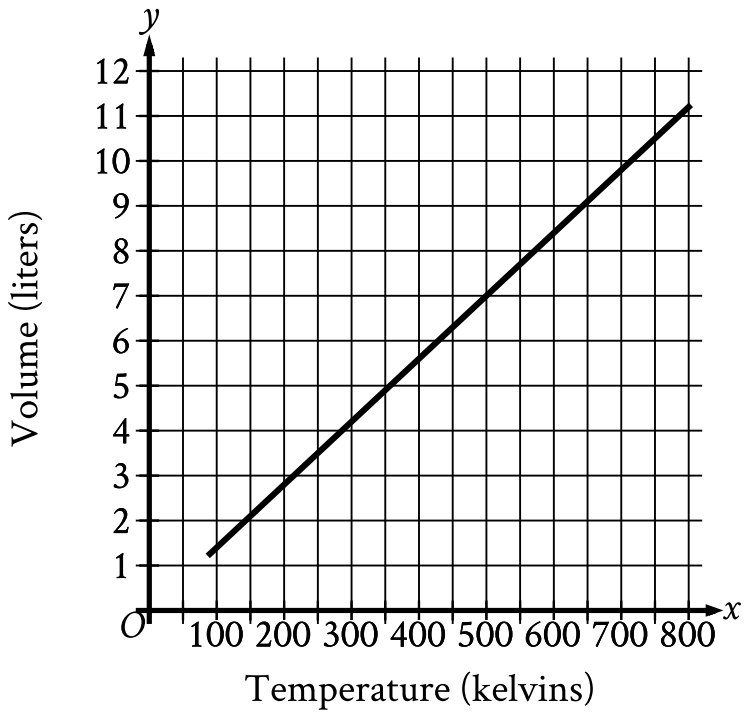
Question Difficulty: Hard

Question ID 930c2990

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 930c2990

Hydrogen is placed inside a container and kept at a constant pressure. The graph shows the estimated volume y, in liters, of the hydrogen when its temperature is x kelvins.



What is the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins?

A. 0

B. $\frac{7}{500}$

C. 7

D. $\frac{500}{7}$

ID: 930c2990 Answer

Correct Answer: C

Rationale

Choice C is correct. For the graph shown, the *x*-axis represents temperature, in kelvins, and the *y*-axis represents volume, in liters. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is represented by the *y*-coordinate of the point on the graph that has an *x*-coordinate of 500. The point on the graph with an *x*-coordinate of 500 has a *y*-coordinate of 7. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is 7.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 317e80f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 317e80f9

$x + y = 18$ $5y = x$ What is the solution (x, y) to the given system of equations?

A. $(15, 3)$

B. $(16, 2)$

C. $(17, 1)$

D. $(18, 0)$

ID: 317e80f9 Answer

Correct Answer: A

Rationale

Choice A is correct. The second equation in the given system defines the value of x as $5y$. Substituting $5y$ for x into the first equation yields $5y + y = 18$ or $6y = 18$. Dividing each side of this equation by 6 yields $y = 3$. Substituting 3 for y in the second equation yields $5(3) = x$ or $x = 15$. Therefore, the solution (x, y) to the given system of equations is $(15, 3)$.

Choice B is incorrect. Substituting 16 for x and 2 for y in the second equation yields $5(2) = 16$, which is not true. Therefore, $(16, 2)$ is not a solution to the given system of equations.

Choice C is incorrect. Substituting 17 for x and 1 for y in the second equation yields $5(1) = 17$, which is not true. Therefore, $(17, 1)$ is not a solution to the given system of equations.

Choice D is incorrect. Substituting 18 for x and 0 for y in the second equation yields $5(0) = 18$, which is not true. Therefore, $(18, 0)$ is not a solution to the given system of equations.

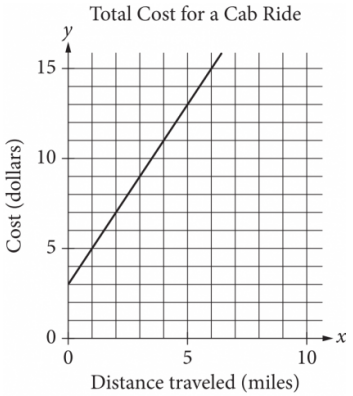
Question Difficulty: Easy

Question ID 3f5375d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 3f5375d9

The line graphed in the *xy*-plane below models the total cost, in dollars, for a cab ride, *y*, in a certain city during nonpeak hours based on the number of miles traveled, *x*.



According to the graph, what is the cost for each additional mile traveled, in dollars, of a cab ride?

A. $2.00

B. $2.60

C. $3.00

D. $5.00

ID: 3f5375d9 Answer

Correct Answer: A

Rationale

Choice A is correct. The cost of each additional mile traveled is represented by the slope of the given line. The slope of the line can be calculated by identifying two points on the line and then calculating the ratio of the change in y to the change in x between the two points. Using the points $(1,5)$ and $(2,7)$, the slope is equal to $\frac{7-5}{2-1}$, or 2. Therefore, the cost for each additional mile traveled of the cab ride is $2.00.

Choice B is incorrect and may result from calculating the slope of the line that passes through the points $(5,13)$ and $(0,0)$. However, $(0,0)$ does not lie on the line shown. Choice C is incorrect. This is the y-coordinate of the y-intercept of the graph and represents the flat fee for a cab ride before the charge for any miles traveled is added. Choice D is incorrect. This value represents the total cost of a 1-mile cab ride.

Question Difficulty: Easy

Question ID fdee0fbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: fdee0fbf

In the *xy*-plane, line *k* intersects the *y*-axis at the point $(0, -6)$ and passes through the point $(2, 2)$. If the point $(20, w)$ lies on line *k*, what is the value of *w*?

ID: fdee0fbf Answer

Rationale

The correct answer is 74. The y-intercept of a line in the xy-plane is the ordered pair (x,y) of the point of intersection of the line with the y-axis. Since line k intersects the y-axis at the point $(0,-6)$, it follows that $(0,-6)$ is the y-intercept of this line. An equation of any line in the xy-plane can be written in the form $y = mx + b$, where m is the slope of the line and b is the y-coordinate of the y-intercept. Therefore, the equation of line k can be written as $y = mx + (-6)$, or $y = mx - 6$. The value of m can be found by substituting the x- and y-coordinates from a point on the line, such as $(2,2)$, for x and y, respectively. This results in $2 = 2m - 6$. Solving this equation for m gives $m = 4$. Therefore, an equation of line k is $y = 4x - 6$. The value of w can be found by substituting the x-coordinate, 20, for x in the equation of line k and solving this equation for y. This gives $y = 4(20) - 6$, or $y = 74$. Since w is the y-coordinate of this point, $w = 74$.

Question Difficulty: Hard

Question ID 541bef2f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 541bef2f

$y \leq x + 7$ $y \geq -2x - 1$ Which point (x, y) is a solution to the given system of inequalities in the *xy*-plane?

A. $(-14, 0)$

B. $(0, -14)$

C. $(0, 14)$

D. $(14, 0)$

ID: 541bef2f Answer

Correct Answer: D

Rationale

Choice D is correct. A point (x, y) is a solution to a system of inequalities in the *xy*-plane if substituting the *x*-coordinate and the *y*-coordinate of the point for x and y, respectively, in each inequality makes both of the inequalities true. Substituting the *x*-coordinate and the *y*-coordinate of choice D, 14 and 0, for x and y, respectively, in the first inequality in the given system, $y \leq x + 7$, yields $0 \leq 14 + 7$, or $0 \leq 21$, which is true. Substituting 14 for x and 0 for y in the second inequality in the given system, $y \geq -2x - 1$, yields $0 \geq -2(14) - 1$, or $0 \geq -29$, which is true. Therefore, the point $(14, 0)$ is a solution to the given system of inequalities in the *xy*-plane.

Choice A is incorrect. Substituting -14 for x and 0 for y in the inequality $y \leq x + 7$ yields $0 \leq -14 + 7$, or $0 \leq -7$, which is not true.

Choice B is incorrect. Substituting 0 for x and -14 for y in the inequality $y \geq -2x - 1$ yields $-14 \geq -2(0) - 1$, or $-14 \geq -1$, which is not true.

Choice C is incorrect. Substituting 0 for x and 14 for y in the inequality $y \leq x + 7$ yields $14 \leq 0 + 7$, or $14 \leq 7$, which is not true.

Question Difficulty: Hard

Question ID 620fe971

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 620fe971

A team of workers has been moving cargo off of a ship. The equation below models the approximate number of tons of cargo, *y*, that remains to be moved *x* hours after the team started working.

$y = 120 - 25x$

The graph of this equation in the *xy*-plane is a line. What is the best interpretation of the *x*-intercept in this context?

A. The team will have moved all the cargo in about 4.8 hours.

B. The team has been moving about 4.8 tons of cargo per hour.

C. The team has been moving about 25 tons of cargo per hour.

D. The team started with 120 tons of cargo to move.

ID: 620fe971 Answer

Correct Answer: A

Rationale

Choice A is correct. The x-intercept of the line with equation y = 120 – 25x can be found by substituting 0 for y and finding the value of x. When y = 0, x = 4.8, so the x-intercept is at (4.8, 0). Since y represents the number of tons of cargo remaining to be moved x hours after the team started working, it follows that the x-intercept refers to the team having no cargo remaining to be moved after 4.8 hours. In other words, the team will have moved all of the cargo after about 4.8 hours.

Choice B is incorrect and may result from incorrectly interpreting the value 4.8. Choices C and D are incorrect and may result from misunderstanding the x-intercept. These statements are accurate but not directly relevant to the x-intercept.

Question Difficulty: Medium

Question ID 6a87902f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 6a87902f

$y = 2x + 10$ $y = 2x - 1$ At how many points do the graphs of the given equations intersect in the *xy*-plane?

A. Zero

B. Exactly one

C. Exactly two

D. Infinitely many

ID: 6a87902f Answer

Correct Answer: A

Rationale

Choice A is correct. A system of two linear equations in two variables, x and y, has zero points of intersection if the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in slope-intercept form, $y = mx + b$, are distinct if the *y*-coordinates of their *y*-intercepts, b, are different and are parallel if their slopes, m, are the same. For the two equations in the given system, $y = 2x + 10$ and $y = 2x - 1$, the values of b are 10 and -1, respectively, and the values of m are both 2. Since the values of b are different, the graphs of these lines have different *y*-coordinates of the *y*-intercept and are distinct. Since the values of m are the same, the graphs of these lines have the same slope and are parallel. Therefore, the graphs of the given equations are lines that intersect at zero points in the *xy*-plane.

Choice B is incorrect. The graphs of a system of two linear equations have exactly one point of intersection if the lines represented by the equations have different slopes. Since the given equations represent lines with the same slope, there is not exactly one intersection point.

Choice C is incorrect. The graphs of a system of two linear equations can never have exactly two intersection points.

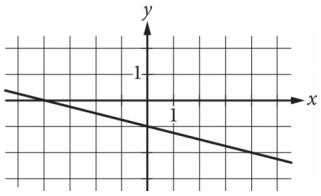
Choice D is incorrect. The graphs of a system of two linear equations have infinitely many intersection points when the lines represented by the equations have the same slope and the same *y*-coordinate of the *y*-intercept. Since the given equations represent lines with different *y*-coordinates of their *y*-intercepts, there are not infinitely many intersection points.

Question Difficulty: Medium

Question ID b2845d88

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b2845d88



Which of the following is an equation of the graph shown in the *xy*-plane above?

A. $y = -\frac{1}{4}x - 1$

B. $y = -x - 4$

C. $y = -x - \frac{1}{4}$

D. $y = -4x - 1$

ID: b2845d88 Answer

Correct Answer: A

Rationale

Choice A is correct. The slope of the line can be found by choosing any two points on the line, such as (4, –2) and (0, –1). Subtracting the y-values results in –2 – (–1) = –1, the change in y. Subtracting the x-values results in 4 – 0 = 4, the change in *x*. Dividing the change in y by the change in *x* yields $-1 \div 4 = -\frac{1}{4}$, the slope. The line intersects the y-axis at (0, –1), so –1 is the y-coordinate of the y-intercept. This information can be expressed in slope-intercept form as the equation $y = -\frac{1}{4}x - 1$.

Choice B is incorrect and may result from incorrectly calculating the slope and then misidentifying the slope as the y-intercept. Choice C is incorrect and may result from misidentifying the slope as the y-intercept. Choice D is incorrect and may result from incorrectly calculating the slope.

Question Difficulty: Easy

Question ID f75bd744

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: f75bd744

$4x - 6y = 10y + 2\ ty = \frac{1}{2} + 2x$

In the given system of equations, t is a constant. If the system has no solution, what is the value of t?

ID: f75bd744 Answer

Correct Answer: 8

Rationale

The correct answer is 8. The given system of equations can be solved using the elimination method. Multiplying both sides of the second equation in the given system by -2 yields $-2ty = -1 - 4x$, or $-1 - 4x = -2ty$. Adding this equation to the first equation in the given system, $4x - 6y = 10y + 2$, yields $(4x - 6y) + (-1 - 4x) = (10y + 2) + (-2ty)$, or $-1 - 6y = 10y - 2ty + 2$. Subtracting $10y$ from both sides of this equation yields $(-1 - 6y) - (10y) = (10y - 2ty + 2) - (10y)$, or $-1 - 16y = -2ty + 2$. If the given system has no solution, then the equation $-1 - 16y = -2ty + 2$ has no solution. If this equation has no solution, the coefficients of y on each side of the equation, -16 and $-2t$, must be equal, which yields the equation $-16 = -2t$. Dividing both sides of this equation by -2 yields $8 = t$. Thus, if the system has no solution, the value of t is 8.

Alternate approach: A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are parallel and distinct. Lines represented by equations in the form $Ax + By = C$, where A, B, and C are constant terms, are parallel if the ratio of the *x*-coefficients is equal to the ratio of the *y*-coefficients, and distinct if the ratio of the *x*-coefficients are not equal to the ratio of the constant terms. Subtracting $10y$ from both sides of the first equation in the given system yields $(4x - 6y) - (10y) = (10y + 2) - (10y)$, or $4x - 16y = 2$. Subtracting $2x$ from both sides of the second equation in the given system yields $(ty) - (2x) = \left(\frac{1}{2} + 2x\right) - (2x)$, or $-2x + ty = \frac{1}{2}$. The ratio of the *x*-coefficients for these equations is $-\frac{2}{4}$, or $-\frac{1}{2}$. The ratio of the *y*-coefficients for these equations is $-\frac{t}{16}$. The ratio of the constant terms for these equations is $\frac{1/2}{2}$, or $\frac{1}{4}$. Since the ratio of the *x*-coefficients, $-\frac{1}{2}$, is not equal to the ratio of the constants, $\frac{1}{4}$, the lines represented by the equations are distinct. Setting the ratio of the *x*-coefficients equal to the ratio of the *y*-coefficients yields $-\frac{1}{2} = -\frac{t}{16}$. Multiplying both sides of this equation by -16 yields $\left(-\frac{1}{2}\right)(-16) = \left(-\frac{t}{16}\right)(-16)$, or $t = 8$. Therefore, when $t = 8$, the lines represented by these equations are parallel. Thus, if the system has no solution, the value of t is 8.

Question Difficulty: Hard

Question ID d0e614a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: d0e614a6

$\frac{3}{5}x + \frac{3}{4}y = 7$ Which table gives three values of x and their corresponding values of y for the given equation?

A.

x	y
1	$\frac{113}{20}$
2	$\frac{101}{20}$
4	$\frac{77}{20}$

B.

x	y
1	$\frac{47}{5}$
2	$\frac{44}{5}$
4	$\frac{38}{5}$

C.

x	y
1	$\frac{148}{15}$
2	$\frac{136}{15}$
4	$\frac{112}{15}$

D.

x	y
1	$\frac{128}{15}$
2	$\frac{116}{15}$
4	$\frac{92}{15}$

ID: d0e614a6 Answer

Correct Answer: D

Rationale

Choice D is correct. Each of the tables gives the same three values of x: 1, 2, and 4. Substituting 1 for x in the given equation yields $\left(\frac{3}{5}\right)(1)+\frac{3}{4}y=7$, or $\frac{3}{5}+\frac{3}{4}y=\frac{35}{5}$. Subtracting $\frac{3}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{32}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{128}{15}$. Therefore, when $x=1$, the corresponding value of y for the given equation is $\frac{128}{15}$. Substituting 2 for x in the given equation yields $\left(\frac{3}{5}\right)(2)+\frac{3}{4}y=7$, or $\frac{6}{5}+\frac{3}{4}y=\frac{35}{5}$. Subtracting $\frac{6}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{29}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{116}{15}$. Therefore, when $x=2$, the corresponding value of y for the given equation is $\frac{116}{15}$. Substituting 4 for x in the given equation yields $\left(\frac{3}{5}\right)(4)+\frac{3}{4}y=7$, or $\frac{12}{5}+\frac{3}{4}y=\frac{35}{5}$. Subtracting $\frac{12}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{23}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{92}{15}$. Therefore, when $x=4$, the corresponding value of y for the given equation is $\frac{92}{15}$. The table in choice D gives *x*-values of 1, 2, and 4 and corresponding *y*-values of $\frac{128}{15}$, $\frac{116}{15}$, and $\frac{92}{15}$, respectively. Therefore, the table in choice D gives three values of x and their corresponding values of y for the given equation.

Choice A is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+\frac{3}{4}+y=7$.

Choice B is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+y=10$.

Choice C is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+\frac{3}{4}y=8$.

Question Difficulty: Hard

Question ID 1d18794b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 1d18794b

A contract for a certain service requires a onetime activation cost of $\$35$ and a monthly cost of $\$23$. Which equation represents this situation, where c is the total cost, in dollars, of this service contract for t months?

A. $c = \frac{t}{23} + 35$

B. $c = \frac{t}{35} + 23$

C. $c = 23t + 35$

D. $c = 35t + 23$

ID: 1d18794b Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that this service contract requires a monthly cost of $\$23$. A monthly cost of $\$23$ for t months results in a cost of $\$23t$. It's also given that this service contract requires a onetime activation cost of $\$35$. Adding the onetime activation cost to the monthly cost of the service contract for t months yields the total cost c, in dollars, of this service contract for t months. Therefore, this situation can be represented by the equation $c = 23t + 35$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID b450ab03

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b450ab03

An employee at a restaurant prepares sandwiches and salads. It takes the employee 1.5 minutes to prepare a sandwich and 1.9 minutes to prepare a salad. The employee spends a total of 46.1 minutes preparing x sandwiches and y salads. Which equation represents this situation?

A. $1.9x + 1.5y = 46.1$

B. $1.5x + 1.9y = 46.1$

C. $x + y = 46.1$

D. $30.7x + 24.3y = 46.1$

ID: b450ab03 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the employee takes 1.5 minutes to prepare a sandwich. Multiplying 1.5 by the number of sandwiches, x, yields $1.5x$, the amount of time the employee spends preparing x sandwiches. It's also given that the employee takes 1.9 minutes to prepare a salad. Multiplying 1.9 by the number of salads, y, yields $1.9y$, the amount of time the employee spends preparing y salads. It follows that the total amount of time, in minutes, the employee spends preparing x sandwiches and y salads is $1.5x + 1.9y$. It's given that the employee spends a total of 46.1 minutes preparing x sandwiches and y salads. Thus, the equation $1.5x + 1.9y = 46.1$ represents this situation.

Choice A is incorrect. This equation represents a situation where it takes the employee 1.9 minutes, rather than 1.5 minutes, to prepare a sandwich and 1.5 minutes, rather than 1.9 minutes, to prepare a salad.

Choice C is incorrect. This equation represents a situation where it takes the employee 1 minute, rather than 1.5 minutes, to prepare a sandwich and 1 minute, rather than 1.9 minutes, to prepare a salad.

Choice D is incorrect. This equation represents a situation where it takes the employee 30.7 minutes, rather than 1.5 minutes, to prepare a sandwich and 24.3 minutes, rather than 1.9 minutes, to prepare a salad.

Question Difficulty: Easy

Question ID b3abf40f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: b3abf40f

$F(x) = \frac{9}{5}(x - 273.15) + 32$

The function F gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of x kelvins. If a temperature increased by 9.10 kelvins, by how much did the temperature increase, in degrees Fahrenheit?

A. 16.38

B. 48.38

C. 475.29

D. 507.29

ID: b3abf40f Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function $F(x) = \frac{9}{5}(x - 273.15) + 32$ gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of x kelvins. A temperature that increased by 9.10 kelvins means that the value of x increased by 9.10 kelvins. It follows that an increase in x by 9.10 increases $F(x)$ by $\frac{9}{5}(9.10)$, or 16.38. Therefore, if a temperature increased by 9.10 kelvins, the temperature increased by 16.38 degrees Fahrenheit.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6ac23de7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 6ac23de7

$\frac{4x}{5} = 20$ In the equation above, what is the value of x ?

A. 25

B. 24

C. 16

D. 15

ID: 6ac23de7 Answer

Correct Answer: A

Rationale

Choice A is correct. Multiplying both sides of the equation by 5 results in $4x = 100$. Dividing both sides of the resulting equation by 4 results in $x = 25$.

Choice B is incorrect and may result from adding 20 and 4. Choice C is incorrect and may result from dividing 20 by 5 and then multiplying the result by 4. Choice D is incorrect and may result from subtracting 5 from 20.

Question Difficulty: Easy

Question ID 1c29bfd1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 1c29bfd1

The pressure exerted on a scuba diver at sea level is 14.70 pounds per square inch (psi). For each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by 0.44 psi. What is the total pressure, in psi, exerted on the scuba diver at 105 feet below sea level?

A. 60.90

B. 31.50

C. 14.70

D. 0.44

ID: 1c29bfd1 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the pressure exerted on a scuba diver at sea level is 14.70 pounds per square inch (psi). It's also given that for each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by 0.44 psi. The total pressure, in psi, exerted on the scuba diver at x feet below sea level can be represented by the expression $0.44x + 14.70$. Substituting 105 for x in this expression yields $0.44(105) + 14.70$, or 60.90. Therefore, the total pressure exerted on the scuba diver at 105 feet below sea level is 60.90 psi.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the pressure, in psi, exerted on the scuba diver at sea level, not at 105 feet below sea level.

Choice D is incorrect. This is the rate by which the pressure, in psi, exerted on the scuba diver increases for each foot the scuba diver descends below sea level.

Question Difficulty: Medium

Question ID dd875c97

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: dd875c97

A truck can haul a maximum weight of $5{,}630$ pounds. During one trip, the truck will be used to haul a 190-pound piece of equipment as well as several crates. Some of these crates weigh 25 pounds each and the others weigh 62 pounds each. Which inequality represents the possible combinations of the number of 25-pound crates, x, and the number of 62-pound crates, y, the truck can haul during one trip if only the piece of equipment and the crates are being hauled?

A. $25x + 62y \leq 5{,}440$

B. $25x + 62y \geq 5{,}440$

C. $62x + 25y \leq 5{,}630$

D. $62x + 25y \geq 5{,}630$

ID: dd875c97 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a truck can haul a maximum of $5{,}630$ pounds. It's also given that during one trip, the truck will be used to haul a 190-pound piece of equipment as well as several crates. It follows that the truck can haul at most $5{,}630 - 190$, or $5{,}440$, pounds of crates. Since x represents the number of 25-pound crates, the expression $25x$ represents the weight of the 25-pound crates. Since y represents the number of 62-pound crates, $62y$ represents the weight of the 62-pound crates. Therefore, $25x + 62y$ represents the total weight of the crates the truck can haul. Since the truck can haul at most $5{,}440$ pounds of crates, the total weight of the crates must be less than or equal to $5{,}440$ pounds, or $25x + 62y \leq 5{,}440$.

Choice B is incorrect. This represents the possible combinations of the number of 25-pound crates, x, and the number of 62-pound crates, y, the truck can haul during one trip if it can haul a minimum, not a maximum, of $5{,}630$ pounds.

Choice C is incorrect. This represents the possible combinations of the number of 62-pound crates, x, and the number of 25-pound crates, y, the truck can haul during one trip if only crates are being hauled.

Choice D is incorrect. This represents the possible combinations of the number of 62-pound crates, x, and the number of 25-pound crates, y, the truck can haul during one trip if it can haul a minimum, not a maximum, weight of $5{,}630$ pounds and only crates are being hauled.

Question Difficulty: Medium

Question ID 6e6a3241

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

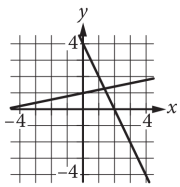
ID: 6e6a3241

$x + 5y = 5$

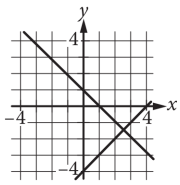
$2x - y = -4$

Which of the following graphs in the *xy*-plane could be used to solve the system of equations above?

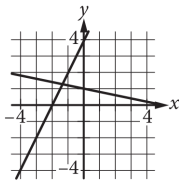
A.



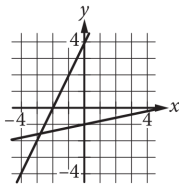
B.



C.



D.



ID: 6e6a3241 Answer

Correct Answer: C

Rationale

Choice C is correct. The graph of a system of equations is the graph that shows the lines represented by each of the equations in the system. The x-intercept of the graph of each given equation can be found by substituting 0 for y in each equation: $x+5(0)=5$, or $x=5$, and $2x-0=-4$, or $x=-2$. The y-intercept of the graph of each equation can be found by substituting 0 for x in each equation: $0+5y=5$, or $y=1$, and $2(0)-y=-4$ or $y=4$. Using these x- and y-intercept values, the line that has equation $x+5y=5$ passes through the points $(0,1)$ and $(5,0)$, and the line that has equation $2x-y=-4$ passes through the points $(0,4)$ and $(-2,0)$. Only the lines in choice C pass through these points and can be used to solve the given system of equations.

Choices A, B, and D are incorrect. In choices A and B, neither line passes through $(0,1)$ and $(5,0)$ or $(0,4)$ and $(-2,0)$. In choice D, although one line passes through $(0,4)$ and $(-2,0)$ the other line doesn't pass through $(0,1)$ and $(5,0)$.

Question Difficulty: Medium

Question ID e6cb2402

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: e6cb2402

$3(kx+13)=\frac{48}{17}x+36$ In the given equation, k is a constant. The equation has no solution. What is the value of k?

ID: e6cb2402 Answer

Correct Answer: .9411, .9412, 16/17

Rationale

The correct answer is $\frac{16}{17}$. It's given that the equation $3(kx+13)=\frac{48}{17}x+36$ has no solution. A linear equation in the form $ax+b=cx+d$, where a, b, c, and d are constants, has no solution only when the coefficients of x on each side of the equation are equal and the constant terms aren't equal. Dividing both sides of the given equation by 3 yields $kx+13=\frac{48}{51}x+\frac{36}{3}$, or $kx+13=\frac{16}{17}x+12$. Since the coefficients of x on each side of the equation must be equal, it follows that the value of k is $\frac{16}{17}$. Note that 16/17, .9411, .9412, and 0.941 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID e470e19d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: e470e19d

The function f is defined by $f(x) = 7x - 84$. What is the *x*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(-12, 0)$

B. $(-7, 0)$

C. $(7, 0)$

D. $(12, 0)$

ID: e470e19d Answer

Correct Answer: D

Rationale

Choice D is correct. The given function f is a linear function. Therefore, the graph of $y = f(x)$ in the *xy*-plane has one *x*-intercept at the point $(k, 0)$, where k is a constant. Substituting 0 for $f(x)$ and k for x in the given function yields $0 = 7k - 84$. Adding 84 to both sides of this equation yields $84 = 7k$. Dividing both sides of this equation by 7 yields $12 = k$. Therefore, the *x*-intercept of the graph of $y = f(x)$ in the *xy*-plane is $(12, 0)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID f7e39fe9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: f7e39fe9

x	10	15	20	25
$f(x)$	82	137	192	247

The table shows four values of x and their corresponding values of $f(x)$. There is a linear relationship between x and $f(x)$ that is defined by the equation $f(x) = mx - 28$, where m is a constant. What is the value of m?

ID: f7e39fe9 Answer

Correct Answer: 11

Rationale

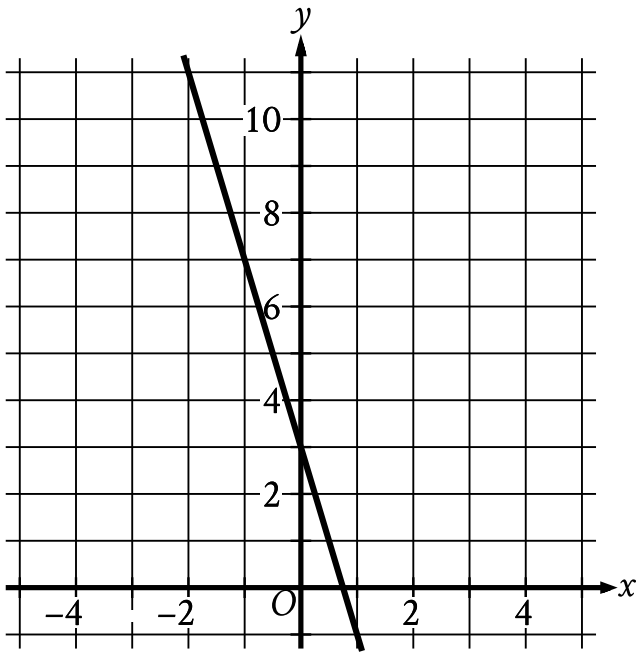
The correct answer is 11. It's given that $f(x)$ is defined by the equation $f(x) = mx - 28$, where m is a constant. It's also given in the table that when $x = 10$, $f(x) = 82$. Substituting 10 for x and 82 for $f(x)$ in the equation $f(x) = mx - 28$ yields, $82 = m(10) - 28$. Adding 28 to both sides of this equation yields $110 = 10m$. Dividing both sides of this equation by 10 yields $11 = m$. Therefore, the value of m is 11.

Question Difficulty: Medium

Question ID 415ab1d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 415ab1d2



The graph of the linear function $y = f(x) + 19$ is shown. If c and d are positive constants, which equation could define f?

A. $f(x) = -d - cx$

B. $f(x) = d - cx$

C. $f(x) = -d + cx$

D. $f(x) = d + cx$

ID: 415ab1d2 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graph of the linear function $y = f(x) + 19$ is shown. This means that the graph of $y = f(x) + 19$ can be translated down 19 units to create the graph of $y = f(x)$ and the *y*-coordinate of every point on the graph of $y = f(x) + 19$ can be decreased by 19 to find the resulting point on the graph of $y = f(x)$. The *y*-intercept of the graph of $y = f(x) + 19$ is $(0, 3)$. Translating the graph of $y = f(x) + 19$ down 19 units results in a *y*-intercept of the graph of $y = f(x)$ at the point $(0, 3 - 19)$, or $(0, -16)$. The graph of $y = f(x) + 19$ slants down from left to right, so the slope of the graph is negative. The translation of a linear graph changes its position, but does not change its slope. It follows that the slope of the graph of $y = f(x)$ is also negative. The equation of a linear function f can be written in the form $f(x) = b + mx$, where b is the *y*-coordinate of the *y*-intercept and m is the slope of the graph of $y = f(x)$. It's given that c and d are positive constants. Since the *y*-coordinate of the *y*-intercept and the slope of the graph of $y = f(x)$ are both negative, it follows that $f(x) = -d - cx$ could define f.

Choice B is incorrect. This could define a linear function where its graph has a positive, not negative, *y*-intercept.

Choice C is incorrect. This could define a linear function where its graph has a positive, not negative, slope.

Choice D is incorrect. This could define a linear function where its graph has a positive, not negative, *y*-intercept and a positive, not negative, slope.

Question Difficulty: Hard

Question ID aff28230

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: aff28230

$x = 10$ $y = x + 21$ The solution to the given system of equations is (x, y). What is the value of y?

A. 2.1

B. 10

C. 21

D. 31

ID: aff28230 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given by the first equation in the given system of equations that $x = 10$. Substituting 10 for x in the second equation in the given system yields $y = 10 + 21$, or $y = 31$. Therefore, the value of y is 31.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of x, not the value of y.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID f5929f7a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: f5929f7a

$y = -\frac{1}{9}x$ $y = \frac{1}{2}x$ The solution to the given system of equations is (x, y). What is the value of x?

A. -9

B. -7

C. 0

D. 2

ID: f5929f7a Answer

Correct Answer: C

Rationale

Choice C is correct. It's given by the first equation in the system that $y = -\frac{1}{9}x$. Substituting $-\frac{1}{9}x$ for y in the second equation in the system yields $-\frac{1}{9}x = \frac{1}{2}x$. Multiplying the left-hand side of this equation by $\frac{2}{2}$ and the right-hand side by $\frac{9}{9}$ yields $-\frac{2}{18}x = \frac{9}{18}x$. Adding $\frac{2}{18}x$ to both sides of this equation yields $0 = \frac{11}{18}x$. Multiplying both sides of this equation by $\frac{18}{11}$ yields $x = 0$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 6c71f3ec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 6c71f3ec

A salesperson's total earnings consist of a base salary of x dollars per year, plus commission earnings of 11% of the total sales the salesperson makes during the year. This year, the salesperson has a goal for the total earnings to be at least 3 times and at most 4 times the base salary. Which of the following inequalities represents all possible values of total sales s, in dollars, the salesperson can make this year in order to meet that goal?

A. $2x \leq s \leq 3x$

B. $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$

C. $3x \leq s \leq 4x$

D. $\frac{3}{0.11}x \leq s \leq \frac{4}{0.11}x$

ID: 6c71f3ec Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that a salesperson's total earnings consist of a base salary of x dollars per year plus commission earnings of 11% of the total sales the salesperson makes during the year. If the salesperson makes s dollars in total sales this year, the salesperson's total earnings can be represented by the expression $x + 0.11s$. It's also given that the salesperson has a goal for the total earnings to be at least 3 times and at most 4 times the base salary, which can be represented by the expressions $3x$ and $4x$, respectively. Therefore, this situation can be represented by the inequality $3x \leq x + 0.11s \leq 4x$. Subtracting x from each part of this inequality yields $2x \leq 0.11s \leq 3x$. Dividing each part of this inequality by 0.11 yields $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$. Therefore, the inequality $\frac{2}{0.11}x \leq s \leq \frac{3}{0.11}x$ represents all possible values of total sales s, in dollars, the salesperson can make this year in order to meet their goal.

Choice A is incorrect. This inequality represents a situation in which the total sales, rather than the total earnings, are at least 2 times and at most 3 times, rather than at least 3 times and at most 4 times, the base salary.

Choice C is incorrect. This inequality represents a situation in which the total sales, rather than the total earnings, are at least 3 times and at most 4 times the base salary.

Choice D is incorrect. This inequality represents a situation in which the total earnings are at least 4 times and at most 5 times, rather than at least 3 times and at most 4 times, the base salary.

Question Difficulty: Hard

Question ID 7392dfc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 7392dfc1

Which of the following is equivalent to $4x+6=12$?

A. $2x+4=6$

B. $x+3=3$

C. $3x+2=4$

D. $2x+3=6$

ID: 7392dfc1 Answer

Correct Answer: D

Rationale

Choice D is correct. Dividing each side of the original equation by 2 yields $\frac{4x+6}{2}=\frac{12}{2}$, which simplifies to $2x+3=6$.

Choice A is incorrect. Dividing each side of the original equation by 2 gives $2x+3=6$, which is not equivalent to $2x+4=6$. Choice B is incorrect. Dividing each side of the original equation by 4 gives $x+\frac{3}{2}=3$, which is not equivalent to $x+3=3$. Choice C is incorrect. Dividing each side of the original equation by 3 gives $\frac{4}{3}x+2=4$, which is not equivalent to $3x+2=4$.

Question Difficulty: Easy

Question ID 9aaf7786

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 9aaf7786

In the *xy*-plane, line p has a slope of $-\frac{5}{3}$ and an *x*-intercept of $(-6, 0)$. What is the *y*-coordinate of the *y*-intercept of line p?

ID: 9aaf7786 Answer

Correct Answer: -10

Rationale

The correct answer is -10. A line in the *xy*-plane can be represented by the equation $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept. It's given that line p has a slope of $-\frac{5}{3}$. Therefore, $m = -\frac{5}{3}$. It's also given that line p has an *x*-intercept of $(-6, 0)$. Therefore, when $x = -6$, $y = 0$. Substituting $-\frac{5}{3}$ for m, -6 for x, and 0 for y in the equation $y = mx + b$ yields $0 = \left(-\frac{5}{3}\right)(-6) + b$, which is equivalent to $0 = 10 + b$. Subtracting 10 from both sides of this equation yields $-10 = b$. Therefore, the *y*-coordinate of the *y*-intercept of line p is -10.

Question Difficulty: Hard

Question ID 93954cfa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 93954cfa

One pound of grapes costs $2. At this rate, how many dollars will *c* pounds of grapes cost?

A. $2c$

B. $2+c$

C. $\frac{2}{c}$

D. $\frac{c}{2}$

ID: 93954cfa Answer

Correct Answer: A

Rationale

Choice A is correct. If one pound of grapes costs $2, two pounds of grapes will cost 2 times $2, three pounds of grapes will cost 3 times $2, and so on. Therefore, c pounds of grapes will cost c times $2, which is 2c dollars.

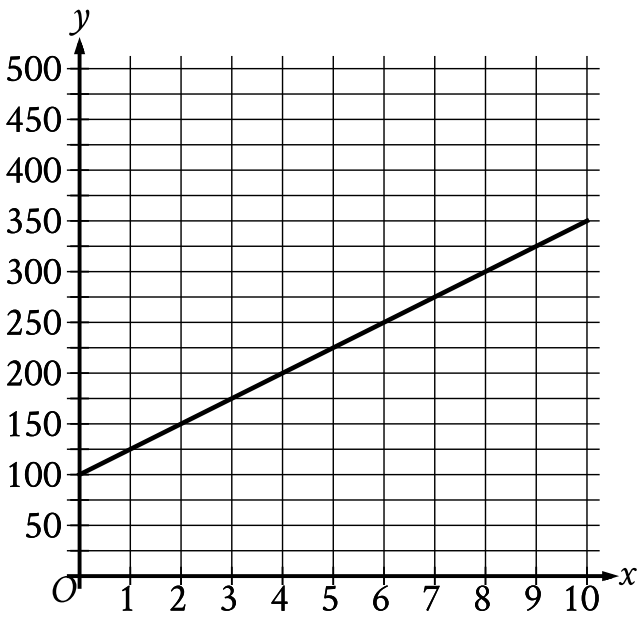
Choice B is incorrect and may result from incorrectly adding instead of multiplying. Choice C is incorrect and may result from assuming that c pounds cost $2, and then finding the cost per pound. Choice D is incorrect and could result from incorrectly assuming that 2 pounds cost $c, and then finding the cost per pound.

Question Difficulty: Easy

Question ID 5cf1bbc9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 5cf1bbc9



The graph of the function f, where $y = f(x)$, gives the total cost y, in dollars, for a certain video game system and x games. What is the best interpretation of the slope of the graph in this context?

A. Each game costs $\$25$.

B. The video game system costs $\$100$.

C. The video game system costs $\$25$.

D. Each game costs $\$100$.

ID: 5cf1bbc9 Answer

Correct Answer: A

Rationale

Choice A is correct. The given graph is a line, and the slope of a line is defined as the change in the value of y for each increase in the value of x by 1. It's given that y represents the total cost, in dollars, and that x represents the number of games. Therefore, the change in the value of y for each increase in the value of x by 1 represents the change in total cost, in dollars, for each increase in the number of games by 1. In other words, the slope represents the cost, in dollars, per game. The graph shows that when the value of x increases from 0 to 1, the value of y increases from 100 to 125. It follows that the slope is 25, or the cost per game is $\$25$. Thus, the best interpretation of the slope of the graph is that each game costs $\$25$.

Choice B is incorrect. This is an interpretation of the *y*-intercept of the graph rather than the slope of the graph.

Choice C is incorrect. The slope of the graph is the cost per game, not the cost of the video game system.

Choice D is incorrect. Each game costs $\$25$, not $\$100$.

Question Difficulty: Medium

Question ID 74c03c21

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 74c03c21

A bus traveled on the highway and on local roads to complete a trip of 160 miles. The trip took 4 hours. The bus traveled at an average speed of 55 miles per hour (mph) on the highway and an average speed of 25 mph on local roads. If x is the time, in hours, the bus traveled on the highway and y is the time, in hours, it traveled on local roads, which system of equations represents this situation?

A. $55x + 25y = 4$
$x + y = 160$

B. $55x + 25y = 160$
$x + y = 4$

C. $25x + 55y = 4$
$x + y = 160$

D. $25x + 55y = 160$
$x + y = 4$

ID: 74c03c21 Answer

Correct Answer: B

Rationale

Choice B is correct. If the bus traveled at an average speed of 55 miles per hour (mph) on the highway for x hours, then the bus traveled $55x$ miles on the highway. If the bus traveled at an average speed of 25 mph on local roads for y hours, then the bus traveled $25y$ miles on local roads. It's given that the trip was 160 miles. This can be represented by the equation $55x + 25y = 160$. It's also given that the trip took 4 hours. This can be represented by the equation $x + y = 4$. Therefore, the system consisting of the equations $55x + 25y = 160$ and $x + y = 4$ represents this situation.

Choice A is incorrect. This system of equations represents a situation where the trip was 4 miles and took 160 hours.

Choice C is incorrect. This system of equations represents a situation where the trip was 4 miles and took 160 hours, and the bus traveled at an average speed of 25 mph on the highway and 55 mph on local roads.

Choice D is incorrect. This system of equations represents a situation where the bus traveled at an average speed of 25 mph on the highway and 55 mph on local roads.

Question Difficulty: Medium

Question ID 9c7741c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 9c7741c6

On a 210-mile trip, Cameron drove at an average speed of 60 miles per hour for the first *x* hours. He then completed the trip, driving at an average speed of 50 miles per hour for the remaining *y* hours. If $x = 1$, what is the value of *y* ?

ID: 9c7741c6 Answer

Rationale

The correct answer is 3. It's given that Cameron drove 60 miles per hour for x hours; therefore, the distance driven at this speed can be represented by $60x$. He then drove 50 miles per hour for y hours; therefore, the distance driven at this speed can be represented by $50y$. Since Cameron drove 210 total miles, the equation $60x + 50y = 210$ represents this situation. If $x = 1$, substitution yields $60(1) + 50y = 210$, or $60 + 50y = 210$. Subtracting 60 from both sides of this equation yields $50y = 150$. Dividing both sides of this equation by 50 yields $y = 3$.

Question Difficulty: Medium

Question ID b51c173d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: b51c173d

For the linear function f, the graph of $y = f(x)$ in the *xy*-plane has a slope of 2 and has a *y*-intercept at $(0, -5)$. Which equation defines f?

A. $f(x) = \frac{1}{2}x - 5$

B. $f(x) = -\frac{1}{2}x - 5$

C. $f(x) = -2x - 5$

D. $f(x) = 2x - 5$

ID: b51c173d Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining the linear function f can be written in the form $f(x) = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane. It's given that the graph of $y = f(x)$ has a slope of 2. Therefore, $m = 2$. It's also given that the graph of $y = f(x)$ has a *y*-intercept at $(0, -5)$. Therefore, $b = -5$. Substituting 2 for m and -5 for b in the equation $f(x) = mx + b$ yields $f(x) = 2x - 5$. Thus, the equation that defines f is $f(x) = 2x - 5$.

Choice A is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane has a slope of $\frac{1}{2}$, not 2.

Choice B is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane has a slope of $-\frac{1}{2}$, not 2.

Choice C is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane has a slope of -2, not 2.

Question Difficulty: Easy

Question ID 68f2cbaf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 68f2cbaf

Ty set a goal to walk at least 24 kilometers every day to prepare for a multiday hike. On a certain day, Ty plans to walk at an average speed of 4 kilometers per hour. What is the minimum number of hours Ty must walk on that day to fulfill the daily goal?

A. 4

B. 6

C. 20

D. 24

ID: 68f2cbaf Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that Ty plans to walk at an average speed of 4 kilometers per hour. The number of kilometers Ty will walk is determined by the expression $4s$, where s is the number of hours Ty walks. The given goal of at least 24 kilometers means that the inequality $4s \geq 24$ represents the situation. Dividing both sides of this inequality by 4 gives $s \geq 6$, which corresponds to a minimum of 6 hours Ty must walk.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 8abed0fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 8abed0fb

$y = 2x + 3$

$x = 1$

What is the solution (x, y) to the given system of equations?

A. $(1, 2)$

B. $(1, 5)$

C. $(2, 3)$

D. $(2, 7)$

ID: 8abed0fb Answer

Correct Answer: B

Rationale

Choice B is correct. Since it's given that $x = 1$, substituting 1 for x in the first equation yields $y = 2(1) + 3$. Simplifying the right-hand side of this equation yields $y = 2 + 3$, or $y = 5$. Therefore, the ordered pair $(1, 5)$ is a solution to the given system of equations.

Choice A is incorrect and may result from a calculation error when substituting 1 for x in the first equation. Choices C and D are incorrect. Because it's given that $x = 1$, x cannot equal 2 as stated in these ordered pairs.

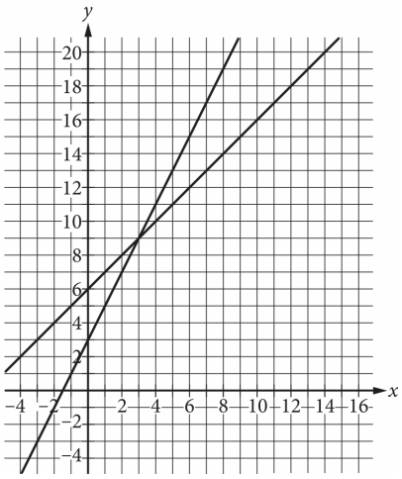
Question Difficulty: Easy

Question ID e1259a5a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: e1259a5a

A system of two linear equations is graphed in the *xy*-plane below.



Which of the following points is the solution to the system of equations?

A. $(3,9)$

B. $(6,15)$

C. $(8,10)$

D. $(12,18)$

ID: e1259a5a Answer

Correct Answer: A

Rationale

Choice A is correct. The solution to this system of linear equations is the point that lies on both lines graphed, or the point of intersection of the two lines. According to the graphs, the point of intersection occurs when $x = 3$ and $y = 9$, or at the point $(3,9)$.

Choices B and D are incorrect. Each of these points lies on one line, but not on both lines in the xy-plane. Choice C is incorrect. This point doesn't lie on either of the lines graphed in the xy-plane.

Question Difficulty: Easy

Question ID 4702da8f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 4702da8f

The function f is defined by $f(x) = 80 - 6x$. What is the value of $f(7)$?

A. 13

B. 38

C. 74

D. 81

ID: 4702da8f Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that function f is defined by $f(x) = 80 - 6x$. The value of $f(7)$ can be found by substituting 7 for x in the given function, which yields $f(7) = 80 - 6(7)$, or $f(7) = 80 - 42$, which is equivalent to $f(7) = 38$. Therefore, the value of $f(7)$ is 38.

Choice A is incorrect. This is the value of $80 - 67$, not $80 - 6(7)$.

Choice C is incorrect. This is the value of $80 - 6(1)$, not $80 - 6(7)$.

Choice D is incorrect. This is the value of $80 - 6 + 7$, not $80 - 6(7)$.

Question Difficulty: Easy

Question ID b988eeec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: b988eeec

The functions f and g are defined as $f(x) = \frac{1}{4}x - 9$ and $g(x) = \frac{3}{4}x + 21$. If the function h is defined as $h(x) = f(x) + g(x)$, what is the *x*-coordinate of the *x*-intercept of the graph of $y = h(x)$ in the *xy*-plane?

ID: b988eeec Answer

Correct Answer: -12

Rationale

The correct answer is -12. It's given that the functions f and g are defined as $f(x) = \frac{1}{4}x - 9$ and $g(x) = \frac{3}{4}x + 21$. If the function h is defined as $h(x) = f(x) + g(x)$, then substituting $\frac{1}{4}x - 9$ for $f(x)$ and $\frac{3}{4}x + 21$ for $g(x)$ in this function yields $h(x) = \frac{1}{4}x - 9 + \frac{3}{4}x + 21$. This can be rewritten as $h(x) = \frac{4}{4}x + 12$, or $h(x) = x + 12$. The *x*-intercept of a graph in the *xy*-plane is the point on the graph where $y = 0$. The equation representing the graph of $y = h(x)$ is $y = x + 12$. Substituting 0 for y in this equation yields $0 = x + 12$. Subtracting 12 from both sides of this equation yields $-12 = x$, or $x = -12$. Therefore, the *x*-coordinate of the *x*-intercept of the graph of $y = h(x)$ in the *xy*-plane is -12.

Question Difficulty: Hard

Question ID 3d04de9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 3d04de9c

A principal used a total of 25 flags that were either blue or yellow for field day. The principal used 20 blue flags. How many yellow flags were used?

A. 5

B. 20

C. 25

D. 30

ID: 3d04de9c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a principal used a total of 25 blue flags and yellow flags. It's also given that of the 25 flags used, 20 flags were blue. Subtracting the number of blue flags used from the total number of flags used results in the number of yellow flags used. It follows that the number of yellow flags used is $25 - 20$, or 5.

Choice B is incorrect. This is the number of blue flags used. Choice C is incorrect. This is the total number of flags used.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 70feb725

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 70feb725

During a month, Morgan ran *r* miles at 5 miles per hour and biked *b* miles at 10 miles per hour. She ran and biked a total of 200 miles that month, and she biked for twice as many hours as she ran. What is the total number of miles that Morgan biked during the month?

A. 80

B. 100

C. 120

D. 160

ID: 70feb725 Answer

Correct Answer: D

Rationale

Choice D is correct. The number of hours Morgan spent running or biking can be calculated by dividing the distance she traveled during that activity by her speed, in miles per hour, for that activity. So the number of hours she ran can be represented by the expression $\frac{r}{5}$, and the number of hours she biked can be represented by the expression $\frac{b}{10}$. It's given that she biked for twice as many hours as she ran, so this can be represented by the equation $\frac{b}{10}=2\left(\frac{r}{5}\right)$, which can be rewritten as $b=4r$. It's also given that she ran r miles and biked b miles, and that she ran and biked a total of 200 miles. This can be represented by the equation $r+b=200$. Substituting $4r$ for b in this equation yields $r+4r=200$, or $5r=200$. Solving for r yields $r=40$. Determining the number of miles she biked, b, can be found by substituting 40 for r in $r+b=200$, which yields $40+b=200$. Solving for b yields $b=160$.

Choices A, B, and C are incorrect because they don't satisfy that Morgan biked for twice as many hours as she ran. In choice A, if she biked 80 miles, then she ran 120 miles, which means she biked for 8 hours and ran for 24 hours. In choice B, if she biked 100 miles, then she ran 100 miles, which means she biked for 10 hours and ran for 20 hours. In choice C, if she biked 120 miles, then she ran for 80 miles, which means she biked for 12 hours and ran for 16 hours.

Question Difficulty: Hard

Question ID 8a87c2c8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 8a87c2c8

$x + 3 = -2y + 5$ $x - 3 = 2y + 7$ The solution to the given system of equations is (x, y). What is the value of $2x$?

A. -2

B. 6

C. 12

D. 24

ID: 8a87c2c8 Answer

Correct Answer: C

Rationale

Choice C is correct. Adding the second equation in the given system to the first equation in the given system yields $(x + 3) + (x - 3) = (-2y + 5) + (2y + 7)$. Adding like terms in this equation yields $2x = 12$. Thus, the value of $2x$ is 12.

Choice A is incorrect. This is the value of y, not $2x$. Choice B is incorrect. This is the value of x, not $2x$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 60f71697

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 60f71697

$8x = 88$ What value of x is the solution to the given equation?

A. 11

B. 80

C. 96

D. 704

ID: 60f71697 Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing both sides of the given equation by 8 yields $x = 11$. Therefore, 11 is the solution to the given equation.

Choice B is incorrect. This is the solution to the equation $x + 8 = 88$.

Choice C is incorrect. This is the solution to the equation $x - 8 = 88$.

Choice D is incorrect. This is the solution to the equation $\frac{x}{8} = 88$.

Question Difficulty: Easy

Question ID 9a216c0f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 9a216c0f

The combined original price for a mirror and a vase is $\$60$. After a 25% discount to the mirror and a 45% discount to the vase are applied, the combined sale price for the two items is $\$39$. Which system of equations gives the original price m, in dollars, of the mirror and the original price v, in dollars, of the vase?

A. $m + v = 60$ $0.55m + 0.75v = 39$

B. $m + v = 60$ $0.45m + 0.25v = 39$

C. $m + v = 60$ $0.75m + 0.55v = 39$

D. $m + v = 60$ $0.25m + 0.45v = 39$

ID: 9a216c0f Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that m represents the original price, in dollars, of the mirror, and v represents the original price, in dollars, of the vase. It's also given that the combined original price for the mirror and the vase is $\$60$. This can be represented by the equation $m + v = 60$. After a 25% discount to the mirror is applied, the sale price of the mirror is 75% of its original price. This can be represented by the expression $0.75m$. After a 45% discount to the vase is applied, the sale price of the vase is 55% of its original price. This can be represented by the expression $0.55v$. It's given that the combined sale price for the two items is $\$39$. This can be represented by the equation $0.75m + 0.55v = 39$. Therefore, the system of equations consisting of the equations $m + v = 60$ and $0.75m + 0.55v = 39$ gives the original price m, in dollars, of the mirror and the original price v, in dollars, of the vase.

Choice A is incorrect. The second equation in this system of equations represents a 45% discount to the mirror and a 25% discount to the vase.

Choice B is incorrect. The second equation in this system of equations represents a 55% discount to the mirror and a 75% discount to the vase.

Choice D is incorrect. The second equation in this system of equations represents a 75% discount to the mirror and a 55% discount to the vase.

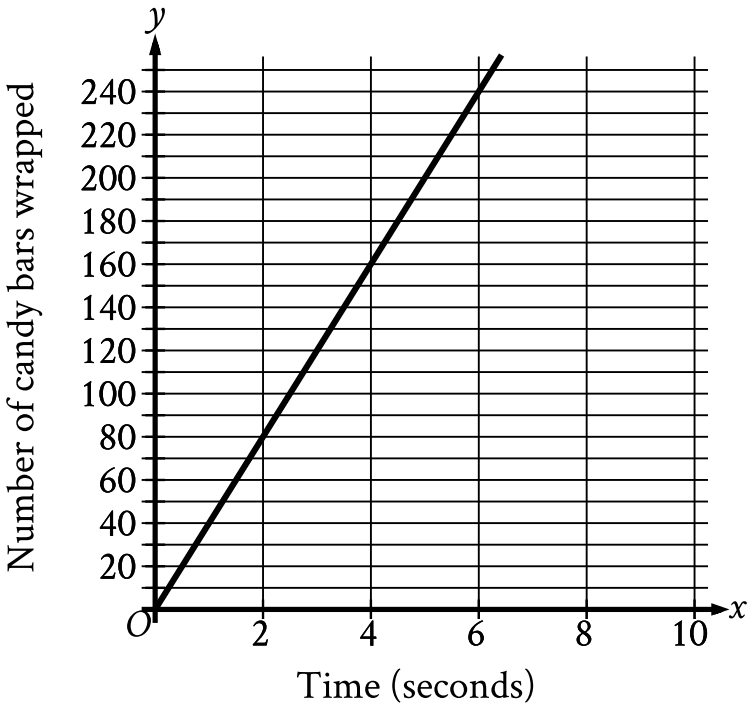
Question Difficulty: Medium

Question ID 13294295

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 13294295

The graph shown models the number of candy bars a certain machine wraps with a label in x seconds.



According to the graph, what is the estimated number of candy bars the machine wraps with a label per second?

A. 2

B. 40

C. 78

D. 80

ID: 13294295 Answer

Correct Answer: B

Rationale

Choice B is correct. For the graph shown, the *x*-axis represents time, in seconds, and the *y*-axis represents the number of candy bars wrapped. The slope of a line in the *xy*-plane is the change in y for each 1-unit increase in x. It follows that the slope of the graph shown represents the estimated number of candy bars the machine wraps with a label per second. The slope, m, of a line in the *xy*-plane can be found using any two points, (x_1, y_1) and (x_2, y_2), on the line and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. The graph shown passes through the points $(0, 0)$ and $(2, 80)$. Substituting these points for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{80 - 0}{2 - 0}$, which is equivalent to $m = \frac{80}{2}$, or $m = 40$. Therefore, the estimated number of candy bars the machine wraps with a label per second is 40.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID ed92fb68

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: ed92fb68

$4x + 5y = 100$
$5x + 4y = 62$

If the system of equations above has solution (x, y),

what is the value of $x + y$?

A. 0

B. 9

C. 18

D. 38

ID: ed92fb68 Answer

Correct Answer: C

Rationale

Choice C is correct. Adding the given equations yields 9x + 9y = 162. Dividing each side of the equation 9x + 9y = 162 by 9 gives x + y = 18.

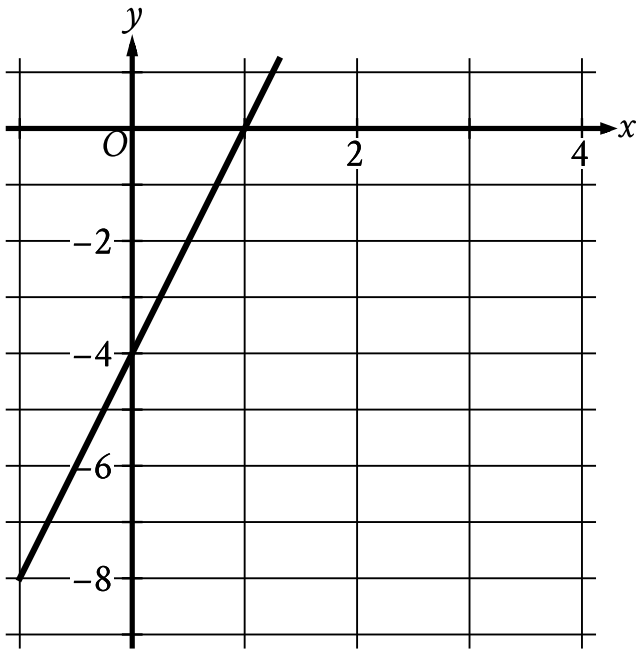
Choice A is incorrect and may result from incorrectly adding the equations. Choice B is incorrect and may result from conceptual or computational errors. Choice D is incorrect. This value is equivalent to y – x.

Question Difficulty: Medium

Question ID 33e4af6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 33e4af6b



The graph of the function f is shown, where $y = f(x)$. What is the *y*-intercept of the graph?

A. $(0, -1)$

B. $(0, -4)$

C. $(0, 1)$

D. $(0, 4)$

ID: 33e4af6b Answer

Correct Answer: B

Rationale

Choice B is correct. The *y*-intercept of a graph is the point where the graph intersects the *y*-axis. The graph of function f shown intersects the *y*-axis at the point $(0, -4)$. Therefore, the *y*-intercept of the graph is $(0, -4)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID bbb0359a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: bbb0359a

x	1	2	3
y	11	16	21

The table shows three values of x and their corresponding values of y. Which equation represents the linear relationship between x and y?

A. $y = 5x + 6$

B. $y = 5x + 11$

C. $y = 6x + 5$

D. $y = 6x + 11$

ID: bbb0359a Answer

Correct Answer: A

Rationale

Choice A is correct. The linear relationship between x and y can be represented by the equation $y = mx + b$, where m is the slope of the line in the *xy*-plane that represents the relationship, and b is the *y*-coordinate of the *y*-intercept. The slope can be computed using any two points on the line. The slope of a line between any two points, (x_1, y_1) and (x_2, y_2), on the line can be calculated using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. In the given table, each value of x and its corresponding value of y can be represented by a point (x, y). In the given table, when the value of x is 1, the corresponding value of y is 11 and when the value of x is 2, the corresponding value of y is 16. Therefore, the points $(1, 11)$ and $(2, 16)$ are on the line. Substituting $(1, 11)$ and $(2, 16)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{16 - 11}{2 - 1}$, or $m = 5$. Substituting 5 for m in the equation $y = mx + b$ yields $y = 5x + b$. Substituting the first value of x in the table, 1, and its corresponding value of y, 11, for x and y, respectively, in this equation yields $11 = 5(1) + b$, or $11 = b + 5$. Subtracting 5 from both sides of this equation yields $6 = b$. Substituting 6 for b in the equation $y = 5x + b$ yields $y = 5x + 6$. Therefore, the equation $y = 5x + 6$ represents the linear relationship between x and y.

Choice B is incorrect. For this relationship, when the value of x is 1, the corresponding value of y is 16, not 11.

Choice C is incorrect. For this relationship, when the value of x is 2, the corresponding value of y is 17, not 16.

Choice D is incorrect. For this relationship, when the value of x is 1, the corresponding value of y is 17, not 11.

Question Difficulty: Medium

Question ID 1a621af4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 1a621af4

A number x is at most 2 less than 3 times the value of y. If the value of y is -4, what is the greatest possible value of x?

ID: 1a621af4 Answer

Correct Answer: -14

Rationale

The correct answer is -14. It's given that a number x is at most 2 less than 3 times the value of y. Therefore, x is less than or equal to 2 less than 3 times the value of y. The expression $3y$ represents 3 times the value of y. The expression $3y - 2$ represents 2 less than 3 times the value of y. Therefore, x is less than or equal to $3y - 2$. This can be shown by the inequality $x \leq 3y - 2$. Substituting -4 for y in this inequality yields $x \leq 3(-4) - 2$ or, $x \leq -14$. Therefore, if the value of y is -4, the greatest possible value of x is -14.

Question Difficulty: Hard

Question ID 3e9eaffc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 3e9eaffc

Caleb used juice to make popsicles. The function $f(x) = -5x + 30$ approximates the volume, in fluid ounces, of juice Caleb had remaining after making x popsicles. Which statement is the best interpretation of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane in this context?

A. Caleb used approximately 5 fluid ounces of juice for each popsicle.

B. Caleb had approximately 5 fluid ounces of juice when he began to make the popsicles.

C. Caleb had approximately 30 fluid ounces of juice when he began to make the popsicles.

D. Caleb used approximately 30 fluid ounces of juice for each popsicle.

ID: 3e9eaffc Answer

Correct Answer: C

Rationale

Choice C is correct. An equation that defines a linear function f can be written in the form $f(x) = mx + b$, where m represents the slope and b represents the *y*-intercept, $(0, b)$, of the line of $y = f(x)$ in the *xy*-plane. The function $f(x) = -5x + 30$ is linear. Therefore, the graph of the given function $y = f(x)$ in the *xy*-plane has a *y*-intercept of $(0, 30)$. It's given that $f(x)$ gives the approximate volume, in fluid ounces, of juice Caleb had remaining after making x popsicles. It follows that the *y*-intercept of $(0, 30)$ means that Caleb had approximately 30 fluid ounces of juice remaining after making 0 popsicles. In other words, Caleb had approximately 30 fluid ounces of juice when he began to make the popsicles.

Choice A is incorrect. This is an interpretation of the slope, rather than the *y*-intercept, of the graph of $y = f(x)$ in the *xy*-plane.

Choice B is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID af2ba762

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: af2ba762

According to data provided by the US Department of Energy, the average price per gallon of regular gasoline in the United States from September 1, 2014, to December 1, 2014, is modeled by the function F defined below, where $F(x)$ is the average price per gallon x months after September 1.

$F(x) = 2.74 - 0.19(x - 3)$

The constant 2.74 in this function estimates which of the following?

A. The average monthly decrease in the price per gallon

B. The difference in the average price per gallon from September 1, 2014, to December 1, 2014

C. The average price per gallon on September 1, 2014

D. The average price per gallon on December 1, 2014

ID: af2ba762 Answer

Correct Answer: D

Rationale

Choice D is correct. Since 2.74 is a constant term, it represents an actual price of gas rather than a measure of change in gas price. To determine what gas price it represents, find x such that F(x) = 2.74, or 2.74 = 2.74 − 0.19(x − 3). Subtracting 2.74 from both sides gives 0 = −0.19(x − 3). Dividing both sides by −0.19 results in 0 = x − 3, or x = 3. Therefore, the average price of gas is $2.74 per gallon 3 months after September 1, 2014, which is December 1, 2014.

Choice A is incorrect. Since 2.74 is a constant, not a multiple of x, it cannot represent a rate of change in price. Choice B is incorrect. The difference in the average price from September 1, 2014, to December 1, 2014, is F(3) − F(0) = 2.74 − 0.19(3 − 3) − (2.74 − 0.19(0 − 3)) = 2.74 − (2.74 + 0.57) = −0.57, which is not 2.74. Choice C is incorrect. The average price per gallon on September 1, 2014, is F(0) = 2.74 − 0.19(0 − 3) = 2.74 + 0.57 = 3.31, which is not 2.74.

Question Difficulty: Hard

Question ID 19fdf387

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 19fdf387

In the *xy*-plane, the graph of $y = x + 3$ intersects the graph of $y = 2x - 6$ at the point (a,b). What is the value of *a* ?

A. 3

B. 6

C. 9

D. 12

ID: 19fdf387 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the graph of $y = x + 3$ intersects the graph of $y = 2x - 6$ at the point (a,b), the ordered pair (a,b) is the solution to the system of linear equations consisting of $y = x + 3$ and $y = 2x - 6$, and the value of a is the value of x in the solution of this system. Since both $x + 3$and $2x - 6$ are equal to y, it follows that $x + 3 = 2x - 6$. Subtracting x from and adding 6 to both sides of the equation yields $9 = x$. Therefore, the value of a is 9.

Choices A and B are incorrect and may result from a calculation or conceptual error in solving the system of equations consisting of $y = x + 3$ and $y = 2x - 6$. Choice D is incorrect. This is the value of b, not a.

Question Difficulty: Medium

Question ID a775af14

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: a775af14

In the *xy*-plane, the graph of the linear function f contains the points $(0, 2)$ and $(8, 34)$. Which equation defines f, where $y = f(x)$?

A. $f(x) = 2x + 42$

B. $f(x) = 32x + 36$

C. $f(x) = 4x + 2$

D. $f(x) = 8x + 2$

ID: a775af14 Answer

Correct Answer: C

Rationale

Choice C is correct. In the *xy*-plane, the graph of a linear function can be written in the form $f(x) = mx + b$, where m represents the slope and $(0, b)$ represents the *y*-intercept of the graph of $y = f(x)$. It's given that the graph of the linear function f, where $y = f(x)$, in the *xy*-plane contains the point $(0, 2)$. Thus, $b = 2$. The slope of the graph of a line containing any two points (x_1, y_1) and (x_2, y_2) can be found using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since it's given that the graph of the linear function f contains the points $(0, 2)$ and $(8, 34)$, it follows that the slope of the graph of the line containing these points is $m = \frac{34 - 2}{8 - 0}$, or $m = 4$. Substituting 4 for m and 2 for b in $f(x) = mx + b$ yields $f(x) = 4x + 2$.

Choice A is incorrect. This function represents a graph with a slope of 2 and a *y*-intercept of $(0, 42)$.

Choice B is incorrect. This function represents a graph with a slope of 32 and a *y*-intercept of $(0, 36)$.

Choice D is incorrect. This function represents a graph with a slope of 8 and a *y*-intercept of $(0, 2)$.

Question Difficulty: Medium

Question ID 9551cd91

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 9551cd91

Number of cars	Maximum number of passengers and crew
3	174
5	284
10	559

The table shows the linear relationship between the number of cars, c, on a commuter train and the maximum number of passengers and crew, p, that the train can carry. Which equation represents the linear relationship between c and p?

A. $55c - p = -9$

B. $55c - p = 9$

C. $55p - c = -9$

D. $55p - c = 9$

ID: 9551cd91 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that there is a linear relationship between the number of cars, c, on a commuter train and the maximum number of passengers and crew, p, that the train can carry. It follows that this relationship can be represented by an equation of the form $p = mc + b$, where m is the rate of change of p in this relationship and b is a constant. The rate of change of p in this relationship can be calculated by dividing the difference in any two values of p by the difference in the corresponding values of c. Using two pairs of values given in the table, the rate of change of p in this relationship is $\frac{284-174}{5-3}$, or 55. Substituting 55 for m in the equation $p = mc + b$ yields $p = 55c + b$. The value of b can be found by substituting any value of c and its corresponding value of p for c and p, respectively, in this equation. Substituting 10 for c and 559 for p yields $559 = 55(10) + b$, or $559 = 550 + b$. Subtracting 550 from both sides of this equation yields $9 = b$. Substituting 9 for b in the equation $p = 55c + b$ yields $p = 55c + 9$. Subtracting 9 from both sides of this equation yields $p - 9 = 55c$. Subtracting p from both sides of this equation yields $-9 = 55c - p$, or $55c - p = -9$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID db0107df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: db0107df

The *y*-intercept of the graph of $12x + 2y = 18$ in the *xy*-plane is $(0, y)$. What is the value of y?

ID: db0107df Answer

Correct Answer: 9

Rationale

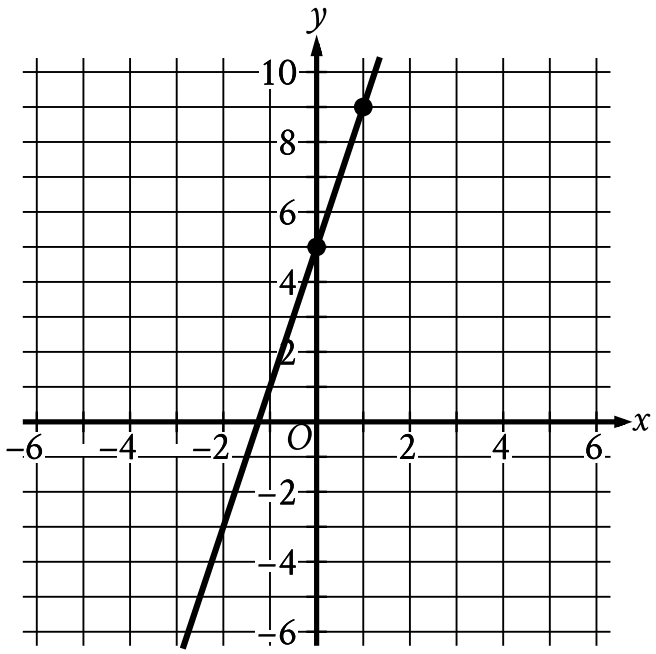
The correct answer is 9. It's given that the *y*-intercept of the graph of $12x + 2y = 18$ in the *xy*-plane is $(0, y)$. Substituting 0 for x in the equation $12x + 2y = 18$ yields $12(0) + 2y = 18$, or $2y = 18$. Dividing both sides of this equation by 2 yields $y = 9$. Therefore, the value of y is 9.

Question Difficulty: Easy

Question ID b8fa27db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b8fa27db



Line j is shown in the *xy*-plane. Line k (not shown) is parallel to line j. What is the slope of line k?

ID: b8fa27db Answer

Correct Answer: 4

Rationale

The correct answer is 4. It's given that line k is parallel to line j. It follows that the slope of line k is equal to the slope of line j. Given two points on a line in the *xy*-plane, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated as $\frac{y_2-y_1}{x_2-x_1}$. In the *xy*-plane shown, the points $(0, 5)$ and $(1, 9)$ are on line j. It follows that the slope of line j is $\frac{9-5}{1-0}$, or 4. Since the slope of line j is equal to the slope of line k, the slope of line k is also 4.

Question Difficulty: Easy

Question ID b9835972

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: b9835972

In the *xy*-plane, line ℓ passes through the point $(0, 0)$ and is parallel to the line represented by the equation $y = 8x + 2$. If line ℓ also passes through the point $(3, d)$, what is the value of d?

ID: b9835972 Answer

Correct Answer: 24

Rationale

The correct answer is 24. A line in the *xy*-plane can be defined by the equation $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept of the line. It's given that line ℓ passes through the point $(0, 0)$. Therefore, the *y*-coordinate of the *y*-intercept of line ℓ is 0. It's given that line ℓ is parallel to the line represented by the equation $y = 8x + 2$. Since parallel lines have the same slope, it follows that the slope of line ℓ is 8. Therefore, line ℓ can be defined by an equation in the form $y = mx + b$, where $m = 8$ and $b = 0$. Substituting 8 for m and 0 for b in $y = mx + b$ yields the equation $y = 8x + 0$, or $y = 8x$. If line ℓ passes through the point $(3, d)$, then when $x = 3$, $y = d$ for the equation $y = 8x$. Substituting 3 for x and d for y in the equation $y = 8x$ yields $d = 8(3)$, or $d = 24$.

Question Difficulty: Hard

Question ID ebd457f4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: ebd457f4

Brian saves $\frac{2}{5}$ of the $\$215$ he earns each week from his job. If Brian continues to save at this rate, how much money, in dollars, will Brian save in 9 weeks?

ID: ebd457f4 Answer

Correct Answer: 774

Rationale

The correct answer is 774. It's given that Brian saves $\frac{2}{5}$ of the $\$215$ he earns each week from his job. Therefore, Brian saves $\left(\frac{2}{5}\right)(\$215)$, or $\$86$, per week. If Brian continues to save at this rate of $\$86$ per week for 9 weeks, then he will save a total of $(9)(86)$, or 774, dollars.

Question Difficulty: Medium

Question ID e0f59119

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: e0f59119

What is the slope of the graph of $y = \frac{1}{3}(29x + 10) + 5x$ in the *xy*-plane?

ID: e0f59119 Answer

Correct Answer: 14.66, 14.67, 44/3

Rationale

The correct answer is $\frac{44}{3}$. A linear equation can be written in the form $y = mx + b$, where m is the slope of the graph of the equation in the *xy*-plane and $(0, b)$ is the *y*-intercept. Distributing the $\frac{1}{3}$ in the equation $y = \frac{1}{3}(29x + 10) + 5x$ yields $y = \frac{29}{3}x + \frac{10}{3} + 5x$. Combining like terms on the right-hand side of this equation yields $y = \frac{44}{3}x + \frac{10}{3}$. This equation is in the form $y = mx + b$, where $m = \frac{44}{3}$ and $b = \frac{10}{3}$. Therefore, the slope of the graph of the given equation in the *xy*-plane is $\frac{44}{3}$. Note that 44/3, 14.66, and 14.67 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 6c5c2a81

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 6c5c2a81

For the linear function h, the graph of $y = h(x)$ in the *xy*-plane passes through the points $(7, 21)$ and $(9, 25)$. Which equation defines h?

A. $h(x) = \frac{1}{2}x - \frac{7}{2}$

B. $h(x) = 2x + 7$

C. $h(x) = 7x + 21$

D. $h(x) = 9x + 25$

ID: 6c5c2a81 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph of the linear function h, where $y = h(x)$, passes through the points $(7, 21)$ and $(9, 25)$ in the *xy*-plane. An equation defining h can be written in the form $y = mx + b$, where $y = h(x)$, m represents the slope of the graph in the *xy*-plane, and b represents the *y*-coordinate of the *y*-intercept of the graph. The slope can be found using any two points, (x_1, y_1) and (x_2, y_2), and the formula $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$. Substituting $(7, 21)$ and $(9, 25)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{25 - 21}{9 - 7}$, which is equivalent to $m = \frac{4}{2}$, or $m = 2$. Substituting 2 for m and $(7, 21)$ for (x, y) in the equation $y = mx + b$ yields $21 = (2)(7) + b$, or $21 = 14 + b$. Subtracting 14 from each side of this equation yields $7 = b$. Substituting 2 for m and 7 for b in the equation $y = mx + b$ yields $y = 2x + 7$. Since $y = h(x)$, it follows that the equation that defines h is $h(x) = 2x + 7$.

Choice A is incorrect. For this function, the graph of $y = h(x)$ in the *xy*-plane would pass through $(7, 0)$, not $(7, 21)$, and $(9, 1)$, not $(9, 25)$.

Choice C is incorrect. For this function, the graph of $y = h(x)$ in the *xy*-plane would pass through $(7, 70)$, not $(7, 21)$, and $(9, 84)$, not $(9, 25)$.

Choice D is incorrect. For this function, the graph of $y = h(x)$ in the *xy*-plane would pass through $(7, 88)$, not $(7, 21)$, and $(9, 106)$, not $(9, 25)$.

Question Difficulty: Medium

Question ID df32b09c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: df32b09c

Tom scored 85, 78, and 98 on his first three exams in history class. Solving which inequality gives the score, *G*, on Tom's fourth exam that will result in a mean score on all four exams of at least 90 ?

A. $90-(85+78+98)\leq 4G$

B. $4G+85+78+98\geq 360$

C. $\frac{(G+85+78+98)}{4}\geq 90$

D. $\frac{(85+78+98)}{4}\geq 90-4G$

ID: df32b09c Answer

Correct Answer: C

Rationale

Choice C is correct. The mean of the four scores (G, 85, 78, and 98) can be expressed as $\frac{G+85+78+98}{4}$. The inequality that expresses the condition that the mean score is at least 90 can therefore be written as $\frac{G+85+78+98}{4}\geq 90$.

Choice A is incorrect. The sum of the scores (G, 85, 78, and 98) isn't divided by 4 to express the mean. Choice B is incorrect and may be the result of an algebraic error when multiplying both sides of the inequality by 4. Choice D is incorrect because it doesn't include G in the mean with the other three scores.

Question Difficulty: Easy

Question ID e1248a5c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: e1248a5c

$$\frac{1}{2}x+\frac{1}{3}y=\frac{1}{6}$$

In the system of equations below, *a* and *c* are constants. $ax+y=c$

If the system of equations has an infinite number of solutions (x,y), what is the value of *a* ?

A. $-\frac{1}{2}$

B. 0

C. $\frac{1}{2}$

D. $\frac{3}{2}$

ID: e1248a5c Answer

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations has infinitely many solutions if one equation is equivalent to the other. This means that when the two equations are written in the same form, each coefficient or constant in one equation is equal to the corresponding coefficient or constant in the other equation multiplied by the same number. The equations in the given system of equations are written in the same form, with x and y on the left-hand side and a constant on the right-hand side of the equation. The coefficient of y in the second equation is equal to the coefficient of y in the first equation multiplied by 3. Therefore, a, the coefficient of x in the second equation, must be equal to 3 times the coefficient of x in the first equation: $a=(\frac{1}{2})(3)$, or $a=\frac{3}{2}$.

Choices A, B, and C are incorrect. When $a=-\frac{1}{2}$, $a=0$, or $a=\frac{1}{2}$, the given system of equations has one solution.

Question Difficulty: Hard

Question ID b8cbe394

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: b8cbe394

Sean rents a tent at a cost of $\$11$ per day plus a onetime insurance fee of $\$10$. Which equation represents the total cost c, in dollars, to rent the tent with insurance for d days?

A. $c = 11(d + 10)$

B. $c = 10(d + 11)$

C. $c = 11d + 10$

D. $c = 10d + 11$

ID: b8cbe394 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the cost of renting a tent is $\$11$ per day for d days. Multiplying the rental cost by the number of days yields $\$11d$, which represents the cost of renting the tent for d days before the insurance is added. Adding the onetime insurance fee of $\$10$ to the rental cost of $\$11d$ gives the total cost c, in dollars, which can be represented by the equation $c = 11d + 10$.

Choice A is incorrect. This equation represents the total cost to rent the tent if the insurance fee was charged every day.

Choice B is incorrect. This equation represents the total cost to rent the tent if the daily fee was $\$(d + 11)$ for 10 days.

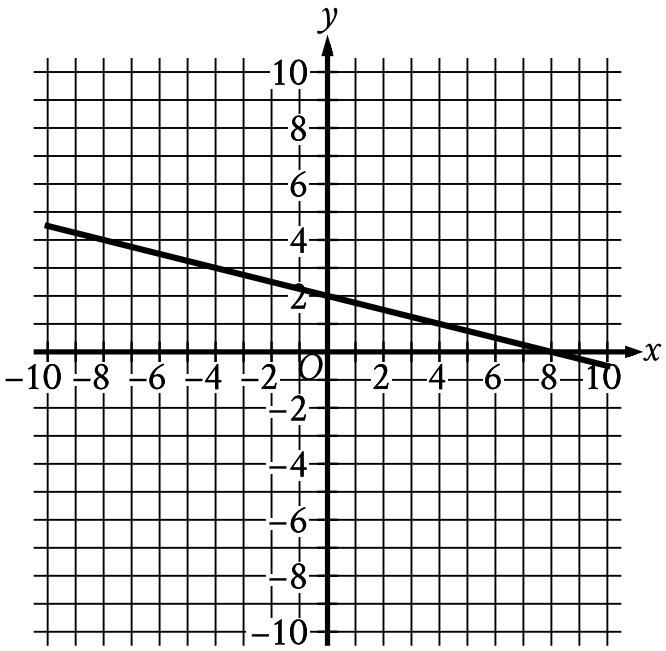
Choice D is incorrect. This equation represents the total cost to rent the tent if the daily fee was $\$10$ and the onetime fee was $\$11$.

Question Difficulty: Easy

Question ID 05bb1af9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 05bb1af9



The graph of $y = f(x) + 14$ is shown. Which equation defines function f?

A. $f(x) = -\frac{1}{4}x - 12$

B. $f(x) = -\frac{1}{4}x + 16$

C. $f(x) = -\frac{1}{4}x + 2$

D. $f(x) = -\frac{1}{4}x - 14$

ID: 05bb1af9 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation for the graph shown can be written in slope-intercept form $y = mx + b$, where m is the slope of the graph and its *y*-intercept is $(0, b)$. Since the *y*-intercept of the graph shown is $(0, 2)$, the value of b is 2. Since the graph also passes through the point $(4, 1)$, the slope can be calculated as $\frac{1-2}{4-0}$, or $-\frac{1}{4}$. Therefore, the value of m is $-\frac{1}{4}$. Substituting $-\frac{1}{4}$ for m and 2 for b in the equation $y = mx + b$ yields $y = -\frac{1}{4}x + 2$. It's given that an equation for the graph shown is $y = f(x) + 14$. Substituting $f(x) + 14$ for y in the equation $y = -\frac{1}{4}x + 2$ yields $f(x) + 14 = -\frac{1}{4}x + 2$. Subtracting 14 from both sides of this equation yields $f(x) = -\frac{1}{4}x - 12$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID cc7ffe02

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: cc7ffe02

Keenan made 32 cups of vegetable broth. Keenan then filled x small jars and y large jars with all the vegetable broth he made. The equation $3x + 5y = 32$ represents this situation. Which is the best interpretation of $5y$ in this context?

A. The number of large jars Keenan filled

B. The number of small jars Keenan filled

C. The total number of cups of vegetable broth in the large jars

D. The total number of cups of vegetable broth in the small jars

ID: cc7ffe02 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the equation $3x + 5y = 32$ represents the situation where Keenan filled x small jars and y large jars with all the vegetable broth he made, which was 32 cups. Therefore, $3x$ represents the total number of cups of vegetable broth in the small jars and $5y$ represents the total number of cups of vegetable broth in the large jars.

Choice A is incorrect. The number of large jars Keenan filled is represented by y, not $5y$.

Choice B is incorrect. The number of small jars Keenan filled is represented by x, not $5y$.

Choice D is incorrect. The total number of cups of vegetable broth in the small jars is represented by $3x$, not $5y$.

Question Difficulty: Hard

Question ID 86f7483f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 86f7483f

During spring migration, a dragonfly traveled a minimum of $1{,}510$ miles and a maximum of $4{,}130$ miles between stopover locations. Which inequality represents this situation, where d is a possible distance, in miles, this dragonfly traveled between stopover locations during spring migration?

A. $d \leq 1{,}510$

B. $1{,}510 \leq d \leq 4{,}130$

C. $d \geq 4{,}130$

D. $4{,}130 \leq d \leq 5{,}640$

ID: 86f7483f Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that during spring migration, a dragonfly traveled a minimum of $1{,}510$ miles and a maximum of $4{,}130$ miles between stopover locations. It's also given that d represents a possible distance, in miles, this dragonfly traveled between stopover locations. It follows that the inequality $1{,}510 \leq d \leq 4{,}130$ represents this situation.

Choice A is incorrect. This inequality represents a situation in which a dragonfly traveled a maximum of $1{,}510$ miles between stopover locations.

Choice C is incorrect. This inequality represents a situation in which a dragonfly traveled a minimum of $4{,}130$ miles between stopover locations.

Choice D is incorrect. This inequality represents a situation in which a dragonfly traveled a minimum of $4{,}310$ miles and a maximum of $5{,}640$ miles between stopover locations.

Question Difficulty: Easy

Question ID dae126d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: dae126d7

The boiling point of water at sea level is 212 degrees Fahrenheit $(°F)$. For every 550 feet above sea level, the boiling point of water is lowered by about $1°F$.

Which of the following equations can be used to find the boiling point B of water, in $°F$, x feet above sea level?

A. $B = 550 + \frac{x}{212}$

B. $B = 550 - \frac{x}{212}$

C. $B = 212 + \frac{x}{550}$

D. $B = 212 - \frac{x}{550}$

ID: dae126d7 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the boiling point of water at sea level is 212°F and that for every 550 feet above sea level, the boiling point of water is lowered by about 1°F. Therefore, the change in the boiling point of water x feet above sea level is represented by the expression $-\frac{x}{550}$. Adding this expression to the boiling point of water at sea level gives the equation for the boiling point B of water, in °F, x feet above sea level: $B = -\frac{x}{550} + 212$, or $B = 212 - \frac{x}{550}$.

Choices A and B are incorrect and may result from using the boiling point of water at sea level as the rate of change and the rate of change as the initial boiling point of water at sea level. Choice C is incorrect and may result from representing the change in the boiling point of water as an increase rather than a decrease.

Question Difficulty: Medium

Question ID bf5f80c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: bf5f80c6

$y < -4x + 4$ Which point (x, y) is a solution to the given inequality in the xy-plane?

A. $(-4, 0)$

B. $(0, 5)$

C. $(2, 1)$

D. $(2, -1)$

ID: bf5f80c6 Answer

Correct Answer: A

Rationale

Choice D is correct. For a point (x, y) to be a solution to the given inequality in the *xy*-plane, the value of the point's *y*-coordinate must be less than the value of $-4x + 4$, where x is the value of the *x*-coordinate of the point. This is true of the point $(-4, 0)$ because $0 < -4(-4) + 4$, or $0 < 20$. Therefore, the point $(-4, 0)$ is a solution to the given inequality.

Choices A, B, and C are incorrect. None of these points are a solution to the given inequality because each point's *y*-coordinate is greater than the value of $-4x + 4$ for the point's *x*-coordinate.

Question Difficulty: Medium

Question ID 12983c1e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 12983c1e

x	$f(x)$
1	5
3	13
5	21

Some values of the linear function *f* are shown in the table above.
Which of the following defines *f* ?

A. $f(x)=2x+3$

B. $f(x)=3x+2$

C. $f(x)=4x+1$

D. $f(x)=5x$

ID: 12983c1e Answer

Correct Answer: C

Rationale

Choice C is correct. Because f is a linear function of x, the equation $f(x)=mx+b$, where m and b are constants, can be used to define the relationship between x and f (*x*). In this equation, m represents the increase in the value of f (x) for every increase in the value of x by 1. From the table, it can be determined that the value of f (x) increases by 8 for every increase in the value of x by 2. In other words, for the function *f* the value of m is $\frac{8}{2}$, or 4. The value of b can be found by substituting the values of x and f (x) from any row of the table and the value of m into the equation $f(x)=mx+b$ and solving for b. For example, using $x=1$, $f(x)=5$, and $m=4$ yields $5=4(1)+b$. Solving for b yields $b=1$. Therefore, the equation defining the function f can be written in the form $f(x)=4x+1$.

Choices A, B, and D are incorrect. Any equation defining the linear function f must give values of f (x) for corresponding values of x, as shown in each row of the table. According to the table, if $x=3$, $f(x)=13$. However, substituting $x=3$ into the equation given in choice A gives $f(3)=2(3)+3$, or $f(3)=9$, not 13. Similarly, substituting $x=3$ into the equation given in choice B gives $f(3)=3(3)+2$, or $f(3)=11$, not 13.

Lastly, substituting $x=3$ into the equation given in choice D gives $f(3)=5(3)$, or $f(3)=15$, not 13. Therefore, the equations in choices A, B, and D cannot define f.

Question Difficulty: Easy

Question ID aeaba0b6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: aeaba0b6

$f(x) = 14 + 4x$

The function f represents the total cost, in dollars, of attending an arcade when x games are played. How many games can be played for a total cost of $\$58$?

ID: aeaba0b6 Answer

Correct Answer: 11

Rationale

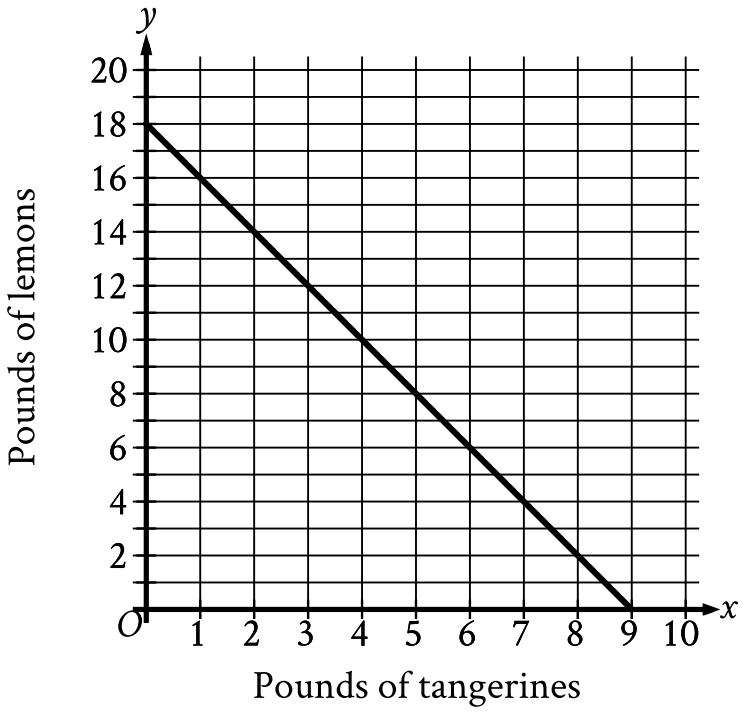
The correct answer is 11. It's given that the function $f(x) = 14 + 4x$ represents the total cost, in dollars, of attending an arcade when x games are played. Substituting 58 for $f(x)$ in the given equation yields $58 = 14 + 4x$. Subtracting 14 from each side of this equation yields $44 = 4x$. Dividing each side of this equation by 4 yields $11 = x$. Therefore, 11 games can be played for a total cost of $\$58$.

Question Difficulty: Easy

Question ID 8368afd1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 8368afd1



The graph shows the possible combinations of the number of pounds of tangerines and lemons that could be purchased for $18 at a certain store. If Melvin purchased lemons and 4 pounds of tangerines for a total of $18, how many pounds of lemons did he purchase?

A. 7

B. 10

C. 14

D. 16

ID: 8368afd1 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph shows the possible combinations of the number of pounds of tangerines, x, and the number of pounds of lemons, y, that could be purchased for $\$18$ at a certain store. If Melvin purchased lemons and 4 pounds of tangerines for a total of $\$18$, the number of pounds of lemons he purchased is represented by the y-coordinate of the point on the graph where $x = 4$. For the graph shown, when $x = 4$, $y = 10$. Therefore, if Melvin purchased lemons and 4 pounds of tangerines for a total of $\$18$, then he purchased 10 pounds of lemons.

Choice A is incorrect. This is the number of pounds of tangerines Melvin purchased if he purchased tangerines and 4 pounds of lemons for a total of $\$18$.

Choice C is incorrect. This is the number of pounds of lemons Melvin purchased if he purchased lemons and 2 pounds of tangerines for a total of $\$18$.

Choice D is incorrect. This is the number of pounds of lemons Melvin purchased if he purchased lemons and 1 pound of tangerines for a total of $\$18$.

Question Difficulty: Easy

Question ID ae2287e2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: ae2287e2

A certain product costs a company $65 to make. The product is sold by a salesperson who earns a commission that is equal to 20% of the sales price of the product. The profit the company makes for each unit is equal to the sales price minus the combined cost of making the product and the commission. If the sales price of the product is $100, which of the following equations gives the number of units, *u*, of the product the company sold to make a profit of $6,840 ?

A. $(100(1-0.2)-65)u=6{,}840$

B. $(100-65)(1-0.8)u=6{,}840$

C. $0.8(100)-65u=6{,}840$

D. $(0.2(100)+65)u=6{,}840$

ID: ae2287e2 Answer

Correct Answer: A

Rationale

Choice A is correct. The sales price of one unit of the product is given as $100. Because the salesperson is awarded a commission equal to 20% of the sales price, the expression 100(1 – 0.2) gives the sales price of one unit after the commission is deducted. It is also given that the profit is equal to the sales price minus the combined cost of making the product, or $65, and the commission: 100(1 – 0.2) – 65. Multiplying this expression by u gives the profit of u units: (100(1 – 0.2) – 65)u. Finally, it is given that the profit for u units is $6,840; therefore (100(1 – 0.2) – 65)u = $6,840.

Choice B is incorrect. In this equation, cost is subtracted before commission and the equation gives the commission, not what the company retains after commission. Choice C is incorrect because the number of units is multiplied only by the cost but not by the sale price. Choice D is incorrect because the value 0.2 shows the commission, not what the company retains after commission.

Question Difficulty: Hard

Question ID 70d9516e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 70d9516e

A bus is traveling at a constant speed along a straight portion of road. The equation $d = 30t$ gives the distance d, in feet from a road marker, that the bus will be t seconds after passing the marker. How many feet from the marker will the bus be 2 seconds after passing the marker?

A. 30

B. 32

C. 60

D. 90

ID: 70d9516e Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that t represents the number of seconds after the bus passes the marker. Substituting 2 for t in the given equation $d = 30t$ yields $d = 30(2)$, or $d = 60$. Therefore, the bus will be 60 feet from the marker 2 seconds after passing it.

Choice A is incorrect. This is the distance, in feet, the bus will be from the marker 1 second, not 2 seconds, after passing it.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the distance, in feet, the bus will be from the marker 3 seconds, not 2 seconds, after passing it.

Question Difficulty: Easy

Question ID 1362ccde

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 1362ccde

$y = 4x + 1$
$4y = 15x - 8$ The solution to the given system of equations is (x, y). What is the value of $x - y$?

ID: 1362ccde Answer

Correct Answer: 35

Rationale

The correct answer is 35. The first equation in the given system of equations defines y as $4x + 1$. Substituting $4x + 1$ for y in the second equation in the given system of equations yields $4(4x + 1) = 15x - 8$. Applying the distributive property on the left-hand side of this equation yields $16x + 4 = 15x - 8$. Subtracting $15x$ from each side of this equation yields $x + 4 = -8$. Subtracting 4 from each side of this equation yields $x = -12$. Substituting -12 for x in the first equation of the given system of equations yields $y = 4(-12) + 1$, or $y = -47$. Substituting -12 for x and -47 for y into the expression $x - y$ yields $-12 - (-47)$, or 35.

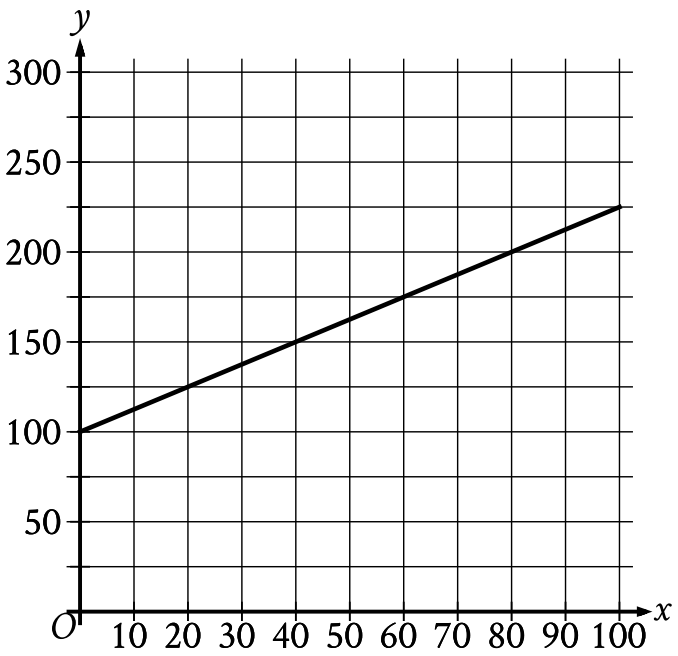
Question Difficulty: Hard

Question ID 720e51ac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 720e51ac

The cost y, in dollars, for a manufacturer to make x rings is represented by the line shown.



What is the cost, in dollars, for the manufacturer to make 60 rings?

A. 100

B. 125

C. 175

D. 225

ID: 720e51ac Answer

Correct Answer: C

Rationale

Choice C is correct. The line shown represents the cost y, in dollars, for a manufacturer to make x rings. For the line shown, the x-axis represents the number of rings made by the manufacturer and the y-axis represents the cost, in dollars. Therefore, the cost, in dollars, for the manufacturer to make 60 rings is represented by the y-coordinate of the point on the line that has an x-coordinate of 60. The point on the line with an x-coordinate of 60 has a y-coordinate of 175. Therefore, the cost, in dollars, for the manufacturer to make 60 rings is 175.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the cost, in dollars, for the manufacturer to make 20 rings.

Choice D is incorrect. This is the cost, in dollars, for the manufacturer to make 100 rings.

Question Difficulty: Easy

Question ID 4de87c9a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 4de87c9a

3 more than 8 times a number x is equal to 83. Which equation represents this situation?

A. $(3)(8)x = 83$

B. $8x = 83 + 3$

C. $3x + 8 = 83$

D. $8x + 3 = 83$

ID: 4de87c9a Answer

Correct Answer: D

Rationale

Choice D is correct. The given phrase "8 times a number x" can be represented by the expression $8x$. The given phrase "3 more than" indicates an increase of 3 to a quantity. Therefore "3 more than 8 times a number x" can be represented by the expression $8x + 3$. Since it's given that 3 more than 8 times a number x is equal to 83, it follows that $8x + 3$ is equal to 83, or $8x + 3 = 83$. Therefore, the equation that represents this situation is $8x + 3 = 83$.

Choice A is incorrect. This equation represents 3 times the quantity 8 times a number x is equal to 83.

Choice B is incorrect. This equation represents 8 times a number x is equal to 3 more than 83.

Choice C is incorrect. This equation represents 8 more than 3 times a number x is equal to 83.

Question Difficulty: Easy

Question ID 52cb8ea4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 52cb8ea4

$7x-5y=4$
$4x-8y=9$

If (x,y) is the solution to the system of equations above, what is the value of $3x+3y$?

A. -13

B. -5

C. 5

D. 13

ID: 52cb8ea4 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting the second equation, $4x-8y=9$, from the first equation, $7x-5y=4$, results in $(7x-5y)-(4x-8y)=4-9$, or $7x-5y-4x+8y=5$. Combining like terms on the left-hand side of this equation yields $3x+3y=-5$.

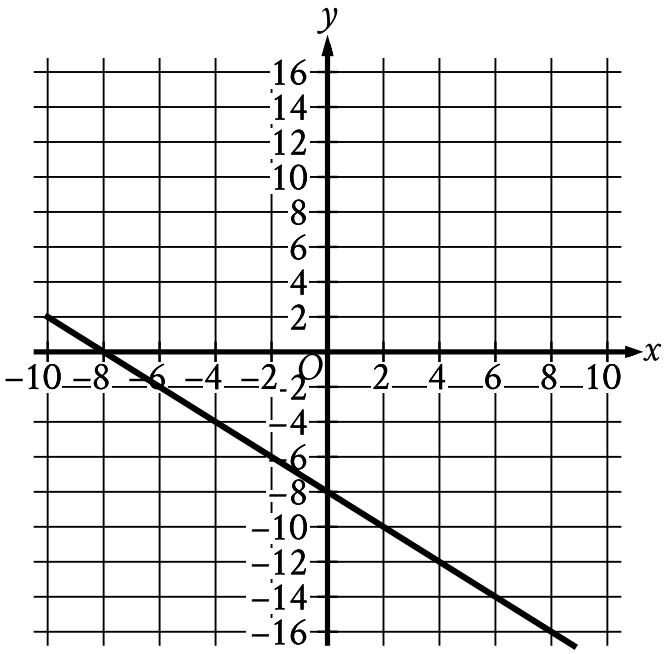
Choice A is incorrect and may result from miscalculating $4-9$ as -13. Choice C is incorrect and may result from miscalculating $4-9$ as 5. Choice D is incorrect and may result from adding 9 to 4 instead of subtracting 9 from 4.

Question Difficulty: Hard

Question ID c307283c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: c307283c



What is an equation of the graph shown?

A. $y = -2x - 8$

B. $y = x - 8$

C. $y = -x - 8$

D. $y = 2x - 8$

ID: c307283c Answer

Correct Answer: C

Rationale

Choice C is correct. An equation of a line can be written in the form $y = mx + b$, where m is the slope of the line and $(0, b)$ is the *y*-intercept of the line. The line shown passes through the point $(0, -8)$, so $b = -8$. The line shown also passes through the point $(-8, 0)$. The slope, m, of a line passing through two points (x_1, y_1) and (x_2, y_2) can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. For the points $(0, -8)$ and $(-8, 0)$, this gives $m = \frac{(-8) - 0}{0 - (-8)}$, or $m = -1$. Substituting -8 for b and -1 for m in $y = mx + b$ yields $y = (-1)x + (-8)$, or $y = -x - 8$. Therefore, an equation of the graph shown is $y = -x - 8$.

Choice A is incorrect. This is an equation of a line with a slope of -2, not -1.

Choice B is incorrect. This is an equation of a line with a slope of 1, not -1.

Choice D is incorrect. This is an equation of a line with a slope of 2, not -1.

Question Difficulty: Medium

Question ID 4e97f862

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 4e97f862

The function f is defined by $f(x) = 3x - 8$. What is the value of $f(7)$?

A. 29

B. 13

C. -5

D. -29

ID: 4e97f862 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the function f is defined by $f(x) = 3x - 8$. The value of $f(7)$ is the value of $f(x)$ when $x = 7$. Substituting 7 for x in the given equation yields $f(7) = 3(7) - 8$, which is equivalent to $f(7) = 21 - 8$, or $f(7) = 13$.

Choice A is incorrect. This is the value of $f(7)$ when $f(x) = 3x + 8$, rather than $f(x) = 3x - 8$.

Choice C is incorrect. This is the value of $f(1)$, rather than $f(7)$.

Choice D is incorrect. This is the value of $f(-7)$, rather than $f(7)$.

Question Difficulty: Easy

Question ID 8adf1335

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 8adf1335

A city's total expense budget for one year was *x* million dollars. The city budgeted *y* million dollars for departmental expenses and 201 million dollars for all other expenses. Which of the following represents the relationship between *x* and *y* in this context?

A. $x+y=201$

B. $x-y=201$

C. $2x-y=201$

D. $y-x=201$

ID: 8adf1335 Answer

Correct Answer: B

Rationale

Choice B is correct. Of the city's total expense budget for one year, the city budgeted y million dollars for departmental expenses and 201 million dollars for all other expenses. This means that the expression $y+201$ represents the total expense budget, in millions of dollars, for one year. It's given that the total expense budget for one year is x million dollars. It follows then that the expression $y+201$ is equivalent to x, or $y+201=x$. Subtracting y from both sides of this equation yields $201=x-y$. By the symmetric property of equality, this is the same as $x-y=201$.

Choices A and C are incorrect. Because it's given that the total expense budget for one year, x million dollars, is comprised of the departmental expenses, y million dollars, and all other expenses, 201 million dollars, the expressions $x+y$ and $2x-y$ both must be equivalent to a value greater than 201 million dollars. Therefore, the equations $x+y=201$ and $2x-y=201$ aren't true. Choice D is incorrect. The value of x must be greater than the value of y. Therefore, $y-x=201$ can't represent this relationship.

Question Difficulty: Easy

Question ID a0489274

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: a0489274

$y = -\frac{1}{5}x$ $y = \frac{1}{7}x$ The solution to the given system of equations is (x, y). What is the value of x?

A. -5

B. 0

C. 2

D. 7

ID: a0489274 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given by the first equation in the system that $y = -\frac{1}{5}x$. Substituting $-\frac{1}{5}x$ for y in the second equation in the system, $y = \frac{1}{7}x$, yields $-\frac{1}{5}x = \frac{1}{7}x$. Adding $-\frac{1}{5}x$ to both sides of this equation yields $0 = \frac{1}{7}x + \frac{1}{5}x$, which is equivalent to $0 = \frac{5}{35}x + \frac{7}{35}x$, or $0 = \frac{12}{35}x$. Multiplying both sides of this equation by $\frac{35}{12}$ yields $0 = x$. Therefore, the value of x is 0.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 9db5b5c1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 9db5b5c1

$4x = 20$ $-3x + y = -7$ The solution to the given system of equations is (x, y). What is the value of $x + y$?

A. -27

B. -13

C. 13

D. 27

ID: 9db5b5c1 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $4x = 20$ and $-3x + y = -7$ is a system of equations with a solution (x, y). Adding the second equation in the given system to the first equation yields $4x + (-3x + y) = 20 + (-7)$, which is equivalent to $x + y = 13$. Thus, the value of $x + y$ is 13.

Choice A is incorrect. This represents the value of $-2(x + y) - 1$.

Choice B is incorrect. This represents the value of $-(x + y)$.

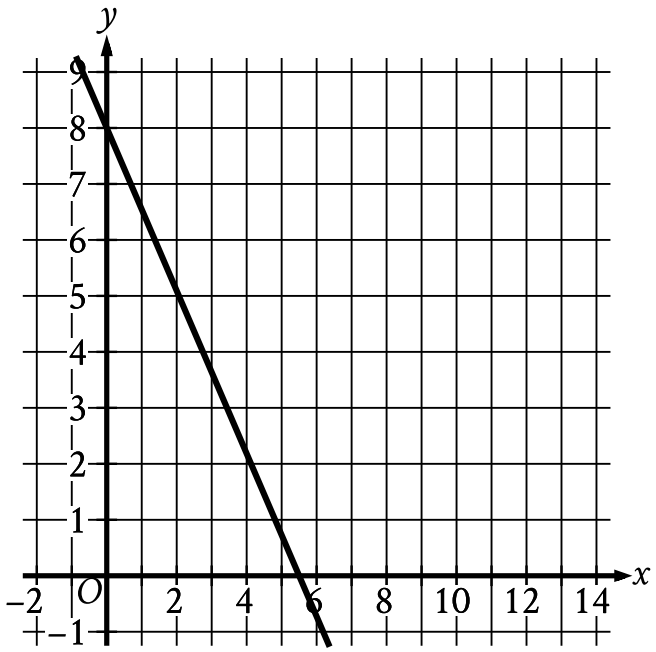
Choice D is incorrect. This represents the value of $2(x + y) + 1$.

Question Difficulty: Easy

Question ID 3174f07d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 3174f07d



The graph of the linear function f is shown, where $y = f(x)$. What is the *y*-intercept of the graph of f?

A. $(0, 0)$

B. $(0, -\frac{16}{11})$

C. $(0, -8)$

D. $(0, 8)$

ID: 3174f07d Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of a graph is the point where the graph intersects the *y*-axis. The graph of function f shown intersects the *y*-axis at the point $(0, 8)$. Therefore, the *y*-intercept of the graph of f is $(0, 8)$.

Choice A is incorrect. This is the point where the *x*-axis, not the graph of f, intersects the *y*-axis.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 80da233d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 80da233d

A certain elephant weighs 200 pounds at birth and gains more than 2 but less than 3 pounds per day during its first year. Which of the following inequalities represents all possible weights *w*, in pounds, for the elephant 365 days after birth?

A. $400 < w < 600$

B. $565 < w < 930$

C. $730 < w < 1{,}095$

D. $930 < w < 1{,}295$

ID: 80da233d Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the elephant weighs 200 pounds at birth and gains more than 2 pounds but less than 3 pounds per day during its first year. The inequality $200 + 2d < w < 200 + 3d$ represents this situation, where d is the number of days after birth. Substituting 365 for d in the inequality gives $200 + 2(365) < w < 200 + 3(365)$, or $930 < w < 1{,}295$.

Choice A is incorrect and may result from solving the inequality $200(2) < w < 200(3)$. Choice B is incorrect and may result from solving the inequality for a weight range of more than 1 pound but less than 2 pounds: $200 + 1(365) < w < 200 + 2(365)$. Choice C is incorrect and may result from calculating the possible weight gained by the elephant during the first year without adding the 200 pounds the elephant weighed at birth.

Question Difficulty: Medium

Question ID 271f7e3f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 271f7e3f

$$f(x)=\frac{(x+7)}{4}$$

For the function f defined above, what is the value of $f(9)-f(1)$?

A. 1

B. 2

C. $\frac{1}{4}$

D. $\frac{9}{4}$

ID: 271f7e3f Answer

Correct Answer: B

Rationale

Choice B is correct. The value of $f(9)-f(1)$ can be calculated by finding the values of $f(9)$ and $f(1)$. The value of $f(9)$ can be found by substituting 9 for x in the given function: $f(9)=\frac{(9+7)}{4}$. This equation can be rewritten as $f(9)=\frac{16}{4}$, or 4. Then, the value of $f(1)$ can be found by substituting 1 for x in the given function: $f(1)=\frac{(1+7)}{4}$. This equation can be rewritten as $f(1)=\frac{8}{4}$, or 2. Therefore, $f(9)-f(1)=4-2$, which is equivalent to 2.

Choices A, C, and D are incorrect and may result from incorrectly substituting values of x in the given function or making computational errors.

Question Difficulty: Medium

Question ID 70e29454

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 70e29454

$$a(3-x)-b=-1-2x$$

In the equation above, *a* and *b* are constants. If the equation has infinitely many solutions, what are the values of *a* and *b* ?

A. $a=2$ and $b=1$

B. $a=2$ and $b=7$

C. $a=-2$ and $b=5$

D. $a=-2$ and $b=-5$

ID: 70e29454 Answer

Correct Answer: B

Rationale

Choice B is correct. Distributing the a on the left-hand side of the equation gives 3a − b − ax = −1 − 2x. Rearranging the terms in each side of the equation yields −ax + 3a − b = −2x −1. Since the equation has infinitely many solutions, it follows that the coefficients of x and the free terms on both sides must be equal. That is, −a = −2, or a = 2, and 3a − b = −1. Substituting 2 for a in the equation 3a − b = −1 gives 3(2) − b = −1, so b = 7.

Choice A is incorrect and may be the result of a conceptual error when finding the value of b. Choices C and D are incorrect and may result from making a sign error when simplifying.

Question Difficulty: Medium

Question ID 7866a908

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 7866a908

A sample of a certain alloy has a total mass of 50.0 grams and is 50.0% silicon by mass. The sample was created by combining two pieces of different alloys. The first piece was 30.0% silicon by mass and the second piece was 80.0% silicon by mass. What was the mass, in grams, of the silicon in the second piece?

A. 9.0

B. 16.0

C. 20.0

D. 30.0

ID: 7866a908 Answer

Correct Answer: B

Rationale

Choice B is correct. Let x represent the total mass, in grams, of the first piece, and let y represent the total mass, in grams, of the second piece. It's given that the sample has a total mass of 50.0 grams. Therefore, the equation $x + y = 50.0$ represents this situation. It's also given that the sample is 50.0% silicon by mass. Therefore, the total mass of the silicon in the sample is $0.500(50.0)$, or 25.0, grams. It's also given that the first piece was 30.0% silicon by mass and the second piece was 80.0% silicon by mass. Therefore, the masses, in grams, of the silicon in the first and second pieces can be represented by the expressions $0.300x$ and $0.800y$, respectively. Since the sample was created by combining the first and second pieces, and the total mass of the silicon in the sample is 25.0 grams, the equation $0.300x + 0.800y = 25.0$ represents this situation. Subtracting y from both sides of the equation $x + y = 50.0$ yields $x = 50.0 - y$. Substituting $50.0 - y$ for x in the equation $0.300x + 0.800y = 25.0$ yields $0.300(50.0 - y) + 0.800y = 25.0$. Distributing 0.300 on the left-hand side of this equation yields $15.0 - 0.300y + 0.800y = 25.0$. Combining like terms on the left-hand side of this equation yields $15.0 + 0.500y = 25.0$. Subtracting 15.0 from both sides of this equation yields $0.500y = 10.0$. Dividing both sides of this equation by 0.500 yields $y = 20.0$. Substituting 20.0 for y in the expression representing the mass, in grams, of the silicon in the second piece, $0.800y$, yields $0.800(20.0)$, or 16.0. Therefore, the mass, in grams, of the silicon in the second piece is 16.0.

Choice A is incorrect. This is the mass, in grams, of the silicon in the first piece, not the second piece.

Choice C is incorrect. This is the total mass, in grams, of the second piece, not the mass, in grams, of the silicon in the second piece.

Choice D is incorrect. This is the total mass, in grams, of the first piece, not the mass, in grams, of the silicon in the second piece.

Question Difficulty: Hard

Question ID e7b6f0d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: e7b6f0d1

$4x + 6 = 18$ Which equation has the same solution as the given equation?

A. $4x = 108$

B. $4x = 24$

C. $4x = 12$

D. $4x = 3$

ID: e7b6f0d1 Answer

Correct Answer: C

Rationale

Choice C is correct. Subtracting 6 from both sides of the given equation yields $4x = 12$, which is the equation given in choice C. Since this equation is equivalent to the given equation, it has the same solution as the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 72a5fd28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 72a5fd28

For a party, 50 dinner rolls are needed. Dinner rolls are sold in packages of 12. What is the minimum number of packages that should be bought for the party?

ID: 72a5fd28 Answer

Correct Answer: 5

Rationale

The correct answer is 5. Let p represent the number of packages of dinner rolls that should be bought for the party. It's given that dinner rolls are sold in packages of 12. Therefore, $12p$ represents the number of dinner rolls that should be bought for the party. It's also given that 50 dinner rolls are needed; therefore, $12p \geq 50$. Dividing both sides of this inequality by 12 yields $p \geq \frac{50}{12}$, or approximately $p \geq 4.17$. Since the number of packages of dinner rolls must be a whole number, the minimum number of packages that should be bought for the party is 5.

Question Difficulty: Easy

Question ID 0b46bad5

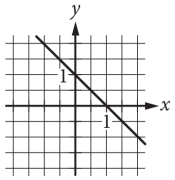
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 0b46bad5

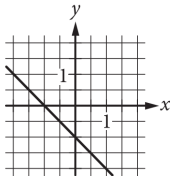
$ax + by = b$

In the equation above, *a* and *b* are constants and $0 < a < b$. Which of the following could represent the graph of the equation in the *xy*-plane?

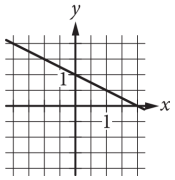
A.



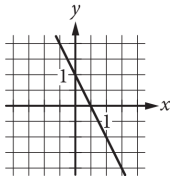
B.



C.



D.



ID: 0b46bad5 Answer

Correct Answer: C

Rationale

Choice C is correct. The given equation $ax + by = b$ can be rewritten in slope-intercept form, $y = mx + k$, where m represents the slope of the line represented by the equation, and k represents the y-coordinate of the y-intercept of the line. Subtracting ax from both sides of the equation yields $by = -ax + b$, and dividing both sides of this equation by b yields $y = -\frac{a}{b}x + \frac{b}{b}$, or $y = -\frac{a}{b}x + 1$. With the equation now in slope-intercept form, it shows that $k = 1$, which means the y-coordinate of the y-intercept is 1. It's given that a and b are both greater than 0 (positive) and that $a < b$. Since $m = -\frac{a}{b}$, the slope of the line must be a value between -1 and 0. Choice C is the only graph of a line that has a y-value of the y-intercept that is 1 and a slope that is between -1 and 0.

Choices A, B, and D are incorrect because the slopes of the lines in these graphs aren't between -1 and 0.

Question Difficulty: Hard

Question ID b31c3117

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: b31c3117

$H = 120p + 60$

The Karvonen formula above shows the relationship between Alice's target heart rate H, in beats per minute (bpm), and the intensity level p of different activities. When $p = 0$, Alice has a resting heart rate. When $p = 1$, Alice has her maximum heart rate. It is recommended that p be between 0.5 and 0.85 for Alice when she trains. Which of the following inequalities describes Alice's target training heart rate?

A. $120 \leq H \leq 162$

B. $102 \leq H \leq 120$

C. $60 \leq H \leq 162$

D. $60 \leq H \leq 102$

ID: b31c3117 Answer

Correct Answer: A

Rationale

Choice A is correct. When Alice trains, it's recommended that p be between 0.5 and 0.85. Therefore, her target training heart rate is represented by the values of H corresponding to $0.5 \leq p \leq 0.85$. When $p = 0.5$, $H = 120(0.5) + 60$, or $H = 120$. When $p = 0.85$, $H = 120(0.85) + 60$, or $H = 162$. Therefore, the inequality that describes Alice's target training heart rate is $120 \leq H \leq 162$.

Choice B is incorrect. This inequality describes Alice's target heart rate for $0.35 \leq p \leq 0.5$. Choice C is incorrect. This inequality describes her target heart rate for $0 \leq p \leq 0.85$. Choice D is incorrect. This inequality describes her target heart rate for $0 \leq p \leq 0.35$.

Question Difficulty: Medium

Question ID f79fffba

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: f79fffba

The function h is defined by $h(x) = 3x - 7$. What is the value of $h(-2)$?

A. -13

B. -10

C. 10

D. 13

ID: f79fffba Answer

Correct Answer: A

Rationale

Choice A is correct. The value of $h(-2)$ can be found by substituting -2 for x in the equation defining h. Substituting -2 for x in $h(x) = 3x - 7$ yields $h(-2) = 3(-2) - 7$, or $h(-2) = -13$. Therefore, the value of $h(-2)$ is -13.

Choice B is incorrect. This is the value of $h(-1)$, not $h(-2)$.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7d5d1b32

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 7d5d1b32

$2(kx - n) = -\frac{28}{15}x - \frac{36}{19}$

In the given equation, k and n are constants and $n > 1$. The equation has no solution. What is the value of k?

ID: 7d5d1b32 Answer

Correct Answer: -.9333, -14/15

Rationale

The correct answer is $-\frac{14}{15}$. A linear equation in the form $ax + b = cx + d$ has no solution only when the coefficients of x on each side of the equation are equal and the constant terms are not equal. Dividing both sides of the given equation by 2 yields $kx - n = -\frac{28}{30}x - \frac{36}{38}$, or $kx - n = -\frac{14}{15}x - \frac{18}{19}$. Since it's given that the equation has no solution, the coefficient of x on both sides of this equation must be equal, and the constant terms on both sides of this equation must not be equal. Since $\frac{18}{19} < 1$, and it's given that $n > 1$, the second condition is true. Thus, k must be equal to $-\frac{14}{15}$. Note that -14/15, -.9333, and -0.933 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID e7343559

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: e7343559

$y = -4x + 40$ Which table gives three values of x and their corresponding values of y for the given equation?

A.

x	y
0	0
1	-4
2	-8

B.

x	y
0	40
1	44
2	48

C.

x	y
0	40
1	36
2	32

D.

x	y
0	0
1	4
2	8

ID: e7343559 Answer

Correct Answer: C

Rationale

Choice C is correct. Each of the given choices gives three values of x: 0, 1, and 2. Substituting 0 for x in the given equation yields $y = -4(0) + 40$, or $y = 40$. Therefore, when $x = 0$, the corresponding value of y for the given equation is 40. Substituting 1 for x in the given equation yields $y = -4(1) + 40$, or $y = 36$. Therefore, when $x = 1$, the corresponding value of y for the given equation is 36. Substituting 2 for x in the given equation yields $y = -4(2) + 40$, or $y = 32$. Therefore, when $x = 2$, the corresponding value of y for the given equation is 32. Choice C gives three values of x, 0, 1, and 2, and their corresponding values of y, 40, 36, and 32, respectively, for the given equation.

Choice A is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = -4x$.

Choice B is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = 4x + 40$.

Choice D is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = 4x$.

Question Difficulty: Easy

Question ID f09097b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: f09097b1

An agricultural scientist studying the growth of corn plants recorded the height of a corn plant at the beginning of a study and the height of the plant each day for the next 12 days. The scientist found that the height of the plant increased by an average of 1.20 centimeters per day for the 12 days. If the height of the plant on the last day of the study was 36.8 centimeters, what was the height, in centimeters, of the corn plant at the beginning of the study?

ID: f09097b1 Answer

Rationale

The correct answer is 22.4. If the height of the plant increased by an average of 1.20 centimeters per day for 12 days, then its total growth over the 12 days was $(1.20)(12) = 14.4$ centimeters. The plant was 36.8 centimeters tall after 12 days, so at the beginning of the study its height was $36.8 - 14.4 = 22.4$ centimeters. Note that 22.4 and 112/5 are examples of ways to enter a correct answer.

Alternate approach: The equation $36.8 = 12(1.20) + h$ can be used to represent this situation, where h is the height of the plant, in centimeters, at the beginning of the study. Solving this equation for h yields 22.4 centimeters.

Question Difficulty: Medium

Question ID a9039591

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a9039591

x	$f(x)$
0	29
1	32
2	35

For the linear function f, the table shows three values of x and their corresponding values of $f(x)$. Which equation defines $f(x)$?

A. $f(x) = 3x + 29$

B. $f(x) = 29x + 32$

C. $f(x) = 35x + 29$

D. $f(x) = 32x + 35$

ID: a9039591 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation that defines a linear function f can be written in the form $f(x) = mx + b$, where m and b are constants. It's given in the table that when $x = 0$, $f(x) = 29$. Substituting 0 for x and 29 for $f(x)$ in the equation $f(x) = mx + b$ yields $29 = m(0) + b$, or $29 = b$. Substituting 29 for b in the equation $f(x) = mx + b$ yields $f(x) = mx + 29$. It's also given in the table that when $x = 1$, $f(x) = 32$. Substituting 1 for x and 32 for $f(x)$ in the equation $f(x) = mx + 29$ yields $32 = m(1) + 29$, or $32 = m + 29$. Subtracting 29 from both sides of this equation yields $3 = m$. Substituting 3 for m in the equation $f(x) = mx + 29$ yields $f(x) = 3x + 29$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

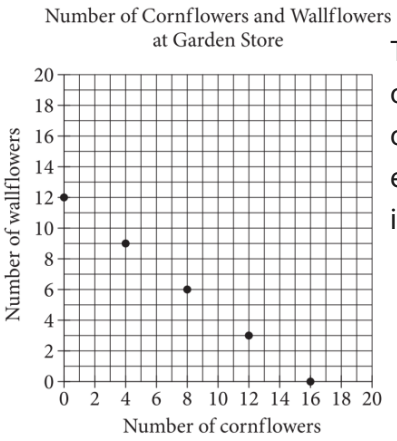
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c362c210

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: c362c210



The points plotted in the coordinate plane above represent the possible numbers of wallflowers and cornflowers that someone can buy at the Garden Store in order to spend exactly $24.00 total on the two types of flowers. The price of each wallflower is the same and the price of each cornflower is the same. What is the price, in dollars, of 1 cornflower?

ID: c362c210 Answer

Rationale

The correct answer is 1.5. The point $(16,0)$ corresponds to the situation where 16 cornflowers and 0 wallflowers are purchased. Since the total spent on the two types of flowers is $24.00, it follows that the price of 16 cornflowers is $24.00, and the price of one cornflower is $1.50. Note that 1.5 and 3/2 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ee7b1de1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: ee7b1de1

A small business owner budgets $\$2{,}200$ to purchase candles. The owner must purchase a minimum of 200 candles to maintain the discounted pricing. If the owner pays $\$4.90$ per candle to purchase small candles and $\$11.60$ per candle to purchase large candles, what is the maximum number of large candles the owner can purchase to stay within the budget and maintain the discounted pricing?

ID: ee7b1de1 Answer

Correct Answer: 182

Rationale

The correct answer is 182. Let s represent the number of small candles the owner can purchase, and let ℓ represent the number of large candles the owner can purchase. It's given that the owner pays $\$4.90$ per candle to purchase small candles and $\$11.60$ per candle to purchase large candles. Therefore, the owner pays $4.90s$ dollars for s small candles and 11.60ℓ dollars for ℓ large candles, which means the owner pays a total of $4.90s + 11.60\ell$ dollars to purchase candles. It's given that the owner budgets $\$2{,}200$ to purchase candles. Therefore, $4.90s + 11.60\ell \leq 2{,}200$. It's also given that the owner must purchase a minimum of 200 candles. Therefore, $s + \ell \geq 200$. The inequalities $4.90s + 11.60\ell \leq 2{,}200$ and $s + \ell \geq 200$ can be combined into one compound inequality by rewriting the second inequality so that its left-hand side is equivalent to the left-hand side of the first inequality. Subtracting ℓ from both sides of the inequality $s + \ell \geq 200$ yields $s \geq 200 - \ell$. Multiplying both sides of this inequality by 4.90 yields $4.90s \geq 4.90(200 - \ell)$, or $4.90s \geq 980 - 4.90\ell$. Adding 11.60ℓ to both sides of this inequality yields $4.90s + 11.60\ell \geq 980 - 4.90\ell + 11.60\ell$, or $4.90s + 11.60\ell \geq 980 + 6.70\ell$. This inequality can be combined with the inequality $4.90s + 11.60\ell \leq 2{,}200$, which yields the compound inequality $980 + 6.70\ell \leq 4.90s + 11.60\ell \leq 2{,}200$. It follows that $980 + 6.70\ell \leq 2{,}200$. Subtracting 980 from both sides of this inequality yields $6.70\ell \leq 2{,}200$. Dividing both sides of this inequality by 6.70 yields approximately $\ell \leq 182.09$. Since the number of large candles the owner purchases must be a whole number, the maximum number of large candles the owner can purchase is the largest whole number less than 182.09, which is 182.

Question Difficulty: Hard

Question ID c17d9ba9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: c17d9ba9

A number x is at most 17 less than 5 times the value of y. If the value of y is 3, what is the greatest possible value of x?

ID: c17d9ba9 Answer

Correct Answer: -2

Rationale

The correct answer is -2. It's given that a number x is at most 17 less than 5 times the value of y, or $x \leq 5y - 17$. Substituting 3 for y in this inequality yields $x \leq 5(3) - 17$, or $x \leq -2$. Thus, if the value of y is 3, the greatest possible value of x is -2.

Question Difficulty: Medium

Question ID d1042cf8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: d1042cf8

A food truck buys forks for $\$0.04$ each and plates for $\$0.48$ each. The total cost of x forks and y plates is $\$661.76$. Which equation represents this situation?

A. $0.48x - 0.04y = 661.76$

B. $0.04x - 0.48y = 661.76$

C. $0.48x + 0.04y = 661.76$

D. $0.04x + 0.48y = 661.76$

ID: d1042cf8 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the food truck buys forks for $\$0.04$ each. Therefore, the cost, in dollars, of x forks can be represented by the expression $0.04x$. It's also given that the food truck buys plates for $\$0.48$ each. Therefore, the cost, in dollars, of y plates can be represented by the expression $0.48y$. Since the total cost of x forks and y plates is $\$661.76$, the equation $0.04x + 0.48y = 661.76$ represents this situation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This equation represents a situation in which the food truck buys forks for $\$0.48$ each and plates for $\$0.04$ each.

Question Difficulty: Easy

Question ID 94b48cbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 94b48cbf

The graph of $7x + 2y = -31$ in the xy-plane has an x-intercept at $(a, 0)$ and a y-intercept at $(0, b)$, where a and b are constants. What is the value of $\frac{b}{a}$?

A. $-\frac{7}{2}$

B. $-\frac{2}{7}$

C. $\frac{2}{7}$

D. $\frac{7}{2}$

ID: 94b48cbf Answer

Correct Answer: D

Rationale

Choice D is correct. The x-coordinate a of the x-intercept $(a, 0)$ can be found by substituting 0 for y in the given equation, which gives $7x + 2(0) = -31$, or $7x = -31$. Dividing both sides of this equation by 7 yields $x = -\frac{31}{7}$. Therefore, the value of a is $-\frac{31}{7}$. The y-coordinate b of the y-intercept $(0, b)$ can be found by substituting 0 for x in the given equation, which gives $7(0) + 2y = -31$, or $2y = -31$. Dividing both sides of this equation by 2 yields $y = -\frac{31}{2}$. Therefore, the value of b is $-\frac{31}{2}$. It follows that the value of $\frac{b}{a}$ is $\frac{-\frac{31}{2}}{-\frac{31}{7}}$, which is equivalent to $\left(\frac{31}{2}\right)\left(\frac{7}{31}\right)$, or $\frac{7}{2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1035faea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 1035faea

A psychologist set up an experiment to study the tendency of a person to select the first item when presented with a series of items. In the experiment, 300 people were presented with a set of five pictures arranged in random order. Each person was asked to choose the most appealing picture. Of the first 150 participants, 36 chose the first picture in the set. Among the remaining 150 participants, p people chose the first picture in the set. If more than 20% of all participants chose the first picture in the set, which of the following inequalities best describes the possible values of p ?

A. $p > 0.20(300-36)$, where $p \leq 150$

B. $p > 0.20(300+36)$, where $p \leq 150$

C. $p-36 > 0.20(300)$, where $p \leq 150$

D. $p+36 > 0.20(300)$, where $p \leq 150$

ID: 1035faea Answer

Correct Answer: D

Rationale

Choice D is correct. Of the first 150 participants, 36 chose the first picture in the set, and of the 150 remaining participants, p chose the first picture in the set. Hence, the proportion of the participants who chose the first picture in the set is $\frac{36+p}{300}$. Since more than 20% of all the participants chose the first picture, it follows that $\frac{36+p}{300} > 0.20$.

This inequality can be rewritten as $p+36 > 0.20(300)$. Since p is a number of people among the remaining 150 participants, $p \leq 150$.

Choices A, B, and C are incorrect and may be the result of some incorrect interpretations of the given information or of computational errors.

Question Difficulty: Hard

Question ID c5082ce3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: c5082ce3

The score on a trivia game is obtained by subtracting the number of incorrect answers from twice the number of correct answers. If a player answered 40 questions and obtained a score of 50, how many questions did the player answer correctly?

ID: c5082ce3 Answer

Rationale

The correct answer is 30. Let x represent the number of correct answers from the player and y represent the number of incorrect answers from the player. Since the player answered 40 questions in total, the equation $x+y=40$ represents this situation. Also, since the score is found by subtracting the number of incorrect answers from twice the number of correct answers and the player received a score of 50, the equation $2x-y=50$ represents this situation. Adding the equations in the system of two equations together yields $(x+y)+(2x-y)=40+50$. This can be rewritten as $3x=90$. Finally, solving for x by dividing both sides of the equation by 3 yields $x=30$.

Question Difficulty: Medium

Question ID 8339793c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 8339793c

Nasir bought 9 storage bins that were each the same price. He used a coupon for $\$63$ off the entire purchase. The cost for the entire purchase after using the coupon was $\$27$. What was the original price, in dollars, for 1 storage bin?

ID: 8339793c Answer

Correct Answer: 10

Rationale

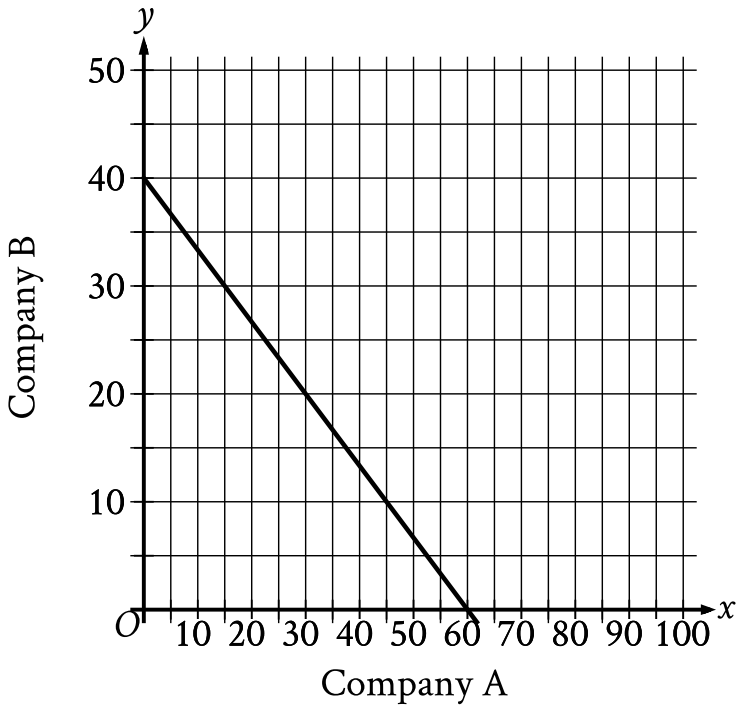
The correct answer is 10. It's given that the cost for the entire purchase was $\$27$ after a coupon was used for $\$63$ off the entire purchase. Adding the amount of the coupon to the purchase price yields $27 + 63 = 90$. Thus, the cost for the entire purchase before using the coupon was $\$90$. It's given that Nasir bought 9 storage bins. The original price for 1 storage bin can be found by dividing the total cost by 9. Therefore, the original price, in dollars, for 1 storage bin is $\frac{90}{9}$, or 10.

Question Difficulty: Easy

Question ID 2e0290c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 2e0290c3



The graph shows the relationship between the number of shares of stock from Company A, x, and the number of shares of stock from Company B, y, that Simone can purchase. Which equation could represent this relationship?

A. $y = 8x + 12$

B. $8x + 12y = 480$

C. $y = 12x + 8$

D. $12x + 8y = 480$

ID: 2e0290c3 Answer

Correct Answer: B

Rationale

Choice B is correct. The graph shown is a line passing through the points $(0, 40)$ and $(60, 0)$. Since the relationship between x and y is linear, if two points on the graph make a linear equation true, then the equation represents the relationship. Substituting 0 for x and 40 for y in the equation in choice B, $8x + 12y = 480$, yields $8(0) + 12(40) = 480$, or $480 = 480$, which is true. Substituting 60 for x and 0 for y in the equation $8x + 12y = 480$ yields $8(60) + 12(0) = 480$, or $480 = 480$, which is true. Therefore, the equation $8x + 12y = 480$ represents the relationship between x and y.

Choice A is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40 = 8(0) + 12$, or $40 = 12$, is not true.

Choice C is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40 = 12(0) + 8$, or $40 = 8$, is not true.

Choice D is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $12(0) + 8(40) = 480$, or $320 = 480$, is not true.

Question Difficulty: Medium

Question ID dd797fe2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: dd797fe2

$4x + 3y = 24$

Mario purchased 4 binders that cost *x* dollars each and 3 notebooks that cost *y* dollars each. If the given equation represents this situation, which of the following is the best interpretation of 24 in this context?

A. The total cost, in dollars, for all binders purchased

B. The total cost, in dollars, for all notebooks purchased

C. The total cost, in dollars, for all binders and notebooks purchased

D. The difference in the total cost, in dollars, between the number of binders and notebooks purchased

ID: dd797fe2 Answer

Correct Answer: C

Rationale

Choice C is correct. Since Mario purchased 4 binders that cost x dollars each, the expression $4x$ represents the total cost, in dollars, of the 4 binders he purchased. Since Mario purchased 3 notebooks that cost y dollars each, the expression $3y$ represents the total cost, in dollars, of the 3 notebooks he purchased. Therefore, the expression $4x + 3y$ represents the total cost, in dollars, for all binders and notebooks he purchased. In the given equation, the expression $4x + 3y$ is equal to 24. Therefore, it follows that 24 is the total cost, in dollars, for all binders and notebooks purchased.

Choice A is incorrect. This is represented by the expression $4x$ in the given equation. Choice B is incorrect. This is represented by the expression $3y$ in the given equation. Choice D is incorrect. This is represented by the expression $|4x - 3y|$.

Question Difficulty: Easy

Question ID 45a534d0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 45a534d0

$48x - 72y = 30y + 24\ ry = \frac{1}{6} - 16x$

In the given system of equations, r is a constant. If the system has no solution, what is the value of r?

ID: 45a534d0 Answer

Correct Answer: -34

Rationale

The correct answer is -34. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. Two lines represented by equations in standard form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system can be written in standard form by subtracting $30y$ from both sides of the equation to yield $48x - 102y = 24$. The second equation in the given system can be written in standard form by adding $16x$ to both sides of the equation to yield $16x + ry = \frac{1}{6}$. The coefficient of x in this second equation, 16, is $\frac{1}{3}$ times the coefficient of x in the first equation, 48. For the lines to be parallel the coefficient of y in the second equation, r, must also be $\frac{1}{3}$ times the coefficient of y in the first equation, -102. Thus, $r = \frac{1}{3}(-102)$, or $r = -34$. Therefore, if the given system has no solution, the value of r is -34.

Question Difficulty: Hard

Question ID 550b352c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 550b352c

$10 = 2x + 4$

How many solutions exist to the equation shown above?

A. None

B. Exactly 1

C. Exactly 3

D. Infinitely many

ID: 550b352c Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 4 from each side of the given equation yields $6 = 2x$, or $x = 3$, so the equation has a unique solution of $x = 3$.

Choice A is incorrect. Since 3 is a value of x that satisfies the given equation, the equation has at least 1 solution. Choice C is incorrect. Linear equations can have 0, 1, or infinitely many solutions; no linear equation has exactly 3 solutions. Choice D is incorrect. If a linear equation has infinitely many solutions, it can be reduced to $0 = 0$. This equation reduces to $x = 3$, so there is only 1 solution.

Question Difficulty: Easy

Question ID a396ed75

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a396ed75

For a training program, Juan rides his bike at an average rate of 5.7 minutes per mile. Which function m models the number of minutes it will take Juan to ride x miles at this rate?

A. $m(x) = \frac{x}{5.7}$

B. $m(x) = x + 5.7$

C. $m(x) = x - 5.7$

D. $m(x) = 5.7x$

ID: a396ed75 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that Juan rides his bike at an average rate of 5.7 minutes per mile. The number of minutes it will take Juan to ride x miles can be determined by multiplying his average rate by the number of miles, x, which yields $5.7x$. Therefore, the function $m(x) = 5.7x$ models the number of minutes it will take Juan to ride x miles.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 50f4cb9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 50f4cb9c

x	$f(x)$
1	-64
2	0
3	64

For the linear function f, the table shows three values of x and their corresponding values of $f(x)$. Function f is defined by $f(x) = ax + b$, where a and b are constants. What is the value of $a - b$?

A. -64

B. 62

C. 128

D. 192

ID: 50f4cb9c Answer

Correct Answer: D

Rationale

Choice D is correct. The table gives that $f(x) = 0$ when $x = 2$. Substituting 0 for $f(x)$ and 2 for x into the equation $f(x) = ax + b$ yields $0 = 2a + b$. Subtracting $2a$ from both sides of this equation yields $b = -2a$. The table gives that $f(x) = -64$ when $x = 1$. Substituting $-2a$ for b, -64 for $f(x)$, and 1 for x into the equation $f(x) = ax + b$ yields $-64 = a(1) + (-2a)$. Combining like terms yields $-64 = -a$, or $a = 64$. Since $b = -2a$, substituting 64 for a into this equation gives $b = (-2)(64)$, which yields $b = -128$. Thus, the value of $a - b$ can be written as $64 - (-128)$, which is 192.

Choice A is incorrect. This is the value of $a + b$, not $a - b$. Choice B is incorrect. This is the value of $a - 2$, not $a - b$.

Choice C is incorrect. This is the value of $2a$, not $a - b$.

Question Difficulty: Hard

Question ID 87071893

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 87071893

$x + 40 = 95$ What value of x is the solution to the given equation?

ID: 87071893 Answer

Correct Answer: 55

Rationale

The correct answer is 55. Subtracting 40 from both sides of the given equation yields $x = 55$. Therefore, the value of x is 55.

Question Difficulty: Easy

Question ID b00ad7f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: b00ad7f2

$y - 9x = 13$ $5x = 2y$ What is the solution (x, y) to the given system of equations?

A. $(\frac{5}{2}, 1)$

B. $(1, \frac{2}{5})$

C. $(-2, -5)$

D. $(-5, -2)$

ID: b00ad7f2 Answer

Correct Answer: C

Rationale

Choice C is correct. Adding $9x$ to both sides of the first equation in the given system yields $y = 9x + 13$. Substituting the expression $9x + 13$ for y in the second equation in the given system yields $5x = 2(9x + 13)$. Distributing the 2 on the right-hand side of this equation yields $5x = 18x + 26$. Subtracting $18x$ from both sides of this equation yields $-13x = 26$. Dividing both sides of this equation by -13 yields $x = -2$. Substituting -2 for x in the equation $y = 9x + 13$ yields $y = 9(-2) + 13$, or $y = -5$. Therefore, the solution (x, y) to the given system of equations is $(-2, -5)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the solution (y, x), not (x, y), to the given system of equations.

Question Difficulty: Medium

Question ID ca9bb527

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: ca9bb527

$y = 4x - 9$
$y = 19$ What is the solution (x, y) to the given system of equations?

A. $(4, 19)$

B. $(7, 19)$

C. $(19, 4)$

D. $(19, 7)$

ID: ca9bb527 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given by the second equation in the system that $y = 19$. Substituting 19 for y in the first equation yields $19 = 4x - 9$. Adding 9 to both sides of this equation yields $28 = 4x$. Dividing both sides of this equation by 4 yields $7 = x$. Therefore, since $x = 7$ and $y = 19$, the solution (x, y) to the given system of equations is $(7, 19)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 16889ef3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 16889ef3

Oil and gas production in a certain area dropped from 4 million barrels in 2000 to 1.9 million barrels in 2013. Assuming that the oil and gas production decreased at a constant rate, which of the following linear functions *f* best models the production, in millions of barrels, *t* years after the year 2000?

A. $f(t)=\frac{21}{130}t+4$

B. $f(t)=\frac{19}{130}t+4$

C. $f(t)=-\frac{21}{130}t+4$

D. $f(t)=-\frac{19}{130}t+4$

ID: 16889ef3 Answer

Correct Answer: C

Rationale

Choice C is correct. It is assumed that the oil and gas production decreased at a constant rate. Therefore, the function f that best models the production t years after the year 2000 can be written as a linear function, $f(t)=mt+b$, where m is the rate of change of the oil and gas production and b is the oil and gas production, in millions of barrels, in the year 2000. Since there were 4 million barrels of oil and gas produced in 2000, $b=4$. The rate of change, m, can be calculated as $\frac{4-1.9}{0-13}=-\frac{2.1}{13}$, which is equivalent to $-\frac{21}{130}$, the rate of change in choice C.

Choices A and B are incorrect because each of these functions has a positive rate of change. Since the oil and gas production decreased over time, the rate of change must be negative. Choice D is incorrect. This model may result from misinterpreting 1.9 million barrels as the amount by which the production decreased.

Question Difficulty: Hard

Question ID c651cc56

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: c651cc56

x	$f(x)$
0	−2
2	4
6	16

Some values of the linear function *f* are shown in the table above. What is the value of $f(3)$?

A. 6

B. 7

C. 8

D. 9

ID: c651cc56 Answer

Correct Answer: B

Rationale

Choice B is correct. A linear function has a constant rate of change, and any two rows of the table shown can be used to calculate this rate. From the first row to the second, the value of x is increased by 2 and the value of $f(x)$ is increased by $6=4-(-2)$. So the values of $f(x)$ increase by 3 for every increase by 1 in the value of x. Since $f(2)=4$, it follows that $f(2+1)=4+3=7$. Therefore, $f(3)=7$.

Choice A is incorrect. This is the third x-value in the table, not $f(3)$. Choices C and D are incorrect and may result from errors when calculating the function's rate of change.

Question Difficulty: Medium

Question ID 79cf8505

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 79cf8505

A line segment that has a length of 115 centimeters (cm) is divided into three parts. One part is 47 cm long. The other two parts have lengths that are equal to each other. What is the length, in cm, of one of the other two parts of equal length?

ID: 79cf8505 Answer

Correct Answer: 34

Rationale

The correct answer is 34. It's given that a line segment has a length of 115 cm and is divided into three parts, where one part is 47 cm long and the other two parts have lengths that are equal. If x represents the length, in cm, of each of the two parts of equal length, then the equation $47 + x + x = 115$, or $47 + 2x = 115$, represents this situation. Subtracting 47 from each side of this equation yields $2x = 68$. Dividing each side of this equation by 2 yields $x = 34$. Therefore, the length, in cm, of one of the two parts of equal length is 34.

Question Difficulty: Medium

Question ID adb0c96c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: adb0c96c

$24x + y = 48$ $6x + y = 72$ The solution to the given system of equations is (x, y). What is the value of y?

ID: adb0c96c Answer

Correct Answer: 80

Rationale

The correct answer is 80. Subtracting the second equation in the given system from the first equation yields $(24x + y) - (6x + y) = 48 - 72$, which is equivalent to $24x - 6x + y - y = -24$, or $18x = -24$. Dividing each side of this equation by 3 yields $6x = -8$. Substituting -8 for $6x$ in the second equation yields $-8 + y = 72$. Adding 8 to both sides of this equation yields $y = 80$.

Alternate approach: Multiplying each side of the second equation in the given system by 4 yields $24x + 4y = 288$. Subtracting the first equation in the given system from this equation yields $(24x + 4y) - (24x + y) = 288 - 48$, which is equivalent to $24x - 24x + 4y - y = 240$, or $3y = 240$. Dividing each side of this equation by 3 yields $y = 80$.

Question Difficulty: Hard

Question ID b4553284

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: b4553284

If $2x = 12$, what is the value of $9x$?

ID: b4553284 Answer

Correct Answer: 54

Rationale

The correct answer is 54. Dividing both sides of the given equation by 2 yields $x = 6$. Multiplying both sides of this equation by 9 yields $9x = 54$. Thus, the value of $9x$ is 54.

Question Difficulty: Easy

Question ID c22b5f25

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: c22b5f25

In the *xy*-plane, the points $(-2,3)$ and $(4,-5)$ lie on the graph of which of the following linear functions?

A. $f(x)=x+5$

B. $f(x)=\frac{1}{2}x+4$

C. $f(x)=-\frac{4}{3}x+\frac{1}{3}$

D. $f(x)=-\frac{3}{2}x+1$

ID: c22b5f25 Answer

Correct Answer: C

Rationale

Choice C is correct. A linear function can be written in the form $f(x)=mx+b$, where m is the slope and b is the y-coordinate of the y-intercept of the line. The slope of the graph can be found using the formula $m=\frac{y_2-y_1}{x_2-x_1}$. Substituting the values of the given points into this formula yields $m=\frac{-5-3}{4-(-2)}$ or $m=\frac{-8}{6}$, which simplifies to $m=-\frac{4}{3}$. Only choice C shows an equation with this slope.

Choices A, B, and D are incorrect and may result from computation errors or misinterpreting the given information.

Question Difficulty: Medium

Question ID d7bf55e1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: d7bf55e1

A movie theater sells two types of tickets, adult tickets for $12 and child tickets for $8. If the theater sold 30 tickets for a total of $300, how much, in dollars, was spent on adult tickets? (Disregard the $ sign when gridding your answer.)

ID: d7bf55e1 Answer

Rationale

The correct answer is 180. Let a be the number of adult tickets sold and c be the number of child tickets sold. Since the theater sold a total of 30 tickets, a + c = 30. The price per adult ticket is $12, and the price per child ticket is $8. Since the theater received a total of $300 for the 30 tickets sold, it follows that 12a + 8c = 300. To eliminate c, the first equation can be multiplied by 8 and then subtracted from the second equation:

$$\begin{array}{r} 12a+8c = 300 \\ -8a-8c = -240 \\ \hline 4a+0c = 60 \end{array}$$

Because the question asks for the amount spent on adult tickets, which is 12a dollars, the resulting equation can be multiplied by 3 to give 3(4a) = 3(60) = 180. Therefore, $180 was spent on adult tickets.

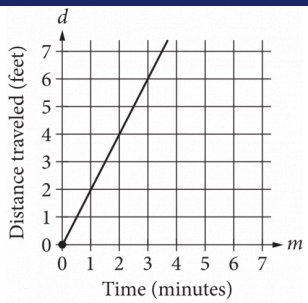
Alternate approach: If all the 30 tickets sold were child tickets, their total price would be 30($8) = $240. Since the actual total price of the 30 tickets was $300, the extra $60 indicates that a certain number of adult tickets, a, were sold. Since the price of each adult ticket is $4 more than each child ticket, 4a = 60, and it follows that 12a = 180.

Question Difficulty: Hard

Question ID 11e1ab81

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 11e1ab81



The graph above shows the distance traveled *d*, in feet, by a product on a conveyor belt *m* minutes after the product is placed on the belt. Which of the following equations correctly relates *d* and *m* ?

A. $d = 2m$

B. $d = \frac{1}{2}m$

C. $d = m + 2$

D. $d = 2m + 2$

ID: 11e1ab81 Answer

Correct Answer: A

Rationale

Choice A is correct. The line passes through the origin. Therefore, this is a relationship of the form $d = km$, where k is a constant representing the slope of the graph. To find the value of k, choose a point (m,d) on the graph of the line other than the origin and substitute the values of m and d into the equation. For example, if the point $(2,4)$ is chosen, then $4 = k(2)$, and $k = 2$. Therefore, the equation of the line is $d = 2m$.

Choice B is incorrect and may result from calculating the slope of the line as the change in time over the change in distance traveled instead of the change in distance traveled over the change in time. Choices C and D are incorrect because each of these equations represents a line with a d-intercept of 2. However, the graph shows a line with a d-intercept of 0.

Question Difficulty: Medium

Question ID 771bd0ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 771bd0ca

$5(t+3)-7(t+3)=38$ What value of t is the solution to the given equation?

ID: 771bd0ca Answer

Correct Answer: -22

Rationale

The correct answer is -22. The given equation can be rewritten as $-2(t+3)=38$. Dividing both sides of this equation by -2 yields $t+3=-19$. Subtracting 3 from both sides of this equation yields $t=-22$. Therefore, -22 is the value of t that is the solution to the given equation.

Question Difficulty: Hard

Question ID 69f609b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 69f609b2

How many solutions does the equation $12(x-3)=-3(x+12)$ have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 69f609b2 Answer

Correct Answer: A

Rationale

Choice A is correct. Distributing 12 on the left-hand side and -3 on the right-hand side of the given equation yields $12x-36=-3x-36$. Adding $3x$ to each side of this equation yields $15x-36=-36$. Adding 36 to each side of this equation yields $15x=0$. Dividing each side of this equation by 15 yields $x=0$. This means that 0 is the only solution to the given equation. Therefore, the given equation has exactly one solution.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2e379126

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 2e379126

The function g is defined by $g(x) = 4x - 6$. What is the value of $g(-7)$?

A. -34

B. -22

C. $-\frac{13}{4}$

D. $-\frac{1}{4}$

ID: 2e379126 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function g is defined by $g(x) = 4x - 6$. Substituting -7 for x into the given equation yields $g(-7) = 4(-7) - 6$, or $g(-7) = -34$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of x for which $g(x) = -7$, not the value of $g(-7)$.

Question Difficulty: Easy

Question ID 4fe4fd7c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 4fe4fd7c

$c(x) = mx + 500$

A company's total cost $c(x)$, in dollars, to produce x shirts is given by the function above, where m is a constant and $x > 0$. The total cost to produce 100 shirts is \$800. What is the total cost, in dollars, to produce 1000 shirts?
(Disregard the \$ sign when gridding your answer.)

ID: 4fe4fd7c Answer

Rationale

The correct answer is 3500. The given information includes a cost, \$800, to produce 100 shirts. Substituting $c(x) = 800$ and $x = 100$ into the given equation yields $800 = m \cdot 100 + 500$. Subtracting 500 from both sides of the equation yields $300 = m \cdot 100$. Dividing both sides of this equation by 100 yields $3 = m$. Substituting the value of m into the given equation yields $c(x) = 3x + 500$. Substituting 1000 for x in this equation and solving for $c(x)$ gives the cost of 1000 shirts: $3(1000) + 500$, or 3500.

Question Difficulty: Medium

Question ID 979b0b8d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 979b0b8d

For the linear function f, the graph of $y = f(x)$ in the *xy*-plane has a slope of 39 and passes through the point $(0, 0)$. Which equation defines f?

A. $f(x) = -39x$

B. $f(x) = \frac{1}{39}x$

C. $f(x) = x - 39$

D. $f(x) = 39x$

ID: 979b0b8d Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining a linear function can be written in the form $f(x) = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane. It's given that the graph of $y = f(x)$ has a slope of 39, so $m = 39$. It's also given that the graph of $y = f(x)$ passes through the point $(0, 0)$, so $b = 0$. Substituting 39 for m and 0 for b in $f(x) = mx + b$ yields $f(x) = 39x + 0$, or $f(x) = 39x$. Thus, the equation that defines f is $f(x) = 39x$.

Choice A is incorrect. This equation defines a function whose graph has a slope of -39, not 39.

Choice B is incorrect. This equation defines a function whose graph has a slope of $\frac{1}{39}$, not 39.

Choice C is incorrect. This equation defines a function whose graph has a slope of 1, not 39, and passes through the point $(0, -39)$, not $(0, 0)$.

Question Difficulty: Easy

Question ID 789975b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 789975b7

A gardener buys two kinds of fertilizer. Fertilizer A contains 60% filler materials by weight and Fertilizer B contains 40% filler materials by weight. Together, the fertilizers bought by the gardener contain a total of 240 pounds of filler materials. Which equation models this relationship, where x is the number of pounds of Fertilizer A and y is the number of pounds of Fertilizer B?

A. $0.4x + 0.6y = 240$

B. $0.6x + 0.4y = 240$

C. $40x + 60y = 240$

D. $60x + 40y = 240$

ID: 789975b7 Answer

Correct Answer: B

Rationale

Choice B is correct. Since Fertilizer A contains 60% filler materials by weight, it follows that x pounds of Fertilizer A consists of 0.6x pounds of filler materials. Similarly, y pounds of Fertilizer B consists of 0.4y pounds of filler materials. When x pounds of Fertilizer A and y pounds of Fertilizer B are combined, the result is 240 pounds of filler materials. Therefore, the total amount, in pounds, of filler materials in a mixture of x pounds of Fertilizer A and y pounds of Fertilizer B can be expressed as $0.6x + 0.4y = 240$.

Choice A is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B. Fertilizer A consists of 0.6x pounds of filler materials and Fertilizer B consists of 0.4y pounds of filler materials. Therefore, $0.6x + 0.4y$ is equal to 240, not $0.4x + 0.6y$. Choice C is incorrect. This choice transposes the percentages of filler materials for Fertilizer A and Fertilizer B and incorrectly represents how to take the percentage of a value mathematically. Choice D is incorrect. This choice incorrectly represents how to take the percentage of a value mathematically. Fertilizer A consists of 0.6x pounds of filler materials, not 60x pounds of filler materials, and Fertilizer B consists of 0.4y pounds of filler materials, not 40y pounds of filler materials.

Question Difficulty: Easy

Question ID a309803e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: a309803e

One gallon of paint will cover 220 square feet of a surface. A room has a total wall area of w square feet. Which equation represents the total amount of paint P, in gallons, needed to paint the walls of the room twice?

A. $P = \frac{w}{110}$

B. $P = 440w$

C. $P = \frac{w}{220}$

D. $P = 220w$

ID: a309803e Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that w represents the total wall area, in square feet. Since the walls of the room will be painted twice, the amount of paint, in gallons, needs to cover $2w$ square feet. It's also given that one gallon of paint will cover 220 square feet. Dividing the total area, in square feet, of the surface to be painted by the number of square feet covered by one gallon of paint gives the number of gallons of paint that will be needed. Dividing $2w$ by 220 yields $\frac{2w}{220}$, or $\frac{w}{110}$. Therefore, the equation that represents the total amount of paint P, in gallons, needed to paint the walls of the room twice is $P = \frac{w}{110}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from finding the amount of paint needed to paint the walls once rather than twice.

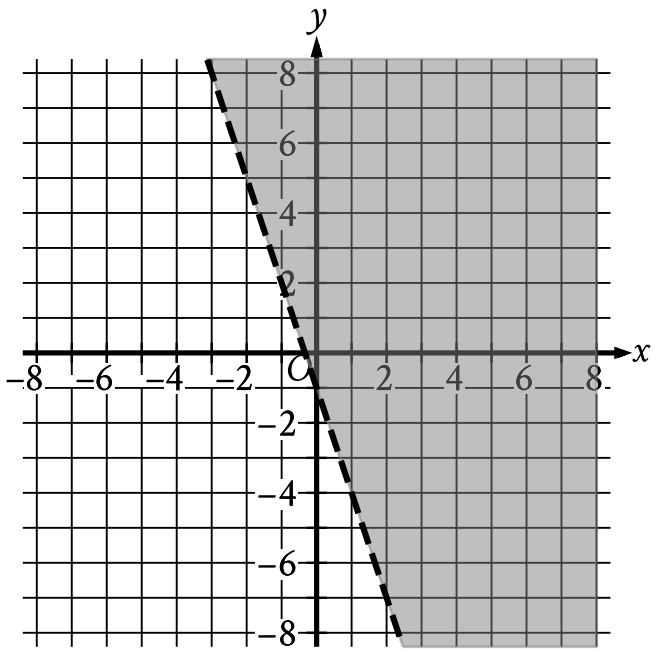
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c41e5688

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: c41e5688



The shaded region shown represents the solutions to which inequality?

A. $y < -1 + 3x$

B. $y < -1 - 3x$

C. $y > -1 + 3x$

D. $y > -1 - 3x$

ID: c41e5688 Answer

Correct Answer: D

Rationale

Choice D is correct. The equation for the line representing the boundary of the shaded region can be written in slope-intercept form $y = b + mx$, where m is the slope and $(0, b)$ is the *y*-intercept of the line. For the graph shown, the boundary line passes through the points $(0, -1)$ and $(1, -4)$. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(0, -1)$ and $(1, -4)$ for (x_1, y_1) and (x_2, y_2) in this equation yields $m = \frac{-4 - (-1)}{1 - 0}$, which is equivalent to $m = \frac{-3}{1}$, or $m = -3$. Since the point $(0, -1)$ represents the *y*-intercept, it follows that $b = -1$. Substituting -3 for m and -1 for b in the equation $y = b + mx$ yields $y = -1 - 3x$ as the equation of the boundary line. Since the shaded region represents all the points above this boundary line, it follows that the shaded region shown represents the solutions to the inequality $y > -1 - 3x$.

Choice A is incorrect. This inequality represents a region below, not above, a boundary line with a slope of 3, not -3.

Choice B is incorrect. This inequality represents a region below, not above, the boundary line shown.

Choice C is incorrect. This inequality represents a region whose boundary line has a slope of 3, not -3.

Question Difficulty: Medium

Question ID e006209c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: e006209c

A geologist needs to collect at least 67 samples of lava from a volcano. If the geologist has already collected 63 samples from the volcano, what is the minimum number of additional samples the geologist needs to collect?

A. 130

B. 63

C. 4

D. 0

ID: e006209c Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the geologist has already collected 63 samples from the volcano. Let x represent the number of additional samples the geologist needs to collect. After collecting x additional samples, the geologist will have collected a total of $63 + x$ samples. It's given that the geologist needs to collect at least 67 samples. Therefore, $63 + x \geq 67$. Subtracting 63 from each side of this inequality yields the inequality $x \geq 4$. Thus, the geologist needs to collect a minimum of 4 additional samples.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the number of samples the geologist has already collected, rather than the minimum number of additional samples the geologist needs to collect.

Choice D is incorrect. If the geologist collects 0 additional samples, the geologist will have collected a total of 63 samples, which is less than 67 samples.

Question Difficulty: Easy

Question ID bf883fde

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: bf883fde

For the function f, the graph of $y = f(x)$ in the *xy*-plane has a slope of 3 and passes through the point $(0, -8)$. Which equation defines f?

A. $f(x) = 3x$

B. $f(x) = 3x - 8$

C. $f(x) = 3x + 5$

D. $f(x) = 3x + 11$

ID: bf883fde Answer

Correct Answer: B

Rationale

Choice B is correct. An equation defining a linear function can be written in the form $f(x) = mx + b$, where m and b are constants, m is the slope of the graph of $y = f(x)$ in the *xy*-plane, and $(0, b)$ is the *y*-intercept of the graph. It's given that for the function f, the graph of $y = f(x)$ in the *xy*-plane has a slope of 3. Therefore, $m = 3$. It's also given that this graph passes through the point $(0, -8)$. Therefore, the *y*-intercept of the graph is $(0, -8)$, and it follows that $b = -8$. Substituting 3 for m and -8 for b in the equation $f(x) = mx + b$ yields $f(x) = 3x - 8$. Thus, the equation that defines f is $f(x) = 3x - 8$.

Choice A is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane passes through the point $(0, 0)$, not $(0, -8)$.

Choice C is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane passes through the point $(0, 5)$, not $(0, -8)$.

Choice D is incorrect. For this function, the graph of $y = f(x)$ in the *xy*-plane passes through the point $(0, 11)$, not $(0, -8)$.

Question Difficulty: Easy

Question ID 2554b413

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 2554b413

In the *xy*-plane, a line has a slope of 6 and passes through the point $(0,8)$. Which of the following is an equation of this line?

A. $y=6x+8$

B. $y=6x+48$

C. $y=8x+6$

D. $y=8x+48$

ID: 2554b413 Answer

Correct Answer: A

Rationale

Choice A is correct. The slope-intercept form of an equation for a line is $y=mx+b$, where m is the slope of the line and b is the y-coordinate of the y-intercept of the line. It's given that the slope is 6, so $m=6$. It's also given that the line passes through the point $(0,8)$ on the y-axis, so $b=8$. Substituting $m=6$ and $b=8$ into the equation $y=mx+b$ gives $y=6x+8$.

Choices B, C, and D are incorrect and may result from misinterpreting the slope-intercept form of an equation of a line.

Question Difficulty: Easy

Question ID 620abf36

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 620abf36

If $5(x+4)=4(x+4)+29$, what is the value of $x+4$?

A. -4

B. 25

C. 29

D. 33

ID: 620abf36 Answer

Correct Answer: C

Rationale

Choice C is correct. Subtracting $4(x+4)$ from both sides of the given equation yields $1(x+4)=29$, or $x+4=29$. Therefore, the value of $x+4$ is 29.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of x, not $x+4$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID d62ad380

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: d62ad380

An artist paints and sells square tiles. The selling price P, in dollars, of a painted tile is a linear function of the side length of the tile s, in inches, as shown in the table below.

Side length, s (inches)	Price, P (dollars)
3	8.00
6	18.00
9	28.00

Which of the following could define the relationship between s and P ?

A. $P = 3s + 10$

B. $P = \frac{10}{3}s + 8$

C. $P = \frac{10}{3}s - 2$

D. $P = \frac{3}{10}s - \frac{1}{10}$

ID: d62ad380 Answer

Correct Answer: C

Rationale

Choice C is correct. The relationship between s and P can be modeled by a linear equation of the form P = ks + a, where k and a are constants. The table shows that P increases by 10 when s increases by 3, so k = $\frac{10}{3}$. To solve for a, substitute one of the given pairs of values for s and P: when s = 3, P = 8, so $8 = \frac{10}{3}(3) + a$, which yields a = −2. The solution is therefore $P = \frac{10}{3}s - 2$.

Choice A is incorrect. When s = 3, P = 8, but 3(3) + 10 = 19 ≠ 8. Choice B is incorrect. This may result from using the first number given for P in the table as the constant term a in the linear equation $P = ks + a$, which is true only when s = 0. Choice D is incorrect and may result from using the reciprocal of the slope of the line.

Question Difficulty: Medium

Question ID 5bf5136d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 5bf5136d

The triangle inequality theorem states that the sum of any two sides of a triangle must be greater than the length of the third side. If a triangle has side lengths of 6 and 12, which inequality represents the possible lengths, x, of the third side of the triangle?

A. $x < 18$

B. $x > 18$

C. $6 < x < 18$

D. $x < 6$ or $x > 18$

ID: 5bf5136d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a triangle has side lengths of 6 and 12, and x represents the length of the third side of the triangle. It's also given that the triangle inequality theorem states that the sum of any two sides of a triangle must be greater than the length of the third side. Therefore, the inequalities $6 + x > 12$, $6 + 12 > x$, and $12 + x > 6$ represent all possible values of x. Subtracting 6 from both sides of the inequality $6 + x > 12$ yields $x > 12 - 6$, or $x > 6$. Adding 6 and 12 in the inequality $6 + 12 > x$ yields $18 > x$, or $x < 18$. Subtracting 12 from both sides of the inequality $12 + x > 6$ yields $x > 6 - 12$, or $x > -6$. Since all *x*-values that satisfy the inequality $x > 6$ also satisfy the inequality $x > -6$, it follows that the inequalities $x > 6$ and $x < 18$ represent the possible values of x. Therefore, the inequality $6 < x < 18$ represents the possible lengths, x, of the third side of the triangle.

Choice A is incorrect. This inequality gives the upper bound for x but does not include its lower bound.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2f34cd1c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 2f34cd1c

The function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature $f(x)$, in degrees Celsius, of a body of water on the $x\text{th}$ day of the year, where $220 \leq x \leq 360$. Based on the model, what is the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year?

A. 55.20

B. 3.04

C. -0.16

D. -52.16

ID: 2f34cd1c Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature, in degrees Celsius, of a body of water on the $x\text{th}$ day of the year. Substituting 326 for x in the given function yields $f(326) = 55.20 - 0.16(326)$, which is equivalent to $f(326) = 55.20 - 52.16$, or $f(326) = 3.04$. Therefore, the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year is 3.04.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the rate of change, in degrees Celsius per day, of the estimated surface water temperature.

Choice D is incorrect. This is the change, in degrees Celsius, in the estimated surface water temperature over 326 days.

Question Difficulty: Medium

Question ID ed18c4f7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: ed18c4f7

Cathy has *n* CDs. Gerry has 3 more than twice the number of CDs that Cathy has.
In terms of *n*, how many CDs does Gerry have?

A. $3n-2$

B. $3n+2$

C. $2n-3$

D. $2n+3$

ID: ed18c4f7 Answer

Correct Answer: D

Rationale

Choice D is correct. The term 2n represents twice the number of CDs that Cathy has, and adding 3 represents 3 more than that amount.

Choices A and B are incorrect. The expression 3n represents three times the number of CDs that Cathy has. Choice C is incorrect. Subtracting 3 represents 3 fewer than twice the number of CDs that Cathy has.

Question Difficulty: Easy

Question ID 52a8ef85

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 52a8ef85

The equation $40x + 20y = 160$ represents the number of sweaters, x, and number of shirts, y, that Yesenia purchased for $\$160$. If Yesenia purchased 2 sweaters, how many shirts did she purchase?

A. 3

B. 4

C. 8

D. 40

ID: 52a8ef85 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $40x + 20y = 160$ represents the number of sweaters, x, and the number of shirts, y, that Yesenia purchased for $\$160$. If Yesenia purchased 2 sweaters, the number of shirts she purchased can be calculated by substituting 2 for x in the given equation, which yields $40(2) + 20y = 160$, or $80 + 20y = 160$. Subtracting 80 from both sides of this equation yields $20y = 80$. Dividing both sides of this equation by 20 yields $y = 4$. Therefore, if Yesenia purchased 2 sweaters, she purchased 4 shirts.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the number of shirts Yesenia purchased if she purchased 0 sweaters.

Choice D is incorrect. This is the price, in dollars, for each sweater, not the number of shirts Yesenia purchased.

Question Difficulty: Easy

Question ID 3462d850

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 3462d850

Marisol drove 3 hours from City A to City B. The equation below estimates the distance d, in miles, Marisol traveled after driving for t hours.

$d = 45t$

Which of the following does 45 represent in the equation?

A. Marisol took 45 trips from City A to City B.

B. The distance between City A and City B is 45 miles.

C. Marisol drove at an average speed of about 45 miles per hour.

D. It took Marisol 45 hours to drive from City A to City B.

ID: 3462d850 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that d is the distance, in miles, Marisol traveled after driving for t hours. Therefore, 45 represents the distance in miles traveled per hour, which is the speed she drove in miles per hour.

Choice A is incorrect and may result from misidentifying speed as the number of trips. Choice B is incorrect and may result from misidentifying speed as the total distance. Choice D is incorrect and may result from misidentifying the speed as the time, in hours.

Question Difficulty: Easy

Question ID 0d685865

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 0d685865

If $x = 7$, what is the value of $x + 20$?

A. 13

B. 20

C. 27

D. 34

ID: 0d685865 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $x = 7$. Substituting 7 for x into the given expression $x + 20$ yields $7 + 20$, which is equivalent to 27.

Choice A is incorrect. This is the value of $x + 6$. Choice B is incorrect. This is the value of $x + 13$.

Choice D is incorrect. This is the value of $x + 27$.

Question Difficulty: Easy

Question ID fe6f9678

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: fe6f9678

For the linear function f, $f(0) = 17$ and $f(1) = 17$. Which equation defines f?

A. $f(x) = \frac{1}{17}$

B. $f(x) = 1$

C. $f(x) = 17$

D. $f(x) = 34$

ID: fe6f9678 Answer

Correct Answer: C

Rationale

Choice C is correct. An equation defining the linear function f can be written in the form $f(x) = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane. The slope of the graph of $y = f(x)$ can be found using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are any two points that the graph passes through. If $f(0) = 17$, it follows that the graph of $y = f(x)$ passes through the point $(0, 17)$. If $f(1) = 17$, it follows that the graph of $y = f(x)$ passes through the point $(1, 17)$. Substituting $(0, 17)$ and $(1, 17)$ for (x_1, y_1) and (x_2, y_2), respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{17 - 17}{1 - 0}$, which is equivalent to $m = \frac{0}{1}$, or $m = 0$. Since the graph of $y = f(x)$ passes through $(0, 17)$, it follows that $b = 17$. Substituting 0 for m and 17 for b in the equation $f(x) = mx + b$ yields $f(x) = 0x + 17$, or $f(x) = 17$. Thus, the equation that defines f is $f(x) = 17$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 12255364

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 12255364

A gym charges its members a onetime $\$36$ enrollment fee and a membership fee of $\$19$ per month. If there are no charges other than the enrollment fee and the membership fee, after how many months will a member have been charged a total of $\$188$ at the gym?

A. 4

B. 5

C. 8

D. 10

ID: 12255364 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a gym charges its members a onetime $\$36$ enrollment fee and a membership fee of $\$19$ per month. Let x represent the number of months at the gym after which a member will have been charged a total of $\$188$. If there are no charges other than the enrollment fee and the membership fee, the equation $36 + 19x = 188$ can be used to represent this situation. Subtracting 36 from both sides of this equation yields $19x = 152$. Dividing both sides of this equation by 19 yields $x = 8$. Therefore, a member will have been charged a total of $\$188$ after 8 months at the gym.

Choice A is incorrect. A member will have been charged a total of $\$(36 + 19 \times 4)$, or $\$112$, after 4 months at the gym.

Choice B is incorrect. A member will have been charged a total of $\$(36 + 19 \times 5)$, or $\$131$, after 5 months at the gym.

Choice D is incorrect. A member will have been charged a total of $\$(36 + 19 \times 10)$, or $\$226$, after 10 months at the gym.

Question Difficulty: Easy

Question ID b82a943c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: b82a943c

If $7x = 28$, what is the value of $8x$?

A. 21

B. 32

C. 168

D. 224

ID: b82a943c Answer

Correct Answer: B

Rationale

Choice B is correct. Dividing both sides of the given equation $7x = 28$ by 7 yields $x = 4$. Substituting 4 for x in the expression $8x$ yields $8(4)$, which is equivalent to 32.

Choice A is incorrect. This is the value of $\frac{21}{4}x$. Choice C is incorrect. This is the value of $42x$.

Choice D is incorrect. This is the value of $56x$.

Question Difficulty: Easy

Question ID 092ad67d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 092ad67d

$x + 2y = 6$ $x - 2y = 4$ The solution to the given system of equations is (x, y). What is the value of x?

A. 2.5

B. 5

C. 6

D. 10

ID: 092ad67d Answer

Correct Answer: B

Rationale

Choice B is correct. Adding the first equation to the second equation in the given system yields $(x + 2y) + (x - 2y) = 6 + 4$, or $(x + x) + (2y - 2y) = 10$. Combining like terms in this equation yields $2x = 10$. Dividing both sides of this equation by 2 yields $x = 5$. Thus, the value of x is 5.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of $2x$, not x.

Question Difficulty: Medium

Question ID 90095507

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 90095507

Townsend Realty Group Investments

Property address	Purchase price (dollars)	Monthly rental price (dollars)
Clearwater Lane	128,000	950
Driftwood Drive	176,000	1,310
Edgemont Street	70,000	515
Glenview Street	140,000	1,040
Hamilton Circle	450,000	3,365

The Townsend Realty Group invested in the five different properties listed in the table above. The table shows the amount, in dollars, the company paid for each property and the corresponding monthly rental price, in dollars, the company charges for the property at each of the five locations. Townsend Realty purchased the Glenview Street property and received a 40% discount off the original price along with an additional 20% off the discounted price for purchasing the property in cash. Which of the following best approximates the original price, in dollars, of the Glenview Street property?

A. $350,000

B. $291,700

C. $233,300

D. $175,000

ID: 90095507 Answer

Correct Answer: B

Rationale

Choice B is correct. Let x be the original price, in dollars, of the Glenview Street property. After the 40% discount, the price of the property became $0.6x$ dollars, and after the additional 20% off the discounted price, the price of the property became $0.8(0.6x)$. Thus, in terms of the original price of the property, x, the purchase price of the property is $0.48x$. It follows that $0.48x = 140{,}000$. Solving this equation for x gives $x = 291{,}666.\overline{6}$. Therefore, of the given choices, $291,700 best approximates the original price of the Glenview Street property.

Choice A is incorrect because it is the result of dividing the purchase price of the property by 0.4, as though the purchase price were 40% of the original price. Choice C is incorrect because it is the closest to dividing the purchase price of the property by 0.6, as though the purchase price were 60% of the original price. Choice D is incorrect because it is the result of dividing the purchase price of the property by 0.8, as though the purchase price were 80% of the original price.

Question Difficulty: Hard

Question ID eac739b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: eac739b2

If $4x + 2 = 12$, what is the value of $16x + 8$?

A. 40

B. 48

C. 56

D. 60

ID: eac739b2 Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying both sides of the given equation by 4 yields $(4)(4x + 2) = (4)(12)$, or $16x + 8 = 48$. Therefore, the value of $16x + 8$ is 48.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 3122fc7b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 3122fc7b

A linear model estimates the population of a city from 1991 to 2015. The model estimates the population was 57 thousand in 1991, 224 thousand in 2011, and x thousand in 2015. To the nearest whole number, what is the value of x?

ID: 3122fc7b Answer

Correct Answer: 257

Rationale

The correct answer is 257. It's given that a linear model estimates the population of a city from 1991 to 2015. Since the population can be estimated using a linear model, it follows that there is a constant rate of change for the model. It's also given that the model estimates the population was 57 thousand in 1991, 224 thousand in 2011, and x thousand in 2015. The change in the population between 2011 and 1991 is $224 - 57$, or 167, thousand. The change in the number of years between 2011 and 1991 is $2011 - 1991$, or 20, years. Dividing 167 by 20 gives $167/20$, or 8.35, thousand per year. Thus, the change in population per year from 1991 to 2015 estimated by the model is 8.35 thousand. The change in the number of years between 2015 and 2011 is $2015 - 2011$, or 4, years. Multiplying the change in population per year by the change in number of years yields the increase in population from 2011 to 2015 estimated by the model: $(8.35)(4)$, or 33.4, thousand. Adding the change in population from 2011 to 2015 estimated by the model to the estimated population in 2011 yields the estimated population in 2015. Thus, the estimated population in 2015 is $33.4 + 224$, or 257.4, thousand. Therefore to the nearest whole number, the value of x is 257.

Question Difficulty: Medium

Question ID d9733ed9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: d9733ed9

$y > 4x + 8$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given inequality?

A.

x	y
2	19
4	30
6	41

B.

x	y
2	8
4	16
6	24

C.

x	y
2	13
4	18
6	23

D.

x	y
2	13
4	21
6	29

ID: d9733ed9 Answer

Correct Answer: A

Rationale

Choice A is correct. In each choice, the values of x are 2, 4, and 6. Substituting the first value of x, 2, for x in the given inequality yields $y > 4(2) + 8$, or $y > 16$. Therefore, when $x = 2$, the corresponding value of y must be greater than 16. Of the given choices, only choice A is a table where the value of y corresponding to $x = 2$ is greater than 16. To confirm that the other values of x in this table and their corresponding values of y are also solutions to the given inequality, the values of x and y in the table can be substituted for x and y in the given inequality. Substituting 4 for x and 30 for y in the given inequality yields $30 > 4(4) + 8$, or $30 > 24$, which is true. Substituting 6 for x and 41 for y in the given inequality yields $41 > 4(6) + 8$, or $41 > 32$, which is true. It follows that for choice A, all the values of x and their corresponding values of y are solutions to the given inequality.

Choice B is incorrect. Substituting 2 for x and 8 for y in the given inequality yields $8 > 4(2) + 8$, or $8 > 16$, which is false.

Choice C is incorrect. Substituting 2 for x and 13 for y in the given inequality yields $13 > 4(2) + 8$, or $13 > 16$, which is false.

Choice D is incorrect. Substituting 2 for x and 13 for y in the given inequality yields $13 > 4(2) + 8$, or $13 > 16$, which is false.

Question Difficulty: Medium

Question ID ba79f10f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: ba79f10f

x	y
0	18
1	13
2	8

The table shows three values of x and their corresponding values of y. There is a linear relationship between x and y. Which of the following equations represents this relationship?

A. $y = 18x + 13$

B. $y = 18x + 18$

C. $y = -5x + 13$

D. $y = -5x + 18$

ID: ba79f10f Answer

Correct Answer: D

Rationale

Choice D is correct. A linear relationship can be represented by an equation of the form $y = mx + b$, where m and b are constants. It's given in the table that when $x = 0$, $y = 18$. Substituting 0 for x and 18 for y in $y = mx + b$ yields $18 = m(0) + b$, or $18 = b$. Substituting 18 for b in the equation $y = mx + b$ yields $y = mx + 18$. It's also given in the table that when $x = 1$, $y = 13$. Substituting 1 for x and 13 for y in the equation $y = mx + 18$ yields $13 = m(1) + 18$, or $13 = m + 18$. Subtracting 18 from both sides of this equation yields $-5 = m$. Therefore, the equation $y = -5x + 18$ represents the relationship between x and y.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 36fd6752

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 36fd6752

$6 + 7r = pw$ $7r - 5w = 5w + 11$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p?

ID: 36fd6752 Answer

Correct Answer: 10

Rationale

The correct answer is 10. Solving by substitution, the given system of equations, where p is a constant, can be written so that the left-hand side of each equation is equal to $7r$. Subtracting 6 from each side of the first equation in the given system, $6 + 7r = pw$, yields $7r = pw - 6$. Adding $5w$ to each side of the second equation in the given system, $7r - 5w = 5w + 11$, yields $7r = 10w + 11$. Since the left-hand side of each equation is equal to $7r$, setting the the right-hand side of the equations equal to each other yields $pw - 6 = 10w + 11$. A linear equation in one variable, w, has no solution if and only if the equation is false; that is, when there's no value of w that produces a true statement. For the equation $pw - 6 = 10w + 11$, there's no value of w that produces a true statement when $pw = 10w$. Therefore, for the equation $pw - 6 = 10w + 11$, there's no value of w that produces a true statement when the value of p is 10. It follows that in the given system of equations, the system has no solution when the value of p is 10.

Question Difficulty: Hard

Question ID 2e98b1df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 2e98b1df

On the first day of a semester, a film club has 90 members. Each day after the first day of the semester, 10 new members join the film club. If no members leave the film club, how many total members will the film club have 4 days after the first day of the semester?

A. 400

B. 130

C. 94

D. 90

ID: 2e98b1df Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the film club has 90 members on the first day of a semester, and 10 new members join the film club each day after the first day of the semester. This means that after 4 days, 4×10, or 40, new members will have joined the club. Adding 40 members to the original 90 club members yields 130 members. Thus, the film club will have 130 total members 4 days after the first day of the semester.

Choice A is incorrect. This is the number of members that will have joined the film club 4 days after the first day of the semester if 100 new members, not 10, join the film club each day.

Choice C is incorrect. This is the number of members the film club will have 4 days after the first day of the semester if 1 new member, not 10, joins the film club each day.

Choice D is incorrect. This is the number of members the film club has on the first day of the semester.

Question Difficulty: Easy

Question ID d9d83c02

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: d9d83c02

For what value of w does $w-10=2(w+5)$?

A. 5

B. 0

C. -15

D. -20

ID: d9d83c02 Answer

Correct Answer: D

Rationale

Choice D is correct. To solve the equation, use the distributive property to multiply on the right-hand side of the equation which gives w – 10 = 2w + 10. Subtract w from both sides of the equation, which gives –10 = w + 10. Finally, subtract 10 from both sides of the equation, which gives –20 = w.

Choices A and B are incorrect and may result from making sign errors. Choice C is incorrect and may result from incompletely distributing the 2 in the expression 2(w + 5).

Question Difficulty: Easy

Question ID 23dedddd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 23dedddd

In the linear function f, $f(0) = 8$ and $f(1) = 12$. Which equation defines f?

A. $f(x) = 12x + 8$

B. $f(x) = 4x$

C. $f(x) = 4x + 12$

D. $f(x) = 4x + 8$

ID: 23dedddd Answer

Correct Answer: D

Rationale

Choice D is correct. Since f is a linear function, it can be defined by an equation of the form $f(x) = ax + b$, where a and b are constants. It's given that $f(0) = 8$. Substituting 0 for x and 8 for $f(x)$ in the equation $f(x) = ax + b$ yields $8 = a(0) + b$, or $8 = b$. Substituting 8 for b in the equation $f(x) = ax + b$ yields $f(x) = ax + 8$. It's given that $f(1) = 12$. Substituting 1 for x and 12 for $f(x)$ in the equation $f(x) = ax + 8$ yields $12 = a(1) + 8$, or $12 = a + 8$. Subtracting 8 from both sides of this equation yields $a = 4$. Substituting 4 for a in the equation $f(x) = ax + 8$ yields $f(x) = 4x + 8$. Therefore, an equation that defines f is $f(x) = 4x + 8$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

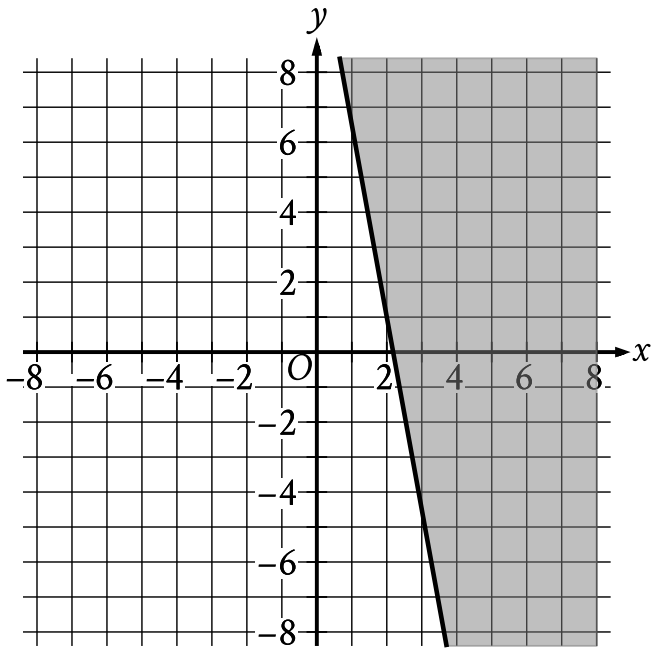
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 59a49431

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 59a49431



The shaded region shown represents solutions to an inequality. Which ordered pair (x, y) is a solution to this inequality?

A. $(0, -4)$

B. $(0, 4)$

C. $(-4, 0)$

D. $(4, 0)$

ID: 59a49431 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the shaded region shown represents solutions to an inequality, an ordered pair (x, y) is a solution to the inequality if it's represented by a point in the shaded region. Of the given choices, only $(4, 0)$ is represented by a point in the shaded region. Therefore, $(4, 0)$ is a solution to the inequality.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID c8fb6bcb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: c8fb6bcb

$f(x) = 2x + 244$

The given function f represents the perimeter, in centimeters (cm), of a rectangle with a length of x cm and a fixed width. What is the width, in cm, of the rectangle?

A. 2

B. 122

C. 244

D. 488

ID: c8fb6bcb Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $f(x) = 2x + 244$ represents the perimeter, in centimeters (cm), of a rectangle with a length of x cm and a fixed width. If w represents a fixed width, in cm, then the perimeter, in cm, of a rectangle with a length of x cm and a fixed width of w cm can be given by the function $f(x) = 2x + 2w$. Therefore, $2x + 2w = 2x + 244$. Subtracting $2x$ from both sides of this equation yields $2w = 244$. Dividing both sides of this equation by 2 yields $w = 122$. Therefore, the width, in cm, of the rectangle is 122.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID d909cd31

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: d909cd31

$-15x + 25y = 65$

One of the two equations in a system of linear equations is given. The system has infinitely many solutions. Which of the following could be the second equation in the system?

A. $12x + 20y = 52$

B. $12x + 20y = -52$

C. $-12x + 20y = 52$

D. $-12x + 20y = -52$

ID: d909cd31 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. Dividing both sides of the given equation by 5 yields $-3x + 5y = 13$. Dividing both sides of choice C by 4 also yields $-3x + 5y = 13$, so choice C is equivalent to the given equation. Thus, choice C could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions.

Choice B is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions.

Choice D is incorrect. The system consisting of this equation and the given equation has no solution, not infinitely many solutions.

Question Difficulty: Medium

Question ID 98d3393a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 98d3393a

Line ℓ in the *xy*-plane is perpendicular to the line with equation $x = 2$. What is the slope of line ℓ?

A. 0

B. $-\frac{1}{2}$

C. -2

D. The slope of line ℓ is undefined.

ID: 98d3393a Answer

Correct Answer: A

Rationale

Choice A is correct. It is given that line ℓ is perpendicular to a line whose equation is x = 2. A line whose equation is a constant value of x is vertical, so ℓ must therefore be horizontal. Horizontal lines have a slope of 0, so ℓ has a slope of 0.

Choice B is incorrect. A line with slope $-\frac{1}{2}$ is perpendicular to a line with slope 2. However, the line with equation x = 2 is vertical and has undefined slope (not slope of 2). Choice C is incorrect. A line with slope –2 is perpendicular to a line with slope $\frac{1}{2}$. However, the line with equation x = 2 has undefined slope (not slope of $\frac{1}{2}$). Choice D is incorrect; this is the slope of the line x = 2 itself, not the slope of a line perpendicular to it.

Question Difficulty: Hard

Question ID f88970cc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: f88970cc

$x = 5$ $y = x - 8$ Which of the following points (x, y) is the solution to the given system of equations in the *xy*-plane?

A. $(0, 0)$

B. $(5, -3)$

C. $(5, -8)$

D. $(5, 8)$

ID: f88970cc Answer

Correct Answer: B

Rationale

Choice B is correct. A solution to a system of equations in the *xy*-plane is a point (x, y) that lies on the graph of each equation in the system. The first equation given is $x = 5$. Substituting 5 for x in the second given equation yields $y = 5 - 8$, or $y = -3$. It follows that in the *xy*-plane, the point $(5, -3)$ lies on the graph of each equation in the system. Therefore, the solution to the given system of equations in the *xy*-plane is $(5, -3)$.

Choice A is incorrect. The point $(0, 0)$ doesn't lie on the graph of either equation in the given system.

Choice C is incorrect. The point $(5, -8)$ doesn't lie on the graph of the second equation in the given system.

Choice D is incorrect. The point $(5, 8)$ doesn't lie on the graph of the second equation in the given system.

Question Difficulty: Easy

Question ID 56dc8045

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 56dc8045

$w(t) = 300 - 4t$

The function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. According to the model, what is the predicted volume, in milliliters, draining from the container each second?

A. 300

B. 296

C. 75

D. 4

ID: 56dc8045 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. The given function $w(t) = 300 - 4t$ can be rewritten as $w(t) = -4t + 300$. Thus, for each increase of t by 1, the value of $w(t)$ decreases by $4(1)$, or 4. Therefore, the predicted volume, in milliliters, draining from the container each second is 4 milliliters.

Choice A is incorrect. This is the amount of liquid, in milliliters, in the container before the liquid begins draining.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 92aa3a94

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 92aa3a94

Line k is defined by $y = 7x + \frac{1}{8}$. Line j is perpendicular to line k in the *xy*-plane. What is the slope of line j?

A. -8

B. $-\frac{1}{7}$

C. $\frac{1}{8}$

D. 7

ID: 92aa3a94 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that line k is defined by $y = 7x + \frac{1}{8}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line defined by this equation in the *xy*-plane and b represents the *y*-coordinate of the *y*-intercept of this line. Therefore, the slope of line k is 7. It's also given that line j is perpendicular to line k in the *xy*-plane. Therefore, the slope of line j is the opposite reciprocal of the slope of line k. The opposite reciprocal of 7 is $-\frac{1}{7}$. Therefore, the slope of line j is $-\frac{1}{7}$.

Choice A is incorrect. This is the opposite reciprocal of the *y*-coordinate of the *y*-intercept, not the slope, of line k.

Choice C is incorrect. This is the *y*-coordinate of the *y*-intercept of line k, not the slope of line j.

Choice D is incorrect. This is the slope of a line that is parallel, not perpendicular, to line k.

Question Difficulty: Medium

Question ID 4f669597

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 4f669597

$$2(p+1)+8(p-1)=5p$$

What value of p is the solution of the equation above?

ID: 4f669597 Answer

Rationale

The correct answer is 1.2. One way to solve the equation $2(p+1)+8(p-1)=5p$ is to first distribute the terms outside the parentheses to the terms inside the parentheses: $2p+2+8p-8=5p$. Next, combine like terms on the left side of the equal sign: $10p-6=5p$. Subtracting 10p from both sides yields $-6=-5p$. Finally, dividing both sides by -5 gives $p=\frac{6}{5}$, which is equivalent to $p=1.2$. Note that 1.2 and 6/5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 3c4ce699

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 3c4ce699

If $6 + x = 9$, what is the value of $18 + 3x$?

ID: 3c4ce699 Answer

Correct Answer: 27

Rationale

The correct answer is 27. Multiplying both sides of the given equation by 3 yields $3(6 + x) = 3(9)$, or $18 + 3x = 27$. Therefore, the value of $18 + 3x$ is 27.

Question Difficulty: Easy

Question ID f2bbd43d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: f2bbd43d

$y > 14$ $4x + y < 18$

The point $(x, 53)$ is a solution to the system of inequalities in the *xy*-plane. Which of the following could be the value of x ?

A. -9

B. -5

C. 5

D. 9

ID: f2bbd43d Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the point $(x, 53)$ is a solution to the given system of inequalities in the *xy*-plane. This means that the coordinates of the point, when substituted for the variables x and y, make both of the inequalities in the system true. Substituting 53 for y in the inequality $y > 14$ yields $53 > 14$, which is true. Substituting 53 for y in the inequality $4x + y < 18$ yields $4x + 53 < 18$. Subtracting 53 from both sides of this inequality yields $4x < -35$. Dividing both sides of this inequality by 4 yields $x < -8.75$. Therefore, x must be a value less than -8.75. Of the given choices, only -9 is less than -8.75.

Choice B is incorrect. Substituting -5 for x and 53 for y in the inequality $4x + y < 18$ yields $4(-5) + 53 < 18$, or $33 < 18$, which is not true.

Choice C is incorrect. Substituting 5 for x and 53 for y in the inequality $4x + y < 18$ yields $4(5) + 53 < 18$, or $73 < 18$, which is not true.

Choice D is incorrect. Substituting 9 for x and 53 for y in the inequality $4x + y < 18$ yields $4(9) + 53 < 18$, or $89 < 18$, which is not true.

Question Difficulty: Medium

Question ID 9fc31513

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 9fc31513

The perimeter of an isosceles triangle is 36 feet. Each of the two congruent sides of the triangle has a length of 10 feet. What is the length, in feet, of the third side?

A. 10

B. 12

C. 16

D. 18

ID: 9fc31513 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the perimeter of an isosceles triangle is 36 feet and that each of the two congruent sides has a length of 10 feet. The perimeter of a triangle is the sum of the lengths of its three sides. The equation $10 + 10 + x = 36$ can be used to represent this situation, where x is the length, in feet, of the third side. Combining like terms on the left-hand side of this equation yields $20 + x = 36$. Subtracting 20 from each side of this equation yields $x = 16$. Therefore, the length, in feet, of the third side is 16.

Choice A is incorrect. This would be the length, in feet, of the third side if the perimeter was 30 feet, not 36 feet.

Choice B is incorrect. This would be the length, in feet, of the third side if the perimeter was 32 feet, not 36 feet.

Choice D is incorrect. This would be the length, in feet, of the third side if the perimeter was 38 feet, not 36 feet.

Question Difficulty: Easy

Question ID ffb371f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: ffb371f5

$3x = 12$ $-3x + y = -6$ The solution to the given system of equations is (x, y). What is the value of y?

A. -3

B. 6

C. 18

D. 30

ID: ffb371f5 Answer

Correct Answer: B

Rationale

Choice B is correct. Adding the second equation in the given system to the first equation in the given system yields $3x + (-3x + y) = 12 + (-6)$, which is equivalent to $y = 6$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 6989c80a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 6989c80a

$F(x) = \frac{9}{5}(x - 273.15) + 32$

The function F gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of x kelvins. If a temperature increased by 2.10 kelvins, by how much did the temperature increase, in degrees Fahrenheit?

A. 3.78

B. 35.78

C. 487.89

D. 519.89

ID: 6989c80a Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function $F(x) = \frac{9}{5}(x - 273.15) + 32$ gives the temperature, in degrees Fahrenheit, that corresponds to a temperature of x kelvins. A temperature that increased by 2.10 kelvins means that the value of x increased by 2.10 kelvins. It follows that an increase in x by 2.10 increases $F(x)$ by $\frac{9}{5}(2.10)$, or 3.78. Therefore, if a temperature increased by 2.10 kelvins, the temperature increased by 3.78 degrees Fahrenheit.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID bc638f2d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: bc638f2d

The function f defined by $f(t) = 14t + 9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. Which of the following is the best interpretation of 9 in this context?

A. Tavon will keep the vine plant for 9 months.

B. The vine plant is expected to grow 9 inches each month.

C. The vine plant is expected to grow to a maximum length of 9 inches.

D. The estimated length of the vine plant was 9 inches when Tavon purchased it.

ID: bc638f2d Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function f defined by $f(t) = 14t + 9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. For a function defined by an equation of the form $f(t) = mt + b$, where m and b are constants, b represents the value of $f(0)$, or the value of $f(t)$ when the value of t is 0. Therefore, for the function defined by $f(t) = 14t + 9$, 9 represents the value of $f(t)$ when the value of t is 0. This means that 0 months after the vine plant was purchased, the estimated length of the vine plant was 9 inches. Therefore, the best interpretation of 9 in this context is the estimated length of the vine plant was 9 inches when Tavon purchased it.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. The vine plant is expected to grow 14 inches, not 9 inches, each month.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c4d49134

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: c4d49134

$s = 40 + 3t$

The equation gives the speed s, in miles per hour, of a certain car t seconds after it began to accelerate. What is the speed, in miles per hour, of the car 5 seconds after it began to accelerate?

A. 40

B. 43

C. 45

D. 55

ID: c4d49134 Answer

Correct Answer: D

Rationale

Choice D is correct. In the given equation, s is the speed, in miles per hour, of a certain car t seconds after it began to accelerate. Therefore, the speed of the car, in miles per hour, 5 seconds after it began to accelerate can be found by substituting 5 for t in the given equation, which yields $s = 40 + 3(5)$, or $s = 55$. Thus, the speed of the car 5 seconds after it began to accelerate is 55 miles per hour.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 0cb57740

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 0cb57740

Each side of a 30-sided polygon has one of three lengths. The number of sides with length 8 centimeters (cm) is 5 times the number of sides n with length 3 cm. There are 6 sides with length 4 cm. Which equation must be true for the value of n?

A. $5n + 6 = 30$

B. $6n + 6 = 30$

C. $8n + 3n + 4n = 30$

D. $8(5n) + 3n + 4(6) = 30$

ID: 0cb57740 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that each side of a 30-sided polygon has one of three lengths. It's also given that the number of sides with length 8 centimeters (cm) is 5 times the number of sides n with length 3 cm. Therefore, there are $5 \times n$, or $5n$, sides with length 8 cm. It's also given that there are 6 sides with length 4 cm. Therefore, the number of 3 cm, 4 cm, and 8 cm sides are n, 6, and $5n$, respectively. Since there are a total of 30 sides, the equation $n + 6 + 5n = 30$ represents this situation. Combining like terms on the left-hand side of this equation yields $6n + 6 = 30$. Therefore, the equation that must be true for the value of n is $6n + 6 = 30$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID ece00725

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: ece00725

Connor has c dollars and Maria has m dollars. Connor has 4 times as many dollars as Maria, and together they have a total of $\$25.00$. Which system of equations represents this situation?

A. $c = 4m$ $c + m = 25$

B. $m = 4c$ $c + m = 25$

C. $c = 25m$ $c + m = 4$

D. $m = 25c$ $c + m = 4$

ID: ece00725 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that Connor has c dollars, Maria has m dollars, and Connor has 4 times as many dollars as Maria. This can be represented by the equation $c = 4m$. It's also given that together, Connor and Maria have a total of $\$25.00$, which can be represented by the equation $c + m = 25$. Therefore, the system consisting of the equations $c = 4m$ and $c + m = 25$ represents this situation.

Choice B is incorrect. The equation $m = 4c$ represents a situation where Maria has 4 times as many dollars as Connor, rather than the situation where Connor has 4 times as many dollars as Maria.

Choice C is incorrect. The equation $c = 25m$ represents a situation where Connor has 25 times, rather than 4 times, as many dollars as Maria. The equation $c + m = 4$ represents a situation where Connor and Maria together have a total of $\$4.00$, rather than $\$25.00$.

Choice D is incorrect. The equation $m = 25c$ represents a situation where Maria has 25 times as many dollars as Connor, rather than the situation where Connor has 4 times as many dollars as Maria. The equation $c + m = 4$ represents a situation where Connor and Maria together have a total of $\$4.00$, rather than $\$25.00$.

Question Difficulty: Easy

Question ID 255996a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 255996a6

$T = 1{,}000 + 18h$

In the equation above, T represents Brittany's total take-home pay, in dollars, for her first week of work, where h represents the number of hours she worked that week and 1,000 represents a sign-on bonus. If Brittany's total take-home pay was $1,576, for how many hours was Brittany paid for her first week of work?

A. 16

B. 32

C. 55

D. 88

ID: 255996a6 Answer

Correct Answer: B

Rationale

Choice B is correct. Since Brittany's total take-home pay was $1,576, the value 1,576 can be substituted for T in the given equation $T = 1{,}000 + 18h$ to give $1{,}576 = 1{,}000 + 18h$. Subtracting 1,000 from both sides of this equation gives $576 = 18h$. Dividing both sides of this equation by 18 gives $32 = h$. Therefore, Brittany was paid for 32 hours for her first week of work.

Choice A is incorrect. This is half the number of hours Brittany was paid for. Choice C is incorrect and may result from dividing 1,000 by 18. Choice D is incorrect and may result from dividing 1,576 by 18.

Question Difficulty: Easy

Question ID a1696f3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a1696f3e

The function g is defined as $g(x) = 5x + a$, where a is a constant. If $g(4) = 31$, what is the value of a ?

A. 30

B. 22

C. 11

D. -23

ID: a1696f3e Answer

Correct Answer: C

Rationale

Choice C is correct. Substituting 4 for x in g(x) = 5x + a gives g(4) = 5(4) + a. Since g(4) = 31, the equation g(4) = 5(4) + a simplifies to 31 = 20 + a. It follows that a = 11.

Choices A, B, and D are incorrect and may result from arithmetic errors.

Question Difficulty: Easy

Question ID c01f4a95

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: c01f4a95

$j(x) = mx + 144$ For the linear function j, m is a constant and $j(12) = 18$. What is the value of $j(10)$?

ID: c01f4a95 Answer

Correct Answer: 39

Rationale

The correct answer is 39. It's given that for the linear function j, m is a constant and $j(12) = 18$. Substituting 12 for x and 18 for $j(x)$ in the given equation yields $18 = m(12) + 144$. Subtracting 144 from both sides of this equation yields $-126 = m(12)$. Dividing both sides of this equation by 12 yields $-10.5 = m$. Substituting -10.5 for m in the given equation, $j(x) = mx + 144$, yields $j(x) = -10.5x + 144$. Substituting 10 for x in this equation yields $j(10) = (-10.5)(10) + 144$, or $j(10) = 39$. Therefore, the value of $j(10)$ is 39.

Question Difficulty: Medium

Question ID dfa45424

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: dfa45424

Tony spends $80 per month on public transportation. A 10-ride pass costs $12.50, and a single-ride pass costs $1.50. If *g* represents the number of 10-ride passes Tony buys in a month and *t* represents the number of single-ride passes Tony buys in a month, which of the following equations best represents the relationship between *g* and *t* ?

A. $g+t=80$

B. $g+t=1.50+12.50$

C. $1.50g+12.50t=80$

D. $12.50g+1.50t=80$

ID: dfa45424 Answer

Correct Answer: D

Rationale

Choice D is correct. Since a 10-ride pass costs $12.50 and g is the number of 10-ride passes Tony buys in a month, the expression $12.50g$ represents the amount Tony spends on 10-ride passes in a month. Since a single-ride pass costs $1.50 and t is the number of single-ride passes Tony buys in a month, the expression $1.50t$ represents the amount Tony spends on single-ride passes in a month. Therefore, the sum $12.50g+1.50t$ represents the amount he spends on the two types of passes in a month. Since Tony spends a total of $80 on passes in a month, this expression can be set equal to 80, producing $12.50g+1.50t=80$.

Choices A and B are incorrect. The expression $g+t$ represents the total number of the two types of passes Tony buys in a month, not the amount Tony spends, which is equal to 80, nor the cost of one of each pass, which is equal to $1.50+12.50$. Choice C is incorrect and may result from reversing the cost for each type of pass Tony buys in a month.

Question Difficulty: Easy

Question ID 431c3038

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 431c3038

In an article about exercise, it is estimated that a 160-pound adult uses 200 calories for every 30 minutes of hiking and 150 calories for every 30 minutes of bicycling. An adult who weighs 160 pounds has completed 1 hour of bicycling. Based on the article, how many hours should the adult hike to use a total of 1,900 calories from bicycling and hiking?

A. 9.5

B. 8.75

C. 6

D. 4

ID: 431c3038 Answer

Correct Answer: D

Rationale

Choice D is correct. Since a 160-pound adult uses 200 calories for every 30 minutes of hiking, then the same adult uses $200h$ calories after hiking for h 30-minute periods. Similarly, the same adult uses $150b$ calories after bicycling for b 30-minute periods. Therefore, the equation $200h + 150b = 1{,}900$ represents the situation where a 160-pound adult uses a total of 1,900 calories from hiking for h 30-minute periods and bicycling for b 30-minute periods. It's given that the adult completes 1 hour, or 2 30-minute periods, of bicycling. Substituting 2 for b in the equation $200h + 150b = 1{,}900$ yields $200h + 150(2) = 1{,}900$, or $200h + 300 = 1{,}900$. Subtracting 300 from both sides of this equation yields $200h = 1{,}600$. Dividing both sides by 200 yields $h = 8$. Since h represents the number of 30-minute periods spent hiking and there are 2 30-minute periods in every hour, it follows that the adult will need to hike for $\frac{8}{2}$, or 4 hours to use a total of 1,900 calories from bicycling and hiking.

Choice A is incorrect and may result from solving the equation $200h = 1{,}900$. This represents 0 30-minute periods bicycling instead of 2. Choice B is incorrect and may result from solving the equation $200h + 150 = 1{,}900$. This represents 1 30-minute period of bicycling instead of 2. Choice C is incorrect. This may result from determining that the number of 30-minute periods the adult should hike is 8, but then subtracting 2 from 8, rather than dividing 8 by 2, to find the number of hours the adult should hike.

Question Difficulty: Medium

Question ID 4b0c156b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 4b0c156b

In the linear function h, $h(28) = 15$ and $h(26) = 22$. Which equation defines h?

A. $h(x) = -\frac{2}{7}x + 23$

B. $h(x) = -\frac{2}{7}x + 113$

C. $h(x) = -\frac{7}{2}x + 23$

D. $h(x) = -\frac{7}{2}x + 113$

ID: 4b0c156b Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining h can be written in the form $y = mx + b$, where $y = h(x)$, m represents the slope of the graph of $y = h(x)$ in the *xy*-plane, and b represents the *y*-coordinate of the *y*-intercept of the graph. It's given that $h(28) = 15$ and $h(26) = 22$. It follows that the points $(28, 15)$ and $(26, 22)$ are on the graph of $y = h(x)$ in the *xy*-plane. The slope can be found by using any two points, (x_1, y_1) and (x_2, y_2), and the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(28, 15)$ and $(26, 22)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{22 - 15}{26 - 28}$, or $m = -\frac{7}{2}$. Substituting $-\frac{7}{2}$ for m and $(28, 15)$ for (x, y) in the equation $y = mx + b$ yields $15 = \left(-\frac{7}{2}\right)(28) + b$, or $15 = -98 + b$. Adding 98 to both sides of this equation yields $113 = b$. Substituting $-\frac{7}{2}$ for m and 113 for b in the equation $y = mx + b$ yields $y = -\frac{7}{2}x + 113$. Since $y = h(x)$, it follows that the equation that defines h is $h(x) = -\frac{7}{2}x + 113$.

Choice A is incorrect. For this function, $h(26) = \frac{109}{7}$, not $h(26) = 22$.

Choice B is incorrect. For this function, $h(28) = 105$, not $h(28) = 15$, and $h(26) = \frac{739}{7}$, not $h(26) = 22$.

Choice C is incorrect. For this function, $h(28) = -75$, not $h(28) = 15$, and $h(26) = -68$, not $h(26) = 22$.

Question Difficulty: Medium

Question ID 868fc236

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 868fc236

Energy per Gram of Typical Macronutrients

Macronutrient	Food calories	Kilojoules
Protein	4.0	16.7
Fat	9.0	37.7
Carbohydrate	4.0	16.7

The table above gives the typical amounts of energy per gram, expressed in both food calories and kilojoules, of the three macronutrients in food. If x food calories is equivalent to k kilojoules, of the following, which best represents the relationship between x and k ?

A. $k = 0.24x$

B. $k = 4.2x$

C. $x = 4.2k$

D. $xk = 4.2$

ID: 868fc236 Answer

Correct Answer: B

Rationale

Choice B is correct. The relationship between x food calories and k kilojoules can be modeled as a proportional relationship. Let (x_1, k_1) and (x_2, k_2) represent the values in the first two rows in the table: $(4.0, 16.7)$ and $(9.0, 37.7)$. The rate of change, or $\frac{(k_2 - k_1)}{(x_2 - x_1)}$, is $\frac{21}{5} = 4.2$; therefore, the equation that best represents the relationship between x and k is $k = 4.2x$.

Choice A is incorrect and may be the result of calculating the rate of change using $\frac{(x_2 - x_1)}{(k_2 - k_1)}$. Choice C is incorrect because the number of kilojoules is greater than the number of food calories. Choice D is incorrect and may be the result of an error when setting up the equation.

Question Difficulty: Medium

Question ID e0177f5f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: e0177f5f

$x = 4\ y = 5 - x$ The solution to the given system of equations is (x, y). What is the value of y?

A. 1

B. 4

C. 5

D. 9

ID: e0177f5f Answer

Correct Answer: A

Rationale

Choice A is correct. The first equation in the given system of equations is $x = 4$. Substituting 4 for x in the second equation in the given system of equations yields $y = 5 - 4$, or $y = 1$.

Choice B is incorrect. This is the value of x in the solution to the given system of equations, not the value of y.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID e8f9e117

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: e8f9e117

$$I = \frac{V}{R}$$

The formula above is Ohm's law for an electric circuit with current I, in amperes, potential difference V, in volts, and resistance R, in ohms. A circuit has a resistance of 500 ohms, and its potential difference will be generated by n six-volt batteries that produce a total potential difference of $6n$ volts. If the circuit is to have a current of no more than 0.25 ampere, what is the greatest number, n, of six-volt batteries that can be used?

ID: e8f9e117 Answer

Rationale

The correct answer is 20. For the given circuit, the resistance R is 500 ohms, and the total potential difference V generated by n batteries is $6n$ volts. It's also given that the circuit is to have a current of no more than 0.25 ampere, which can be expressed as $I < 0.25$. Since Ohm's law says that $I = \frac{V}{R}$, the given values for V and R can be substituted for I in this inequality, which yields $\frac{6n}{500} < 0.25$. Multiplying both sides of this inequality by 500 yields $6n < 125$, and dividing both sides of this inequality by 6 yields $n < 20.833$. Since the number of batteries must be a whole number less than 20.833, the greatest number of batteries that can be used in this circuit is 20.

Question Difficulty: Hard

Question ID c7d7980e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: c7d7980e

$13x = 112 - x$ What value of x is the solution to the given equation?

ID: c7d7980e Answer

Correct Answer: 8

Rationale

The correct answer is 8. Adding x to both sides of the given equation yields $14x = 112$. Dividing both sides of this equation by 14 yields $x = 8$.

Question Difficulty: Easy

Question ID d8539e09

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: d8539e09

$y < 6x + 2$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given inequality?

A.

x	y
3	20
5	32
7	44

B.

x	y
3	16
5	36
7	40

C.

x	y
3	16
5	28
7	40

D.

x	y
3	24
5	36
7	48

ID: d8539e09 Answer

Correct Answer: C

Rationale

Choice C is correct. All the tables in the choices have the same three values of x, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 3 for x in the given inequality yields $y < 6(3) + 2$, or $y < 20$. Therefore, when $x = 3$, the corresponding value of y is less than 20. Substituting 5 for x in the given inequality yields $y < 6(5) + 2$, or $y < 32$. Therefore, when $x = 5$, the corresponding value of y is less than 32. Substituting 7 for x in the given inequality yields $y < 6(7) + 2$, or $y < 44$. Therefore, when $x = 7$, the corresponding value of y is less than 44. For the table in choice C, when $x = 3$, the corresponding value of y is 16, which is less than 20; when $x = 5$, the corresponding value of y is 28, which is less than 32; when $x = 7$, the corresponding value of y is 40, which is less than 44. Therefore, the table in choice C gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. In the table for choice A, when $x = 3$, the corresponding value of y is 20, which is not less than 20; when $x = 5$, the corresponding value of y is 32, which is not less than 32; when $x = 7$, the corresponding value of y is 44, which is not less than 44.

Choice B is incorrect. In the table for choice B, when $x = 5$, the corresponding value of y is 36, which is not less than 32.

Choice D is incorrect. In the table for choice D, when $x = 3$, the corresponding value of y is 24, which is not less than 20; when $x = 5$, the corresponding value of y is 36, which is not less than 32; when $x = 7$, the corresponding value of y is 48, which is not less than 44.

Question Difficulty: Hard

Question ID ce314070

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: ce314070

If $4x-\frac{1}{2}=-5$, what is the value of $8x-1$?

A. 2

B. $-\frac{9}{8}$

C. $-\frac{5}{2}$

D. -10

ID: ce314070 Answer

Correct Answer: D

Rationale

Choice D is correct. Multiplying the given equation by 2 on each side yields $2\left(4x-\frac{1}{2}\right)=2(-5)$. Applying the distributive property, this equation can be rewritten as $2(4x)-2\left(\frac{1}{2}\right)=2(-5)$, or $8x-1=-10$.

Choices A, B, and C are incorrect and may result from calculation errors in solving the given equation for x and then substituting that value of x in the expression $8x-1$.

Question Difficulty: Medium

Question ID 7e1bff94

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 7e1bff94

The table gives the number of hours, h, of labor and a plumber's total charge $f(h)$, in dollars, for two different jobs.

h	$f(h)$
1	155
3	285

There is a linear relationship between h and $f(h)$. Which equation represents this relationship?

A. $f(h) = 25h + 130$

B. $f(h) = 130h + 25$

C. $f(h) = 65h + 90$

D. $f(h) = 90h + 65$

ID: 7e1bff94 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that there is a linear relationship between a plumber's hours of labor, h, and the plumber's total charge $f(h)$, in dollars. It follows that the relationship can be represented by an equation of the form $f(h) = mh + b$, where m is the rate of change of the function f and b is a constant. The rate of change of f can be calculated by dividing the difference in two values of $f(h)$ by the difference in the corresponding values of h. Based on the values given in the table, the rate of change of f is $\frac{285-155}{3-1}$, or 65. Substituting 65 for m in the equation $f(h) = mh + b$ yields $f(h) = 65h + b$. The value of b can be found by substituting any value of h and its corresponding value of $f(h)$ for h and $f(h)$, respectively, in this equation. Substituting 1 for h and 155 for $f(h)$ yields $155 = 65(1) + b$, or $155 = 65 + b$. Subtracting 65 from both sides of this equation yields $90 = b$. Substituting 90 for b in the equation $f(h) = 65h + b$ yields $f(h) = 65h + 90$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 946ab892

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 946ab892

For the linear function g, the graph of $y = g(x)$ in the *xy*-plane has a slope of 2 and passes through the point $(1, 14)$. Which equation defines g?

A. $g(x) = 2x$

B. $g(x) = 2x + 2$

C. $g(x) = 2x + 12$

D. $g(x) = 2x + 14$

ID: 946ab892 Answer

Correct Answer: C

Rationale

Choice C is correct. An equation defining a linear function can be written in the form $g(x) = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of $y = g(x)$ in the *xy*-plane. It's given that the graph of $y = g(x)$ has a slope of 2. Therefore, $m = 2$. It's also given that the graph of $y = g(x)$ passes through the point $(1, 14)$. It follows that when $x = 1$, $g(x) = 14$. Substituting 1 for x, 14 for $g(x)$, and 2 for m in the equation $g(x) = mx + b$ yields $14 = 2(1) + b$, or $14 = 2 + b$. Subtracting 2 from each side of this equation yields $12 = b$. Therefore, $b = 12$. Substituting 2 for m and 12 for b in the equation $g(x) = mx + b$ yields $g(x) = 2x + 12$. Therefore, the equation that defines g is $g(x) = 2x + 12$.

Choice A is incorrect. For this function, the graph of $y = g(x)$ in the *xy*-plane passes through the point $(1, 2)$, not $(1, 14)$.

Choice B is incorrect. For this function, the graph of $y = g(x)$ in the *xy*-plane passes through the point $(1, 4)$, not $(1, 14)$.

Choice D is incorrect. For this function, the graph of $y = g(x)$ in the *xy*-plane passes through the point $(1, 16)$, not $(1, 14)$.

Question Difficulty: Medium

Question ID 9f6f96ff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 9f6f96ff

A wire with a length of 106 inches is cut into two parts. One part has a length of x inches, and the other part has a length of y inches. The value of x is 6 more than 4 times the value of y. What is the value of x?

A. 25

B. 28

C. 56

D. 86

ID: 9f6f96ff Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that a wire with a length of 106 inches is cut into two parts. It's also given that one part has a length of x inches and the other part has a length of y inches. This can be represented by the equation $x + y = 106$. It's also given that the value of x is 6 more than 4 times the value of y. This can be represented by the equation $x = 4y + 6$. Substituting $4y + 6$ for x in the equation $x + y = 106$ yields $4y + 6 + y = 106$, or $5y + 6 = 106$. Subtracting 6 from each side of this equation yields $5y = 100$. Dividing each side of this equation by 5 yields $y = 20$. Substituting 20 for y in the equation $x = 4y + 6$ yields $x = 4(20) + 6$, or $x = 86$.

Choice A is incorrect. This value represents less than half of the total length of 106 inches; however, x represents the length of the longer part of the wire, since it's given that the value of x is 6 more than 4 times the value of y.

Choice B is incorrect. This value represents less than half of the total length of 106 inches; however, x represents the length of the longer part of the wire, since it's given that the value of x is 6 more than 4 times the value of y.

Choice C is incorrect. This represents a part that is 6 more than the length of the other part, rather than 6 more than 4 times the length of the other part.

Question Difficulty: Medium

Question ID 48fb34c8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 48fb34c8

$y > 13x - 18$

For which of the following tables are all the values of x and their corresponding values of y solutions to the given inequality?

A.

x	y
3	21
5	47
8	86

B.

x	y
3	26
5	42
8	86

C.

x	y
3	16
5	42
8	81

D.

x	y
3	26
5	52
8	91

ID: 48fb34c8 Answer

Correct Answer: D

Rationale

Choice D is correct. All the tables in the choices have the same three values of x, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 3 for x in the given inequality yields $y > 13(3) - 18$, or $y > 21$. Therefore, when $x = 3$, the corresponding value of y is greater than 21. Substituting 5 for x in the given inequality yields $y > 13(5) - 18$, or $y > 47$. Therefore, when $x = 5$, the corresponding value of y is greater than 47. Substituting 8 for x in the given inequality yields $y > 13(8) - 18$, or $y > 86$. Therefore, when $x = 8$, the corresponding value of y is greater than 86. For the table in choice D, when $x = 3$, the corresponding value of y is 26, which is greater than 21; when $x = 5$, the corresponding value of y is 52, which is greater than 47; when $x = 8$, the corresponding value of y is 91, which is greater than 86. Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. In the table for choice A, when $x = 3$, the corresponding value of y is 21, which is not greater than 21; when $x = 5$, the corresponding value of y is 47, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86.

Choice B is incorrect. In the table for choice B, when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86.

Choice C is incorrect. In the table for choice C, when $x = 3$, the corresponding value of y is 16, which is not greater than 21; when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 81, which is not greater than 86.

Question Difficulty: Hard

Question ID f718c9cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: f718c9cf

$5x + 14y = 45$ $10x + 7y = 27$ The solution to the given system of equations is (x, y). What is the value of xy?

ID: f718c9cf Answer

Correct Answer: 1.8, 9/5

Rationale

The correct answer is $\frac{9}{5}$. Multiplying the first equation in the given system by 2 yields $10x + 28y = 90$. Subtracting the second equation in the given system, $10x + 7y = 27$, from $10x + 28y = 90$ yields $(10x + 28y) - (10x + 7y) = 90 - 27$, which is equivalent to $10x + 28y - 10x - 7y = 63$, or $21y = 63$. Dividing both sides of this equation by 21 yields $y = 3$. The value of x can be found by substituting 3 for y in either of the two given equations. Substituting 3 for y in the equation $10x + 7y = 27$ yields $10x + 7(3) = 27$, or $10x + 21 = 27$. Subtracting 21 from both sides of this equation yields $10x = 6$. Dividing both sides of this equation by 10 yields $x = \frac{6}{10}$, or $x = \frac{3}{5}$. Therefore, the value of xy is $\left(\frac{3}{5}\right)(3)$, or $\frac{9}{5}$. Note that 9/5 and 1.8 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 915463e0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 915463e0

Normal body temperature for an adult is between $97.8°F$ and $99°F$, inclusive.

If Kevin, an adult male, has a body temperature that is considered to be normal, which of the following could be his body temperature?

A. $96.7°F$

B. $97.6°F$

C. $97.9°F$

D. $99.7°F$

ID: 915463e0 Answer

Correct Answer: C

Rationale

Choice C is correct. Normal body temperature must be greater than or equal to 97.8°F but less than or equal to 99°F. Of the given choices, 97.9°F is the only temperature that fits these restrictions.

Choices A and B are incorrect. These temperatures are less than 97.8°F, so they don't fit the given restrictions. Choice D is incorrect. This temperature is greater than 99°F, so it doesn't fit the given restrictions.

Question Difficulty: Easy

Question ID 62ef6f73

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 62ef6f73

A total of 2 squares each have side length r. A total of 6 equilateral triangles each have side length t. None of these squares and triangles shares a side. The sum of the perimeters of all these squares and triangles is 210. Which equation represents this situation?

A. $6r + 24t = 210$

B. $2r + 6t = 210$

C. $8r + 18t = 210$

D. $6r + 2t = 210$

ID: 62ef6f73 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a total of 2 squares each have side length r. Therefore, each of the squares has perimeter $4r$. Since there are a total of 2 squares, the sum of the perimeters of these squares is $4r + 4r$, which is equivalent to $2(4r)$, or $8r$. It's also given that a total of 6 equilateral triangles each have side length t. Therefore, each of the equilateral triangles has perimeter $3t$. Since there are a total of 6 equilateral triangles, the sum of the perimeters of these triangles is $3t + 3t + 3t + 3t + 3t + 3t$, which is equivalent to $6(3t)$, or $18t$. Since the sum of the perimeters of the squares is $8r$ and the sum of the perimeters of the triangles is $18t$, the sum of the perimeters of all these squares and triangles is $8r + 18t$. It's given that the sum of the perimeters of all these squares and triangles is 210. Therefore, the equation $8r + 18t = 210$ represents this situation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID cc3e9528

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: cc3e9528

The graph of $9x - 10y = 19$ is translated down 4 units in the *xy*-plane. What is the *x*-coordinate of the *x*-intercept of the resulting graph?

ID: cc3e9528 Answer

Correct Answer: 59/9, 6.555, 6.556

Rationale

The correct answer is $\frac{59}{9}$. When the graph of an equation in the form $Ax + By = C$, where A, B, and C are constants, is translated down k units in the *xy*-plane, the resulting graph can be represented by the equation $Ax + B(y + k) = C$. It's given that the graph of $9x - 10y = 19$ is translated down 4 units in the *xy*-plane. Therefore, the resulting graph can be represented by the equation $9x - 10(y + 4) = 19$, or $9x - 10y - 40 = 19$. Adding 40 to both sides of this equation yields $9x - 10y = 59$. The *x*-coordinate of the *x*-intercept of the graph of an equation in the *xy*-plane is the value of x in the equation when $y = 0$. Substituting 0 for y in the equation $9x - 10y = 59$ yields $9x - 10(0) = 59$, or $9x = 59$. Dividing both sides of this equation by 9 yields $x = \frac{59}{9}$. Therefore, the *x*-coordinate of the *x*-intercept of the resulting graph is $\frac{59}{9}$. Note that 59/9, 6.555, and 6.556 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 520e6f5b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 520e6f5b

Characteristics for Rock Types

Rock type	Weight per volume (lb/ft^3)	Cost per pound
Basalt	180	$0.18
Granite	165	$0.09
Limestone	120	$0.03
Sandstone	135	$0.22

A city is planning to build a rock retaining wall, a monument, and a garden in a park. The table above shows four rock types that will be considered for use in the project. Also shown for each rock type is its weight per volume, in pounds per cubic foot (lb/ft^3), and the cost per pound, in dollars. The equation $0.03(120w)+0.18(180z)+3{,}385.80=7{,}576.20$ gives the total cost, in dollars, of the rocks used in the project in terms of the number of ft^3 of limestone, w, and the number of ft^3 of basalt, z. All four rock types are used in the project. Which of the following is the best interpretation of 3,385.80 in this context?

A. The cost of the granite and sandstone needed for the project

B. The cost of the basalt and limestone needed for the project

C. The cost of the basalt needed for the project

D. The cost of the sandstone needed for the project

ID: 520e6f5b Answer

Correct Answer: A

Rationale

Choice A is correct. The table shows the cost of limestone is $0.03/lb, and the weight per volume for limestone is 120 lb/ft^3. Therefore, the term $0.03(120w)$ represents the cost, in dollars, of w ft^3 of limestone. Similarly, the term $0.18(180z)$ represents the cost, in dollars, of z ft^3 of basalt. The given equation shows that the total cost of all the rocks used in the project is $7,576.20. Since it's given that all four rock types are used in the project, the remaining term, 3,385.80, represents the cost, in dollars, of the granite and sandstone needed for the project.

Choice B is incorrect. The cost of basalt and limestone needed for the project can be represented by $0.18(180z)+0.03(120w)$. Choice C is incorrect. The cost of the basalt needed for the project can be represented by the expression $0.18(180z)$. Choice D is incorrect and may result from neglecting to include granite in the rock types used for the project.

Question Difficulty: Easy

Question ID 153ee763

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 153ee763

$-3x + 21px = 84$ In the given equation, p is a constant. The equation has no solution. What is the value of p?

A. 0

B. $\frac{1}{7}$

C. $\frac{4}{3}$

D. 4

ID: 153ee763 Answer

Correct Answer: B

Rationale

Choice B is correct. A linear equation in one variable has no solution if and only if the equation is false; that is, when there is no value of x that produces a true statement. It's given that in the equation $-3x + 21px = 84$, p is a constant and the equation has no solution for x. Therefore, the value of the constant p is one that results in a false equation. Factoring out the common factor of $-3x$ on the left-hand side of the given equation yields $-3x(1 - 7p) = 84$. Dividing both sides of this equation by -3 yields $x(1 - 7p) = -28$. Dividing both sides of this equation by $(1 - 7p)$ yields $x = \frac{-28}{1-7p}$. This equation is false if and only if $1 - 7p = 0$. Adding $7p$ to both sides of $1 - 7p = 0$ yields $1 = 7p$. Dividing both sides of this equation by 7 yields $\frac{1}{7} = p$. It follows that the equation $x = \frac{-28}{1-7p}$ is false if and only if $p = \frac{1}{7}$. Therefore, the given equation has no solution if and only if the value of p is $\frac{1}{7}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 89541f9b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 89541f9b

Which of the following ordered pairs (x, y) satisfies the inequality $5x - 3y < 4$?

$(1, 1)(2, 5)(3, 2)$

A. I only

B. II only

C. I and II only

D. I and III only

ID: 89541f9b Answer

Correct Answer: C

Rationale

Choice C is correct. Substituting $(1,1)$ into the inequality gives $5(1) - 3(1) < 4$, or $2 < 4$, which is a true statement. Substituting $(2,5)$ into the inequality gives $5(2) - 3(5) < 4$, or $-5 < 4$, which is a true statement. Substituting $(3,2)$ into the inequality gives $5(3) - 3(2) < 4$, or $9 < 4$, which is not a true statement. Therefore, $(1,1)$ and $(2,5)$ are the only ordered pairs shown that satisfy the given inequality.

Choice A is incorrect because the ordered pair $(2,5)$ also satisfies the inequality. Choice B is incorrect because the ordered pair $(1,1)$ also satisfies the inequality. Choice D is incorrect because the ordered pair $(3,2)$ does not satisfy the inequality.

Question Difficulty: Easy

Question ID 2875ba81

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 2875ba81

$6x + 7y = 28$
$2x + 2y = 10$ The solution to the given system of equations is (x, y). What is the value of *y*?

A. -2

B. 7

C. 14

D. 18

ID: 2875ba81 Answer

Correct Answer: A

Rationale

Choice A is correct. The given system of linear equations can be solved by the elimination method. Multiplying each side of the second equation in the given system by 3 yields $(2x + 2y)(3) = (10)(3)$, or $6x + 6y = 30$. Subtracting this equation from the first equation in the given system yields $(6x + 7y) - (6x + 6y) = (28) - (30)$, which is equivalent to $(6x - 6x) + (7y - 6y) = 28 - 30$, or $y = -2$.

Choice B is incorrect. This is the value of x, not the value of y.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 6a12efbb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 6a12efbb

The equation $46 = 2x + 2y$ gives the perimeter of a rectangular rug that has length x, in feet, and width y, in feet. The width of the rug is 8 feet. What is the length, in feet, of the rug?

ID: 6a12efbb Answer

Correct Answer: 15

Rationale

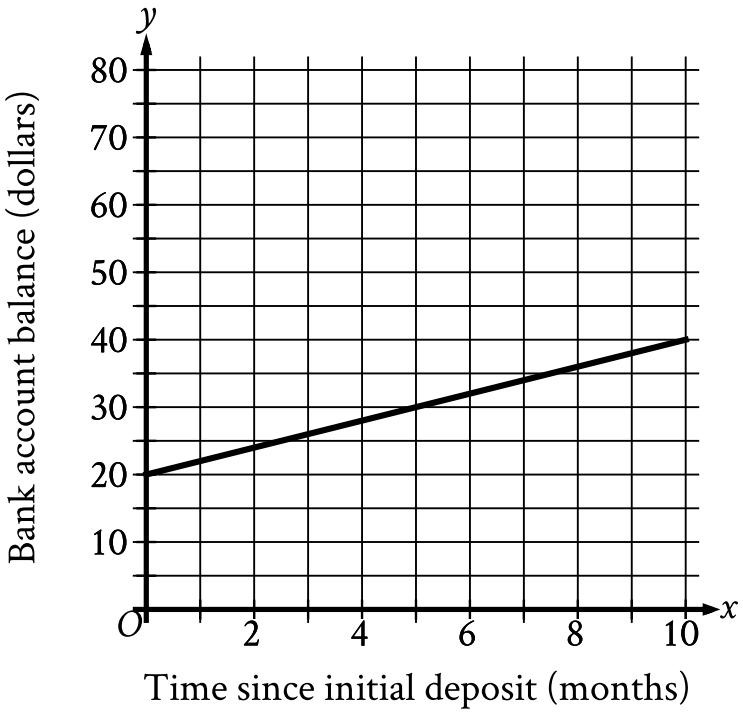
The correct answer is 15. It's given that the equation $46 = 2x + 2y$ gives the perimeter of a rectangular rug that has length x, in feet, and width y, in feet. It's also given that the width of the rug is 8 feet. Substituting 8 for y in the equation $46 = 2x + 2y$ yields $46 = 2x + 2(8)$, or $46 = 2x + 16$. Subtracting 16 from both sides of this equation yields $30 = 2x$. Dividing both sides of this equation by 2 yields $15 = x$. Since x represents the length, in feet, of the rug, it follows that the length of the rug is 15 feet.

Question Difficulty: Easy

Question ID 2ecce641

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 2ecce641



A bank account was opened with an initial deposit. Over the next several months, regular deposits were made into this account, and there were no withdrawals made during this time. The graph of the function f shown, where $y = f(x)$, estimates the account balance, in dollars, in this bank account x months since the initial deposit. To the nearest whole dollar, what is the amount of the initial deposit estimated by the graph?

ID: 2ecce641 Answer

Correct Answer: 20

Rationale

The correct answer is 20. For the graph shown, the *x*-axis represents the time since the initial deposit, in months, and the *y*-axis represents the bank account balance, in dollars. The amount of the initial deposit is estimated by the *y*-coordinate of the point on the graph that represents 0 months since the initial deposit. Therefore, the amount of the initial deposit is estimated by the corresponding *y*-value for the point when $x = 0$. When $x = 0$, it is estimated that $y = 20$. Thus, the amount of the initial deposit estimated by the graph, to the nearest whole dollar, is 20.

Question Difficulty: Easy

Question ID 265f2a53

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 265f2a53

When line n is graphed in the *xy*-plane, it has an *x*-intercept of $(-4, 0)$ and a *y*-intercept of $\left(0, \frac{86}{3}\right)$. What is the slope of line n?

A. $\frac{3}{344}$

B. $\frac{6}{43}$

C. $\frac{43}{6}$

D. $\frac{344}{3}$

ID: 265f2a53 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that when line n is graphed in the *xy*-plane, it has an *x*-intercept of $(-4, 0)$ and a *y*-intercept of $\left(0, \frac{86}{3}\right)$. The slope, m, of a line can be found using any two points on the line, (x_1, y_1) and (x_2, y_2), and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(-4, 0)$ and $\left(0, \frac{86}{3}\right)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{\frac{86}{3} - 0}{0 - (-4)}$, or $m = \frac{43}{6}$. Therefore, the slope of line n is $\frac{43}{6}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the slope of a line that has an *x*-intercept of $\left(\frac{86}{3}, 0\right)$ and a *y*-intercept of $(0, -4)$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID ee031767

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: ee031767

A dance teacher ordered outfits for students for a dance recital. Outfits for boys cost $26, and outfits for girls cost $35. The dance teacher ordered a total of 28 outfits and spent $881. If b represents the number of outfits the dance teacher ordered for boys and g represents the number of outfits the dance teacher ordered for girls, which of the following systems of equations can be solved to find b and g ?

A. $\begin{aligned} 26b+35g&=28 \\ b+g&=881 \end{aligned}$

B. $\begin{aligned} 26b+35g&=881 \\ b+g&=28 \end{aligned}$

C. $\begin{aligned} 26g+35b&=28 \\ b+g&=881 \end{aligned}$

D. $\begin{aligned} 26g+35b&=881 \\ b+g&=28 \end{aligned}$

ID: ee031767 Answer

Correct Answer: B

Rationale

Choice B is correct. Outfits for boys cost $26 each and the teacher ordered b outfits for boys, so the teacher spent 26b dollars on outfits for boys. Similarly, outfits for girls cost $35 each and the teacher ordered g outfits for girls, so the teacher spent 35g dollars on outfits for girls. Since the teacher spent a total of $881 on outfits for boys and girls, the equation 26b + 35g = 881 must be true. And since the teacher ordered a total of 28 outfits, the equation b + g = 28 must also be true.

Choice A is incorrect and may result from switching the constraint on the total number of outfits with the constraint on the cost of the outfits. Choice C is incorrect and may result from switching the constraint on the total number of outfits with the constraint on the cost of the outfits, as well as switching the cost of the outfits for boys with the cost of the outfits for girls. Choice D is incorrect and may result from switching the cost of the outfits for boys with the cost of the outfits for girls.

Question Difficulty: Easy

Question ID 0cadb20e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 0cadb20e

The function f is defined by $f(x) = \frac{x+15}{5}$, and $f(a) = 10$, where a is a constant. What is the value of a?

A. 5

B. 10

C. 35

D. 65

ID: 0cadb20e Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x) = \frac{x+15}{5}$ and $f(a) = 10$, where a is a constant. Therefore, for the given function f, when $x = a$, $f(x) = 10$. Substituting a for x and 10 for $f(x)$ in the given function f yields $10 = \frac{a+15}{5}$. Multiplying both sides of this equation by 5 yields $50 = a + 15$. Subtracting 15 from both sides of this equation yields $35 = a$. Therefore, the value of a is 35.

Choice A is incorrect. This is the value of a if $f(a) = 4$. Choice B is incorrect. This is the value of a if $f(a) = 5$.

Choice D is incorrect. This is the value of a if $f(a) = 16$.

Question Difficulty: Medium

Question ID 466b87e3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 466b87e3

$$y = \frac{1}{2}x + 8$$

$$y = cx + 10$$

In the system of equations above, c is a constant. If the system has no solution, what is the value of c ?

ID: 466b87e3 Answer

Rationale

The correct answer is $\frac{1}{2}$. A system of two linear equations has no solution when the graphs of the equations have the same slope and different y-intercepts. Each of the given linear equations is written in the slope-intercept form, $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept of the graph of the equation. For these two linear equations, the y-intercepts are $(0,8)$ and $(0,10)$. Thus, if the system of equations has no solution, the slopes of the graphs of the two linear equations must be the same. The slope of the graph of the first linear equation is $\frac{1}{2}$. Therefore, for the system of equations to have no solution, the value of c must be $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ce6b52d8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: ce6b52d8

If $2(3t - 10) + t = 40 + 4t$, what is the value of $3t$?

ID: ce6b52d8 Answer

Correct Answer: 60

Rationale

The correct answer is 60. Subtracting t from both sides of the given equation yields $2(3t - 10) = 40 + 3t$. Applying the distributive property to the left-hand side of this equation yields $6t - 20 = 40 + 3t$. Adding 20 to both sides of this equation yields $6t = 60 + 3t$. Subtracting $3t$ from both sides of this equation yields $3t = 60$. Therefore, the value of $3t$ is 60.

Question Difficulty: Medium

Question ID 83fb222d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 83fb222d

If $6n = 12$, what is the value of $n + 4$?

ID: 83fb222d Answer

Correct Answer: 6

Rationale

The correct answer is 6. Dividing both sides of the equation $6n = 12$ by 6 yields $n = 2$. Substituting 2 for n in the expression $n + 4$ yields $2 + 4$, or 6.

Question Difficulty: Easy

Question ID aee9fd2d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: aee9fd2d

If $\frac{x+6}{3} = \frac{x+6}{13}$, the value of $x + 6$ is between which of the following pairs of values?

A. -7 and -3

B. -2 and 2

C. 2 and 7

D. 8 and 13

ID: aee9fd2d Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying both sides of the given equation by $(3)(13)$, or 39, yields $(39)\left(\frac{x+6}{3}\right) = (39)\left(\frac{x+6}{13}\right)$, or $13(x + 6) = 3(x + 6)$. Subtracting $3(x + 6)$ from both sides of this equation yields $10(x + 6) = 0$. Dividing both sides of this equation by 10 yields $x + 6 = 0$. Therefore, if $\frac{x+6}{3} = \frac{x+6}{13}$, then the value of $x + 6$ is 0. It follows that of the given choices, the value of $x + 6$ is between -2 and 2.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 84d0d07e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 84d0d07e

A clothing store is having a sale on shirts and pants. During the sale, the cost of each shirt is $15 and the cost of each pair of pants is $25. Geoff can spend at most $120 at the store. If Geoff buys *s* shirts and *p* pairs of pants, which of the following must be true?

A. $15s + 25p \leq 120$

B. $15s + 25p \geq 120$

C. $25s + 15p \leq 120$

D. $25s + 15p \geq 120$

ID: 84d0d07e Answer

Correct Answer: A

Rationale

Choice A is correct. Since the cost of each shirt is $15 and Geoff buys s shirts, the expression $15s$ represents the amount Geoff spends on shirts. Since the cost of each pair of pants is $25 and Geoff buys p pairs of pants, the expression $25p$ represents the amount Geoff spends on pants. Therefore, the sum $15s + 25p$ represents the total amount Geoff spends at the store. Since Geoff can spend at most $120 at the store, the total amount he spends must be less than or equal to 120. Thus, $15s + 25p \leq 120$.

Choice B is incorrect. This represents the situation in which Geoff spends at least, rather than at most, $120 at the store. Choice C is incorrect and may result from reversing the cost of a shirt and that of a pair of paints. Choice D is incorrect and may result from both reversing the cost of a shirt and that of a pair of pants and from representing a situation in which Geoff spends at least, rather than at most, $120 at the store.

Question Difficulty: Easy

Question ID 7a987ae4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 7a987ae4

If $\frac{2n}{5} = 10$, what is the value of $2n - 1$?

A. 24

B. 49

C. 50

D. 99

ID: 7a987ae4 Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying both sides of the given equation by 5 yields $2n = 50$. Substituting 50 for $2n$ in the expression $2n - 1$ yields $50 - 1 = 49$.

Alternate approach: Dividing both sides of $2n = 50$ by 2 yields $n = 25$. Evaluating the expression $2n - 1$ for $n = 25$ yields $2(25) - 1 = 49$.

Choice A is incorrect and may result from finding the value of $n - 1$ instead of $2n - 1$. Choice C is incorrect and may result from finding the value of $2n$ instead of $2n - 1$. Choice D is incorrect and may result from finding the value of $4n - 1$ instead of $2n - 1$.

Question Difficulty: Easy

Question ID f81a0503

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: f81a0503

In the *xy*-plane, line k passes through the points $(0, -5)$ and $(1, -1)$. Which equation defines line k?

A. $y = -x + \frac{1}{4}$

B. $y = \frac{1}{4}x - 5$

C. $y = -x + 4$

D. $y = 4x - 5$

ID: f81a0503 Answer

Correct Answer: D

Rationale

Choice D is correct. An equation defining a line in the *xy*-plane can be written in the form $y = mx + b$, where m represents the slope and $(0, b)$ represents the *y*-intercept of the line. It's given that line k passes through the point $(0, -5)$; therefore, $b = -5$. The slope, m, of a line can be found using any two points on the line, (x_1, y_1) and (x_2, y_2), and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(0, -5)$ and $(1, -1)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{(-1-(-5))}{(1-0)}$, or $m = 4$. Substituting 4 for m and -5 for b in the equation $y = mx + b$ yields $y = 4x - 5$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 0366d965

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 0366d965

x	y
3	7
k	11
12	n

The table above shows the coordinates of three points on a line in the xy-plane, where k and n are constants. If the slope of the line is 2, what is the value of $k+n$?

ID: 0366d965 Answer

Rationale

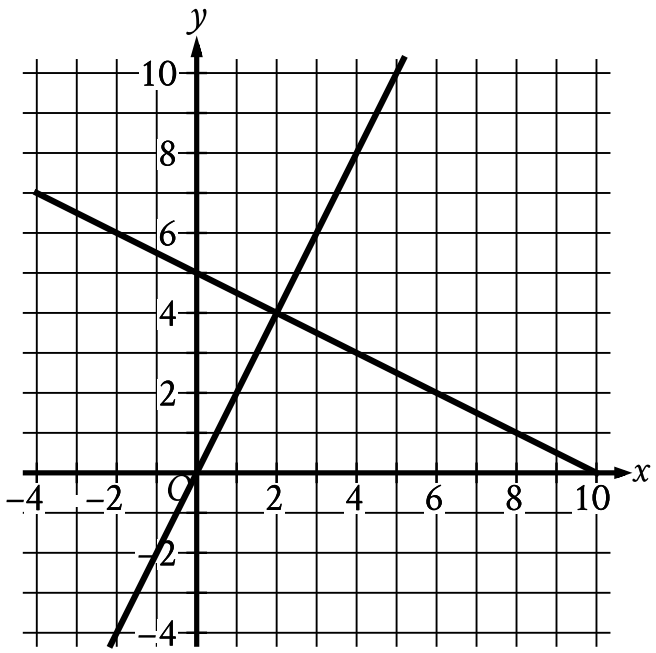
The correct answer is 30. The slope of a line can be found by using the slope formula, $\frac{y_2-y_1}{x_2-x_1}$. It's given that the slope of the line is 2; therefore, $\frac{y_2-y_1}{x_2-x_1}=2$. According to the table, the points $(3,7)$ and $(k,11)$ lie on the line. Substituting the coordinates of these points into the equation gives $\frac{11-7}{k-3}=2$. Multiplying both sides of this equation by $k-3$ gives $11-7=2(k-3)$, or $11-7=2k-6$. Solving for k gives $k=5$. According to the table, the points $(3,7)$ and $(12,n)$ also lie on the line. Substituting the coordinates of these points into $\frac{y_2-y_1}{x_2-x_1}=2$ gives $\frac{n-7}{12-3}=2$. Solving for n gives $n=25$. Therefore, $k+n=5+25$, or 30.

Question Difficulty: Hard

Question ID 1006cad7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 1006cad7



The graph of a system of linear equations is shown. What is the solution (x, y) to the system?

A. $(0, 5)$

B. $(2, 4)$

C. $(5, 10)$

D. $(10, 0)$

ID: 1006cad7 Answer

Correct Answer: B

Rationale

Choice B is correct. A solution to a system of equations must be the solution to each equation in the system. It follows that if (x, y) is a solution to the system, the point (x, y) lies on the graph in the *xy*-plane of each equation in the system. The point that lies on each graph of the system of linear equations shown is their intersection point $(2, 4)$. Therefore, the solution to the system is $(2, 4)$.

Choice A is incorrect. The point $(0, 5)$ lies on one, but not both, of the graphs of the linear equations shown.

Choice C is incorrect. The point $(5, 10)$ lies on one, but not both, of the graphs of the linear equations shown.

Choice D is incorrect. The point $(10, 0)$ lies on one, but not both, of the graphs of the linear equations shown.

Question Difficulty: Easy

Question ID 13909d78

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 13909d78

The function f is defined by the equation $f(x) = 100x + 2$. What is the value of $f(x)$ when $x = 9$?

A. 111

B. 118

C. 900

D. 902

ID: 13909d78 Answer

Correct Answer: D

Rationale

Choice D is correct. Substituting 9 for x in the given equation yields $f(9) = 100(9) + 2$, or $f(9) = 902$. Therefore, the value of $f(x)$ when $x = 9$ is 902.

Choice A is incorrect. This is the value of $f(x)$ when $x = 1.09$.

Choice B is incorrect. This is the value of $f(x)$ when $x = 1.16$.

Choice C is incorrect. This is the value of $f(x)$ when $x = 8.98$.

Question Difficulty: Easy

Question ID 10c448d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 10c448d6

A line in the *xy*-plane has a slope of $\frac{1}{9}$ and passes through the point $(0, 14)$. Which equation represents this line?

A. $y = -\frac{1}{9}x - 14$

B. $y = -\frac{1}{9}x + 14$

C. $y = \frac{1}{9}x - 14$

D. $y = \frac{1}{9}x + 14$

ID: 10c448d6 Answer

Correct Answer: D

Rationale

Choice D is correct. The equation of a line in the *xy*-plane can be written as $y = mx + b$, where m represents the slope of the line and $(0, b)$ represents the *y*-intercept of the line. It's given that the slope of the line is $\frac{1}{9}$. It follows that $m = \frac{1}{9}$. It's also given that the line passes through the point $(0, 14)$. It follows that $b = 14$. Substituting $\frac{1}{9}$ for m and 14 for b in $y = mx + b$ yields $y = \frac{1}{9}x + 14$. Thus, the equation $y = \frac{1}{9}x + 14$ represents this line.

Choice A is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a *y*-intercept of $(0, -14)$.

Choice B is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a *y*-intercept of $(0, 14)$.

Choice C is incorrect. This equation represents a line with a slope of $\frac{1}{9}$ and a *y*-intercept of $(0, -14)$.

Question Difficulty: Easy

Question ID 939fc21b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 939fc21b

$s + 7r = 27$ $r = 3$ What is the solution (r, s) to the given system of equations?

A. $(6, 3)$

B. $(3, 6)$

C. $(3, 27)$

D. $(27, 3)$

ID: 939fc21b Answer

Correct Answer: B

Rationale

Choice B is correct. The second equation in the given system is $r = 3$. Substituting 3 for r in the first equation in the given system yields $s + 7(3) = 27$, or $s + 21 = 27$. Subtracting 21 from both sides of this equation yields $s = 6$. Therefore, the solution (r, s) to the given system of equations is $(3, 6)$.

Choice A is incorrect. This is the solution (s, r), not (r, s), to the given system of equations.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7038b587

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 7038b587

Vivian bought party hats and cupcakes for $71. Each package of party hats cost $3, and each cupcake cost $1. If Vivian bought 10 packages of party hats, how many cupcakes did she buy?

ID: 7038b587 Answer

Correct Answer: 41

Rationale

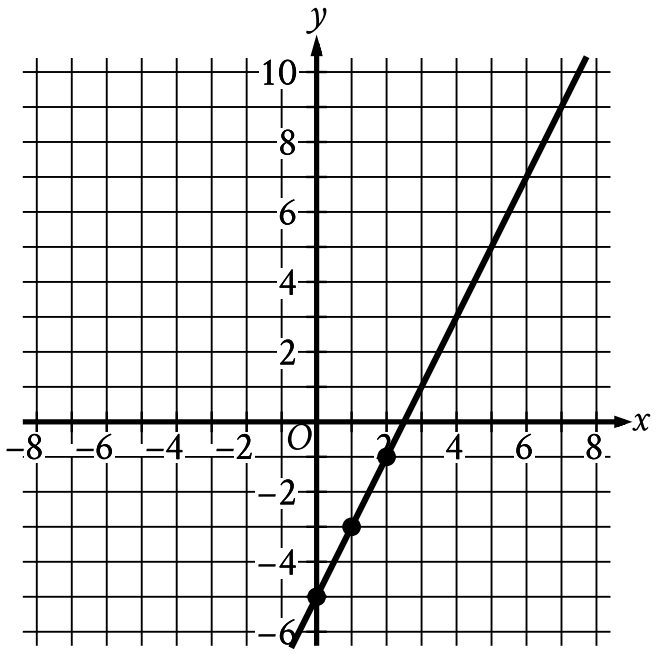
The correct answer is 41. The number of cupcakes Vivian bought can be found by first finding the amount Vivian spent on cupcakes. The amount Vivian spent on cupcakes can be found by subtracting the amount Vivian spent on party hats from the total amount Vivian spent. The amount Vivian spent on party hats can be found by multiplying the cost per package of party hats by the number of packages of party hats, which yields $3 \cdot 10$, or $30. Subtracting the amount Vivian spent on party hats, $30, from the total amount Vivian spent, $71, yields $71 - $30, or $41. Since the amount Vivian spent on cupcakes was $41 and each cupcake cost $1, it follows that Vivian bought 41 cupcakes.

Question Difficulty: Easy

Question ID 4acd05cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 4acd05cd



The graph shows the linear relationship between x and y. Which table gives three values of x and their corresponding values of y for this relationship?

A.

x	y
0	0
1	−7
2	−9

B.

x	y
0	0
1	−3
2	−1

C.

x	y
0	−5
1	−7

2	-9

D.

x	y
0	-5
1	-3
2	-1

ID: 4acd05cd Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the graph shows the linear relationship between x and y. The given graph passes through the points $(0, -5)$, $(1, -3)$, and $(2, -1)$. It follows that when $x = 0$, the corresponding value of y is -5, when $x = 1$, the corresponding value of y is -3, and when $x = 2$, the corresponding value of y is -1. Of the given choices, only the table in choice D gives these three values of x and their corresponding values of y for the relationship shown in the graph.

Choice A is incorrect. This table represents a relationship between x and y such that the graph passes through the points $(0, 0)$, $(1, -7)$, and $(2, -9)$.

Choice B is incorrect. This table represents a relationship between x and y such that the graph passes through the points $(0, 0)$, $(1, -3)$, and $(2, -1)$.

Choice C is incorrect. This table represents a linear relationship between x and y such that the graph passes through the points $(0, -5)$, $(1, -7)$, and $(2, -9)$.

Question Difficulty: Easy

Question ID 34aca984

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 34aca984

The length of a rectangle is 50 inches and the width is x inches. The perimeter is at most 210 inches. Which inequality represents this situation?

A. $2x + 100 \leq 210$

B. $2x + 100 \geq 210$

C. $2x + 50 \leq 210$

D. $2x + 50 \geq 210$

ID: 34aca984 Answer

Correct Answer: A

Rationale

Choice A is correct. The perimeter of a rectangle is equal to the sum of 2 times its length and 2 times its width. It's given that the rectangle's length is 50 inches and the width is x inches. Therefore, the perimeter, in inches, is $2(50) + 2x$, or $100 + 2x$, which is equivalent to $2x + 100$. It's given that the perimeter is at most 210 inches; therefore, $2x + 100 \leq 210$ represents this situation.

Choice B is incorrect. This inequality represents a situation where the perimeter is at least, rather than at most, 210 inches.

Choice C is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches.

Choice D is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches, and the perimeter is at least, rather than at most, 210 inches.

Question Difficulty: Medium

Question ID 963da34c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 963da34c

A shipping service restricts the dimensions of the boxes it will ship for a certain type of service. The restriction states that for boxes shaped like rectangular prisms, the sum of the perimeter of the base of the box and the height of the box cannot exceed 130 inches. The perimeter of the base is determined using the width and length of the box. If a box has a height of 60 inches and its length is 2.5 times the width, which inequality shows the allowable width x, in inches, of the box?

A. $0 < x \leq 10$

B. $0 < x \leq 11\frac{2}{3}$

C. $0 < x \leq 17\frac{1}{2}$

D. $0 < x \leq 20$

ID: 963da34c Answer

Correct Answer: A

Rationale

Choice A is correct. If x is the width, in inches, of the box, then the length of the box is 2.5x inches. It follows that the perimeter of the base is $2(2.5x + x)$, or 7x inches. The height of the box is given to be 60 inches. According to the restriction, the sum of the perimeter of the base and the height of the box should not exceed 130 inches. Algebraically, this can be represented by $7x + 60 \leq 130$, or $7x \leq 70$. Dividing both sides of the inequality by 7 gives $x \leq 10$. Since x represents the width of the box, x must also be a positive number. Therefore, the inequality $0 < x \leq 10$ represents all the allowable values of x that satisfy the given conditions.

Choices B, C, and D are incorrect and may result from calculation errors or misreading the given information.

Question Difficulty: Hard

Question ID 184ce5aa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 184ce5aa

Line h is defined by $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$. Line j is perpendicular to line h in the *xy*-plane. What is the slope of line j?

A. $-\frac{7}{5}$

B. $-\frac{5}{7}$

C. $\frac{7}{5}$

D. $\frac{5}{7}$

ID: 184ce5aa Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that line h is defined by $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$. This equation can be written in slope-intercept form $y = mx + b$, where m is the slope of line h and b is the *y*-coordinate of the *y*-intercept of line h. Adding 70 to both sides of $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$ yields $\frac{1}{5}x + \frac{1}{7}y = 70$. Subtracting $\frac{1}{5}x$ from both sides of this equation yields $\frac{1}{7}y = -\frac{1}{5}x + 70$. Multiplying both sides of this equation by 7 yields $y = -\frac{7}{5}x + 490$. Therefore, the slope of line h is $-\frac{7}{5}$. It's given that line j is perpendicular to line h in the *xy*-plane. Two lines are perpendicular if their slopes are negative reciprocals, meaning that the slope of the first line is equal to -1 divided by the slope of the second line. Therefore, the slope of line j is the negative reciprocal of the slope of line h. The negative reciprocal of $-\frac{7}{5}$ is $\frac{-1}{\left(-\frac{7}{5}\right)}$, or $\frac{5}{7}$. Therefore, the slope of line j is $\frac{5}{7}$.

Choice A is incorrect. This is the slope of a line in the *xy*-plane that is parallel, not perpendicular, to line h.

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of $-\frac{7}{5}$.

Choice C is incorrect. This is the negative, not the negative reciprocal, of $-\frac{7}{5}$.

Question Difficulty: Hard

Question ID b2de69bd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b2de69bd

x	y
1	5
2	7
3	9
4	11

The table above shows some pairs of x values and y values. Which of the following equations could represent the relationship between x and y ?

A. $y = 2x + 3$

B. $y = 3x - 2$

C. $y = 4x - 1$

D. $y = 5x$

ID: b2de69bd Answer

Correct Answer: A

Rationale

Choice A is correct. Each of the choices is a linear equation in the form y = mx + b, where m and b are constants. In this equation, m represents the change in y for each increase in x by 1. From the table, it can be determined that the value of y increases by 2 for each increase in x by 1. In other words, for the pairs of x and y in the given table, m = 2. The value of b can be found by substituting the values of x and y from any row of the table and substituting the value of m into the equation y = mx + b and then solving for b. For example, using x = 1, y = 5, and m = 2 yields 5 = 2(1) + b. Solving for b yields b = 3. Therefore, the equation y = 2x + 3 could represent the relationship between x and y in the given table.

Alternatively, if an equation represents the relationship between x and y, then when each pair of x and y from the table is substituted into the equation, the result will be a true statement. Of the equations given, the equation y = 2x + 3 in choice A is the only equation that results in a true statement when each of the pairs of x and y are substituted into the equation.

Choices B, C, and D are incorrect because when at least one pair of x and y from the table is substituted into the equations given in these choices, the result is a false statement. For example, when the pair x = 4 and y = 11 is substituted into the equation in choice B, the result is 11 = 3(4) – 2, or 11 = 10, which is false.

Question Difficulty: Easy

Question ID 28c2253f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 28c2253f

Characteristics for Rock Types

Rock type	Weight per volume (lb/ft^3)	Cost per pound
Basalt	180	$0.18
Granite	165	$0.09
Limestone	120	$0.03
Sandstone	135	$0.22

A city is planning to build a rock retaining wall, a monument, and a garden in a park. The table above shows four rock types that will be considered for use in the project. Also shown for each rock type is its weight per volume, in pounds per cubic foot (lb/ft^3), and the cost per pound, in dollars. Only basalt, granite, and limestone will be used in the garden. The rocks in the garden will have a total weight of 1,000 pounds. If 330 pounds of granite is used, which of the following equations could show the relationship between the amounts, x and y, in ft^3, for each of the other rock types used?

A. $165x + 180y = 670$

B. $165x + 120y = 1{,}000$

C. $120x + 180y = 670$

D. $120x + 180y = 1{,}000$

ID: 28c2253f Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the weight of the granite used in the garden is 330 pounds. The weight of the limestone used in the garden is a product of its weight per volume, in lb/ft^3, and its volume, in ft^3. Therefore, the weight of the limestone used in the garden can be represented by $120x$, where x is the volume, in ft^3, of the limestone used. Similarly, the weight of the basalt used in the garden can be represented by $180y$, where y is the volume, in ft^3, of the basalt used. It's given that the total weight of the rocks used in the garden will be 1,000 pounds. Thus, the sum of the weights of the three rock types used is 1,000 pounds, which can be represented by the equation $120x + 180y + 330 = 1{,}000$. Subtracting 330 from both sides of this equation yields $120x + 180y = 670$.

Choice A is incorrect. This equation uses the weight per volume of granite instead of limestone. Choice B is incorrect. This equation uses the weight per volume of granite instead of basalt, and doesn't take into account the 330 pounds of granite that will be used in the garden. Choice D is incorrect. This equation doesn't take into account the 330 pounds of granite that will be used in the garden.

Question Difficulty: Medium

Question ID aacc834b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: aacc834b

$x = 8$ $x + 3y = 26$ The solution to the given system of equations is (x, y). What is the value of y?

ID: aacc834b Answer

Correct Answer: 6

Rationale

The correct answer is 6. The first equation in the given system is $x = 8$. Substituting 8 for x in the second equation in the given system yields $8 + 3y = 26$. Subtracting 8 from both sides of this equation yields $3y = 18$. Dividing both sides of this equation by 3 yields $y = 6$. Therefore, the value of y is 6.

Question Difficulty: Easy

Question ID 042aa429

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 042aa429

If $f(x) = x + 7$ and $g(x) = 7x$, what is the value of $4f(2) - g(2)$?

A. -5

B. 1

C. 22

D. 28

ID: 042aa429 Answer

Correct Answer: C

Rationale

Choice C is correct. The value of $f(2)$ can be found by substituting 2 for x in the given equation $f(x) = x + 7$, which yields $f(2) = 2 + 7$, or $f(2) = 9$. The value of $g(2)$ can be found by substituting 2 for x in the given equation $g(x) = 7x$, which yields $g(2) = 7(2)$, or $g(2) = 14$. The value of the expression $4f(2) - g(2)$ can be found by substituting the corresponding values into the expression, which gives $4(9) - 14$. This expression is equivalent to $36 - 14$, or 22.

Choice A is incorrect. This is the value of $f(2) - g(2)$, not $4f(2) - g(2)$.

Choice B is incorrect and may result from calculating $4f(2)$ as $4(2) + 7$, rather than $4(2 + 7)$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID cd33b015

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: cd33b015

$x+y=20 2(x+y)+3y=85$

If (x,y) is the solution to the given system of equations, what is the value of y ?

A. 10

B. 15

C. 60

D. 65

ID: cd33b015 Answer

Correct Answer: B

Rationale

Choice B is correct. Substituting 20 for $x+y$ in the second equation in the system yields $2(20)+3y=85$, or $40+3y=85$. Subtracting 40 from both sides of this equation yields $3y=45$. Dividing both sides of this equation by 3 yields $y=15$.

Choice A is incorrect. If $y=10$, then $x=10$ since $x+y=20$. However, substituting 10 for both x and y in the second equation yields $70=85$, which is a false statement. Choice C is incorrect. If $y=60$, then $x=-40$ since $x+y=20$. However, substituting these values for x and y in the second equation yields $220=85$, which is a false statement. Choice D is incorrect. If $y=65$, then $x=-45$ since $x+y=20$. However, substituting these values for x and y in the second equation yields $235=85$, which is a false statement.

Question Difficulty: Easy

Question ID e2e3942f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: e2e3942f

$y = 2x + 1$

$y = ax - 8$

In the system of equations above, *a* is a constant. If the system of equations has no solution, what is the value of *a* ?

A. $-\frac{1}{2}$

B. 0

C. 1

D. 2

ID: e2e3942f Answer

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations has no solution when the graphs of the equations have the same slope and different y-coordinates of the y-intercepts. Each of the given equations is written in the slope-intercept form of a linear equation, $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept of the graph of the equation. For these two linear equations, the y-coordinates of the y-intercepts are different: 1 and -8. Thus, if the system of equations has no solution, the slopes of the two linear equations must be the same. The slope of the first linear equation is 2. Therefore, for the system of equations to have no solution, the value of a must be 2.

Choices A, B, and C are incorrect and may result from conceptual and computational errors.

Question Difficulty: Hard

Question ID f03465dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: f03465dc

$$8x + 7y = 9$$
$$24x + 21y = 27$$

For each real number r, which of the following points lies on the graph of each equation in the *xy*-plane for the given system?

A. $(r, -\frac{8r}{7} + \frac{9}{7})$

B. $(-\frac{8r}{7} + \frac{9}{7}, r)$

C. $(-\frac{8r}{7} + 9, \frac{8r}{7} + 27)$

D. $(\frac{r}{3} + 9, -\frac{r}{3} + 27)$

ID: f03465dc Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing both sides of the second equation in the given system by 3 yields $8x + 7y = 9$, which is the first equation in the given system. Therefore, the first and second equations represent the same line in the *xy*-plane. If the *x*- and *y*-coordinates of a point satisfy an equation, the point lies on the graph of the equation in the *xy*-plane. Choice A is a point with *x*-coordinate r and *y*-coordinate $-\frac{8r}{7} + \frac{9}{7}$. Substituting r for x and $-\frac{8r}{7} + \frac{9}{7}$ for y in the equation $8x + 7y = 9$ yields $8r + 7\left(-\frac{8}{7}r + \frac{9}{7}\right) = 9$. Applying the distributive property to the left-hand side of this equation yields $8r - 8r + 9 = 9$. Combining like terms on the left-hand side of this equation yields $9 = 9$, so the coordinates of the point $\left(r, -\frac{8}{7}r + \frac{9}{7}\right)$ satisfy both equations in the given system. Therefore, for each real number r, the point $\left(r, -\frac{8}{7}r + \frac{9}{7}\right)$ lies on the graph of each equation in the *xy*-plane for the given system.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a35c7164

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: a35c7164

$5x + 7y = 1$ $ax + by = 1$

In the given pair of equations, a and b are constants. The graph of this pair of equations in the *xy*-plane is a pair of perpendicular lines. Which of the following pairs of equations also represents a pair of perpendicular lines?

A. $10x + 7y = 1$ $ax - 2by = 1$

B. $10x + 7y = 1$ $ax + 2by = 1$

C. $10x + 7y = 1$ $2ax + by = 1$

D. $5x - 7y = 1$ $ax + by = 1$

ID: a35c7164 Answer

Correct Answer: B

Rationale

Choice B is correct. Two lines are perpendicular if their slopes are negative reciprocals, meaning that the slope of the first line is equal to -1 divided by the slope of the second line. Each equation in the given pair of equations can be written in slope-intercept form, $y = mx + b$, where m is the slope of the graph of the equation in the *xy*-plane and $(0, b)$ is the *y*-intercept. For the first equation, $5x + 7y = 1$, subtracting $5x$ from both sides gives $7y = -5x + 1$, and dividing both sides of this equation by 7 gives $y = -\frac{5}{7}x + \frac{1}{7}$. Therefore, the slope of the graph of this equation is $-\frac{5}{7}$. For the second equation, $ax + by = 1$, subtracting ax from both sides gives $by = -ax + 1$, and dividing both sides of this equation by b gives $y = -\frac{a}{b}x + \frac{1}{b}$. Therefore, the slope of the graph of this equation is $-\frac{a}{b}$. Since the graph of the given pair of equations is a pair of perpendicular lines, the slope of the graph of the second equation, $-\frac{a}{b}$, must be the negative reciprocal of the slope of the graph of the first equation, $-\frac{5}{7}$. The negative reciprocal of $-\frac{5}{7}$ is $\frac{-1}{\left(-\frac{5}{7}\right)}$, or $\frac{7}{5}$. Therefore, $-\frac{a}{b} = \frac{7}{5}$, or $\frac{a}{b} = -\frac{7}{5}$. Similarly, rewriting the equations in choice B in slope-intercept form yields $y = -\frac{10}{7}x + \frac{1}{7}$ and $y = -\frac{a}{2b}x + \frac{1}{2b}$. It follows that the slope of the graph of the first equation in choice B is $-\frac{10}{7}$ and the slope of the graph of the second equation in choice B is $-\frac{a}{2b}$. Since $\frac{a}{b} = -\frac{7}{5}$, $-\frac{a}{2b}$ is equal to $-\left(\frac{1}{2}\right)\left(-\frac{7}{5}\right)$, or $\frac{7}{10}$. Since $\frac{7}{10}$ is the negative reciprocal of $-\frac{10}{7}$, the pair of equations in choice B represents a pair of perpendicular lines.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID de6fe450

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: de6fe450

On January 1, 2015, a city's minimum hourly wage was $9.25. It will increase by $0.50 on the first day of the year for the next 5 years. Which of the following functions best models the minimum hourly wage, in dollars, *x* years after January 1, 2015, where $x = 1, 2, 3, 4, 5$?

A. $f(x) = 9.25 - 0.50x$

B. $f(x) = 9.25x - 0.50$

C. $f(x) = 9.25 + 0.50x$

D. $f(x) = 9.25x + 0.50$

ID: de6fe450 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the city's minimum hourly wage will increase by $0.50 on the first day of the year for the 5 years after January 1, 2015. Therefore, the total increase, in dollars, in the minimum hourly wage x years after January 1, 2015, is represented by $0.50x$. Since the minimum hourly wage on January 1, 2015, was $9.25, it follows that the minimum hourly wage, in dollars, x years after January 1, 2015, is represented by $9.25 + 0.50x$. Therefore, the function $f(x) = 9.25 + 0.50x$ best models this situation.

Choices A, B, and D are incorrect. In choice A, the function models a situation where the minimum hourly wage is $9.25 on January 1, 2015, but decreases by $0.50 on the first day of the year for the next 5 years. The functions in choices B and D both model a situation where the minimum hourly wage is increasing by $9.25 on the first day of the year for the 5 years after January 1, 2015.

Question Difficulty: Easy

Question ID 03503d49

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 03503d49

A business owner plans to purchase the same model of chair for each of the 81 employees. The total budget to spend on these chairs is $\$14{,}000$, which includes a 7% sales tax. Which of the following is closest to the maximum possible price per chair, before sales tax, the business owner could pay based on this budget?

A. $\$148.15$

B. $\$161.53$

C. $\$172.84$

D. $\$184.94$

ID: 03503d49 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that a business owner plans to purchase 81 chairs. If p is the price per chair, the total price of purchasing 81 chairs is $81p$. It's also given that 7% sales tax is included, which is equivalent to $81p$ multiplied by 1.07, or $81(1.07)p$. Since the total budget is $\$14{,}000$, the inequality representing the situation is given by $81(1.07)p \leq 14{,}000$. Dividing both sides of this inequality by $81(1.07)$ and rounding the result to two decimal places gives $p \leq 161.53$. To not exceed the budget, the maximum possible price per chair is $\$161.53$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the maximum possible price per chair including sales tax, not the maximum possible price per chair before sales tax.

Choice D is incorrect. This is the maximum possible price if the sales tax is added to the total budget, not the maximum possible price per chair before sales tax.

Question Difficulty: Hard

Question ID 4ec95eab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 4ec95eab

$y = -3x$ $4x + y = 15$ The solution to the given system of equations is (x, y). What is the value of x?

A. 1

B. 5

C. 15

D. 45

ID: 4ec95eab Answer

Correct Answer: C

Rationale

Choice C is correct. The given system of linear equations can be solved by the substitution method. Substituting $-3x$ for y from the first equation in the given system into the second equation yields $4x + (-3x) = 15$, or $x = 15$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the absolute value of y, not the value of x.

Question Difficulty: Easy

Question ID 2d54c272

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 2d54c272

$5G + 45R = 380$

At a school fair, students can win colored tokens that are worth a different number of points depending on the color. One student won G green tokens and R red tokens worth a total of 380 points. The given equation represents this situation. How many more points is a red token worth than a green token?

ID: 2d54c272 Answer

Correct Answer: 40

Rationale

The correct answer is 40. It's given that $5G + 45R = 380$, where G is the number of green tokens and R is the number of red tokens won by one student and these tokens are worth a total of 380 points. Since the equation represents the situation where the student won points with green tokens and red tokens for a total of 380 points, each term on the left-hand side of the equation represents the number of points won for one of the colors. Since the coefficient of G in the given equation is 5, a green token must be worth 5 points. Similarly, since the coefficient of R in the given equation is 45, a red token must be worth 45 points. Therefore, a red token is worth $45 - 5$ points, or 40 points, more than a green token.

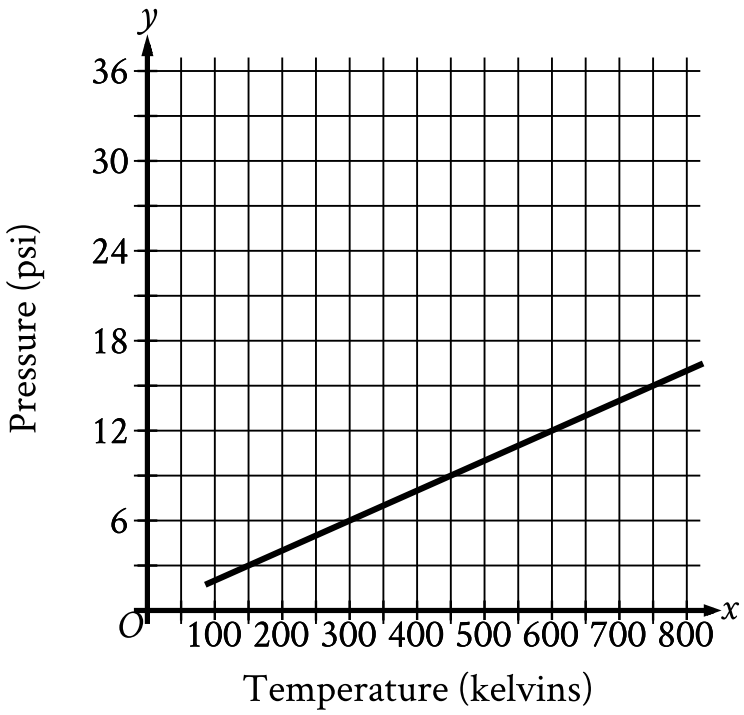
Question Difficulty: Hard

Question ID d0cb49e8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: d0cb49e8

Argon is placed inside a container with a constant volume. The graph shows the estimated pressure y, in pounds per square inch (psi), of the argon when its temperature is x kelvins.



What is the estimated pressure of the argon, in psi, when the temperature is 600 kelvins?

A. 6

B. 12

C. 300

D. 600

ID: d0cb49e8 Answer

Correct Answer: B

Rationale

Choice B is correct. For the graph shown, the *x*-axis represents temperature, in kelvins, and the *y*-axis represents the estimated pressure, in $\text{pounds per square inch (psi)}$. The estimated pressure of the argon when the temperature is 600 kelvins can be found by locating the point on the graph where the value of x is equal to 600. The graph passes through the point $(600, 12)$. This means that when the temperature is 600 kelvins, the estimated pressure is 12 psi.

Choice A is incorrect. This is the estimated pressure, in psi, of the argon when the temperature is 300 kelvins, not 600 kelvins.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the temperature, in kelvins, of the argon.

Question Difficulty: Easy

Question ID cee5b352

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: cee5b352

The length, y, of a white whale was 162 centimeters (cm) when it was born and increased an average of 4.8 cm per month for the first 12 months after it was born. Which equation best represents this situation, where x is the number of months after the whale was born and y is the length, in cm, of the whale?

A. $y = 162x$

B. $y = 162x + 162$

C. $y = 4.8x + 4.8$

D. $y = 4.8x + 162$

ID: cee5b352 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the length of the whale was 162 cm when it was born and that its length increased an average of 4.8 cm per month for the first 12 months after it was born. Since x represents the number of months after the whale was born, the total increase in the whale's length, in cm, is 4.8 times x, or $4.8x$. The length of the whale y, in cm, can be found by adding the whale's length at birth, 162 cm, to the total increase in length, $4.8x$ cm. Therefore, the equation that best represents this situation is $y = 4.8x + 162$.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

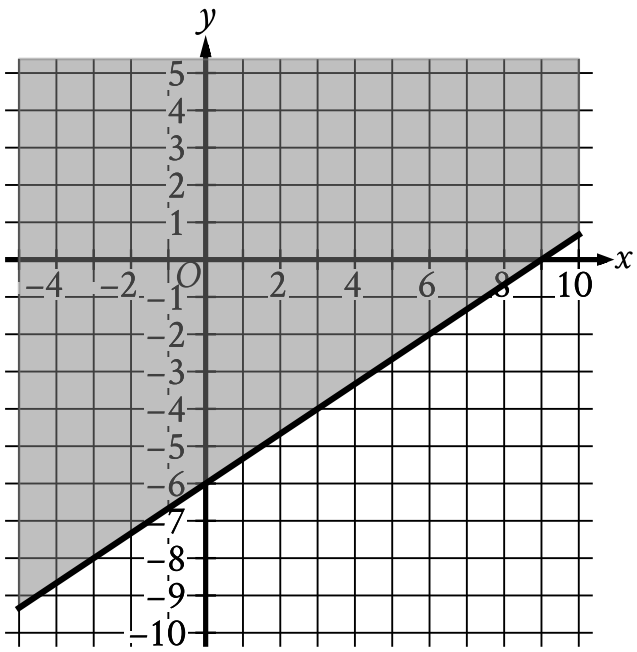
Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID c9355dec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: c9355dec



The shaded region shown represents the solutions to which inequality?

A. $y \geq \frac{2}{3}x - 6$

B. $y \geq \frac{2}{3}x + 6$

C. $y \geq \frac{2}{3}x - 9$

D. $y \geq \frac{2}{3}x + 9$

ID: c9355dec Answer

Correct Answer: A

Rationale

Choice A is correct. The equation for the line representing the boundary of the shaded region can be written in slope-intercept form $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the line. For the graph shown, the boundary line passes through the points $(0, -6)$ and $(9, 0)$. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(0, -6)$ and $(9, 0)$ for (x_1, y_1) and (x_2, y_2), respectively, in this equation yields $m = \frac{0 - (-6)}{9 - 0}$, which is equivalent to $m = \frac{6}{9}$, or $m = \frac{2}{3}$. Since the point $(0, -6)$ represents the *y*-intercept, it follows that $b = -6$. Substituting $\frac{2}{3}$ for m and -6 for b in the equation $y = mx + b$ yields $y = \frac{2}{3}x - 6$ as the equation of the boundary line. Since the shaded region represents all the points on and above this boundary line, it follows that the shaded region shown represents the solutions to the inequality $y \geq \frac{2}{3}x - 6$.

Choice B is incorrect. This inequality represents a region whose boundary line has a *y*-intercept of $(0, 6)$, not $(0, -6)$.

Choice C is incorrect. This inequality represents a region whose boundary line has a *y*-intercept of $(0, -9)$, not $(0, -6)$.

Choice D is incorrect. This inequality represents a region whose boundary line has a *y*-intercept of $(0, 9)$, not $(0, -6)$.

Question Difficulty: Easy

Question ID 1e11190a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 1e11190a

Store A sells raspberries for $\$5.50$ per pint and blackberries for $\$3.00$ per pint. Store B sells raspberries for $\$6.50$ per pint and blackberries for $\$8.00$ per pint. A certain purchase of raspberries and blackberries would cost $\$37.00$ at Store A or $\$66.00$ at Store B. How many pints of blackberries are in this purchase?

A. 4

B. 5

C. 8

D. 12

ID: 1e11190a Answer

Correct Answer: B

Rationale

Choice C is correct. It's given that store A sells raspberries for $\$5.50$ per pint and blackberries for $\$3.00$ per pint, and a certain purchase of raspberries and blackberries at store A would cost $\$37.00$. It's also given that store B sells raspberries for $\$6.50$ per pint and blackberries for $\$8.00$ per pint, and this purchase of raspberries and blackberries at store B would cost $\$66.00$. Let r represent the number of pints of raspberries and b represent the number of pints of blackberries in this purchase. The equation $5.50r + 3.00b = 37.00$ represents this purchase of raspberries and blackberries from store A and the equation $6.50r + 8.00b = 66.00$ represents this purchase of raspberries and blackberries from store B. Solving the system of equations by elimination gives the value of r and the value of b that make the system of equations true. Multiplying both sides of the equation for store A by 6.5 yields $(5.50r)(6.5) + (3.00b)(6.5) = (37.00)(6.5)$, or $35.75r + 19.5b = 240.5$. Multiplying both sides of the equation for store B by 5.5 yields $(6.50r)(5.5) + (8.00b)(5.5) = (66.00)(5.5)$, or $35.75r + 44b = 363$. Subtracting both sides of the equation for store A, $35.75r + 19.5b = 240.5$, from the corresponding sides of the equation for store B, $35.75r + 44b = 363$, yields $(35.75r - 35.75r) + (44b - 19.5b) = (363 - 240.5)$, or $24.5b = 122.5$. Dividing both sides of this equationby 24.5 yields $b = 5$. Thus, 5 pints of blackberries are in this purchase.

Choices A and B are incorrect and may result from conceptual or calculation errors. Choice D is incorrect. This is the number of pints of raspberries, not blackberries, in the purchase.

Question Difficulty: Hard

Question ID 5518885d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 5518885d

The equation $x + y = 1{,}440$ represents the number of minutes of daylight (between sunrise and sunset), x, and the number of minutes of non-daylight, y, on a particular day in Oak Park, Illinois. If this day has 670 minutes of daylight, how many minutes of non-daylight does it have?

A. 670

B. 770

C. $1{,}373$

D. $1{,}440$

ID: 5518885d Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $x + y = 1{,}440$ represents the number of minutes of daylight, x, and the number of minutes of non-daylight, y, on a particular day in Oak Park, Illinois. It's also given that this day has 670 minutes of daylight. Substituting 670 for x in the equation $x + y = 1{,}440$ yields $670 + y = 1{,}440$. Subtracting 670 from both sides of this equation yields $y = 770$. Therefore, this day has 770 minutes of non-daylight.

Choice A is incorrect. This is the number of minutes of daylight, not non-daylight, on this day.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the total number of minutes of daylight and non-daylight.

Question Difficulty: Easy

Question ID 78391fcc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 78391fcc

x	-11	-10	-9	-8
$f(x)$	21	18	15	12

The table above shows some values of x and their corresponding values $f(x)$ for the linear function f. What is the x-intercept of the graph of $y = f(x)$ in the xy-plane?

A. $(-3,0)$

B. $(-4,0)$

C. $(-9,0)$

D. $(-12,0)$

ID: 78391fcc Answer

Correct Answer: B

Rationale

Choice B is correct. The equation of a linear function can be written in the form $y = mx + b$, where $y = f(x)$, m is the slope of the graph of $y = f(x)$, and b is the y-coordinate of the y-intercept of the graph. The value of m can be found using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. According to the table, the points $(-11,21)$ and $(-10,18)$ lie on the graph of $y = f(x)$. Using these two points in the slope formula yields $m = \frac{18-21}{-10+11}$, or -3. Substituting -3 for m in the slope-intercept form of the equation yields $y = -3x + b$. The value of b can be found by substituting values from the table and solving; for example, substituting the coordinates of the point $(-11,21)$ into the equation $y = -3x + b$ gives $21 = -3(-11) + b$, which yields $b = -12$. This means the function given by the table can be represented by the equation $y = -3x - 12$. The value of the x-intercept of the graph of $y = f(x)$ can be determined by finding the value of x when $y = 0$. Substituting $y = 0$ into $y = -3x - 12$ yields $0 = -3x - 12$, or $x = -4$. This corresponds to the point $(-4,0)$.

Choice A is incorrect and may result from substituting the value of the slope for the x-coordinate of the x-intercept. Choice C is incorrect and may result from a calculation error. Choice D is incorrect and may result from substituting the y-coordinate of the y-intercept for the x-coordinate of the x-intercept.

Question Difficulty: Hard

Question ID 9ff10b3b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 9ff10b3b

If $\frac{1}{2}x-\frac{1}{6}x=1$, what is the value of x ?

A. -4

B. $\frac{1}{3}$

C. 3

D. 6

ID: 9ff10b3b Answer

Correct Answer: C

Rationale

Choice C is correct. To make it easier to add like terms on the left-hand side of the given equation, both sides of the equation can be multiplied by 6, which is the lowest common denominator of $\frac{1}{2}$ and $\frac{1}{6}$. This yields $3x-x=6$, which can be rewritten as $2x=6$. Dividing both sides of this equation by 2 yields $x=3$.

Choice A is incorrect and may result from subtracting the denominators instead of numerators with common denominators to get $-\frac{1}{4}x$, rather than $\frac{1}{3}x$, on the left-hand side of the equation. Choice B is incorrect and may result from rewriting the given equation as $\frac{1}{2}x=\frac{1}{6}$ instead of $2x=6$. Choice D is incorrect and may result from conceptual or computational errors.

Question Difficulty: Easy

Question ID ca452900

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: ca452900

What is the slope of the graph of $y = \frac{5x}{13} - 23$ in the *xy*-plane?

ID: ca452900 Answer

Correct Answer: .3846, 5/13

Rationale

The correct answer is $\frac{5}{13}$. The graph of a line in the *xy*-plane can be represented by the equation $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept. The given equation can be written as $y = \left(\frac{5}{13}\right)x - 23$. Therefore, the slope of the graph of this equation in the *xy*-plane is $\frac{5}{13}$. Note that 5/13, .3846, 0.385, and 0.384 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID e77a76ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: e77a76ce

Which of the following systems of linear equations has no solution?

A. $y = 6x + 3$ $y = 6x + 9$

B. $y = 10$ $y = 10x + 10$

C. $y = 14x + 14$ $y = 10x + 14$

D. $x = 3$ $y = 10$

ID: e77a76ce Answer

Correct Answer: A

Rationale

Choice A is correct. A system of two linear equations in two variables, x and y, has no solution if the graphs of the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in slope-intercept form, $y = mx + b$, where m and b are constants, are parallel if their slopes, m, are the same and are distinct if their *y*-coordinates of the *y*-intercepts, b, are different. In the equations $y = 6x + 3$ and $y = 6x + 9$, the values of m are each 6, and the values of b are 3 and 9, respectively. Since the slopes of these lines are the same and the *y*-coordinates of the *y*-intercepts are different, it follows that the system of linear equations in choice A has no solution.

Choice B is incorrect. The two lines represented by these equations are a horizontal line and a line with a slope of 10 that have the same *y*-coordinate of the *y*-intercept. Therefore, this system has a solution, $(0, 10)$, rather than no solution.

Choice C is incorrect. The two lines represented by these equations have different slopes and the same *y*-coordinate of the *y*-intercept. Therefore, this system has a solution, $(0, 14)$, rather than no solution.

Choice D is incorrect. The two lines represented by these equations are a vertical line and a horizontal line. Therefore, this system has a solution, $(3, 10)$, rather than no solution.

Question Difficulty: Medium

Question ID aad7e1b9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: aad7e1b9

The function f is defined by $f(x) = \frac{1}{10}x - 2$. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(-2, 0)$

B. $(0, -2)$

C. $(0, \frac{1}{10})$

D. $(\frac{1}{10}, 0)$

ID: aad7e1b9 Answer

Correct Answer: B

Rationale

Choice B is correct. The *y*-intercept of the graph of a function in the *xy*-plane is the point on the graph where $x = 0$. It's given that $f(x) = \frac{1}{10}x - 2$. Substituting 0 for x in this equation yields $f(0) = \frac{1}{10}(0) - 2$, or $f(0) = -2$. Since it's given that $y = f(x)$, it follows that $y = -2$ when $x = 0$. Therefore, the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane is $(0, -2)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 1bc11c4e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 1bc11c4e

$g(m) = -0.05m + 12.1$

The given function g models the number of gallons of gasoline that remains from a full gas tank in a car after driving m miles. According to the model, about how many gallons of gasoline are used to drive each mile?

A. 0.05

B. 12.1

C. 20

D. 242.0

ID: 1bc11c4e Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function g models the number of gallons that remain from a full gas tank in a car after driving m miles. In the given function $g(m) = -0.05m + 12.1$, the coefficient of m is -0.05. This means that for every increase in the value of m by 1, the value of $g(m)$ decreases by 0.05. It follows that for each mile driven, there is a decrease of 0.05 gallons of gasoline. Therefore, 0.05 gallons of gasoline are used to drive each mile.

Choice B is incorrect and represents the number of gallons of gasoline in a full gas tank.

Choice C is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID b3c7ca1d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: b3c7ca1d

Which of the following systems of linear equations has no solution?

A. $x = 3\, y = 5$

B. $y = 6x + 6\, y = 5x + 6$

C. $y = 16x + 3\, y = 16x + 19$

D. $y = 5\, y = 5x + 5$

ID: b3c7ca1d Answer

Correct Answer: C

Rationale

Choice C is correct. A system of two linear equations in two variables, x and y, has no solution if the graphs of the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in slope-intercept form, $y = mx + b$, where m and b are constants, are parallel if their slopes, m, are the same and are distinct if their *y*-coordinates of the *y*-intercepts, b, are different. In the equations $y = 16x + 3$ and $y = 16x + 19$, the values of m are each 16, and the values of b are 3 and 19, respectively. Since the slopes of these lines are the same, and the *y*-coordinates of the *y*-intercepts are different, it follows that the system of linear equations in choice C has no solution.

Choice A is incorrect. The lines represented by the equations in this system are a vertical line and a horizontal line. Therefore, this system has a solution, $(3, 5)$, rather than no solution.

Choice B is incorrect. The two lines represented by these equations have different slopes and the same *y*-coordinate of the *y*-intercept. Therefore, this system has a solution, $(0, 6)$, rather than no solution.

Choice D is incorrect. The two lines represented by these equations are a horizontal line and a line with a slope of 5 that have the same *y*-coordinate of the *y*-intercept. Therefore, this system has a solution, $(0, 5)$, rather than no solution.

Question Difficulty: Medium

Question ID 2d0e13a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 2d0e13a6

Line k is defined by $y = \frac{1}{4}x + 1$. Line j is parallel to line k in the *xy*-plane. What is the slope of j?

ID: 2d0e13a6 Answer

Correct Answer: .25, 1/4

Rationale

The correct answer is $\frac{1}{4}$. It's given that line k is defined by $y = \frac{1}{4}x + 1$. It's also given that line j is parallel to line k in the *xy*-plane. A line in the *xy*-plane represented by an equation in slope-intercept form $y = mx + b$ has a slope of m and a *y*-intercept of $(0, b)$. Therefore, the slope of line k is $\frac{1}{4}$. Since parallel lines have equal slopes, the slope of line j is $\frac{1}{4}$. Note that 1/4 and .25 are examples of ways to enter a correct answer.

Question Difficulty: Easy

Question ID 59afe8db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 59afe8db

$3x + 5(x + 4) = 76$ What value of x is the solution to the given equation?

A. 7

B. 8

C. 56

D. 72

ID: 59afe8db Answer

Correct Answer: A

Rationale

Choice A is correct. Applying the distributive property on the left-hand side of the given equation yields $3x + 5x + 20 = 76$, or $8x + 20 = 76$. Subtracting 20 from each side of this equation yields $8x = 56$. Dividing each side of this equation by 8 yields $x = 7$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the solution to the equation $x + 4 = 76$, not $3x + 5(x + 4) = 76$.

Question Difficulty: Easy

Question ID b8e73b5b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: b8e73b5b

Ken is working this summer as part of a crew on a farm. He earned $8 per hour for the first 10 hours he worked this week. Because of his performance, his crew leader raised his salary to $10 per hour for the rest of the week. Ken saves 90% of his earnings from each week. What is the least number of hours he must work the rest of the week to save at least $270 for the week?

A. 38

B. 33

C. 22

D. 16

ID: b8e73b5b Answer

Correct Answer: C

Rationale

Choice C is correct. Ken earned $8 per hour for the first 10 hours he worked, so he earned a total of $80 for the first 10 hours he worked. For the rest of the week, Ken was paid at the rate of $10 per hour. Let x be the number of hours he will work for the rest of the week. The total of Ken's earnings, in dollars, for the week will be $10x+80$. He saves 90% of his earnings each week, so this week he will save $0.9(10x+80)$ dollars. The inequality $0.9(10x+80)\geq 270$ represents the condition that he will save at least $270 for the week. Factoring 10 out of the expression $10x+80$ gives $10(x+8)$. The product of 10 and 0.9 is 9, so the inequality can be rewritten as $9(x+8)\geq 270$. Dividing both sides of this inequality by 9 yields $x+8\geq 30$, so $x\geq 22$. Therefore, the least number of hours Ken must work the rest of the week to save at least $270 for the week is 22.

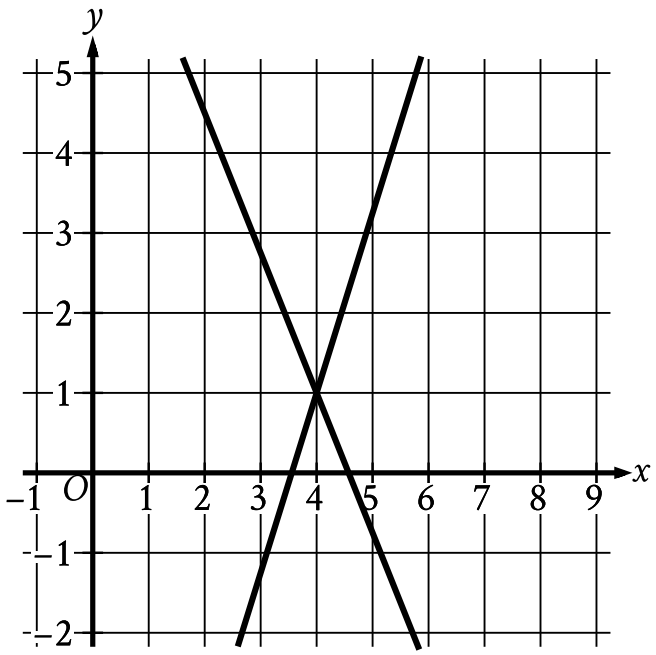
Choices A and B are incorrect because Ken can save $270 by working fewer hours than 38 or 33 for the rest of the week. Choice D is incorrect. If Ken worked 16 hours for the rest of the week, his total earnings for the week will be $\$80+\$160=\$240$, which is less than $270. Since he saves only 90% of his earnings each week, he would save even less than $240 for the week.

Question Difficulty: Hard

Question ID 4b06557b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 4b06557b



The graph of a system of linear equations is shown. The solution to the system is (x, y). What is the value of x?

ID: 4b06557b Answer

Correct Answer: 4

Rationale

The correct answer is 4. A solution to a system of equations must satisfy each equation in the system. It follows that if (x, y) is a solution to the system, the point (x, y) lies on the graph in the *xy*-plane of each equation in the system. According to the graph, the point (x, y) that lies on the graph of each equation in the system is $(4, 1)$. Therefore, the solution to the system is $(4, 1)$. It follows that the value of x is 4.

Question Difficulty: Easy

Question ID 830120b0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■■

ID: 830120b0

$$y > 2x - 1$$
$$2x > 5$$

Which of the following consists of the *y*-coordinates of all the points that satisfy the system of inequalities above?

A. $y > 6$

B. $y > 4$

C. $y > \frac{5}{2}$

D. $y > \frac{3}{2}$

ID: 830120b0 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting the same number from each side of an inequality gives an equivalent inequality. Hence, subtracting 1 from each side of the inequality $2x > 5$ gives $2x - 1 > 4$. So the given system of inequalities is equivalent to the system of inequalities $y > 2x - 1$ and $2x - 1 > 4$, which can be rewritten as $y > 2x - 1 > 4$. Using the transitive property of inequalities, it follows that $y > 4$.

Choice A is incorrect because there are points with a y-coordinate less than 6 that satisfy the given system of inequalities. For example, $(3,5.5)$ satisfies both inequalities. Choice C is incorrect. This may result from solving the inequality $2x > 5$ for x, then replacing x with y. Choice D is incorrect because this inequality allows y-values that are not the y-coordinate of any point that satisfies both inequalities. For example, $y = 2$ is contained in the set $y > \frac{3}{2}$; however, if 2 is substituted into the first inequality for y, the result is $x < \frac{3}{2}$. This cannot be true because the second inequality gives $x > \frac{5}{2}$.

Question Difficulty: Hard

Question ID e86a06fe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: e86a06fe

Kaylani used fabric measuring 5 yards in length to make each suit for a men's choir. The relationship between the number of suits that Kaylani made, x, and the total length of fabric that she purchased y, in yards, is represented by the equation $y - 5x = 6$. What is the best interpretation of 6 in this context?

A. Kaylani made 6 suits.

B. Kaylani purchased a total of 6 yards of fabric.

C. Kaylani used a total of 6 yards of fabric to make the suits.

D. Kaylani purchased 6 yards more fabric than she used to make the suits.

ID: e86a06fe Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the equation $y - 5x = 6$ represents the relationship between the number of suits that Kaylani made, x, and the total length of fabric she purchased, y, in yards. Adding $5x$ to both sides of the given equation yields $y = 5x + 6$. Since Kaylani made x suits and used 5 yards of fabric to make each suit, the expression $5x$ represents the total amount of fabric she used to make the suits. Since y represents the total length of fabric Kaylani purchased, in yards, it follows from the equation $y = 5x + 6$ that Kaylani purchased $5x$ yards of fabric to make the suits, plus an additional 6 yards of fabric. Therefore, the best interpretation of 6 in this context is that Kaylani purchased 6 yards more fabric than she used to make the suits.

Choice A is incorrect. Kaylani made a total of x suits, not 6 suits.

Choice B is incorrect. Kaylani purchased a total of y yards of fabric, not a total of 6 yards of fabric.

Choice C is incorrect. Kaylani used a total of $5x$ yards of fabric to make the suits, not a total of 6 yards of fabric.

Question Difficulty: Hard

Question ID c8e0f511

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: c8e0f511

For a camping trip a group bought x one-liter bottles of water and y three-liter bottles of water, for a total of 240 liters of water. Which equation represents this situation?

A. $x + 3y = 240$

B. $x + y = 240$

C. $3x + 3y = 240$

D. $3x + y = 240$

ID: c8e0f511 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that for a camping trip a group bought x one-liter bottles of water and y three-liter bottles of water. Since the group bought x one-liter bottles of water, the total number of liters bought from x one-liter bottles of water is represented as $1x$, or x. Since the group bought y three-liter bottles of water, the total number of liters bought from y three-liter bottles of water is represented as $3y$. It's given that the group bought a total of 240 liters; thus, the equation $x + 3y = 240$ represents this situation.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

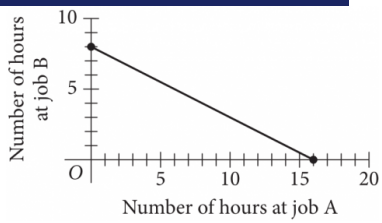
Choice D is incorrect. This equation represents a situation where the group bought x three-liter bottles of water and y one-liter bottles of water, for a total of 240 liters of water.

Question Difficulty: Easy

Question ID c4ea43ef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: c4ea43ef



To earn money for college, Avery works two part-time jobs: A and B. She earns $10 per hour working at job A and $20 per hour working at job B. In one week, Avery earned a total of *s* dollars for working at the two part-time jobs. The graph above represents all possible combinations of numbers of hours Avery could have worked at the two jobs to earn *s* dollars. What is the value of *s* ?

A. 128

B. 160

C. 200

D. 320

ID: c4ea43ef Answer

Correct Answer: B

Rationale

Choice B is correct. Avery earns $10 per hour working at job A. Therefore, if she works a hours at job A, she will earn $10a$ dollars. Avery earns $20 per hour working at job B. Therefore, if she works b hours at job B, she will earn $20b$ dollars. The graph shown represents all possible combinations of the number of hours Avery could have worked at the two jobs to earn s dollars. Therefore, if she worked a hours at job A, worked b hours at job B, and earned s dollars from both jobs, the following equation represents the graph: $10a+20b=s$, where s is a constant. Identifying any point (a,b) from the graph and substituting the values of the coordinates for a and b, respectively, in this equation yield the value of s. For example, the point $(16,0)$, where $a=16$ and $b=0$, lies on the graph. Substituting 16 for a and 0 for b in the equation $10a+20b=s$ yields $10(16)+20(0)=s$, or $160=s$. Similarly, the point $(0,8)$, where $a=0$ and $b=8$, lies on the graph. Substituting 0 for a and 8 for b in the equation $10a+20b=s$ yields $10(0)+20(8)=s$, or $160=s$.

Choices A, C, and D are incorrect. If the value of s is 128, 200, or 320, then no points (a,b) on the graph will satisfy this equation. For example, if the value of s is 128 (choice A), then the equation $10a+20b=s$ becomes $10a+20b=128$. The point $(16,0)$, where $a=16$ and $b=0$, lies on the graph. However, substituting 16 for a and 0 for b in $10a+20b=s$ yields $10(16)+20(0)=128$, or $160=128$, which is false. Therefore, $(16,0)$ doesn't satisfy the equation, and so the value of s can't be 128. Similarly, if $s=200$ (choice C) or $s=320$ (choice D), then substituting 16 for a and 0 for b yields $160=200$ and $160=320$, respectively, which are both false.

Question Difficulty: Hard

Question ID 4e77195b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 4e77195b

If $2 + x = 60$, what is the value of $16 + 8x$?

ID: 4e77195b Answer

Correct Answer: 480

Rationale

The correct answer is 480. Multiplying both sides of the given equation by 8 yields $8(2 + x) = 8(60)$, or $16 + 8x = 480$. Therefore, if $2 + x = 60$, the value of $16 + 8x$ is 480.

Question Difficulty: Easy

Question ID 113b938e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 113b938e

$y = 18 - 5x$

The equation above represents the speed *y*, in feet per second, of Sheila's bicycle *x* seconds after she applied the brakes at the end of a ride. If the equation is graphed in the *xy*-plane, which of the following is the best interpretation of the *x*-coordinate of the line's *x*-intercept in the context of the problem?

A. The speed of Sheila's bicycle, in feet per second, before Sheila applied the brakes

B. The number of feet per second the speed of Sheila's bicycle decreased each second after Sheila applied the brakes

C. The number of seconds it took from the time Sheila began applying the brakes until the bicycle came to a complete stop

D. The number of feet Sheila's bicycle traveled from the time she began applying the brakes until the bicycle came to a complete stop

ID: 113b938e Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that for each point (x, y) on the graph of the given equation, the x-coordinate represents the number of seconds after Sheila applied the brakes, and the y-coordinate represents the speed of Sheila's bicycle at that moment in time. For the graph of the equation, the y-coordinate of the x-intercept is 0. Therefore, the x-coordinate of the x-intercept of the graph of the given equation represents the number of seconds it took from the time Sheila began applying the brakes until the bicycle came to a complete stop.

Choice A is incorrect. The speed of Sheila's bicycle before she applied the brakes is represented by the y-coordinate of the y-intercept of the graph of the given equation, not the x-coordinate of the x-intercept. Choice B is incorrect. The number of feet per second the speed of Sheila's bicycle decreased each second after Sheila applied the brakes is represented by the slope of the graph of the given equation, not the x-coordinate of the x-intercept. Choice D is incorrect and may result from misinterpreting x as the distance, in feet, traveled after applying the brakes, rather than the time, in seconds, after applying the brakes.

Question Difficulty: Medium

Question ID fe287f7e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: fe287f7e

To repair a refrigerator, a technician charges $\$60$ per hour for labor plus $\$120$ for parts. Which function f represents the total amount, in dollars, the technician will charge for this job if it takes x hours?

A. $f(x) = x + 120$

B. $f(x) = 60x$

C. $f(x) = 60x + 120$

D. $f(x) = 60x - 120$

ID: fe287f7e Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the technician charges $\$60$ per hour for labor. Therefore, if the job takes x hours, the technician will charge $\left(\frac{\$60}{1 \text{ hour}}\right)(x \text{ hours})$, or $\$60x$, for labor. It's also given that the technician charges $\$120$ for parts. Therefore, $f(x) = 60x + 120$ represents the total amount, in dollars, the technician will charge for this job if it takes x hours.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This function represents the total amount, in dollars, the technician charges for labor only, not the total amount charged for labor and parts.

Choice D is incorrect. This function represents the total amount, in dollars, the technician would charge if the charge for parts were subtracted from, rather than added to, the charge for labor.

Question Difficulty: Easy

Question ID 029c2dc2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 029c2dc2

A teacher is creating an assignment worth 70 points. The assignment will consist of questions worth 1 point and questions worth 3 points. Which equation represents this situation, where x represents the number of 1-point questions and y represents the number of 3-point questions?

A. $4xy = 70$

B. $4(x + y) = 70$

C. $3x + y = 70$

D. $x + 3y = 70$

ID: 029c2dc2 Answer

Correct Answer: D

Rationale

Choice D is correct. Since x represents the number of 1-point questions and y represents the number of 3-point questions, the assignment is worth a total of $1 \cdot x + 3 \cdot y$, or $x + 3y$, points. Since the assignment is worth 70 points, the equation $x + 3y = 70$ represents this situation.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 2e1a7f66

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 2e1a7f66

Figure A and figure B are both regular polygons. The sum of the perimeter of figure A and the perimeter of figure B is 63 inches. The equation $3x + 6y = 63$ represents this situation, where x is the number of sides of figure A and y is the number of sides of figure B. Which statement is the best interpretation of 6 in this context?

A. Each side of figure B has a length of 6 inches.

B. The number of sides of figure B is 6.

C. Each side of figure A has a length of 6 inches.

D. The number of sides of figure A is 6.

ID: 2e1a7f66 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that figure A and figure B (not shown) are both regular polygons and the sum of the perimeters of the two figures is 63 inches. It's also given that x is the number of sides of figure A and y is the number of sides of figure B, and that the equation $3x + 6y = 63$ represents this situation. Thus, $3x$ and $6y$ represent the perimeters, in inches, of figure A and figure B, respectively. Since $6y$ represents the perimeter, in inches, of figure B and y is the number of sides of figure B, it follows that each side of figure B has a length of 6 inches.

Choice B is incorrect. The number of sides of figure B is y, not 6.

Choice C is incorrect. Since the perimeter, in inches, of figure A is represented by $3x$, each side of figure A has a length of 3 inches, not 6 inches.

Choice D is incorrect. The number of sides of figure A is x, not 6.

Question Difficulty: Medium

Question ID 5e422ff9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 5e422ff9

$$y = 2x - 3$$
$$3y = 5x$$

In the solution to the system of equations above, what is the value of y ?

A. -15

B. -9

C. 9

D. 15

ID: 5e422ff9 Answer

Correct Answer: D

Rationale

Choice D is correct. Multiplying both sides of $y = 2x - 3$ by 5 results in $5y = 10x - 15$. Multiplying both sides of $3y = 5x$ by 2 results in $6y = 10x$. Subtracting the resulting equations yields $5y - 6y = (10x - 15) - (10x)$, which simplifies to $-y = -15$. Dividing both sides of $-y = -15$ by -1 results in $y = 15$.

Choices A and B are incorrect and may result from incorrectly subtracting the transformed equation. Choice C is incorrect and may result from finding the value of x instead of the value of y.

Question Difficulty: Medium

Question ID e744499e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: e744499e

An elementary school teacher is ordering x workbooks and y sets of flash cards for a math class. The teacher must order at least 20 items, but the total cost of the order must not be over $80. If the workbooks cost $3 each and the flash cards cost $4 per set, which of the following systems of inequalities models this situation?

A. $x + y \geq 20$
$3x + 4y \leq 80$

B. $x + y \geq 20$
$3x + 4y \geq 80$

C. $3x + 4y \leq 20$
$x + y \geq 80$

D. $x + y \leq 20$
$3x + 4y \geq 80$

ID: e744499e Answer

Correct Answer: A

Rationale

Choice A is correct. The total number of workbooks and sets of flash cards ordered is represented by x + y. Since the teacher must order at least 20 items, it must be true that x + y ≥ 20. Each workbook costs $3; therefore, 3x represents the cost, in dollars, of x workbooks. Each set of flashcards costs $4; therefore, 4y represents the cost, in dollars, of y sets of flashcards. It follows that the total cost for x workbooks and y sets of flashcards is 3x + 4y. Since the total cost of the order must not be over $80, it must also be true that 3x + 4y ≤ 80. Of the choices given, these inequalities are shown only in choice A.

Choice B is incorrect. The second inequality says that the total cost must be greater, not less than or equal to $80. Choice C incorrectly limits the cost by the minimum number of items and the number of items with the maximum cost. Choice D is incorrect. The first inequality incorrectly says that at most 20 items must be ordered, and the second inequality says that the total cost of the order must be at least, not at most, $80.

Question Difficulty: Easy

Question ID 59352689

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 59352689

$\frac{7}{8}y - \frac{5}{8}x = \frac{4}{7} - \frac{7}{8}y\ \frac{5}{4}x + \frac{7}{4} = py + \frac{15}{4}$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p?

ID: 59352689 Answer

Correct Answer: 3.5, 7/2

Rationale

The correct answer is $\frac{7}{2}$. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. Two lines represented by equations in standard form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system, $\frac{7}{8}y - \frac{5}{8}x = \frac{4}{7} - \frac{7}{8}y$, can be written in standard form by adding $\frac{7}{8}y$ to both sides of the equation, which yields $\frac{14}{8}y - \frac{5}{8}x = \frac{4}{7}$, or $-\frac{5}{8}x + \frac{14}{8}y = \frac{4}{7}$. Multiplying each term in this equation by -8 yields $5x - 14y = -\frac{32}{7}$. The second equation in the given system, $\frac{5}{4}x + \frac{7}{4} = py + \frac{15}{4}$, can be written in standard form by subtracting $\frac{7}{4}$ and py from both sides of the equation, which yields $\frac{5}{4}x - py = \frac{8}{4}$. Multiplying each term in this equation by 4 yields $5x - 4py = 8$. The coefficient of x in the first equation, $5x - 14y = -\frac{32}{7}$, is equal to the coefficient of x in the second equation, $5x - 4py = 8$. For the lines to be parallel, and for the coefficients for x and y in one equation to be proportional to the corresponding coefficients in the other equation, the coefficient of y in the second equation must also be equal to the coefficient of y in the first equation. Therefore, $-14 = -4p$. Dividing both sides of this equation by -4 yields $\frac{-14}{-4} = p$, or $p = \frac{7}{2}$. Therefore, if the given system of equations has no solution, the value of p is $\frac{7}{2}$. Note that 7/2 and 3.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID c5479c1a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: c5479c1a

A shipment consists of 5-pound boxes and 10-pound boxes with a total weight of 220 pounds. There are 13 10-pound boxes in the shipment. How many 5-pound boxes are in the shipment?

A. 5

B. 10

C. 13

D. 18

ID: c5479c1a Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the shipment consists of 5-pound boxes and 10-pound boxes with a total weight of 220 pounds. Let x represent the number of 5-pound boxes and y represent the number of 10-pound boxes in the shipment. Therefore, the equation $5x + 10y = 220$ represents this situation. It's given that there are 13 10-pound boxes in the shipment. Substituting 13 for y in the equation $5x + 10y = 220$ yields $5x + 10(13) = 220$, or $5x + 130 = 220$. Subtracting 130 from both sides of this equation yields $5x = 90$. Dividing both sides of this equation by 5 yields 18. Thus, there are 18 5-pound boxes in the shipment.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the number of 10-pound boxes in the shipment.

Question Difficulty: Easy

Question ID 14360f84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 14360f84

$4x - 9y = 9y + 5$ $hy = 2 + 4x$

In the given system of equations, h is a constant. If the system has no solution, what is the value of h?

A. -9

B. 0

C. 9

D. 18

ID: 14360f84 Answer

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in the form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system can be written in the form $Ax + By = C$ by subtracting $9y$ from both sides of the equation to yield $4x - 18y = 5$. The second equation in the given system can be written in the form $Ax + By = C$ by subtracting $4x$ from both sides of the equation to yield $-4x + hy = 2$. The coefficient of x in this second equation, -4, is -1 times the coefficient of x in the first equation, 4. For the lines to be parallel, the coefficient of y in the second equation, h, must also be -1 times the coefficient of y in the first equation, -18. Thus, $h = -1(-18)$, or $h = 18$. Therefore, if the given system has no solution, the value of h is 18.

Choice A is incorrect. If the value of h is -9, then the given system would have one solution, rather than no solution.

Choice B is incorrect. If the value of h is 0, then the given system would have one solution, rather than no solution.

Choice C is incorrect. If the value of h is 9, then the given system would have one solution, rather than no solution.

Question Difficulty: Hard

Question ID 6efcc0a3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 6efcc0a3

In the linear function h, $h(0) = 41$ and $h(1) = 40$. Which equation defines h?

A. $h(x) = -x + 41$

B. $h(x) = -x$

C. $h(x) = -41x$

D. $h(x) = -41$

ID: 6efcc0a3 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation defining a linear function can be written in the form $h(x) = ax + b$, where a and b are constants. It's given that $h(0) = 41$. Substituting 0 for x and 41 for $h(x)$ in the equation $h(x) = ax + b$ yields $41 = a(0) + b$, or $b = 41$. Substituting 41 for b in the equation $h(x) = ax + b$ yields $h(x) = ax + 41$. It's also given that $h(1) = 40$. Substituting 1 for x and 40 for $h(x)$ in the equation $h(x) = ax + 41$ yields $40 = a(1) + 41$, or $40 = a + 41$. Subtracting 41 from the left- and right-hand sides of this equation yields $-1 = a$. Substituting -1 for a in the equation $h(x) = ax + 41$ yields $h(x) = -1x + 41$, or $h(x) = -x + 41$.

Choice B is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41 = -0$, which isn't a true statement.

Choice C is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41 = -41(0)$, or $41 = 0$, which isn't a true statement.

Choice D is incorrect. Substituting 41 for $h(x)$ in this equation yields $41 = -41$, which isn't a true statement.

Question Difficulty: Easy

Question ID 637022d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 637022d2

$2.5b + 5r = 80$

The given equation describes the relationship between the number of birds, b, and the number of reptiles, r, that can be cared for at a pet care business on a given day. If the business cares for 16 reptiles on a given day, how many birds can it care for on this day?

A. 0

B. 5

C. 40

D. 80

ID: 637022d2 Answer

Correct Answer: A

Rationale

Choice A is correct. The number of birds can be found by calculating the value of b when $r = 16$ in the given equation. Substituting 16 for r in the given equation yields $2.5b + 5(16) = 80$, or $2.5b + 80 = 80$. Subtracting 80 from both sides of this equation yields $2.5b = 0$. Dividing both sides of this equation by 2.5 yields $b = 0$. Therefore, if the business cares for 16 reptiles on a given day, it can care for 0 birds on this day.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 776cfa7c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 776cfa7c

Hana deposited a fixed amount into her bank account each month. The function $f(t) = 100 + 25t$ gives the amount, in dollars, in Hana's bank account after t monthly deposits. What is the best interpretation of 25 in this context?

A. With each monthly deposit, the amount in Hana's bank account increased by $\$25$.

B. Before Hana made any monthly deposits, the amount in her bank account was $\$25$.

C. After 1 monthly deposit, the amount in Hana's bank account was $\$25$.

D. Hana made a total of 25 monthly deposits.

ID: 776cfa7c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that t represents the number of monthly deposits. In the given function $f(t) = 100 + 25t$, the coefficient of t is 25. This means that for every increase in the value of t by 1, the value of $f(t)$ increases by 25. It follows that with each monthly deposit, the amount in Hana's bank account increased by $\$25$.

Choice B is incorrect. Before Hana made any monthly deposits, the amount in her bank account was $\$100$.

Choice C is incorrect. After 1 monthly deposit, the amount in Hana's bank account was $\$125$.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 0393ba15

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 0393ba15

$-49x = -98x$ How many solutions does the given equation have?

A. Zero

B. Exactly one

C. Exactly two

D. Infinitely many

ID: 0393ba15 Answer

Correct Answer: B

Rationale

Choice B is correct. Adding $98x$ to each side of the given equation yields $49x = 0$. Dividing each side of this equation by 49 yields $x = 0$. This means that 0 is the only solution to the given equation. Therefore, the given equation has exactly one solution.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 74c98c82

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 74c98c82

An event planner is planning a party. It costs the event planner a onetime fee of $\$35$ to rent the venue and $\$10.25$ per attendee. The event planner has a budget of $\$200$. What is the greatest number of attendees possible without exceeding the budget?

ID: 74c98c82 Answer

Correct Answer: 16

Rationale

The correct answer is 16. The total cost of the party is found by adding the onetime fee of the venue to the cost per attendee times the number of attendees. Let x be the number of attendees. The expression $35 + 10.25x$ thus represents the total cost of the party. It's given that the budget is $\$200$, so this situation can be represented by the inequality $35 + 10.25x \leq 200$. The greatest number of attendees can be found by solving this inequality for x. Subtracting 35 from both sides of this inequality gives $10.25x \leq 165$. Dividing both sides of this inequality by 10.25 results in approximately $x \leq 16.098$. Since the question is stated in terms of attendees, rounding x down to the nearest whole number, 16, gives the greatest number of attendees possible.

Question Difficulty: Medium

Question ID 36ab4122

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 36ab4122

Megan's regular wage at her job is *p* dollars per hour for the first 8 hours of work in a day plus 1.5 times her regular hourly wage for work in excess of 8 hours that day. On a given day, Megan worked for 10 hours, and her total earnings for that day were $137.50. What is Megan's regular hourly wage?

A. $11.75

B. $12.50

C. $13.25

D. $13.75

ID: 36ab4122 Answer

Rationale

Choice B is correct. Since p represents Megan's regular pay per hour, 1.5p represents the pay per hour in excess of 8 hours. Since Megan worked for 10 hours, she must have been paid p dollars per hour for 8 of the hours plus 1.5p dollars per hour for the remaining 2 hours. Therefore, since Megan earned $137.50 for the 10 hours, the situation can be represented by the equation 137.5 = 8p + 2(1.5)p. Distributing the 2 in the equation gives 137.5 = 8p + 3p, and combining like terms gives 137.5 = 11p. Dividing both sides by 11 gives p = 12.5. Therefore, Megan's regular wage is $12.50.

Choices A and C are incorrect and may be the result of calculation errors. Choice D is incorrect and may result from finding the average hourly wage that Megan earned for the 10 hours of work.

Question Difficulty: Medium

Question ID 1efd8202

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 1efd8202

$y = 70x + 8$ Which table gives three values of x and their corresponding values of y for the given equation?

A.

x	y
0	8
2	148
4	288

B.

x	y
0	70
2	78
4	86

C.

x	y
0	70
2	140
4	280

D.

x	y
0	8
2	132
4	272

ID: 1efd8202 Answer

Correct Answer: A

Rationale

Choice A is correct. Each of the given choices gives three values of x: 0, 2, and 4. Substituting 0 for x in the given equation yields $y = 70(0) + 8$, or $y = 8$. Therefore, when $x = 0$, the corresponding value of y for the given equation is 8. Substituting 2 for x in the given equation yields $y = 70(2) + 8$, or $y = 148$. Therefore, when $x = 2$, the corresponding value of y for the given equation is 148. Substituting 4 for x in the given equation yields $y = 70(4) + 8$, or $y = 288$. Therefore, when $x = 4$, the corresponding value of y for the given equation is 288. Thus, if the three values of x are 0, 2, and 4, then their corresponding values of y are 8, 148, and 288, respectively, for the given equation.

Choice B is incorrect. This table gives three values of x and their corresponding values of y for the equation $y = 4x + 70$.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 73b5f330

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 73b5f330

The function f is defined by $f(x) = 5x + 8$. For what value of x does $f(x) = 58$?

A. 10

B. 13

C. 50

D. 298

ID: 73b5f330 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function f is defined by $f(x) = 5x + 8$. Substituting 58 for $f(x)$ in this equation yields $58 = 5x + 8$. Subtracting 8 from both sides of this equation yields $50 = 5x$. Dividing both sides of this equation by 5 yields $10 = x$. Therefore, the value of x when $f(x) = 58$ is 10.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of $f(58)$, not the value of x when $f(x) = 58$.

Question Difficulty: Easy

Question ID 4f7981a0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 4f7981a0

If $3x+2=8$, what is the value of $9x+6$?

ID: 4f7981a0 Answer

Rationale

The correct answer is 24. Multiplying both sides of the given equation by 3 yields $3(3x+2)=24$. Using the distributive property to rewrite the left-hand side of this equation yields $9x+6=24$.

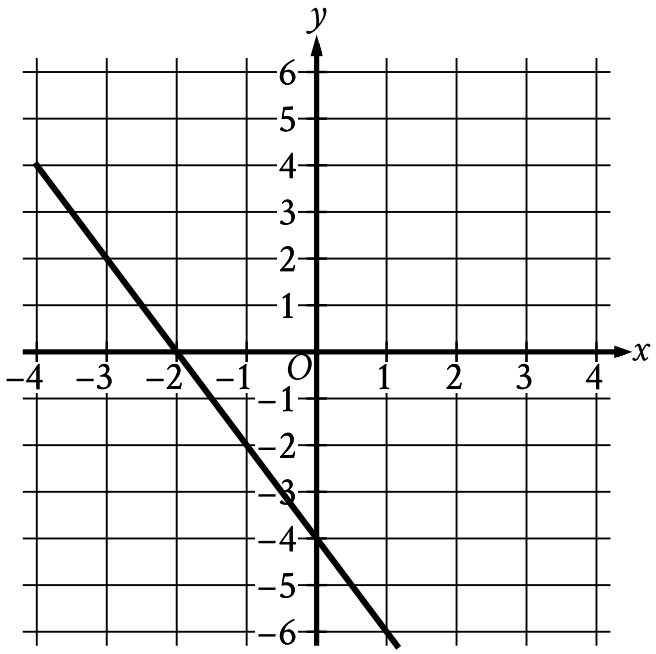
Question Difficulty: Easy

Question ID 295a41f0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 295a41f0

The graph of $y = f(x) - 11$ is shown.



Which equation defines the linear function f?

A. $f(x) = -13x - 11$

B. $f(x) = -2x + 7$

C. $f(x) = -13x + 7$

D. $f(x) = -2x - 11$

ID: 295a41f0 Answer

Correct Answer: B

Rationale

Choice B is correct. The graph of a line in the *xy*-plane can be represented by the equation $y = mx + b$, where m is the slope of the line and $(0, b)$ is the *y*-intercept. The slope of a line that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. The line shown passes through the points $(-1, -2)$ and $(0, -4)$. Substituting $(-1, -2)$ and $(0, 4)$ for (x_1, y_1) and (x_2, y_2), respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{-4 - (-2)}{0 - (-1)}$, which is equivalent to $m = \frac{-2}{1}$, or $m = -2$. Since the line shown passes through the point $(0, -4)$, it follows that $b = -4$. Substituting -2 for m and -4 for b in the equation $y = mx + b$ yields $y = -2x - 4$. It's given that the graph shown is the graph of $y = f(x) - 11$. Substituting $-2x - 4$ for y in the equation $y = f(x) - 11$ yields $-2x - 4 = f(x) - 11$. Adding 11 to both sides of this equation yields $-2x + 7 = f(x)$. Therefore, the equation $f(x) = -2x + 7$ defines the linear function f.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID a71b1bc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: a71b1bc1

A piece of wire with a length of 32 inches is cut into two parts. One part has a length of x inches, and the other part has a length of y inches. The value of x is 4 more than 3 times the value of y. What is the value of x?

ID: a71b1bc1 Answer

Correct Answer: 25

Rationale

The correct answer is 25. It's given that a piece of wire has a length of 32 inches and is cut into two parts. It's also given that one part has a length of x inches and the other part has a length of y inches. It follows that the equation $x + y = 32$ represents this situation. It's also given that the value of x is 4 more than 3 times the value of y, or $x = 3y + 4$. Substituting $3y + 4$ for x in the equation $x + y = 32$ yields $3y + 4 + y = 32$. Combining like terms on the left-hand side of this equation yields $4y + 4 = 32$. Subtracting 4 from both sides of this equation yields $4y = 28$. Dividing both sides of this equation by 4 yields $y = 7$. Substituting 7 for y in the equation $x = 3y + 4$ yields $x = 3(7) + 4$, or $x = 25$. Therefore, the value of x is 25.

Question Difficulty: Hard

Question ID e9ef0e6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: e9ef0e6b

A model estimates that whales from the genus *Eschrichtius* travel 72 to 77 miles in the ocean each day during their migration. Based on this model, which inequality represents the estimated total number of miles, x, a whale from the genus *Eschrichtius* could travel in 16 days of its migration?

A. $72 + 16 \leq x \leq 77 + 16$

B. $(72)(16) \leq x \leq (77)(16)$

C. $72 \leq 16 + x \leq 77$

D. $72 \leq 16x \leq 77$

ID: e9ef0e6b Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the model estimates that whales from the genus *Eschrichtius* travel 72 to 77 miles in the ocean each day during their migration. If one of these whales travels 72 miles each day for 16 days, then the whale travels $72(16)$ miles total. If one of these whales travels 77 miles each day for 16 days, then the whale travels $77(16)$ miles total. Therefore, the model estimates that in 16 days of its migration, a whale from the genus *Eschrichtius* could travel at least $72(16)$ and at most $77(16)$ miles total. Thus, the inequality $(72)(16) \leq x \leq (77)(16)$ represents the estimated total number of miles, x, a whale from the genus *Eschrichtius* could travel in 16 days of its migration.

Choice A is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID c841e8e8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: c841e8e8

$k + 12 = 336$ What is the solution to the given equation?

A. 28

B. 324

C. 348

D. $4{,}032$

ID: c841e8e8 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 12 from both sides of the given equation yields $k = 324$. Therefore, the solution to the given equation is 324.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID cb58833c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: cb58833c

The line with the equation $\frac{4}{5}x+\frac{1}{3}y=1$ is graphed in the *xy*-plane. What is the *x*-coordinate of the *x*-intercept of the line?

ID: cb58833c Answer

Rationale

The correct answer is 1.25. The y-coordinate of the x-intercept is 0, so 0 can be substituted for y, giving $\frac{4}{5}x+\frac{1}{3}(0)=1$. This simplifies to $\frac{4}{5}x=1$. Multiplying both sides of $\frac{4}{5}x=1$ by 5 gives $4x=5$. Dividing both sides of $4x=5$ by 4 gives $x=\frac{5}{4}$, which is equivalent to 1.25. Note that 1.25 and 5/4 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 81390d6c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 81390d6c

The function h is defined by $h(x) = x + 200$. What is the value of $h(50)$?

A. 200

B. 250

C. $10{,}000$

D. $50{,}200$

ID: 81390d6c Answer

Correct Answer: B

Rationale

Choice B is correct. Substituting 50 for x in the given function yields $h(50) = 50 + 200$, or $h(50) = 250$. Therefore, the value of $h(50)$ is 250.

Choice A is incorrect. This is the value of $h(0)$. Choice C is incorrect. This is the value of $h(9{,}800)$.

Choice D is incorrect. This is the value of $h(50{,}000)$.

Question Difficulty: Easy

Question ID ed856e9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: ed856e9c

What is the *y*-intercept of the graph of $y = 34x + 81$ in the *xy*-plane?

A. $(0, 81)$

B. $(0, 34)$

C. $(0, -34)$

D. $(0, -81)$

ID: ed856e9c Answer

Correct Answer: A

Rationale

Choice A is correct. In the *xy*-plane, the graph of an equation in the form $y = mx + b$, where m and b are constants, has a slope of m and a *y*-intercept of $(0, b)$. Therefore, the *y*-intercept of the graph of $y = 34x + 81$ is $(0, 81)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 567ac7ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 567ac7ab

One of the two equations in a linear system is $2x+6y=10$. The system has no solution. Which of the following could be the other equation in the system?

A. $x+3y=5$

B. $x+3y=-20$

C. $6x-2y=0$

D. $6x+2y=10$

ID: 567ac7ab Answer

Correct Answer: B

Rationale

Choice B is correct. A system of two linear equations written in standard form has no solution when the equations are distinct and the ratio of the x-coefficient to the y-coefficient for one equation is equivalent to the ratio of the x-coefficient to the y-coefficient for the other equation. This ratio for the given equation is 2 to 6, or 1 to 3. Only choice B is an equation that isn't equivalent to the given equation and whose ratio of the x-coefficient to the y-coefficient is 1 to 3.

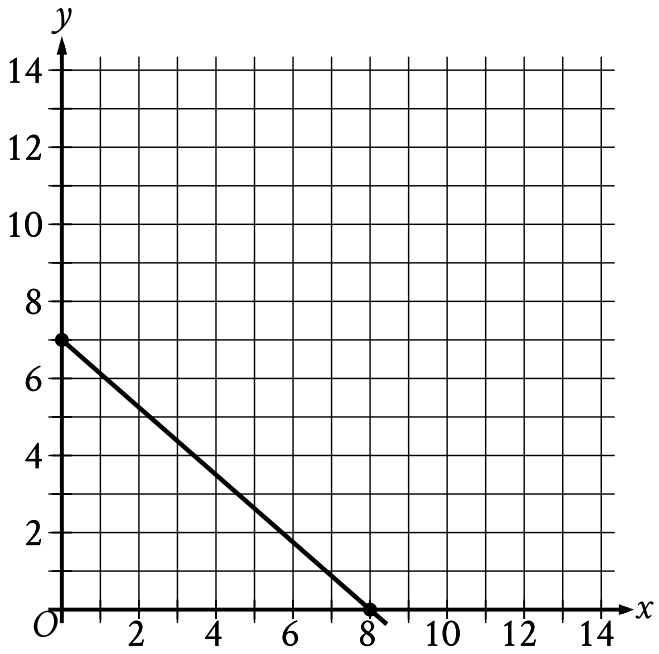
Choice A is incorrect. Multiplying each of the terms in this equation by 2 yields an equation that is equivalent to the given equation. This system would have infinitely many solutions. Choices C and D are incorrect. The ratio of the x-coefficient to the y-coefficient in $6x-2y=0$ (choice C) is -6 to 2, or -3 to 1. This ratio in $6x+2y=10$ (choice D) is 6 to 2, or 3 to 1. Since neither of these ratios is equivalent to that for the given equation, these systems would have exactly one solution.

Question Difficulty: Hard

Question ID 9d0396d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 9d0396d4



The point with coordinates $(d, 4)$ lies on the line shown. What is the value of d?

A. $\frac{7}{2}$

B. $\frac{26}{7}$

C. $\frac{24}{7}$

D. $\frac{27}{8}$

ID: 9d0396d4 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given from the graph that the points $(0, 7)$ and $(8, 0)$ lie on the line. For two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(0, 7)$ for (x_1, y_1) and $(8, 0)$ for (x_2, y_2) in this formula, the slope of the line can be calculated as $m = \frac{0 - 7}{8 - 0}$, or $m = -\frac{7}{8}$. It's also given that the point $(d, 4)$ lies on the line. Substituting $(d, 4)$ for (x_1, y_1), $(8, 0)$ for (x_2, y_2), and $-\frac{7}{8}$ for m in the slope formula yields $-\frac{7}{8} = \frac{0 - 4}{8 - d}$, or $-\frac{7}{8} = \frac{-4}{8 - d}$. Multiplying both sides of this equation by $8 - d$ yields $-\frac{7}{8}(8 - d) = -4$. Expanding the left-hand side of this equation yields $-7 + \frac{7}{8}d = -4$. Adding 7 to both sides of this equation yields $\frac{7}{8}d = 3$. Multiplying both sides of this equation by $\frac{8}{7}$ yields $d = \frac{24}{7}$. Thus, the value of d is $\frac{24}{7}$.

Choice A is incorrect. This is the value of y when $x = 4$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 5a7ab8e8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 5a7ab8e8

$66x = 66x$ How many solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 5a7ab8e8 Answer

Correct Answer: C

Rationale

Choice C is correct. If the two sides of a linear equation are equivalent, then the equation is true for any value. If an equation is true for any value, it has infinitely many solutions. Since the two sides of the given linear equation $66x = 66x$ are equivalent, the given equation has infinitely many solutions.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 55447be2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 55447be2

$y = \frac{1}{3}x - 14$ $y = -x + 18$ The solution to the given system of equations is (x, y). What is the value of x?

ID: 55447be2 Answer

Correct Answer: 24

Rationale

The correct answer is 24. The given system of equations can be solved by the substitution method. The first equation in the given system of equations is $y = \frac{1}{3}x - 14$. Substituting $\frac{1}{3}x - 14$ for y in the second equation in the given system yields $\frac{1}{3}x - 14 = -x + 18$. Adding 14 to both sides of this equation yields $\frac{1}{3}x = -x + 32$. Adding x to both sides of this equation yields $\frac{4}{3}x = 32$. Multiplying both sides of this equation by $\frac{3}{4}$ yields $x = 24$.

Question Difficulty: Medium

Question ID 40049d49

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 40049d49

$4x + 12 = \frac{a(x+3)}{2}$

In the given equation, a is a constant. If the equation has infinitely many solutions, what is the value of a?

A. 0

B. 3

C. 8

D. 12

ID: 40049d49 Answer

Correct Answer: C

Rationale

Choice C is correct. If an equation has infinitely many solutions, then the two sides of the equation must be equivalent. Multiplying each side of the given equation by 2 yields $8x + 24 = a(x + 3)$. Since 8 is a common factor of both terms on the left-hand side of this equation, the equation can be rewritten as $8(x + 3) = a(x + 3)$. The two sides of this equation are equivalent when $a = 8$. Therefore, if the given equation has infinitely many solutions, the value of a is 8.

Alternate approach: If the given equation, $4x + 12 = \frac{a(x+3)}{2}$, has infinitely many solutions, then both sides of this equation are equal for any value of x. If $x = 0$, then substituting 0 for x in the given equation yields $4(0) + 12 = \frac{a(0+3)}{2}$, or $12 = \frac{3}{2}a$. Dividing both sides of this equation by $\frac{3}{2}$ yields $8 = a$.

Choice A is incorrect. If the value of a is 0, the given equation is equivalent to $4x + 12 = 0$, which has one solution, not infinitely many solutions.

Choice B is incorrect. If the value of a is 3, the given equation is equivalent to $4x + 12 = \frac{3(x+3)}{2}$, or $4x + 12 = \frac{3}{2}x + \frac{9}{2}$, which has one solution, not infinitely many solutions.

Choice D is incorrect. If the value of a is 12, the given equation is equivalent to $4x + 12 = \frac{12(x+3)}{2}$, or $4x + 12 = 6x + 18$, which has one solution, not infinitely many solutions.

Question Difficulty: Medium

Question ID a04050d8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: a04050d8

Energy per Gram of Typical Macronutrients

Macronutrient	Food calories	Kilojoules
Protein	4.0	16.7
Fat	9.0	37.7
Carbohydrate	4.0	16.7

The table above gives the typical amounts of energy per gram, expressed in both food calories and kilojoules, of the three macronutrients in food. If the 180 food calories in a granola bar come entirely from p grams of protein, f grams of fat, and c grams of carbohydrate, which of the following expresses f in terms of p and c ?

A. $f = 20 + \frac{4}{9}(p + c)$

B. $f = 20 - \frac{4}{9}(p + c)$

C. $f = 20 - \frac{4}{9}(p - c)$

D. $f = 20 + \frac{9}{4}(p + c)$

ID: a04050d8 Answer

Correct Answer: B

Rationale

Choice B is correct. It is given that there are 4.0 food calories per gram of protein, 9.0 food calories per gram of fat, and 4.0 food calories per gram of carbohydrate. If 180 food calories in a granola bar came from p grams of protein, f grams of fat, and c grams of carbohydrate, then the situation can be represented by the equation $180 = 4p + 9f + 4c$. The equation can then be rewritten in terms of f by subtracting 4p and 4c from both sides of the equation and then dividing both sides of the equation by 9. The result is the equation $f = 20 - \frac{4}{9}(p + c)$.

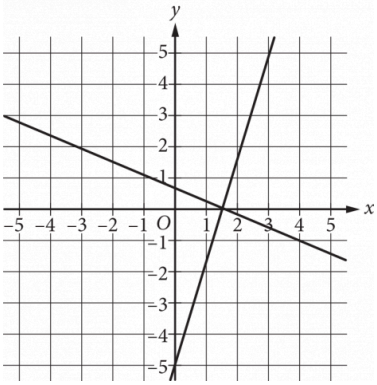
Choices A, C, and D are incorrect and may be the result of not representing the situation with the correct equation or incorrectly rewriting the equation in terms of f.

Question Difficulty: Hard

Question ID 2704399f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 2704399f



Which of the following systems of equations has the same solution as the system of equations graphed above?

A. $y = 0$
$x = \frac{3}{2}$

B. $y = \frac{3}{2}$
$x = 0$

C. $y = 0$
$x = 1$

D. $y = 1$
$x = 0$

ID: 2704399f Answer

Correct Answer: A

Rationale

Choice A is correct. The solution to a system of equations is the coordinates of the intersection point of the graphs of the equations in the xy-plane. Based on the graph, the solution to the given system of equations is best approximated as $(\frac{3}{2},0)$. In the xy-plane, the graph of $y = 0$ is a horizontal line on which every y-coordinate is 0, and the graph of $x = \frac{3}{2}$ is a vertical line on which every x-coordinate is $\frac{3}{2}$. These graphs intersect at the point $(\frac{3}{2},0)$. Therefore, the system of equations in choice A has the same solution as the given system.

Choices B, C, and D are incorrect. If graphed in the xy-plane, these choices would intersect at the points $(0,\frac{3}{2})$, $(1,0)$, and $(0,1)$, respectively, not $(\frac{3}{2},0)$.

Question Difficulty: Medium

Question ID f02b4509

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: f02b4509

A moving truck can tow a trailer if the combined weight of the trailer and the boxes it contains is no more than $4{,}600$ pounds. What is the maximum number of boxes this truck can tow in a trailer with a weight of 500 pounds if each box weighs 120 pounds?

A. 34

B. 35

C. 38

D. 39

ID: f02b4509 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the truck can tow a trailer if the combined weight of the trailer and the boxes it contains is no more than $4{,}600$ pounds. If the trailer has a weight of 500 pounds and each box weighs 120 pounds, the expression $500 + 120b$, where b is the number of boxes, gives the combined weight of the trailer and the boxes. Since the combined weight must be no more than $4{,}600$ pounds, the possible numbers of boxes the truck can tow are given by the inequality $500 + 120b \leq 4{,}600$. Subtracting 500 from both sides of this inequality yields $120b \leq 4{,}100$. Dividing both sides of this inequality by 120 yields $b \leq \frac{205}{6}$, or b is less than or equal to approximately 34.17. Since the number of boxes, b, must be a whole number, the maximum number of boxes the truck can tow is the greatest whole number less than 34.17, which is 34.

Choice B is incorrect. Towing the trailer and 35 boxes would yield a combined weight of $4{,}700$ pounds, which is greater than $4{,}600$ pounds.

Choice C is incorrect. Towing the trailer and 38 boxes would yield a combined weight of $5{,}060$ pounds, which is greater than $4{,}600$ pounds.

Choice D is incorrect. Towing the trailer and 39 boxes would yield a combined weight of $5{,}180$ pounds, which is greater than $4{,}600$ pounds.

Question Difficulty: Medium

Question ID daad7c32

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: daad7c32

An object hangs from a spring. The formula $\ell = 30 + 2w$ relates the length ℓ, in centimeters, of the spring to the weight *w*, in newtons, of the object. Which of the following describes the meaning of the 2 in this context?

A. The length, in centimeters, of the spring with no weight attached

B. The weight, in newtons, of an object that will stretch the spring 30 centimeters

C. The increase in the weight, in newtons, of the object for each one-centimeter increase in the length of the spring

D. The increase in the length, in centimeters, of the spring for each one-newton increase in the weight of the object

ID: daad7c32 Answer

Correct Answer: D

Rationale

Choice D is correct. The value 2 is multiplied by w, the weight of the object. When the weight is 0, the length is 30 + 2(0) = 30 centimeters. If the weight increases by w newtons, the length increases by 2w centimeters, or 2 centimeters for each one-newton increase in weight.

Choice A is incorrect because this describes the value 30. Choice B is incorrect because 30 represents the length of the spring before it has been stretched. Choice C is incorrect because this describes the value w.

Question Difficulty: Hard

Question ID 3f8a701b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 3f8a701b

The equation $9x+5=a(x+b)$, where *a* and *b* are constants, has no solutions.

Which of the following must be true? I. $a=9$ II. $b=5$ III. $b \neq \frac{5}{9}$

A. None

B. I only

C. I and II only

D. I and III only

ID: 3f8a701b Answer

Correct Answer: D

Rationale

Choice D is correct. For a linear equation in a form $ax+b=cx+d$ to have no solutions, the x-terms must have equal coefficients and the remaining terms must not be equal. Expanding the right-hand side of the given equation yields $9x+5=ax+ab$. Inspecting the x-terms, 9 must equal a, so statement I must be true. Inspecting the remaining terms, 5 can't equal $9b$. Dividing both of these quantities by 9 yields that b can't equal $\frac{5}{9}$. Therefore, statement III must be true. Since b can have any value other than $\frac{5}{9}$, statement II may or may not be true.

Choice A is incorrect. For the given equation to have no solution, both $a=9$ and $b \neq \frac{5}{9}$ must be true. Choice B is incorrect because it must also be true that $b \neq \frac{5}{9}$. Choice C is incorrect because when $a=9$, there are many values of b that lead to an equation having no solution. That is, b might be 5, but b isn't required to be 5.

Question Difficulty: Hard

Question ID 0d1dca87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 0d1dca87

$$3x + y = 29$$
$$x = 2$$

If (x, y) is the solution to the given system of equations, what is the value of y ?

ID: 0d1dca87 Answer

Rationale

The correct answer is 23. Since it's given that $x = 2$, the value of y can be found by substituting 2 for x in the first equation and solving for y. Substituting 2 for x yields $3(2) + y = 29$, or $6 + y = 29$. Subtracting 6 from both sides of this equation yields $y = 23$.

Question Difficulty: Easy

Question ID 3a84f885

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 3a84f885

$(x-2)-4(y+7)=117$ $(x-2)+4(y+7)=442$

The solution to the given system of equations is (x, y). What is the value of $6(x-2)$?

ID: 3a84f885 Answer

Correct Answer: 1677

Rationale

The correct answer is $1{,}677$. Adding the first equation to the second equation in the given system yields $(x-2)+(x-2)+(-4)(y+7)+4(y+7)=117+442$, or $2(x-2)=559$. Multiplying both sides of this equation by 3 yields $6(x-2)=1{,}677$. Therefore, the value of $6(x-2)$ is $1{,}677$.

Question Difficulty: Hard

Question ID b9839f9e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: b9839f9e

$F = 2.50x + 7.00y$

In the equation above, F represents the total amount of money, in dollars, a food truck charges for x drinks and y salads. The price, in dollars, of each drink is the same, and the price, in dollars, of each salad is the same. Which of the following is the best interpretation for the number 7.00 in this context?

A. The price, in dollars, of one drink

B. The price, in dollars, of one salad

C. The number of drinks bought during the day

D. The number of salads bought during the day

ID: b9839f9e Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $2.50x + 7.00y$ is equal to the total amount of money, in dollars, a food truck charges for x drinks and y salads. Since each salad has the same price, it follows that the total charge for y salads is $7.00y$ dollars. When $y = 1$, the value of the expression $7.00y$ is 7.00×1, or 7.00. Therefore, the price for one salad is 7.00 dollars.

Choice A is incorrect. Since each drink has the same price, it follows that the total charge for x drinks is $2.50x$ dollars. Therefore, the price, in dollars, for one drink is 2.50, not 7.00. Choices C and D are incorrect. In the given equation, F represents the total charge, in dollars, when x drinks and y salads are bought at the food truck. No information is provided about the number of drinks or the number of salads that are bought during the day. Therefore, 7.00 doesn't represent either of these quantities.

Question Difficulty: Easy

Question ID 023c0a8d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: 023c0a8d

For the function *f*, if $f(3x) = x - 6$ for all values of *x*,
what is the value of $f(6)$?

A. -6

B. -4

C. 0

D. 2

ID: 023c0a8d Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $f(3x) = x - 6$ for all values of x. If $3x = 6$, then $f(3x)$ will equal $f(6)$. Dividing both sides of $3x = 6$ by 3 gives $x = 2$. Therefore, substituting 2 for x in the given equation yields $f(3 \times 2) = 2 - 6$, which can be rewritten as $f(6) = -4$.

Choice A is incorrect. This is the value of the constant in the given equation for f. Choice C is incorrect and may result from substituting $x = 6$, rather than $x = 2$, into the given equation. Choice D is incorrect. This is the value of x that yields $f(6)$ for the left-hand side of the given equation; it's not the value of $f(6)$.

Question Difficulty: Hard

Question ID 686b7cad

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: 686b7cad

A proposal for a new library was included on an election ballot. A radio show stated that 3 times as many people voted in favor of the proposal as people who voted against it. A social media post reported that $15{,}000$ more people voted in favor of the proposal than voted against it. Based on these data, how many people voted against the proposal?

A. $7{,}500$

B. $15{,}000$

C. $22{,}500$

D. $45{,}000$

ID: 686b7cad Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a radio show stated that 3 times as many people voted in favor of the proposal as people who voted against it. Let x represent the number of people who voted against the proposal. It follows that $3x$ is the number of people who voted in favor of the proposal and $3x - x$, or $2x$, is how many more people voted in favor of the proposal than voted against it. It's also given that a social media post reported that $15{,}000$ more people voted in favor of the proposal than voted against it. Thus, $2x = 15{,}000$. Since $2x = 15{,}000$, the value of x must be half of $15{,}000$, or $7{,}500$. Therefore, $7{,}500$ people voted against the proposal.

Choice B is incorrect. This is how many more people voted in favor of the proposal than voted against it, not the number of people who voted against the proposal.

Choice C is incorrect. This is the number of people who voted in favor of the proposal, not the number of people who voted against the proposal.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID fbb0ea7f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: fbb0ea7f

A rocket contained $467{,}000$ kilograms (kg) of propellant before launch. Exactly 21 seconds after launch, $362{,}105$ kg of this propellant remained. On average, approximately how much propellant, in kg, did the rocket burn each second after launch?

A. $4{,}995$

B. $17{,}243$

C. $39{,}481$

D. $104{,}895$

ID: fbb0ea7f Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the rocket contained $467{,}000\ \text{kilograms}\ (\text{kg})$ of propellant before launch and had $362{,}105\ \text{kg}$ remaining exactly 21 seconds after launch. Finding the difference between the amount, in kg, of propellant before launch and the remaining amount, in kg, of propellant after launch gives the amount, in kg, of propellant burned during the 21 seconds: $467{,}000 - 362{,}105 = 104{,}895$. Dividing the amount of propellant burned by the number of seconds yields $\frac{104{,}895}{21} = 4{,}995$. Thus, an average of $4{,}995\ \text{kg}$ of propellant burned each second after launch.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from finding the amount of propellant burned, rather than the amount of propellant burned each second.

Question Difficulty: Easy

Question ID 75012ee7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 75012ee7

$$2x + 3y = 7$$
$$10x + 15y = 35$$

For each real number r, which of the following points lies on the graph of each equation in the *xy*-plane for the given system?

A. $(\frac{r}{5} + 7, -\frac{r}{5} + 35)$

B. $(-\frac{3r}{2} + \frac{7}{2}, r)$

C. $(r, \frac{2r}{3} + \frac{7}{3})$

D. $(r, -\frac{3r}{2} + \frac{7}{2})$

ID: 75012ee7 Answer

Correct Answer: B

Rationale

Choice B is correct. The two given equations are equivalent because the second equation can be obtained from the first equation by multiplying each side of the equation by 5. Thus, the graphs of the equations are coincident, so if a point lies on the graph of one of the equations, it also lies on the graph of the other equation. A point (x, y) lies on the graph of an equation in the *xy*-plane if and only if this point represents a solution to the equation. It is sufficient, therefore, to find the point that represents a solution to the first given equation. Substituting the *x*- and *y*-coordinates of choice B, $-\frac{3r}{2} + \frac{7}{2}$ and r, for x and y, respectively, in the first equation yields $2(-\frac{3r}{2} + \frac{7}{2}) + 3r = 7$, which is equivalent to $-3r + 7 + 3r = 7$, or $7 = 7$. Therefore, the point $(-\frac{3r}{2} + \frac{7}{2}, r)$ represents a solution to the first equation and thus lies on the graph of each equation in the *xy*-plane for the given system.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1f0966db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 1f0966db

The function f is defined by $f(x) = \frac{9}{7}x + \frac{8}{7}$. For what value of x does $f(x) = 5$?

ID: 1f0966db Answer

Correct Answer: 3

Rationale

The correct answer is 3. Substituting 5 for $f(x)$ in the given function yields $5 = \frac{9}{7}x + \frac{8}{7}$. Multiplying each side of this equation by 7 yields $7(5) = 7\left(\frac{9}{7}x + \frac{8}{7}\right)$, or $35 = 9x + 8$. Subtracting 8 from each side of this equation yields $27 = 9x$. Dividing each side of this equation by 9 yields $3 = x$. Therefore, $f(x) = 5$ when the value of x is 3.

Question Difficulty: Medium

Question ID a7a14e87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: a7a14e87

In the *xy*-plane, line *k* is defined by $x+y=0$. Line *j* is perpendicular to line *k*, and the *y*-intercept of line *j* is $(0,3)$. Which of the following is an equation of line *j* ?

A. $x+y=3$

B. $x+y=-3$

C. $x-y=3$

D. $x-y=-3$

ID: a7a14e87 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that line j is perpendicular to line k and that line k is defined by the equation $x+y=0$. This equation can be rewritten in slope-intercept form, $y=mx+b$, where m represents the slope of the line and b represents the y-coordinate of the y-intercept of the line, by subtracting x from both sides of the equation, which yields $y=-x$. Thus, the slope of line k is -1. Since line j and line k are perpendicular, their slopes are opposite reciprocals of each other. Thus, the slope of line j is 1. It's given that the y-intercept of line j is $(0,3)$. Therefore, the equation for line j in slope-intercept form is $y=x+3$, which can be rewritten as $x-y=-3$.

Choices A, B, and C are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1fe778dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 1fe778dc

A line in the *xy*-plane has a slope of $-\frac{1}{2}$ and passes through the point $(0, 3)$. Which equation represents this line?

A. $y = -\frac{1}{2}x - 3$

B. $y = -\frac{1}{2}x + 3$

C. $y = \frac{1}{2}x - 3$

D. $y = \frac{1}{2}x + 3$

ID: 1fe778dc Answer

Correct Answer: B

Rationale

Choice B is correct. A line in the *xy*-plane with a slope of m and a *y*-intercept of $(0, b)$ can be represented by the equation $y = mx + b$. It's given that the line has a slope of $-\frac{1}{2}$. Therefore, $m = -\frac{1}{2}$. It's also given that the line passes through the point $(0, 3)$. Therefore, $b = 3$. Substituting $-\frac{1}{2}$ for m and 3 for b in the equation $y = mx + b$ yields $y = -\frac{1}{2}x + 3$. Therefore, the equation $y = -\frac{1}{2}x + 3$ represents this line.

Choice A is incorrect. This equation represents a line in the *xy*-plane that passes through the point $(0, -3)$, not $(0, 3)$.

Choice C is incorrect. This equation represents a line in the *xy*-plane that has a slope of $\frac{1}{2}$, not $-\frac{1}{2}$, and passes through the point $(0, -3)$, not $(0, 3)$.

Choice D is incorrect. This equation represents a line in the *xy*-plane that has a slope of $\frac{1}{2}$, not $-\frac{1}{2}$.

Question Difficulty: Easy

Question ID c3989ef8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: c3989ef8

Henry receives a $\$60.00$ gift card to pay for movies online. He uses his gift card to buy 3 movies for $\$7.50$ each. If he spends the rest of his gift card balance on renting movies for $\$1.50$ each, how many movies can Henry rent?

A. 10

B. 25

C. 35

D. 40

ID: c3989ef8 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that Henry uses his $\$60.00$ gift card to buy 3 movies for $\$7.50$ each. Therefore, Henry spends $3(\$7.50)$, or $\$22.50$, of his $\$60.00$ gift card to buy 3 movies. After buying 3 movies with his $\$60.00$ gift card, Henry has a gift card balance of $\$60.00 - \$22.50$, or $\$37.50$. It's also given that Henry spends the rest of his gift card balance on renting movies for $\$1.50$ each. Therefore, Henry can rent $\frac{\$37.50}{\$1.50}$, or 25, movies.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 90bd9ef8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 90bd9ef8

The average annual energy cost for a certain home is $4,334. The homeowner plans to spend $25,000 to install a geothermal heating system. The homeowner estimates that the average annual energy cost will then be $2,712. Which of the following inequalities can be solved to find t, the number of years after installation at which the total amount of energy cost savings will exceed the installation cost?

A. $25{,}000 > (4{,}334 - 2{,}712)t$

B. $25{,}000 < (4{,}334 - 2{,}712)t$

C. $25{,}000 - 4{,}334 > 2{,}712t$

D. $25{,}000 > \frac{4{,}332}{2{,}712}t$

ID: 90bd9ef8 Answer

Correct Answer: B

Rationale

Choice B is correct. The savings each year from installing the geothermal heating system will be the average annual energy cost for the home before the geothermal heating system installation minus the average annual energy cost after the geothermal heating system installation, which is $(4{,}334 - 2{,}712)$ dollars. In t years, the savings will be $(4{,}334 - 2{,}712)t$ dollars. Therefore, the inequality that can be solved to find the number of years after installation at which the total amount of energy cost savings will exceed (be greater than) the installation cost, $25,000, is $25{,}000 < (4{,}334 - 2{,}712)t$.

Choice A is incorrect. It gives the number of years after installation at which the total amount of energy cost savings will be less than the installation cost. Choice C is incorrect and may result from subtracting the average annual energy cost for the home from the onetime cost
of the geothermal heating system installation. To find the predicted total savings, the predicted average cost should be subtracted from the average annual energy cost before the installation, and the result should be multiplied by the number of years, t. Choice D is incorrect and may result from misunderstanding the context. The ratio $\frac{4{,}332}{2{,}712}$ compares the average energy cost before installation and the average energy cost after installation; it does not represent the savings.

Question Difficulty: Medium

Question ID 6f6dfe3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 6f6dfe3e

x	y
-6	$n+184$
-3	$n+92$
0	n

The table shows three values of x and their corresponding values of y, where n is a constant, for the linear relationship between x and y. What is the slope of the line that represents this relationship in the *xy*-plane?

A. $-\frac{92}{3}$

B. $-\frac{3}{92}$

C. $\frac{n+92}{-3}$

D. $\frac{2n-92}{3}$

ID: 6f6dfe3e Answer

Correct Answer: A

Rationale

Choice A is correct. The slope, m, of a line in the *xy*-plane can be found using two points on the line, (x_1, y_1) and (x_2, y_2), and the slope formula $m = \frac{y_2-y_1}{x_2-x_1}$. Based on the given table, the line representing the relationship between x and y in the *xy*-plane passes through the points $(-6, n+184)$, $(-3, n+92)$, and $(0, n)$, where n is a constant. Substituting two of these points, $(-3, n+92)$ and $(0, n)$, for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{n-(n+92)}{0-(-3)}$, which is equivalent to $m = \frac{n-n-92}{0+3}$, or $m = -\frac{92}{3}$. Therefore, the slope of the line that represents this relationship in the *xy*-plane is $-\frac{92}{3}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 8f0c82e2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 8f0c82e2

The minimum value of x is 12 less than 6 times another number n. Which inequality shows the possible values of x?

A. $x \leq 6n - 12$

B. $x \geq 6n - 12$

C. $x \leq 12 - 6n$

D. $x \geq 12 - 6n$

ID: 8f0c82e2 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the minimum value of x is 12 less than 6 times another number n. Therefore, the possible values of x are all greater than or equal to the value of 12 less than 6 times n. The value of 6 times n is given by the expression $6n$. The value of 12 less than $6n$ is given by the expression $6n - 12$. Therefore, the possible values of x are all greater than or equal to $6n - 12$. This can be shown by the inequality $x \geq 6n - 12$.

Choice A is incorrect. This inequality shows the possible values of x if the maximum, not the minimum, value of x is 12 less than 6 times n.

Choice C is incorrect. This inequality shows the possible values of x if the maximum, not the minimum, value of x is 6 times n less than 12, not 12 less than 6 times n.

Choice D is incorrect. This inequality shows the possible values of x if the minimum value of x is 6 times n less than 12, not 12 less than 6 times n.

Question Difficulty: Medium

Question ID 5ad9eff0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 5ad9eff0

The width of a rectangular dance floor is *w* feet. The length of the floor is 6 feet longer than its width. Which of the following expresses the perimeter, in feet, of the dance floor in terms of *w* ?

A. $2w+6$

B. $4w+12$

C. w^2+6

D. w^2+6w

ID: 5ad9eff0 Answer

Correct Answer: B

Rationale

Choice B is correct. It is given that the width of the dance floor is w feet. The length is 6 feet longer than the width; therefore, the length of the dance floor is $w+6$. So the perimeter is $w+w+(w+6)+(w+6)=4w+12$.

Choice A is incorrect because it is the sum of one length and one width, which is only half the perimeter. Choice C is incorrect and may result from using the formula for the area instead of the formula for the perimeter and making a calculation error. Choice D is incorrect because this is the area, not the perimeter, of the dance floor.

Question Difficulty: Medium

Question ID 038d87d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 038d87d7

A neighborhood consists of a 2-hectare park and a 35-hectare residential area. The total number of trees in the neighborhood is $3{,}934$. The equation $2x + 35y = 3{,}934$ represents this situation. Which of the following is the best interpretation of *x* in this context?

A. The average number of trees per hectare in the park

B. The average number of trees per hectare in the residential area

C. The total number of trees in the park

D. The total number of trees in the residential area

ID: 038d87d7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a neighborhood consists of a 2-hectare park and a 35-hectare residential area and that the total number of trees in the neighborhood is $3{,}934$. It's also given that the equation $2x + 35y = 3{,}934$ represents this situation. Since the total number of trees for a given area can be determined by taking the number of hectares times the average number of trees per hectare, this must mean that the terms $2x$ and $35y$ correspond to the number of trees in the park and in the residential area, respectively. Since $2x$ corresponds to the number of trees in the park, and 2 is the size of the park, in hectares, x must represent the average number of trees per hectare in the park.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 174885f8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 174885f8

Jay walks at a speed of 3 miles per hour and runs at a speed of 5 miles per hour. He walks for w hours and runs for r hours for a combined total of 14 miles. Which equation represents this situation?

A. $3w + 5r = 14$

B. $\frac{1}{3}w + \frac{1}{5}r = 14$

C. $\frac{1}{3}w + \frac{1}{5}r = 112$

D. $3w + 5r = 112$

ID: 174885f8 Answer

Correct Answer: A

Rationale

Choice A is correct. Since Jay walks at a speed of 3 miles per hour for w hours, Jay walks a total of $3w$ miles. Since Jay runs at a speed of 5 miles per hour for r hours, Jay runs a total of $5r$ miles. Therefore, the total number of miles Jay travels can be represented by $3w + 5r$. Since the combined total number of miles is 14, the equation $3w + 5r = 14$ represents this situation.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 441558e7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 441558e7

Scientists collected fallen acorns that each housed a colony of the ant species *P. ohioensis* and analyzed each colony's structure. For any of these colonies, if the colony has x worker ants, the equation $y = 0.67x + 2.6$, where $20 \leq x \leq 110$, gives the predicted number of larvae, y, in the colony. If one of these colonies has 58 worker ants, which of the following is closest to the predicted number of larvae in the colony?

A. 41

B. 61

C. 83

D. 190

ID: 441558e7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the equation $y = 0.67x + 2.6$, where $20 \leq x \leq 110$, gives the predicted number of larvae, y, in a colony of ants if the colony has x worker ants. If one of these colonies has 58 worker ants, the predicted number of larvae in that colony can be found by substituting 58 for x in the given equation. Substituting 58 for x in the given equation yields $y = 0.67(58) + 2.6$, or $y = 41.46$. Of the given choices, 41 is closest to the predicted number of larvae in the colony.

Choice B is incorrect. This is closest to the predicted number of larvae in a colony with 87 worker ants.

Choice C is incorrect. This is closest to the number of worker ants for which the predicted number of larvae in a colony is 58.

Choice D is incorrect. This is closest to the predicted number of larvae in a colony with 280 worker ants.

Question Difficulty: Medium

Question ID 46f68129

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 46f68129

A librarian has 43 books to distribute to a group of children. If he gives each child 2 books, he will have 7 books left over. How many children are in the group?

A. 15

B. 18

C. 25

D. 29

ID: 46f68129 Answer

Rationale

Choice B is correct. Subtracting the number of books left over from the total number of books results in $43-7=36$, which is the number of books distributed. Dividing the number of books distributed by the number of books given to each child results in $\frac{36}{2}=18$.

Choice A is incorrect and results from dividing the total number of books by the number of books given to each child, $\frac{43}{2}\approx 22$, then subtracting the number of books left over from the result, $22-7=15$. Choice C is incorrect and results from adding the number of books left over to the total number of books, $43+7=50$, then dividing the result by the number of books given to each child, $\frac{50}{2}=25$. Choice D is incorrect and results from dividing the total number of books by the number of books given to each child, $\frac{43}{2}\approx 22$, then adding the number of books left over, $22+7=29$.

Question Difficulty: Easy

Question ID 56e373b3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 56e373b3

A manager is responsible for ordering supplies for a shaved ice shop. The shop's inventory starts with $4{,}500$ paper cups, and the manager estimates that 70 of these paper cups are used each day. Based on this estimate, in how many days will the supply of paper cups reach $1{,}700$?

A. 20

B. 40

C. 60

D. 80

ID: 56e373b3 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the shop's inventory starts with $4{,}500$ paper cups and that the manager estimates that 70 of these paper cups are used each day. Let x represent the number of days in which the estimated supply of paper cups will reach $1{,}700$. The equation $4{,}500 - 70x = 1{,}700$ represents this situation. Subtracting $4{,}500$ from both sides of this equation yields $-70x = -2{,}800$. Dividing both sides of this equation by -70 yields $x = 40$. Therefore, based on this estimate, the supply of paper cups will reach $1{,}700$ in 40 days.

Choice A is incorrect. After 20 days, the estimated supply of paper cups would be $4{,}500 - 70(20)$, or $3{,}100$ cups, not $1{,}700$ cups.

Choice C is incorrect. After 60 days, the estimated supply of paper cups would be $4{,}500 - 70(60)$, or 300 cups, not $1{,}700$ cups.

Choice D is incorrect. After 80 days, the estimated supply of paper cups would be $4{,}500 - 70(80)$, or $-1{,}100$ cups, which isn't possible.

Question Difficulty: Easy

Question ID 2eef7e61

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 2eef7e61

The graph of the function *f* is a line in the *xy*-plane. If the line has slope $\frac{3}{4}$ and $f(0)=3$, which of the following defines *f*?

A. $f(x)=\frac{3}{4}x-3$

B. $f(x)=\frac{3}{4}x+3$

C. $f(x)=4x-3$

D. $f(x)=4x+3$

ID: 2eef7e61 Answer

Correct Answer: B

Rationale

Choice B is correct. The equation for the function f in the xy-plane can be represented by $f(x)=mx+b$, where m is the slope and b is the y-coordinate of the y-intercept. Since it's given that the line has a slope of $\frac{3}{4}$, it follows that $m=\frac{3}{4}$ in $f(x)=mx+b$, which yields $y=\frac{3}{4}x+b$. It's given that $f(0)=3$. This implies that the graph of the function f in the xy-plane passes through the point $(0,3)$. Thus, the y-coordinate of the y-intercept of the graph is 3, so $b=3$ in $f(x)=\frac{3}{4}x+b$, which yields $f(x)=\frac{3}{4}x+3$. Therefore, the equation $f(x)=\frac{3}{4}x+3$ defines the function f.

Choice A is incorrect and may result from a sign error for the y-intercept. Choice C is incorrect and may result from using the denominator of the given slope as m in $f(x)=mx+b$, in addition to a sign error for the y-intercept. Choice D is incorrect and may result from using the denominator of the given slope as m in $f(x)=mx+b$.

Question Difficulty: Easy

Question ID e3bbde69

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: e3bbde69

$8x + y = 5\ y = 9x + 1$ The solution to the given system of equations is (x, y). What is the value of x?

A. -6

B. $\frac{4}{17}$

C. $\frac{6}{17}$

D. 4

ID: e3bbde69 Answer

Correct Answer: B

Rationale

Choice B is correct. The second equation in the given system is $y = 9x + 1$. Substituting $9x + 1$ for y in the first equation in the given system yields $8x + 9x + 1 = 5$, which is equivalent to $17x + 1 = 5$. Subtracting 1 from both sides of this equation yields $17x = 4$. Dividing both sides of this equation by 17 yields $x = \frac{4}{17}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

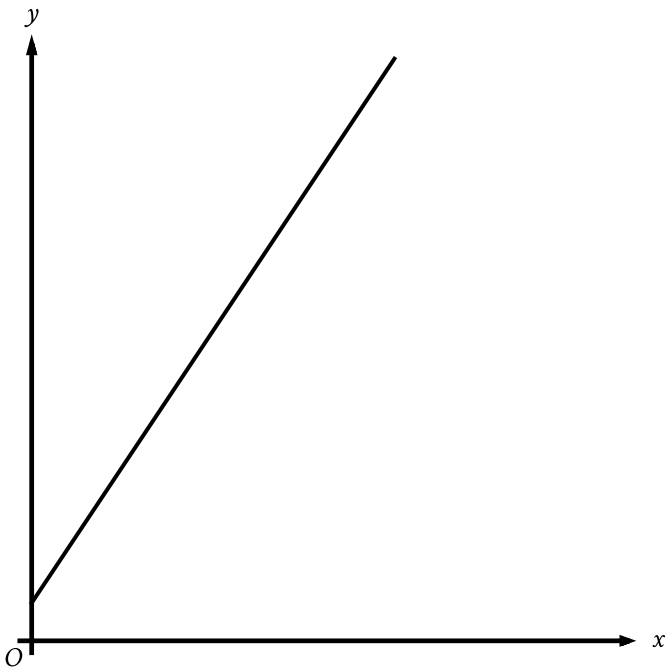
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID f0773a55

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: f0773a55



The graph represents the total charge, in dollars, by an electrician for x hours of work. The electrician charges a onetime fee plus an hourly rate. What is the best interpretation of the slope of the graph?

A. The electrician's hourly rate

B. The electrician's onetime fee

C. The maximum amount that the electrician charges

D. The total amount that the electrician charges

ID: f0773a55 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the electrician charges a onetime fee plus an hourly rate. It's also given that the graph represents the total charge, in dollars, for x hours of work. This graph shows a linear relationship in the *xy*-plane. Thus, the total charge y, in dollars, for x hours of work can be represented as $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of the equation in the *xy*-plane. Since the given graph represents the total charge, in dollars, by an electrician for x hours of work, it follows that its slope is m, or the electrician's hourly rate.

Choice B is incorrect. The electrician's onetime fee is represented by the *y*-coordinate of the *y*-intercept, not the slope, of the graph.

Choice C is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 5e08a055

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 5e08a055

$y = 6x + 18$

One of the equations in a system of two linear equations is given. The system has no solution. Which equation could be the second equation in the system?

A. $-6x + y = 18$

B. $-6x + y = 22$

C. $-12x + y = 36$

D. $-12x + y = 18$

ID: 5e08a055 Answer

Correct Answer: B

Rationale

Choice B is correct. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning $\frac{D}{A} = \frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The given equation, $y = 6x + 18$, can be written in standard form by subtracting $6x$ from both sides of the equation to yield $-6x + y = 18$. Therefore, the given equation can be written in the form $Ax + By = C$, where $A = -6$, $B = 1$, and $C = 18$. The equation in choice B, $-6x + y = 22$, is written in the form $Dx + Ey = F$, where $D = -6$, $E = 1$, and $F = 22$. Therefore, $\frac{D}{A} = \frac{-6}{-6}$, which can be rewritten as $\frac{D}{A} = 1$; $\frac{E}{B} = \frac{1}{1}$, which can be rewritten as $\frac{E}{B} = 1$; and $\frac{F}{C} = \frac{22}{18}$, which can be rewritten as $\frac{F}{C} = \frac{11}{9}$. Since $\frac{D}{A} = 1$, $\frac{E}{B} = 1$, and $\frac{F}{C}$ is not equal to 1, it follows that the given equation and the equation $-6x + y = 22$ are parallel and distinct. Therefore, a system of two linear equations consisting of the given equation and the equation $-6x + y = 22$ has no solution. Thus, the equation in choice B could be the second equation in the system.

Choice A is incorrect. The equation $-6x + y = 18$ and the given equation represent the same line in the *xy*-plane. Therefore, a system of these linear equations would have infinitely many solutions, rather than no solution.

Choice C is incorrect. The equation $-12x + y = 36$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

Choice D is incorrect. The equation $-12x + y = 18$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

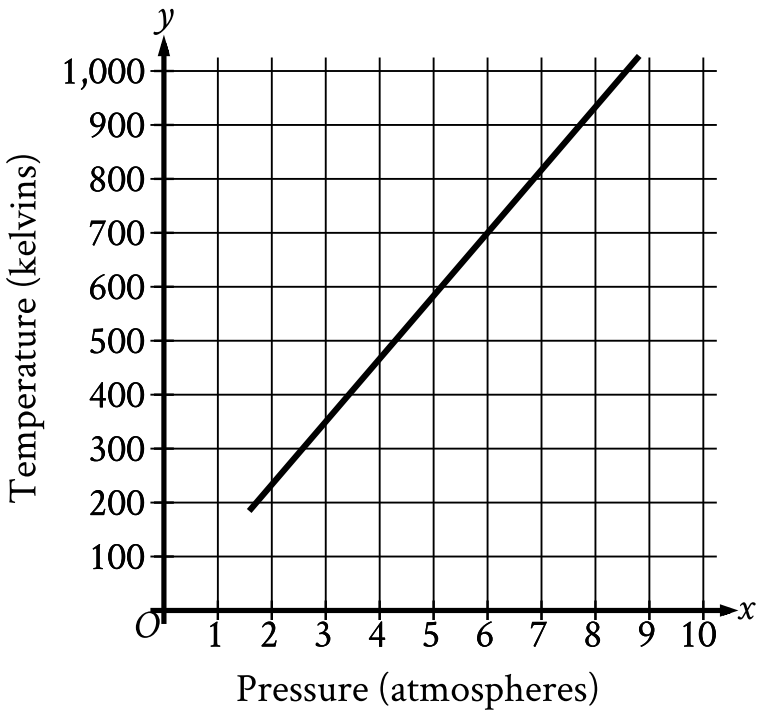
Question Difficulty: Hard

Question ID 0ea7ef01

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 0ea7ef01

Oxygen gas is placed inside a tank with a constant volume. The graph shows the estimated temperature y, in kelvins, of the oxygen gas when its pressure is x atmospheres.



What is the estimated temperature, in kelvins, of the oxygen gas when its pressure is 6 atmospheres?

A. 6

B. 60

C. 700

D. 760

ID: 0ea7ef01 Answer

Correct Answer: C

Rationale

Choice C is correct. For the graph shown, the *x*-axis represents pressure, in atmospheres, and the *y*-axis represents temperature, in kelvins. Therefore, the estimated temperature, in kelvins, of the oxygen gas when its pressure is 6 atmospheres is represented by the *y*-coordinate of the point on the graph that has an *x*-coordinate of 6. The point on the graph with an *x*-coordinate of 6 has a *y*-coordinate of approximately 700. Therefore, the estimated temperature, in kelvins, of the oxygen gas when its pressure is 6 atmospheres is 700.

Choice A is incorrect. This is the pressure, in atmospheres, not the estimated temperature, in kelvins, of the oxygen gas when its pressure is 6 atmospheres.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 0df106df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 0df106df

An online bookstore sells novels and magazines. Each novel sells for $4, and each magazine sells for $1. If Sadie purchased a total of 11 novels and magazines that have a combined selling price of $20, how many novels did she purchase?

A. 2

B. 3

C. 4

D. 5

ID: 0df106df Answer

Correct Answer: B

Rationale

Choice B is correct. Let n be the number of novels and m be the number of magazines that Sadie purchased. If Sadie purchased a total of 11 novels and magazines, then $n+m=11$. It is given that the combined price of 11 novels and magazines is $20. Since each novel sells for $4 and each magazine sells for $1, it follows that $4n+m=20$. So the system of equations below must hold.

$$\begin{aligned} 4n+m &= 20 \\ n+m &= 11 \end{aligned}$$

Subtracting corresponding sides of the second equation from the first equation yields $3n=9$, so $n=3$. Therefore, Sadie purchased 3 novels.

Choice A is incorrect. If 2 novels were purchased, then a total of $8 was spent on novels. That leaves $12 to be spent on magazines, which means that 12 magazines would have been purchased. However, Sadie purchased a total of 11 novels and magazines. Choices C and D are incorrect. If 4 novels were purchased, then a total of $16 was spent on novels. That leaves $4 to be spent on magazines, which means that 4 magazines would have been purchased. By the same logic, if Sadie purchased 5 novels, she would have no money at all ($0) to buy magazines. However, Sadie purchased a total of 11 novels and magazines.

Question Difficulty: Easy

Question ID e53870b6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: e53870b6

$6x + k = 6x + 5$

In the given equation, k is a constant. If the equation has infinitely many solutions, what is the value of k ?

ID: e53870b6 Answer

Rationale

The correct answer is 5. Subtracting $6x$ from both sides of the given equation gives $k = 5$, so for any value of x, $6x + k = 6x + 5$ if and only if $k = 5$. Therefore, if the given equation has infinitely many solutions, the value of k is 5.

Question Difficulty: Easy

Question ID 9f70fd47

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 9f70fd47

What is the *y*-coordinate of the *y*-intercept of the graph of $\frac{3x}{7} = -\frac{5y}{9} + 21$ in the *xy*-plane?

ID: 9f70fd47 Answer

Correct Answer: 189/5, 37.8

Rationale

The correct answer is $\frac{189}{5}$. A *y*-intercept of a graph in the *xy*-plane is a point where the graph intersects the *y*-axis, which is a point with an *x*-coordinate of 0. Substituting 0 for x in the given equation yields $\frac{3(0)}{7} = -\frac{5y}{9} + 21$, or $0 = -\frac{5y}{9} + 21$. Subtracting 21 from both sides of this equation yields $-21 = -\frac{5y}{9}$. Multiplying both sides of this equation by -9 yields $189 = 5y$. Dividing both sides of this equation by 5 yields $\frac{189}{5} = y$. Therefore, the *y*-coordinate of the *y*-intercept of the graph of the given equation in the *xy*-plane is $\frac{189}{5}$. Note that 189/5 and 37.8 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID a1fd2304

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: a1fd2304

How many liters of a 25% saline solution must be added to 3 liters of a 10% saline solution to obtain a 15% saline solution?

ID: a1fd2304 Answer

Rationale

The correct answer is 1.5. The total amount, in liters, of a saline solution can be expressed as the liters of each type of saline solution multiplied by the percent concentration of the saline solution. This gives $3(0.10)$, $x(0.25)$, and $(x+3)(0.15)$, where x is the amount, in liters, of 25% saline solution and 10%, 15%, and 25% are represented as 0.10, 0.15, and 0.25, respectively. Thus, the equation $3(0.10)+0.25x=0.15(x+3)$ must be true. Multiplying 3 by 0.10 and distributing 0.15 to $(x+3)$ yields $0.30+0.25x=0.15x+0.45$. Subtracting 0.15x and 0.30 from each side of the equation gives $0.10x=0.15$. Dividing each side of the equation by 0.10 yields $x=1.5$. Note that 1.5 and 3/2 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID b544a348

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: b544a348

$$5x+3y=38$$
$$x+3y=10$$

In the solution (x, y) to the system of equations above, what is the value of x ?

ID: b544a348 Answer

Rationale

The correct answer is 7. Subtracting the second equation from the first equation eliminates the variable y.

$$\begin{aligned} 5x+3y &= 38 \\ -(x+3y &= 10) \\ 4x &= 28 \end{aligned}$$

Dividing both sides of the resulting equation by 4 yields x = 7.

Question Difficulty: Medium

Question ID 628300a9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■■

ID: 628300a9

A science teacher is preparing the 5 stations of a science laboratory. Each station will have either Experiment A materials or Experiment B materials, but not both. Experiment A requires 6 teaspoons of salt, and Experiment B requires 4 teaspoons of salt. If x is the number of stations that will be set up for Experiment A and the remaining stations will be set up for Experiment B, which of the following expressions represents the total number of teaspoons of salt required?

A. $5x$

B. $10x$

C. $2x + 20$

D. $10x + 20$

ID: 628300a9 Answer

Correct Answer: C

Rationale

Choice C is correct. It is given that x represents the number of stations that will be set up for Experiment A and that there will be 5 stations total, so it follows that 5 – x is the number of stations that will be set up for Experiment B. It is also given that Experiment A requires 6 teaspoons of salt and that Experiment B requires 4 teaspoons of salt, so the total number of teaspoons of salt required is 6x + 4(5 – x), which simplifies to 2x + 20.

Choices A, B, and D are incorrect and may be the result of not understanding the description of the context.

Question Difficulty: Hard

Question ID 400798d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 400798d6

$2x + y = 37$

In triangle QRS, sides QR and RS each have a length of x centimeters and side SQ has a length of y centimeters. The given equation represents this situation. Which of the following is the best interpretation of 37 in this context?

A. The difference, in centimeters, between the lengths of sides QR and SQ

B. The difference, in centimeters, between the lengths of sides QR and RS

C. The sum of the lengths, in centimeters, of the three sides of the triangle

D. The length, in centimeters, of one of the two sides of equal length

ID: 400798d6 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that in triangle QRS, sides QR and RS each have a length of x centimeters. Therefore, the expression $2x$ represents the sum of the lengths, in centimeters, of sides QR and RS. It's also given that side SQ has a length of y centimeters. Therefore, the expression $2x + y$ represents the sum of the lengths, in centimeters, of sides QR, RS, and SQ. Since $2x + y$ is the sum of the lengths, in centimeters, of the three sides of the triangle and $2x + y = 37$, it follows that 37 is the sum of the lengths, in centimeters, of the three sides of the triangle.

Choice A is incorrect. The difference, in centimeters, between the lengths of sides QR and SQ is $x - y$, not 37.

Choice B is incorrect. The difference, in centimeters, between the lengths of sides QR and RS is $x - x$, or 0, not 37.

Choice D is incorrect. The length, in centimeters, of one of the two sides of equal length is x, not 37.

Question Difficulty: Medium

Question ID 9ed4c1a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: 9ed4c1a2

What is the slope of the graph of $y = \frac{1}{4}(27x + 15) + 7x$ in the *xy*-plane?

ID: 9ed4c1a2 Answer

Correct Answer: 13.75, 55/4

Rationale

The correct answer is $\frac{55}{4}$. In the *xy*-plane, the graph of an equation in the form $y = mx + b$, where m and b are constants, has a slope of m and a *y*-intercept of $(0, b)$. Applying the distributive property to the right-hand side of the given equation yields $y = \frac{27}{4}x + \frac{15}{4} + 7x$. Combining like terms yields $y = \frac{55}{4}x + \frac{15}{4}$. This equation is in the form $y = mx + b$, where $m = \frac{55}{4}$ and $b = \frac{15}{4}$. It follows that the slope of the graph of $y = \frac{1}{4}(27x + 15) + 7x$ in the *xy*-plane is $\frac{55}{4}$. Note that 55/4 and 13.75 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 45bba652

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 45bba652

If $2(x-5)+3(x-5)=10$, what is the value of $x-5$?

A. 2

B. 5

C. 7

D. 12

ID: 45bba652 Answer

Correct Answer: A

Rationale

Choice A is correct. Adding the like terms on the left-hand side of the given equation yields $5(x-5)=10$. Dividing both sides of this equation by 5 yields $x-5=2$.

Choice B is incorrect and may result from subtracting 5, not dividing by 5, on both sides of the equation $5(x-5)=10$. Choice C is incorrect. This is the value of x, not the value of $x-5$. Choice D is incorrect. This is the value of $x+5$, not the value of $x-5$.

Question Difficulty: Medium

Question ID b75f7812

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: b75f7812

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

ID: b75f7812 Answer

Rationale

The correct answer is 4. The equation $60h + 10 \leq 280$, where h is the number of hours the boat has been rented, can be written to represent the situation. Subtracting 10 from both sides and then dividing by 60 yields $h \leq 4.5$. Since the boat can be rented only for whole numbers of hours, the maximum number of hours for which Maria can rent the boat is 4.

Question Difficulty: Easy

Question ID 1ecaa9c0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 1ecaa9c0

Robert rented a truck to transport materials he purchased from a hardware store. He was charged an initial fee of $20.00 plus an additional $0.70 per mile driven. If the truck was driven 38 miles, what was the total amount Robert was charged?

A. $46.60

B. $52.90

C. $66.90

D. $86.50

ID: 1ecaa9c0 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that Robert was charged an initial fee of $20.00 to rent the truck plus an additional $0.70 per mile driven. Let m represent the number of miles the truck was driven. Since the rental charge is $0.70 per mile driven, $0.70m$ represents the amount Robert was charged for m miles driven. Let c equal the total amount, in dollars, Robert was charged to rent the truck. The total amount can be represented by the equation $c = 20.00 + 0.70m$. It's given that the truck was driven 38 miles, thus $m = 38$. Substituting 38 into the equation gives $c = 20.00 + 0.70(38)$. Multiplying $0.70(38)$ gives $c = 20.00 + 26.60$. Adding these values gives $c = 46.60$, so the total amount Robert was charged is $46.60.

Choices B, C, and D are incorrect and may result from setting up the equation incorrectly or from making calculation errors.

Question Difficulty: Easy

Question ID fb43b85f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: fb43b85f

A line passes through the points $(4, 6)$ and $(15, 24)$ in the *xy*-plane. What is the slope of the line?

ID: fb43b85f Answer

Correct Answer: 1.636, 18/11

Rationale

The correct answer is $\frac{18}{11}$. For a line that passes through the points (x_1, y_1) and (x_2, y_2) in the *xy*-plane, the slope of the line can be calculated using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. It's given that a line passes through the points $(4, 6)$ and $(15, 24)$ in the *xy*-plane. Substituting $(4, 6)$ for (x_1, y_1) and $(15, 24)$ for (x_2, y_2) in the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, yields $m = \frac{24 - 6}{15 - 4}$, or $m = \frac{18}{11}$. Therefore, the slope of the line is $\frac{18}{11}$. Note that 18/11 and 1.636 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 53487897

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 53487897

The relationship between two variables, x and y, is linear. For every increase in the value of x by 1, the value of y increases by 8. When the value of x is 2, the value of y is 18. Which equation represents this relationship?

A. $y = 2x + 18$

B. $y = 2x + 8$

C. $y = 8x + 2$

D. $y = 3x + 26$

ID: 53487897 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the relationship between x and y is linear. An equation representing a linear relationship can be written in the form $y = mx + b$, where m is the slope and b is the *y*-coordinate of the *y*-intercept of the graph of the relationship in the *xy*-plane. It's given that for every increase in the value of x by 1, the value of y increases by 8. The slope of a line can be expressed as the change in y over the change in x. Thus, the slope, m, of the line representing this relationship can be expressed as $\frac{8}{1}$, or 8. Substituting 8 for m in the equation $y = mx + b$ yields $y = 8x + b$. It's also given that when the value of x is 2, the value of y is 18. Substituting 2 for x and 18 for y in the equation $y = 8x + b$ yields $18 = 8(2) + b$, or $18 = 16 + b$. Subtracting 16 from each side of this equation yields $2 = b$. Substituting 2 for b in the equation $y = 8x + b$ yields $y = 8x + 2$. Therefore, the equation $y = 8x + 2$ represents this relationship.

Choice A is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 22, not 18.

Choice B is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 12, not 18.

Choice D is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 3, not 8, and when the value of x is 2, the value of y is 32, not 18.

Question Difficulty: Medium

Question ID eafdbbbd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: eafdbbbd

$\frac{1}{4}(x+5)-\frac{1}{3}(x+5)=-7$ What value of x is the solution to the given equation?

A. -12

B. -5

C. 79

D. 204

ID: eafdbbbd Answer

Correct Answer: C

Rationale

Choice C is correct. For the given equation, $(x+5)$ is a factor of both terms on the left-hand side. Therefore, the given equation can be rewritten as $\left(\frac{1}{4}-\frac{1}{3}\right)(x+5)=-7$, or $\left(\frac{3}{12}-\frac{4}{12}\right)(x+5)=-7$, which is equivalent to $-\frac{1}{12}(x+5)=-7$. Multiplying both sides of this equation by -12 yields $x+5=84$. Subtracting 5 from both sides of this equation yields $x=79$.

Choice A is incorrect. This is the value of x for which the left-hand side of the given equation equals $\frac{7}{12}$, not -7.

Choice B is incorrect. This is the value of x for which the left-hand side of the given equation equals 0, not -7.

Choice D is incorrect. This is the value of x for which the left-hand side of the given equation equals $-\frac{209}{12}$, not -7.

Question Difficulty: Medium

Question ID 7d89376f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 7d89376f

A discount airline sells a certain number of tickets, *x*, for a flight for $90 each. It sells the number of remaining tickets, *y*, for $250 each. For a particular flight, the airline sold 120 tickets and collected a total of $27,600 from the sale of those tickets. Which system of equations represents this relationship between *x* and *y* ?

A. $\begin{cases} x+y=120 \\ 90x+250y=27{,}600 \end{cases}$

B. $\begin{cases} x+y=120 \\ 90x+250y=120(27{,}600) \end{cases}$

C. $\begin{cases} x+y=27{,}600 \\ 90x+250y=120(27{,}600) \end{cases}$

D. $\begin{cases} 90x=250y \\ 120x+120y=27{,}600 \end{cases}$

ID: 7d89376f Answer

Correct Answer: A

Rationale

Choice A is correct. The airline sold two types of tickets for this flight: x tickets at $90 each and the remaining tickets, y, at $250 each. Because the airline sold a total of 120 tickets for this flight, it must be true that x + y = 120. The amount, in dollars, collected from the sale of x tickets at $90 each is represented by 90x. The amount, in dollars, collected from the sale of the remaining y tickets at $250 each is represented by 250y. It is given that a total of $27,600 was collected from the sale of all tickets. Therefore, it must also be true that 90x + 250y = 27,600.

Choice B is incorrect. The total number of tickets sold is represented correctly as x + y = 120. The total amount, in dollars, collected from the sale of the x tickets at $90 each and the remaining tickets, y, at $250 has been correctly represented as 90x + 250y. However, according to the information given, this total should be equal to 27,600, not 120(27,600) dollars. Choice C is incorrect. The total number of tickets sold has been correctly represented as x + y. However, according to the information given, this total should be equal to 120, not 27,600, as shown in choice C. The total amount, in dollars, collected from the sale of the x tickets at $90 each and the remaining tickets, y, at $250 has been correctly represented as 90x + 250y. However, according to the information given, this total should be equal to 27,600, not 120(27,600) dollars. Choice D is incorrect. The two equations given in choice D have no meaning in this context.

Question Difficulty: Easy

Question ID 3ce92ce8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 3ce92ce8

$f(x) = 2x + 3$

For the given function f, the graph of $y = f(x)$ in the *xy*-plane is parallel to line j. What is the slope of line j?

ID: 3ce92ce8 Answer

Correct Answer: 2

Rationale

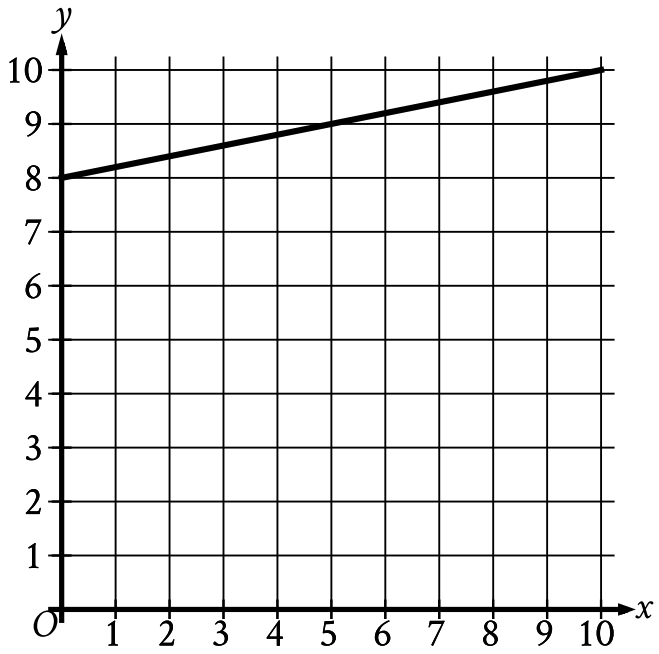
The correct answer is 2. It's given that function f is defined by $f(x) = 2x + 3$. Therefore, the equation representing the graph of $y = f(x)$ in the *xy*-plane is $y = 2x + 3$, and the graph is a line. For a linear equation in the form $y = mx + b$, m represents the slope of the line. Since the value of m in the equation $y = 2x + 3$ is 2, the slope of the line defined by function f is 2. It's given that line j is parallel to the line defined by function f. The slopes of parallel lines are equal. Therefore, the slope of line j is also 2.

Question Difficulty: Medium

Question ID f40552a9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: f40552a9



What is the *y*-intercept of the line graphed?

A. $(0, -8)$

B. $(0, -\frac{1}{8})$

C. $(0, 0)$

D. $(0, 8)$

ID: f40552a9 Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of a line graphed in the *xy*-plane is the point where the line intersects the *y*-axis. The line graphed intersects the *y*-axis at the point $(0, 8)$. Therefore, the *y*-intercept of the line graphed is $(0, 8)$.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 12ae3452

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 12ae3452

The equation $46 = 2a + 2b$ gives the relationship between the side lengths a and b of a certain parallelogram. If $a = 9$, what is the value of b?

ID: 12ae3452 Answer

Correct Answer: 14

Rationale

The correct answer is 14. It's given that the equation $46 = 2a + 2b$ gives the relationship between the side lengths a and b of a certain parallelogram. Substituting 9 for a in the given equation yields $46 = 2(9) + 2b$, or $46 = 18 + 2b$. Subtracting 18 from both sides of this equation yields $28 = 2b$. Dividing both sides of this equation by 2 yields $14 = b$. Therefore, if $a = 9$, the value of b is 14.

Question Difficulty: Easy

Question ID 17f176ec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 17f176ec

A movie theater charges $11 for each full-price ticket and $8.25 for each reduced-price ticket. For one movie showing, the theater sold a total of 214 full-price and reduced-price tickets for $2,145. Which of the following systems of equations could be used to determine the number of full-price tickets, f, and the number of reduced-price tickets, r, sold?

A. $f + r = 2{,}145$
$11f + 8.25r = 214$

B. $f + r = 214$
$11f + 8.25r = 2{,}145$

C. $f + r = 214$
$8.25f + 11r = 2{,}145$

D. $f + r = 2{,}145$
$8.25f + 11r = 214$

ID: 17f176ec Answer

Correct Answer: B

Rationale

Choice B is correct. The movie theater sells f full-price tickets and r reduced-price tickets, so the total number of tickets sold is f + r. Since the movie theater sold a total of 214 full-price and reduced-price tickets for one movie showing, it follows that f + r = 214. The movie theater charges $11 for each full-price ticket; thus, the sales for full-price tickets, in dollars, is given by 11f. The movie theater charges $8.25 for each reduced-price ticket; thus, the sales for reduced-price tickets, in dollars, is given by 8.25r. Therefore, the total sales, in dollars, for the movie showing is given by 11f + 8.25r. Since the total sales for all full-price and reduced-price tickets is $2,145, it follows that 11f + 8.25r = 2,145.

Choice A is incorrect. This system of equations suggests that the movie theater sold a total of 2,145 full-price and reduced-price tickets for a total of $214. Choice C is incorrect. This system suggests that the movie theater charges $8.25 for each full-price ticket and $11 for each reduced-price ticket. Choice D is incorrect. This system suggests that the movie theater charges $8.25 for each full-price ticket and $11 for each reduced-price ticket and sold a total of 2,145 tickets for a total of $214.

Question Difficulty: Easy

Question ID 8a6de407

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 8a6de407

The function f is defined by $f(x) = mx + b$, where m and b are constants. If $f(0) = 18$ and $f(1) = 20$, what is the value of m ?

ID: 8a6de407 Answer

Rationale

The correct answer is 2. The slope-intercept form of an equation for a line is $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept. Two ordered pairs, (x_1, y_1) and (x_2, y_2), can be used to compute the slope using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. It's given that $f(0) = 18$ and $f(1) = 20$; therefore, the two ordered pairs for this line are $(0, 18)$ and $(1, 20)$. Substituting these values for (x_1, y_1) and (x_2, y_2) gives $\frac{20 - 18}{1 - 0} = \frac{2}{1}$, or 2.

Question Difficulty: Medium

Question ID 8643d906

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 8643d906

$P(t) = 250 + 10t$

The population of snow leopards in a certain area can be modeled by the function P defined above, where $P(t)$ is the population t years after 1990. Of the following, which is the best interpretation of the equation $P(30) = 550$?

A. The snow leopard population in this area is predicted to be 30 in the year 2020.

B. The snow leopard population in this area is predicted to be 30 in the year 2030.

C. The snow leopard population in this area is predicted to be 550 in the year 2020.

D. The snow leopard population in this area is predicted to be 550 in the year 2030.

ID: 8643d906 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $P(t)$ represents the population of snow leopards t years after 1990. $P(30) = 550$ corresponds to $t = 30$ and $P(t) = 550$. It follows that $t = 30$ corresponds to 30 years after 1990, or 2020. Thus, the best interpretation of $P(30) = 550$ is that the snow leopard population in this area is predicted to be 550 in the year 2020.

Choices A and B are incorrect and may result from reversing the interpretations of t and $P(t)$. Choice D is incorrect and may result from determining that 30 years after 1990 is 2030, not 2020.

Question Difficulty: Easy

Question ID bbf9e5ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■■

ID: bbf9e5ce

For groups of 25 or more people, a museum charges $\$21$ per person for the first 25 people and $\$14$ for each additional person. Which function f gives the total charge, in dollars, for a tour group with n people, where $n \geq 25$?

A. $f(n) = 14n + 175$

B. $f(n) = 14n + 525$

C. $f(n) = 35n - 350$

D. $f(n) = 14n + 21$

ID: bbf9e5ce Answer

Correct Answer: A

Rationale

Choice A is correct. A tour group with n people, where $n \geq 25$, can be split into two subgroups: the first 25 people and the additional $n - 25$ people. Since the museum charges $\$21$ per person for the first 25 people and $\$14$ for each additional person, the charge for the first 25 people is $\$21(25)$ and the charge for the additional $n - 25$ people is $\$14(n - 25)$. Therefore, the total charge, in dollars, is given by the function $f(n) = 21(25) + 14(n - 25)$, or $f(n) = 14n + 175$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

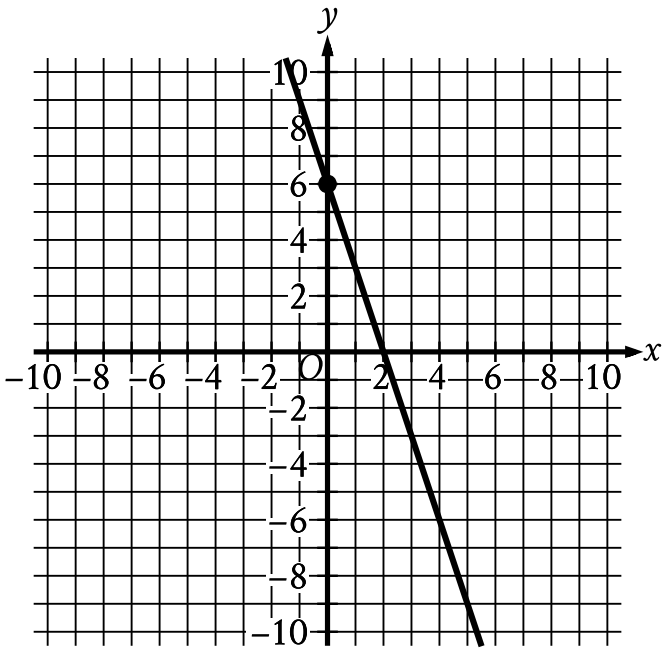
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 5b7599a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 5b7599a6



The graph shows a linear relationship between x and y. Which equation represents this relationship, where R is a positive constant?

A. $Rx + 18y = 36$

B. $Rx - 18y = -36$

C. $18x + Ry = 36$

D. $18x - Ry = -36$

ID: 5b7599a6 Answer

Correct Answer: C

Rationale

Choice C is correct. The equation representing the linear relationship shown can be written in slope-intercept form $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the line. The line shown passes through the points $(0, 6)$ and $(2, 0)$. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(0, 6)$ and $(2, 0)$ for (x_1, y_1) and (x_2, y_2), respectively, in this equation yields $m = \frac{0 - 6}{2 - 0}$, which is equivalent to $m = -\frac{6}{2}$, or $m = -3$. Since $(0, 6)$ is the *y*-intercept, it follows that $b = 6$. Substituting -3 for m and 6 for b in the equation $y = mx + b$ yields $y = -3x + 6$. Adding $3x$ to both sides of this equation yields $3x + y = 6$. Multiplying this equation by 6 yields $18x + 6y = 36$. It follows that the equation $18x + Ry = 36$, where R is a positive constant, represents this relationship.

Choice A is incorrect. The graph of this relationship passes through the point $(0, 2)$, not $(0, 6)$.

Choice B is incorrect. The graph of this relationship passes through the point $(0, 2)$, not $(0, 6)$.

Choice D is incorrect. The graph of this relationship passes through the point $(-2, 0)$, not $(2, 0)$.

Question Difficulty: Hard

Question ID a4d6fbec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a4d6fbec

If $y = 5x + 10$, what is the value of y when $x = 8$?

ID: a4d6fbec Answer

Correct Answer: 50

Rationale

The correct answer is 50. Substituting 8 for x in the given equation yields $y = 5(8) + 10$, or $y = 50$. Therefore, the value of y is 50 when $x = 8$.

Question Difficulty: Easy

Question ID 39571c77

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 39571c77

Naomi bought both rabbit snails and nerite snails for a total of $\$52$. Each rabbit snail costs $\$8$ and each nerite snail costs $\$6$. If Naomi bought 2 nerite snails, how many rabbit snails did she buy?

A. 5

B. 12

C. 14

D. 50

ID: 39571c77 Answer

Correct Answer: A

Rationale

Choice A is correct. Let x represent the number of rabbit snails that Naomi bought. It's given that each rabbit snail costs $\$8$. Therefore, the total cost, in dollars, of the rabbit snails that Naomi bought can be represented by the expression $8x$. It's also given that each nerite snail costs $\$6$, and that Naomi bought 2 nerite snails. Therefore, the total cost, in dollars, of the nerite snails that Naomi bought is $6(2)$, or 12. Since Naomi bought both the rabbit snails and the nerite snails for a total of $\$52$, the equation $8x + 12 = 52$ can be used to represent the situation. Subtracting 12 from both sides of this equation yields $8x = 40$. Dividing both sides of this equation by 8 yields $x = 5$. Therefore, Naomi bought 5 rabbit snails.

Choice B is incorrect. This is the total cost, in dollars, of the nerite snails that Naomi bought, not the number of rabbit snails.

Choice C is incorrect. This is the cost, in dollars, of one rabbit snail and one nerite snail, not the number of rabbit snails that Naomi bought.

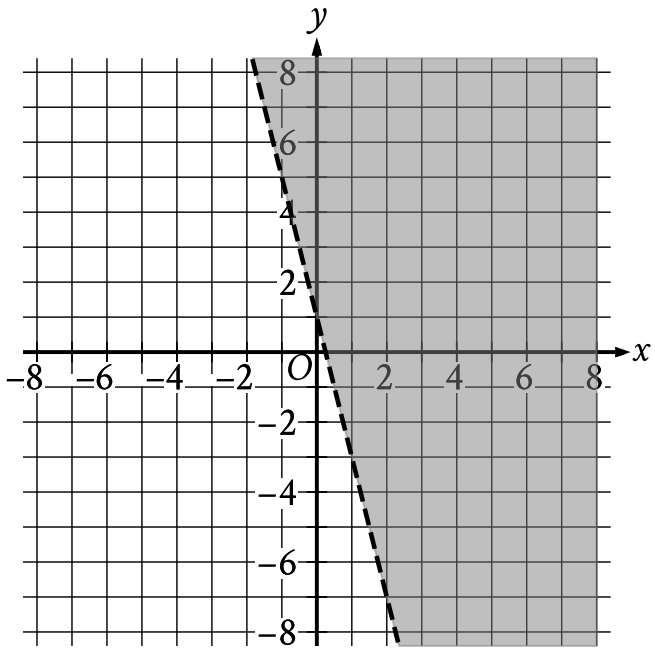
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID d02193fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: d02193fb



The shaded region shown represents the solutions to which inequality?

A. $y < 1 + 4x$

B. $y < 1 - 4x$

C. $y > 1 + 4x$

D. $y > 1 - 4x$

ID: d02193fb Answer

Correct Answer: D

Rationale

Choice D is correct. The equation for the line representing the boundary of the shaded region can be written in slope-intercept form $y = b + mx$, where m is the slope and $(0, b)$ is the *y*-intercept of the line. For the graph shown, the boundary line passes through the points $(0, 1)$ and $(1, -3)$. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(0, 1)$ and $(1, -3)$ for (x_1, y_1) and (x_2, y_2) in this equation yields $m = \frac{-3 - 1}{1 - 0}$, which is equivalent to $m = \frac{-4}{1}$, or $m = -4$. Since the point $(0, 1)$ represents the *y*-intercept, it follows that $b = 1$. Substituting -4 for m and 1 for b in the equation $y = b + mx$ yields $y = 1 - 4x$ as the equation of the boundary line. Since the shaded region represents all the points above this boundary line, it follows that the shaded region shown represents the solutions to the inequality $y > 1 - 4x$.

Choice A is incorrect. This inequality represents a region below, not above, a boundary line with a slope of 4, not -4.

Choice B is incorrect. This inequality represents a region below, not above, the boundary line shown.

Choice C is incorrect. This inequality represents a region whose boundary line has a slope of 4, not -4.

Question Difficulty: Medium

Question ID 768b2425

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 768b2425

Last week, an interior designer earned a total of $\$1,258$ from consulting for x hours and drawing up plans for y hours. The equation $68x + 85y = 1,258$ represents this situation. Which of the following is the best interpretation of 68 in this context?

A. The interior designer earned $\$68$ per hour consulting last week.

B. The interior designer worked 68 hours drawing up plans last week.

C. The interior designer earned $\$68$ per hour drawing up plans last week.

D. The interior designer worked 68 hours consulting last week.

ID: 768b2425 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $68x + 85y = 1,258$ represents the situation where an interior designer earned a total of $\$1,258$ last week from consulting for x hours and drawing up plans for y hours. Thus, $68x$ represents the amount earned, in dollars, from consulting for x hours, and $85y$ represents the amount earned, in dollars, from drawing up plans for y hours. Since $68x$ represents the amount earned, in dollars, from consulting for x hours, it follows that the interior designer earned $\$68$ per hour consulting last week.

Choice B is incorrect. The interior designer worked y hours, not 68 hours, drawing up plans last week.

Choice C is incorrect. The interior designer earned $\$85$ per hour, not $\$68$ per hour, drawing up plans last week.

Choice D is incorrect. The interior designer worked x hours, not 68 hours, consulting last week.

Question Difficulty: Easy

Question ID e53688cb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■□

ID: e53688cb

$x + 3y = 29$ $3y = 11$ The solution to the given system of equations is (x, y). What is the value of x?

ID: e53688cb Answer

Correct Answer: 18

Rationale

The correct answer is 18. It's given by the second equation in the system that $3y = 11$. Substituting 11 for $3y$ in the first equation in the system, $x + 3y = 29$, yields $x + 11 = 29$. Subtracting 11 from both sides of this equation yields $x = 18$.

Question Difficulty: Medium

Question ID 44d65912

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 44d65912

Angela is playing a video game. In this game, players can score points only by collecting coins and stars. Each coin is worth c points, and each star is worth s points.

The first time she played, Angela scored 700 points. She collected 20 coins and 10 stars.

The second time she played, Angela scored 850 points. She collected 25 coins and 12 stars.

Which system of equations can be used to correctly determine the values of c and s ?

A. $10c + 20s = 700$
$12c + 25s = 850$

B. $20c + 10s = 700$
$25c + 12s = 850$

C. $20c + 700s = 10$
$25c + 850s = 12$

D. $700c + 20s = 10$
$850c + 25s = 12$

ID: 44d65912 Answer

Correct Answer: B

Rationale

Choice B is correct. The number of coins collected can be multiplied by c to give the score from the points earned from coins. Similarly, the number of stars collected can be multiplied by s to give the score from the points earned from the stars. Therefore, the total score each time Angela played is $20c + 10s = 700$, and the total score the second time she played is $25c + 12s = 850$.

Choices A, C, and D are incorrect and may result from misidentifying the terms of the equation. Choice A switches coins and stars, choice C switches stars and points, and choice D misidentifies coins, stars, and points.

Question Difficulty: Easy

Question ID 41fdc0b8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 41fdc0b8

Population of Greenleaf, Idaho

Year	Population
2000	862
2010	846

The table above shows the population of Greenleaf, Idaho, for the years 2000 and 2010. If the relationship between population and year is linear, which of the following functions *P* models the population of Greenleaf *t* years after 2000?

A. $P(t) = 862 - 1.6t$

B. $P(t) = 862 - 16t$

C. $P(t) = 862 + 16(t - 2{,}000)$

D. $P(t) = 862 - 1.6(t - 2{,}000)$

ID: 41fdc0b8 Answer

Correct Answer: A

Rationale

Choice A is correct. It is given that the relationship between population and year is linear; therefore, the function that models the population t years after 2000 is of the form $P(t) = mt + b$, where m is the slope and b is the population when $t = 0$. In the year 2000, $t = 0$. Therefore, $b = 862$. The slope is given by $m = \frac{P(10) - P(0)}{10 - 0} = \frac{846 - 862}{10 - 0} = \frac{-16}{10} = -1.6$. Therefore, $P(t) = -1.6t + 862$, which is equivalent to the equation in choice A.

Choice B is incorrect and may be the result of incorrectly calculating the slope as just the change in the value of P. Choice C is incorrect and may be the result of the same error as in choice B, in addition to incorrectly using t to represent the year, instead of the number of years after 2000. Choice D is incorrect and may be the result of incorrectly using t to represent the year instead of the number of years after 2000.

Question Difficulty: Medium

Question ID 8ad64841

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■■□

ID: 8ad64841

A linear function f gives a company's profit, in dollars, for selling x items. The company's profit is $\$220$ when it sells 8 items, and its profit is $\$320$ when it sells 10 items. Which equation defines f?

A. $f(x) = 150x - 320$

B. $f(x) = 32x$

C. $f(x) = 50x - 10x$

D. $f(x) = 50x - 180$

ID: 8ad64841 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the relationship between x and $f(x)$ is linear. A linear function can be written in the form $f(x) = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept of the graph of $y = f(x)$ in the xy-plane. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be found using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. It's given that the company's profit is $\$220$ when it sells 8 items and the profit is $\$320$ when it sells 10 items. Since $f(x)$ represents the company's profit, in dollars, for selling x items, the graph of $y = f(x)$ in the xy-plane passes through the points $(8, 220)$ and $(10, 320)$. Substituting $(8, 220)$ and $(10, 320)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{320 - 220}{10 - 8}$, which gives $m = \frac{100}{2}$, or $m = 50$. Substituting 50 for m, 8 for x, and 220 for $f(x)$ in $f(x) = mx + b$ yields $220 = (50)(8) + b$, or $220 = 400 + b$. Subtracting 400 from each side of this equation yields $-180 = b$. Substituting 50 for m and -180 for b in $f(x) = mx + b$ yields $f(x) = 50x - 180$. Therefore, the equation that defines f is $f(x) = 50x - 180$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 8b2a2a63

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 8b2a2a63

The *y*-intercept of the graph of $y = -6x - 32$ in the *xy*-plane is $(0, y)$. What is the value of y?

ID: 8b2a2a63 Answer

Correct Answer: -32

Rationale

The correct answer is -32. It's given that the *y*-intercept of the graph of $y = -6x - 32$ is $(0, y)$. Substituting 0 for x in this equation yields $y = -6(0) - 32$, or $y = -32$. Therefore, the value of y that corresponds to the *y*-intercept of the graph of $y = -6x - 32$ in the *xy*-plane is -32.

Question Difficulty: Easy

Question ID 70774aa4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 70774aa4

If $5x = 20$, what is the value of $15x$?

A. 7

B. 12

C. 23

D. 60

ID: 70774aa4 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $5x = 20$. Multiplying both sides of this equation by 3 yields $15x = 60$. Therefore, the value of $15x$ is 60.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

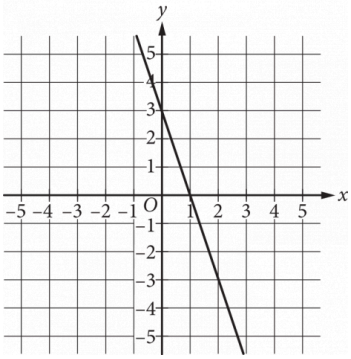
Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 8a1544f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 8a1544f1



What is the equation of the line shown in the *xy*-plane above?

A. $y = 3x - 3$

B. $y = -3x + 3$

C. $y = \frac{1}{3}x - 3$

D. $y = -\frac{1}{3}x + 3$

ID: 8a1544f1 Answer

Correct Answer: B

Rationale

Choice B is correct. Any line in the xy-plane can be defined by an equation in the form y = mx + b, where m is the slope of the line and b is the y-coordinate of the y-intercept of the line. From the graph, the y-intercept of the line is (0, 3). Therefore, b = 3. The slope of the line is the change in the value of y divided by the change in the value of x for any two points on the line. The line shown passes through (0, 3) and (1, 0), so $m = \frac{3 - 0}{0 - 1}$, or m = −3. Therefore, the equation of the line is y = −3x + 3.

Choices A and C are incorrect because the equations given in these choices represent a line with a positive slope. However, the line shown has a negative slope. Choice D is incorrect because the equation given in this choice represents a line with slope of $-\frac{1}{3}$. However, the line shown has a slope of −3.

Question Difficulty: Easy

Question ID a9c04a21

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: a9c04a21

What is the solution to the equation $2x+3=7$?

A. 1

B. 1.5

C. 2

D. 4

ID: a9c04a21 Answer

Correct Answer: C

Rationale

Choice C is correct. Subtracting 3 from both sides of the given equation yields $2x=4$. Dividing both sides by 2 results in $x=2$.

Choices A and B are incorrect and may result from computational errors. Choice D is incorrect. This is the value of $2x$.

Question Difficulty: Easy

Question ID 5907e072

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 5907e072

$f(x) = x + b$ For the linear function f, b is a constant. When $x = 0$, $f(x) = 30$. What is the value of b?

A. -30

B. $-\frac{1}{30}$

C. $\frac{1}{30}$

D. 30

ID: 5907e072 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that when $x = 0$, $f(x) = 30$. Substituting 0 for x and 30 for $f(x)$ in the given function yields $30 = 0 + b$, or $30 = b$. Therefore, the value of b is 30.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

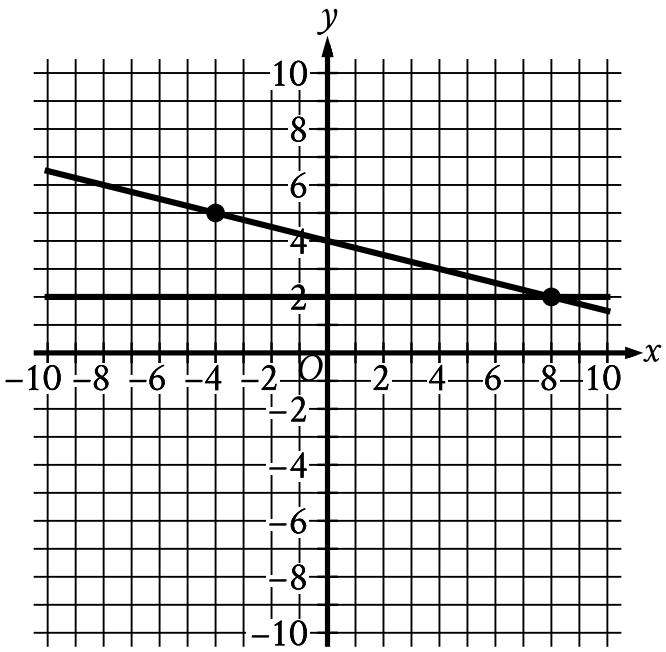
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 27f5fff3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 27f5fff3



If a new graph of three linear equations is created using the system of equations shown and the equation $x + 4y = -16$, how many solutions (x, y) will the resulting system of three equations have?

A. Zero

B. Exactly one

C. Exactly two

D. Infinitely many

ID: 27f5fff3 Answer

Correct Answer: A

Rationale

Choice A is correct. A solution to a system of equations must satisfy each equation in the system. It follows that if an ordered pair (x, y) is a solution to the system, the point (x, y) lies on the graph in the *xy*-plane of each equation in the system. The only point that lies on each graph of the system of two linear equations shown is their intersection point $(8, 2)$. It follows that if a new graph of three linear equations is created using the system of equations shown and the graph of $x + 4y = -16$, this system has either zero solutions or one solution, the point $(8, 2)$. Substituting 8 for x and 2 for y in the equation $x + 4y = -16$ yields $8 + 4(2) = -16$, or $16 = -16$. Since this equation is not true, the point $(8, 2)$ does not lie on the graph of $x + 4y = -16$. Therefore, $(8, 2)$ is not a solution to the system of three equations. It follows that there are zero solutions to this system.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 535fa6e6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■□□

ID: 535fa6e6

Davio bought some potatoes and celery. The potatoes cost $\$0.69$ per pound, and the celery cost $\$0.99$ per pound. If Davio spent $\$5.34$ in total and bought twice as many pounds of celery as pounds of potatoes, how many pounds of celery did Davio buy?

A. 2

B. 2.5

C. 2.67

D. 4

ID: 535fa6e6 Answer

Correct Answer: D

Rationale

Choice D is correct. Let p represent the number of pounds of potatoes and let c represent the number of pounds of celery that Davio bought. It's given that potatoes cost $\$0.69$ per pound and celery costs $\$0.99$ per pound. If Davio spent $\$5.34$ in total, then the equation $0.69p + 0.99c = 5.34$ represents this situation. It's also given that Davio bought twice as many pounds of celery as pounds of potatoes; therefore, $c = 2p$. Substituting $2p$ for c in the equation $0.69p + 0.99c = 5.34$ yields $0.69p + 0.99(2p) = 5.34$, which is equivalent to $0.69p + 1.98p = 5.34$, or $2.67p = 5.34$. Dividing both sides of this equation by 2.67 yields $p = 2$. Substituting 2 for p in the equation $c = 2p$ yields $c = 2(2)$, or $c = 4$. Therefore, Davio bought 4 pounds of celery.

Choice A is incorrect. This is the number of pounds of potatoes, not the number of pounds of celery, Davio bought.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a73a5c22

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: a73a5c22

The function g is defined by $g(x) = 10x + 8$. What is the value of $g(x)$ when $x = 8$?

A. 0

B. 8

C. 10

D. 88

ID: a73a5c22 Answer

Correct Answer: D

Rationale

Choice D is correct. The value of $g(x)$ when $x = 8$ can be found by substituting 8 for x in the given equation $g(x) = 10x + 8$. This yields $g(8) = 10(8) + 8$, or $g(8) = 88$. Therefore, when $x = 8$, the value of $g(x)$ is 88.

Choice A is incorrect. This is the value of x when $g(x) = 8$, rather than the value of $g(x)$ when $x = 8$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 6fa593f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■□□

ID: 6fa593f1

If $x = 40$, what is the value of $x + 6$?

A. 34

B. 40

C. 46

D. 64

ID: 6fa593f1 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $x = 40$. Adding 6 to both sides of this equation yields $x + 6 = 40 + 6$, or $x + 6 = 46$. Therefore, the value of $x + 6$ is 46.

Choice A is incorrect. This is the value of $x - 6$, not $x + 6$. Choice B is incorrect. This is the value of x, not $x + 6$.

Choice D is incorrect. This is the value of $x + 24$, not $x + 6$.

Question Difficulty: Easy

Question ID 8c515062

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■■□

ID: 8c515062

A candle is made of 17 ounces of wax. When the candle is burning, the amount of wax in the candle decreases by 1 ounce every 4 hours. If 6 ounces of wax remain in this candle, for how many hours has it been burning?

A. 3

B. 6

C. 24

D. 44

ID: 8c515062 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the candle starts with 17 ounces of wax and has 6 ounces of wax remaining after a period of time has passed. The amount of wax the candle has lost during the time period can be found by subtracting the remaining amount of wax from the amount of wax the candle was made of, which yields $17 - 6$ ounces, or 11 ounces. This means the candle loses 11 ounces of wax during that period of time. It's given that the amount of wax decreases by 1 ounce every 4 hours. If h represents the number of hours the candle has been burning, it follows that $\frac{1}{4} = \frac{11}{h}$. Multiplying both sides of this equation by $4h$ yields $h = 44$. Therefore, the candle has been burning for 44 hours.

Choice A is incorrect and may result from using the equation $\frac{1}{4} = \frac{h}{11}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation, and then rounding to the nearest whole number.

Choice B is incorrect. This is the amount of wax, in ounces, remaining in the candle, not the number of hours it has been burning.

Choice C is incorrect and may result from using the equation $\frac{1}{4} = \frac{6}{h}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation.

Question Difficulty: Medium

Question ID 4b76c7f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■□□

ID: 4b76c7f1

$$2x + 7y = 9$$
$$8x + 28y = a$$

In the given system of equations, a is a constant. If the system has infinitely many solutions, what is the value of a ?

A. 4

B. 9

C. 36

D. 54

ID: 4b76c7f1 Answer

Correct Answer: C

Rationale

Choice C is correct. A system of two linear equations has infinitely many solutions if one equation is equivalent to the other. This means that when the two equations are written in the same form, each coefficient or constant in one equation is equal to the corresponding coefficient or constant in the other equation multiplied by the same number. The equations in the given system of equations are written in the same form, with x and y on the left-hand side of the equation and a constant on the right-hand side of the equation. The coefficients of x and y in the second equation are equal to the coefficients of x and y, respectively, in the first equation multiplied by 4: $8 = 2(4)$ and $28 = 7(4)$. Therefore, the constant in the second equation must be equal to 4 times the constant in the first equation: $a = 9(4)$, or $a = 36$.

Choices A, B, and D are incorrect. When $a = 4$, $a = 9$, or $a = 54$, the given system of equations has no solution.

Question Difficulty: Easy

Question ID b64e2c7f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: b64e2c7f

Monarch butterflies can fly only with a body temperature of at least 55.0 degrees Fahrenheit $(^\circ\mathrm{F})$. If a monarch butterfly's body temperature is $51.3^\circ\mathrm{F}$, what is the minimum increase needed in its body temperature, in $^\circ\mathrm{F}$, so that it can fly?

A. 1.3

B. 3.7

C. 5.0

D. 6.3

ID: b64e2c7f Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that monarch butterflies can fly only with a body temperature of at least 55.0 degrees Fahrenheit $(^\circ\mathrm{F})$. Let x represent the minimum increase needed in the monarch butterfly's body temperature to fly. If the monarch butterfly's body temperature is $51.3^\circ\mathrm{F}$, the inequality $51.3 + x \geq 55.0$ represents this situation. Subtracting 51.3 from both sides of this inequality yields $x \geq 3.7$. Therefore, if the monarch butterfly's body temperature is $51.3^\circ\mathrm{F}$, the minimum increase needed in its body temperature, in $^\circ\mathrm{F}$, so that it can fly is 3.7.

Choice A is incorrect. This is the minimum increase needed in body temperature if the monarch butterfly's body temperature is $53.7^\circ\mathrm{F}$, not $51.3^\circ\mathrm{F}$.

Choice C is incorrect. This is the minimum increase needed in body temperature if the monarch butterfly's body temperature is $50.0^\circ\mathrm{F}$, not $51.3^\circ\mathrm{F}$.

Choice D is incorrect. This is the minimum increase needed in body temperature if the monarch butterfly's body temperature is $48.7^\circ\mathrm{F}$, not $51.3^\circ\mathrm{F}$.

Question Difficulty: Easy

Question ID 49800634

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

ID: 49800634

x	y
-18	-48
7	52

The table shows two values of x and their corresponding values of y. In the *xy*-plane, the graph of the linear equation representing this relationship passes through the point $\left(\frac{1}{7},\ a\right)$. What is the value of a?

A. $-\frac{4}{11}$

B. $-\frac{4}{77}$

C. $\frac{4}{7}$

D. $\frac{172}{7}$

ID: 49800634 Answer

Correct Answer: D

Rationale

Choice D is correct. The linear relationship between x and y can be represented by the equation $y = mx + b$, where m is the slope of the graph of this equation in the *xy*-plane and b is the *y*-coordinate of the *y*-intercept. The slope of a line between any two points (x_1, y_1) and (x_2, y_2) on the line can be calculated using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Based on the table, the graph contains the points $(-18, -48)$ and $(7, 52)$. Substituting $(-18, -48)$ and $(7, 52)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{52-(-48)}{7-(-18)}$, which is equivalent to $m = \frac{100}{25}$, or $m = 4$. Substituting 4 for m, -18 for x, and -48 for y in the equation $y = mx + b$ yields $-48 = 4(-18) + b$, or $-48 = -72 + b$. Adding 72 to both sides of this equation yields $24 = b$. Therefore, $m = 4$ and $b = 24$. Substituting 4 for m and 24 for b in the equation $y = mx + b$ yields $y = 4x + 24$. Thus, the equation $y = 4x + 24$ represents the linear relationship between x and y. It's also given that the graph of the linear equation representing this relationship in the *xy*-plane passes through the point $\left(\frac{1}{7}, a\right)$. Substituting $\frac{1}{7}$ for x and a for y in the equation $y = 4x + 24$ yields $a = 4\left(\frac{1}{7}\right) + 24$, which is equivalent to $a = \frac{4}{7} + \frac{168}{7}$, or $a = \frac{172}{7}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 7d6928bd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■□□

ID: 7d6928bd

A cleaning service that cleans both offices and homes can clean at most 14 places per day. Which inequality represents this situation, where f is the number of offices and h is the number of homes?

A. $f + h \leq 14$

B. $f + h \geq 14$

C. $f - h \leq 14$

D. $f - h \geq 14$

ID: 7d6928bd Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the cleaning service cleans both offices and homes, where f is the number of offices and h is the number of homes the cleaning service can clean per day. Therefore, the expression $f + h$ represents the number of places the cleaning service can clean per day. It's also given that the cleaning service can clean at most 14 places per day. Since $f + h$ represents the number of places the cleaning service can clean per day and the service can clean at most 14 places per day, it follows that the inequality $f + h \leq 14$ represents this situation.

Choice B is incorrect. This inequality represents a cleaning service that cleans at least 14 places per day.

Choice C is incorrect. This inequality represents a cleaning service that cleans at most 14 more offices than homes per day.

Choice D is incorrect. This inequality represents a cleaning service that cleans at least 14 more offices than homes per day.

Question Difficulty: Easy

Question ID a04190b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■□

ID: a04190b7

A store sells two different-sized containers of blueberries. The store's sales of these blueberries totaled 896.86 dollars last month. The equation $4.51x + 6.07y = 896.86$ represents this situation, where x is the number of smaller containers sold and y is the number of larger containers sold. According to the equation, what is the price, in dollars, of each smaller container?

ID: a04190b7 Answer

Correct Answer: 4.51, 451/100

Rationale

The correct answer is 4.51. It's given that the equation $4.51x + 6.07y = 896.86$ represents this situation, where x is the number of smaller containers sold, y is the number of larger containers sold, and 896.86 is the store's total sales, in dollars, of blueberries last month. Therefore, $4.51x$ represents the store's sales, in dollars, of smaller containers, and $6.07y$ represents the store's sales, in dollars, of larger containers. Since x is the number of smaller containers sold, the price, in dollars, of each smaller container is 4.51.

Question Difficulty: Medium

Question ID 5ad6bc97

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

ID: 5ad6bc97

$f(x) = 7x + 1$

The function gives the total number of people on a company retreat with x managers. What is the total number of people on a company retreat with 7 managers?

ID: 5ad6bc97 Answer

Correct Answer: 50

Rationale

The correct answer is 50. It's given that the function f gives the total number of people on a company retreat with x managers. It's also given that 7 managers are on the company retreat. Substituting 7 for x in the given function yields $f(7) = 7(7) + 1$, or $f(7) = 50$. Therefore, there are a total of 50 people on a company retreat with 7 managers.

Question Difficulty: Easy

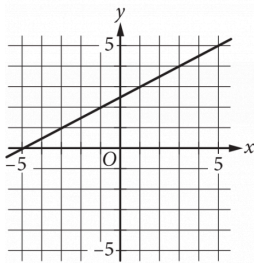
Question ID a8e6bd75

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	■□□

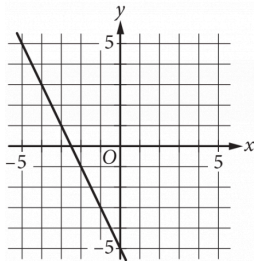
ID: a8e6bd75

Which of the following is the graph of the equation $y = 2x - 5$ in the *xy*-plane?

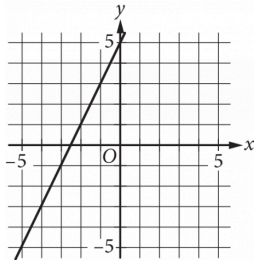
A.



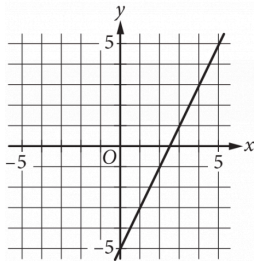
B.



C.



D.



ID: a8e6bd75 Answer

Correct Answer: D

Rationale

Choice D is correct. In the xy-plane, the graph of the equation $y = mx + b$, where m and b are constants, is a line with slope m and y-intercept $(0,b)$. Therefore, the graph of $y = 2x - 5$ in the xy-plane is a line with slope 2 and a y-intercept $(0,-5)$. Having a slope of 2 means that for each increase in x by 1, the value of y increases by 2. Only the graph in choice D has a slope of 2 and crosses the y-axis at $(0,-5)$. Therefore, the graph shown in choice D must be the correct answer.

Choices A, B, and C are incorrect. The graph of $y = 2x - 5$ in the xy-plane is a line with slope 2 and a y-intercept at $(0,-5)$. The graph in choice A crosses the y-axis at the point $(0,2.5)$, not $(0,-5)$, and it has a slope of $\frac{1}{2}$, not 2. The graph in choice B crosses the y-axis at $(0,-5)$; however, the slope of this line is -2, not 2. The graph in choice C has a slope of 2; however, the graph crosses the y-axis at $(0,5)$, not $(0,-5)$.

Question Difficulty: Easy

Question ID 948087f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□

ID: 948087f2

$y \leq 3x + 1$

$x - y > 1$

Which of the following ordered pairs (x, y) satisfies the system of inequalities above?

A. $(-2, -1)$

B. $(-1, 3)$

C. $(1, 5)$

D. $(2, -1)$

ID: 948087f2 Answer

Correct Answer: D

Rationale

Choice D is correct. Any point (x, y) that is a solution to the given system of inequalities must satisfy both inequalities in the system. The second inequality in the system can be rewritten as $x > y + 1$. Of the given answer choices, only choice D satisfies this inequality, because inequality $2 > -1 + 1$ is a true statement. The point $(2, -1)$ also satisfies the first inequality.

Alternate approach: Substituting $(2, -1)$ into the first inequality gives $-1 \leq 3(2) + 1$, or $-1 \leq 7$, which is a true statement. Substituting $(2, -1)$ into the second inequality gives $2 - (-1) > 1$, or $3 > 1$, which is a true statement. Therefore, since $(2, -1)$ satisfies both inequalities, it is a solution to the system.

Choice A is incorrect because substituting −2 for x and −1 for y in the first inequality gives $-1 \leq 3(-2) + 1$, or $-1 \leq -5$, which is false. Choice B is incorrect because substituting −1 for x and 3 for y in the first inequality gives $3 \leq 3(-1) + 1$, or $3 \leq -2$, which is false. Choice C is incorrect because substituting 1 for x and 5 for y in the first inequality gives $5 \leq 3(1) + 1$, or $5 \leq 4$, which is false.

Question Difficulty: Medium

Question ID 73b3b7d8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	■■■

ID: 73b3b7d8

$5y = 10x + 11$ $-5y = 5x - 21$ The solution to the given system of equations is (x, y). What is the value of $30x$?

ID: 73b3b7d8 Answer

Correct Answer: 20

Rationale

The correct answer is 20. Adding the first equation to the second equation in the given system yields $5y - 5y = 10x + 5x + 11 - 21$, or $0 = 15x - 10$. Adding 10 to both sides of this equation yields $10 = 15x$. Multiplying both sides of this equation by 2 yields $20 = 30x$. Therefore, the value of $30x$ is 20.

Question Difficulty: Hard

Question ID beca03de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: beca03de

A rectangle has a length that is 15 times its width. The function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. Which of the following is the best interpretation of $15w$ in this context?

A. The length of the rectangle, in feet

B. The area of the rectangle, in square feet

C. The difference between the length and the width of the rectangle, in feet

D. The width of the rectangle, in feet

ID: beca03de Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a rectangle has a length that is 15 times its width. It's also given that the function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. The area of a rectangle can be calculated by multiplying the rectangle's length by its width. Since the rectangle has a length that is 15 times its width, it follows that w represents the width of the rectangle, in feet, and $15w$ represents the length of the rectangle, in feet. Therefore, the best interpretation of $15w$ in this context is that it's the length of the rectangle, in feet.

Choice B is incorrect. This is the best interpretation of y, not $15w$, in the given function.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect. This is the best interpretation of w, not $15w$, in the given function.

Question Difficulty: Medium

Question ID 4e18fc5d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 4e18fc5d

$v = -\frac{w}{150x}$

The given equation relates the distinct positive numbers v, w, and x. Which equation correctly expresses w in terms of v and x?

A. $w = -150vx$

B. $w = -\frac{150v}{x}$

C. $w = -\frac{x}{150v}$

D. $w = v + 150x$

ID: 4e18fc5d Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that x is positive. Therefore, multiplying each side of the given equation by $-150x$ yields $-150xv = w$, which is equivalent to $w = -150vx$. Thus, the equation $w = -150vx$ correctly expresses w in terms of v and x.

Choice B is incorrect. This equation is equivalent to $v = -\frac{wx}{150}$.

Choice C is incorrect. This equation is equivalent to $v = -\frac{x}{150w}$.

Choice D is incorrect. This equation is equivalent to $v = w - 150x$.

Question Difficulty: Medium

Question ID f5c3e3b8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: f5c3e3b8

Which expression is equivalent to $\left(m^4q^4z^{-1}\right)\left(mq^5z^3\right)$, where m, q, and z are positive?

A. $m^4q^{20}z^{-3}$

B. $m^5q^9z^2$

C. $m^6q^8z^{-1}$

D. $m^{20}q^{12}z^{-2}$

ID: f5c3e3b8 Answer

Correct Answer: B

Rationale

Choice B is correct. Applying the commutative property of multiplication, the expression $\left(m^4q^4z^{-1}\right)\left(mq^5z^3\right)$ can be rewritten as $\left(m^4m\right)\left(q^4q^5\right)\left(z^{-1}z^3\right)$. For positive values of x, $\left(x^a\right)\left(x^b\right) = x^{a+b}$. Therefore, the expression $\left(m^4m\right)\left(q^4q^5\right)\left(z^{-1}z^3\right)$ can be rewritten as $\left(m^{4+1}\right)\left(q^{4+5}\right)\left(z^{-1+3}\right)$, or $m^5q^9z^2$.

Choice A is incorrect and may result from multiplying, not adding, the exponents.

Choice C is incorrect and may result from conceptual or calculation errors.

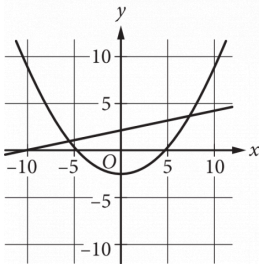
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a5663025

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: a5663025



A system of equations consists of a quadratic equation and a linear equation. The equations in this system are graphed in the *xy*-plane above. How many solutions does this system have?

A. 0

B. 1

C. 2

D. 3

ID: a5663025 Answer

Correct Answer: C

Rationale

Choice C is correct. The solutions to a system of two equations correspond to points where the graphs of the equations intersect. The given graphs intersect at 2 points; therefore, the system has 2 solutions.

Choice A is incorrect because the graphs intersect. Choice B is incorrect because the graphs intersect more than once. Choice D is incorrect. It's not possible for the graph of a quadratic equation and the graph of a linear equation to intersect more than twice.

Question Difficulty: Medium

Question ID 3c95093c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 3c95093c

$6x - 9y > 12$

Which of the following inequalities is equivalent to the inequality above?

A. $x - y > 2$

B. $2x - 3y > 4$

C. $3x - 2y > 4$

D. $3y - 2x > 2$

ID: 3c95093c Answer

Correct Answer: B

Rationale

Choice B is correct. Both sides of the given inequality can be divided by 3 to yield $2x - 3y > 4$.

Choices A, C, and D are incorrect because they are not equivalent to (do not have the same solution set as) the given inequality. For example, the ordered pair $(0, -1.5)$ is a solution to the given inequality, but it is not a solution to any of the inequalities in choices A, C, or D.

Question Difficulty: Easy

Question ID d0a7871e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: d0a7871e

$y = x + 1$

$y = x^2 + x$

If (x,y) is a solution to the system of equations above, which of the following could be the value of x ?

A. −1

B. 0

C. 2

D. 3

ID: d0a7871e Answer

Correct Answer: A

Rationale

Choice A is correct. It is given that $y = x + 1$ and $y = x^2 + x$. Setting the values for y equal to each other yields $x + 1 = x^2 + x$. Subtracting x from each side of this equation yields $x^2 = 1$. Therefore, x can equal 1 or −1. Of these, only −1 is given as a choice.

Choice B is incorrect. If $x = 0$, then $x + 1 = 1$, but $x^2 + x = 0^2 + 0 = 0 \neq 1$. Choice C is incorrect. If $x = 2$, then $x + 1 = 3$, but $x^2 + x = 2^2 + 2 = 6 \neq 3$. Choice D is incorrect. If $x = 3$, then $x + 1 = 4$, but $x^2 + x = 3^2 + 3 = 12 \neq 4$.

Question Difficulty: Medium

Question ID 72ebc024

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 72ebc024

Which expression is equivalent to $16x^3y^2 + 14xy$?

A. $2xy(8xy + 7)$

B. $2xy(8x^2y + 7)$

C. $14xy(2x^2y + 1)$

D. $14xy(8x^2y + 1)$

ID: 72ebc024 Answer

Correct Answer: B

Rationale

Choice B is correct. Since $2xy$ is a common factor of each term in the given expression, the expression can be rewritten as $2xy(8x^2y + 7)$.

Choice A is incorrect. This expression is equivalent to $16x^2y^2 + 14xy$.

Choice C is incorrect. This expression is equivalent to $28x^3y^2 + 14xy$.

Choice D is incorrect. This expression is equivalent to $112x^3y^2 + 14xy$.

Question Difficulty: Easy

Question ID dd4ab4c4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: dd4ab4c4

$4a^2+20ab+25b^2$

Which of the following is a factor of the polynomial above?

A. $a+b$

B. $2a+5b$

C. $4a+5b$

D. $4a+25b$

ID: dd4ab4c4 Answer

Correct Answer: B

Rationale

Choice B is correct. The first and last terms of the polynomial are both squares such that $4a^2=(2a)^2$ and $25b^2=(5b)^2$. The second term is twice the product of the square root of the first and last terms: $20ab=2(2a)(5b)$. Therefore, the polynomial is the square of a binomial such that $4a^2+20ab+25b^2=(2a+5b)^2$, and $(2a+5b)$ is a factor.

Choice A is incorrect and may be the result of incorrectly factoring the polynomial. Choice C is incorrect and may be the result of dividing the second and third terms of the polynomial by their greatest common factor. Choice D is incorrect and may be the result of not factoring the coefficients.

Question Difficulty: Medium

Question ID b8caaf84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: b8caaf84

If $p = 3x + 4$ and $v = x + 5$, which of the following is equivalent to $pv - 2p + v$?

A. $3x^2 + 12x + 7$

B. $3x^2 + 14x + 17$

C. $3x^2 + 19x + 20$

D. $3x^2 + 26x + 33$

ID: b8caaf84 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $p = 3x + 4$ and $v = x + 5$. Substituting the values for p and v into the expression $pv - 2p + v$ yields $(3x + 4)(x + 5) - 2(3x + 4) + x + 5$. Multiplying the terms $(3x + 4)(x + 5)$ yields $3x^2 + 4x + 15x + 20$. Using the distributive property to rewrite $-2(3x + 4)$ yields $-6x - 8$. Therefore, the entire expression can be represented as $3x^2 + 4x + 15x + 20 - 6x - 8 + x + 5$. Combining like terms yields $3x^2 + 14x + 17$.

Choice A is incorrect and may result from subtracting, instead of adding, the term $x + 5$. Choice C is incorrect. This is the result of multiplying the terms $(3x + 4)(x + 5)$. Choice D is incorrect and may result from distributing 2, instead of -2, to the term $3x + 4$.

Question Difficulty: Medium

Question ID 7f81d0c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 7f81d0c3

$x^2 - x - 1 = 0$

What values satisfy the equation above?

A. $x = 1$ and $x = 2$

B. $x = -\frac{1}{2}$ and $x = \frac{3}{2}$

C. $x = \frac{1+\sqrt{5}}{2}$ and $x = \frac{1-\sqrt{5}}{2}$

D. $x = \frac{-1+\sqrt{5}}{2}$ and $x = \frac{-1-\sqrt{5}}{2}$

ID: 7f81d0c3 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the quadratic formula to solve the given expression yields $x = \frac{-(-1) \pm \sqrt{(-1)^2 - (4)(1)(-1)}}{(2)(1)} = \frac{1 \pm \sqrt{5}}{2}$. Therefore, $x = \frac{1+\sqrt{5}}{2}$ and $x = \frac{1-\sqrt{5}}{2}$ satisfy the given equation.

Choices A and B are incorrect and may result from incorrectly factoring or incorrectly applying the quadratic formula. Choice D is incorrect and may result from a sign error.

Question Difficulty: Medium

Question ID e312081b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: e312081b

$(x+5)+(2x-3)$

Which of the following is equivalent to the given expression?

A. $3x-2$

B. $3x+2$

C. $3x-8$

D. $3x+8$

ID: e312081b Answer

Correct Answer: B

Rationale

Choice B is correct. Using the associative and commutative properties of addition, the given expression $(x+5)+(2x-3)$ can be rewritten as $(x+2x)+(5-3)$. Adding these like terms results in $3x+2$.

Choice A is incorrect and may result from adding $(x-5)+(2x+3)$. Choice C is incorrect and may result from adding $(x-5)+(2x-3)$. Choice D is incorrect and may result from adding $(x+5)+(2x+3)$.

Question Difficulty: Easy

Question ID 301faf80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 301faf80

The product of two positive integers is 462. If the first integer is 5 greater than twice the second integer, what is the smaller of the two integers?

ID: 301faf80 Answer

Correct Answer: 14

Rationale

The correct answer is 14. Let x represent the first integer and y represent the second integer. If the first integer is 5 greater than twice the second integer, then $x = 2y + 5$. It's given that the product of the two integers is 462; therefore $xy = 462$. Substituting $2y + 5$ for x in this equation yields $(2y + 5)(y) = 462$, which can be written as $2y^2 + 5y = 462$. Subtracting 462 from each side of this equation yields $2y^2 + 5y - 462 = 0$. The left-hand side of this equation can be factored by finding two values whose product is $2(-462)$, or -924, and whose sum is 5. The two values whose product is -924 and whose sum is 5 are 33 and -28. Thus, the equation $2y^2 + 5y - 462 = 0$ can be rewritten as $2y^2 - 28y + 33y - 462 = 0$, which is equivalent to $2y(y - 14) + 33(y - 14) = 0$, or $(2y + 33)(y - 14) = 0$. By the zero product property, it follows that $2y + 33 = 0$ or $y - 14 = 0$. Subtracting 33 from both sides of the equation $2y + 33 = 0$ yields $2y = -33$. Dividing both sides of this equation by 2 yields $y = -\frac{33}{2}$. Since y is a positive integer, the value of y isn't $-\frac{33}{2}$. Adding 14 to both sides of the equation $y - 14 = 0$ yields $y = 14$. Substituting 14 for y in the equation $xy = 462$ yields $x(14) = 462$. Dividing both sides of this equation by 14 yields $x = 33$. Therefore, the two integers are 14 and 33, so the smaller of the two integers is 14.

Question Difficulty: Hard

Question ID 02060533

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 02060533

x	$g(x)$
-27	3
-9	0
21	5

The table shows three values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$ and f is a linear function. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 36)$

B. $(0, 12)$

C. $(0, 4)$

D. $(0, -9)$

ID: 02060533 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the table shows values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$. It's also given that f is a linear function. It follows that an equation that defines f can be written in the form $f(x) = mx + b$, where m represents the slope and b represents the *y*-coordinate of the *y*-intercept $(0, b)$ of the graph of $y = f(x)$ in the *xy*-plane. The slope of the graph of $y = f(x)$ can be found using two points, (x_1, y_1) and (x_2, y_2), that are on the graph of $y = f(x)$, and the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Since the table shows values of x and their corresponding values of $g(x)$, substituting values of x and $g(x)$ in the equation $g(x) = \frac{f(x)}{x+3}$ can be used to define function f. Using the first pair of values from the table, $x = -27$ and $g(x) = 3$, yields $3 = \frac{f(-27)}{-27+3}$, or $3 = \frac{f(-27)}{-24}$. Multiplying each side of this equation by -24 yields $-72 = f(-27)$, so the point $(-27, -72)$ is on the graph of $y = f(x)$. Using the second pair of values from the table, $x = -9$ and $g(x) = 0$, yields $0 = \frac{f(-9)}{-9+3}$, or $0 = \frac{f(-9)}{-6}$. Multiplying each side of this equation by -6 yields $0 = f(-9)$, so the point $(-9, 0)$ is on the graph of $y = f(x)$. Substituting $(-27, -72)$ and $(-9, 0)$ for (x_1, y_1) and (x_2, y_2), respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{0-(-72)}{-9-(-27)}$, or $m = 4$. Substituting 4 for m in the equation $f(x) = mx + b$ yields $f(x) = 4x + b$. Since $0 = f(-9)$, substituting -9 for x and 0 for $f(x)$ in the equation $f(x) = 4x + b$ yields $0 = 4(-9) + b$, or $0 = -36 + b$. Adding 36 to both sides of this equation yields $36 = b$. It follows that 36 is the *y*-coordinate of the *y*-intercept $(0, b)$ of the graph of $y = f(x)$. Therefore, the *y*-intercept of the graph of $y = f(x)$ is $(0, 36)$.

Choice B is incorrect. 12 is the *y*-coordinate of the *y*-intercept of the graph of $y = g(x)$.

Choice C is incorrect. 4 is the slope of the graph of $y = f(x)$.

Choice D is incorrect. -9 is the *x*-coordinate of the *x*-intercept of the graph of $y = f(x)$.

Question Difficulty: Hard

Question ID 52931bfa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 52931bfa

Which expression is equivalent to $\frac{8x(x-7)-3(x-7)}{2x-14}$, where $x > 7$?

A. $\frac{x-7}{5}$

B. $\frac{8x-3}{2}$

C. $\frac{8x^2-3x-14}{2x-14}$

D. $\frac{8x^2-3x-77}{2x-14}$

ID: 52931bfa Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression has a common factor of 2 in the denominator, so the expression can be rewritten as $\frac{8x(x-7)-3(x-7)}{2(x-7)}$. The three terms in this expression have a common factor of $(x-7)$. Since it's given that $x > 7$, x can't be equal to 7, which means $(x-7)$ can't be equal to 0. Therefore, each term in the expression, $\frac{8x(x-7)-3(x-7)}{2(x-7)}$, can be divided by $(x-7)$, which gives $\frac{8x-3}{2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 1e003284

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 1e003284

$x = 49$ $y = \sqrt{x} + 9$

The graphs of the given equations intersect at the point (x, y) in the *xy*-plane. What is the value of y?

A. 16

B. 40

C. 81

D. 130

ID: 1e003284 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graphs of the given equations intersect at the point (x, y) in the *xy*-plane. It follows that (x, y) represents a solution to the system consisting of the given equations. The first equation given is $x = 49$. Substituting 49 for x in the second equation given, $y = \sqrt{x} + 9$, yields $y = \sqrt{49} + 9$, which is equivalent to $y = 7 + 9$, or $y = 16$. It follows that the graphs of the given equations intersect at the point $(49, 16)$. Therefore, the value of y is 16.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 91e7ea5e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 91e7ea5e

$h(x)=2(x-4)^2-32$

The quadratic function h is defined as shown. In the xy-plane, the graph of $y=h(x)$ intersects the x-axis at the points $(0,0)$ and $(t,0)$, where t is a constant.

What is the value of t?

A. 1

B. 2

C. 4

D. 8

ID: 91e7ea5e Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the graph of $y=h(x)$ intersects the x-axis at $(0,0)$ and $(t,0)$, where t is a constant. Since this graph intersects the x-axis when $y=0$ or when $h(x)=0$, it follows that $h(0)=0$ and $h(t)=0$. If $h(t)=0$, then $0=2(t-4)^2-32$. Adding 32 to both sides of this equation yields $32=2(t-4)^2$. Dividing both sides of this equation by 2 yields $16=(t-4)^2$. Taking the square root of both sides of this equation yields $4=t-4$. Adding 4 to both sides of this equation yields $8=t$. Therefore, the value of t is 8.

Choices A, B, and C are incorrect and may result from calculation errors.

Question Difficulty: Hard

Question ID 358f18bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 358f18bc

$f(x) = x^2 - 48x + 2{,}304$ What is the minimum value of the given function?

ID: 358f18bc Answer

Correct Answer: 1728

Rationale

The correct answer is $1{,}728$. The given function can be rewritten in the form $f(x) = a(x - h)^2 + k$, where a is a positive constant and the minimum value, k, of the function occurs when the value of x is h. By completing the square, $f(x) = x^2 - 48x + 2{,}304$ can be written as $f(x) = x^2 - 48x + \left(\frac{48}{2}\right)^2 + 2{,}304 - \left(\frac{48}{2}\right)^2$, or $f(x) = (x - 24)^2 + 1{,}728$. This equation is in the form $f(x) = a(x - h)^2 + k$, where $a = 1$, $h = 24$, and $k = 1{,}728$. Therefore, the minimum value of the given function is $1{,}728$.

Question Difficulty: Hard

Question ID 3a9d60b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 3a9d60b2

$2|4-x|+3|4-x|=25$ What is the positive solution to the given equation?

ID: 3a9d60b2 Answer

Correct Answer: 9

Rationale

The correct answer is 9. The given equation can be rewritten as $5|4-x|=25$. Dividing each side of this equation by 5 yields $|4-x|=5$. By the definition of absolute value, if $|4-x|=5$, then $4-x=5$ or $4-x=-5$. Subtracting 4 from each side of the equation $4-x=5$ yields $-x=1$. Dividing each side of this equation by -1 yields $x=-1$. Similarly, subtracting 4 from each side of the equation $4-x=-5$ yields $-x=-9$. Dividing each side of this equation by -1 yields $x=9$. Therefore, since the two solutions to the given equation are -1 and 9, the positive solution to the given equation is 9.

Question Difficulty: Hard

Question ID 8490cc45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 8490cc45

The function f is defined by $f(x) = (-8)(2)^x + 22$. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 14)$

B. $(0, 2)$

C. $(0, 22)$

D. $(0, -8)$

ID: 8490cc45 Answer

Correct Answer: A

Rationale

Choice A is correct. The *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane occurs at the point on the graph where $x = 0$. In other words, when $x = 0$, the corresponding value of $f(x)$ is the *y*-coordinate of the *y*-intercept. Substituting 0 for x in the given equation yields $f(0) = (-8)(2)^0 + 22$, which is equivalent to $f(0) = (-8)(1) + 22$, or $f(0) = 14$. Thus, when $x = 0$, the corresponding value of $f(x)$ is 14. Therefore, the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane is $(0, 14)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

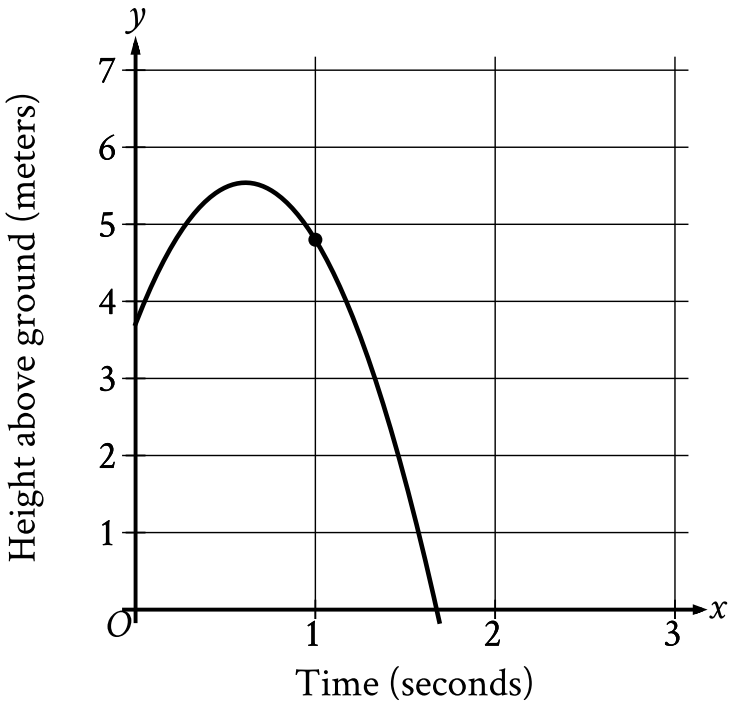
Choice D is incorrect. This could be the *y*-intercept for $f(x) = (-8)(2)^x$, not $f(x) = (-8)(2)^x + 22$.

Question Difficulty: Hard

Question ID 4fbffc0a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 4fbffc0a



The graph shows the height above ground, in meters, of a ball x seconds after the ball was launched upward from a platform. Which statement is the best interpretation of the marked point $(1.0, 4.8)$ in this context?

A. 1.0 second after being launched, the ball's height above ground is 4.8 meters.

B. 4.8 seconds after being launched, the ball's height above ground is 1.0 meter.

C. The ball was launched from an initial height of 1.0 meter with an initial velocity of 4.8 meters per second.

D. The ball was launched from an initial height of 4.8 meters with an initial velocity of 1.0 meter per second.

ID: 4fbffc0a Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graph shows the height above ground, in meters, of a ball x seconds after the ball was launched upward from a platform. In the graph shown, the *x*-axis represents time, in seconds, and the *y*-axis represents the height of the ball above ground, in meters. It follows that for the marked point $(1.0, 4.8)$, 1.00 represents the time, in seconds, after the ball was launched upward from a platform and 4.80 represents the height of the ball above ground, in meters. Therefore, the best interpretation of the marked point $(1.0, 4.8)$ is 1.00 second after being launched, the ball's height above ground is 4.80 meters.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID ba0edc30

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: ba0edc30

$x^2 - 2x - 9 = 0$

One solution to the given equation can be written as $1 + \sqrt{k}$, where k is a constant. What is the value of k?

A. 8

B. 10

C. 20

D. 40

ID: ba0edc30 Answer

Correct Answer: B

Rationale

Choice B is correct. Adding 9 to each side of the given equation yields $x^2 - 2x = 9$. To complete the square, adding 1 to each side of this equation yields $x^2 - 2x + 1 = 9 + 1$, or $(x - 1)^2 = 10$. Taking the square root of each side of this equation yields $x - 1 = \pm\sqrt{10}$. Adding 1 to each side of this equation yields $x = 1 \pm \sqrt{10}$. Since it's given that one of the solutions to the equation can be written as $1 + \sqrt{k}$, the value of k must be 10.

Alternate approach: It's given that $1 + \sqrt{k}$ is a solution to the given equation. It follows that $x = 1 + \sqrt{k}$. Substituting $1 + \sqrt{k}$ for x in the given equation yields $\left(1 + \sqrt{k}\right)^2 - 2\left(1 + \sqrt{k}\right) - 9 = 0$, or $\left(1 + \sqrt{k}\right)\left(1 + \sqrt{k}\right) - 2\left(1 + \sqrt{k}\right) - 9 = 0$. Expanding the products on the left-hand side of this equation yields $1 + 2\sqrt{k} + k - 2 - 2\sqrt{k} - 9 = 0$, or $k - 10 = 0$. Adding 10 to each side of this equation yields $k = 10$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 39714777

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 39714777

$p(x) + 57 = x^2$

The given equation relates the value of x and its corresponding value of $p(x)$ for the function p. What is the minimum value of the function p?

A. $-3{,}249$

B. -57

C. 57

D. $3{,}249$

ID: 39714777 Answer

Correct Answer: B

Rationale

Choice B is correct. For a quadratic function defined by an equation of the form $p(x) = a(x - h)^2 + k$, where a, h, and k are constants and $a > 0$, the minimum value of the function is k. Subtracting 57 from both sides of the given equation yields $p(x) = x^2 - 57$. This function is in the form $p(x) = a(x - h)^2 + k$, where $a = 1$, $h = 0$, and $k = -57$. Therefore, the minimum value of the function p is -57.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID fc3d783a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: fc3d783a

In the xy-plane, a line with equation $2y = 4.5$ intersects a parabola at exactly one point. If the parabola has equation $y = -4x^2 + bx$, where b is a positive constant, what is the value of b?

ID: fc3d783a Answer

Correct Answer: 6

Rationale

The correct answer is 6. It's given that a line with equation $2y = 4.5$ intersects a parabola with equation $y = -4x^2 + bx$, where b is a positive constant, at exactly one point in the *xy*-plane. It follows that the system of equations consisting of $2y = 4.5$ and $y = -4x^2 + bx$ has exactly one solution. Dividing both sides of the equation of the line by 2 yields $y = 2.25$. Substituting 2.25 for y in the equation of the parabola yields $2.25 = -4x^2 + bx$. Adding $4x^2$ and subtracting bx from both sides of this equation yields $4x^2 - bx + 2.25 = 0$. A quadratic equation in the form of $ax^2 + bx + c = 0$, where a, b, and c are constants, has exactly one solution when the discriminant, $b^2 - 4ac$, is equal to zero. Substituting 4 for a and 2.25 for c in the expression $b^2 - 4ac$ and setting this expression equal to 0 yields $b^2 - 4(4)(2.25) = 0$, or $b^2 - 36 = 0$. Adding 36 to each side of this equation yields $b^2 = 36$. Taking the square root of each side of this equation yields $b = \pm 6$. It's given that b is positive, so the value of b is 6.

Question Difficulty: Hard

Question ID a9084ca4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: a9084ca4

$f(x) = 9{,}000(0.66)^x$

The given function f models the number of advertisements a company sent to its clients each year, where x represents the number of years since 1997, and $0 \leq x \leq 5$. If $y = f(x)$ is graphed in the *xy*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $1{,}708$.

B. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $9{,}000$.

C. The estimated number of advertisements the company sent to its clients in 1997 was $1{,}708$.

D. The estimated number of advertisements the company sent to its clients in 1997 was $9{,}000$.

ID: a9084ca4 Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of a graph in the *xy*-plane is the point where $x = 0$. For the given function f, the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane can be found by substituting 0 for x in the equation $y = 9{,}000(0.66)^x$, which gives $y = 9{,}000(0.66)^0$. This is equivalent to $y = 9{,}000(1)$, or $y = 9{,}000$. Therefore, the *y*-intercept of the graph of $y = f(x)$ is $(0, 9{,}000)$. It's given that the function f models the number of advertisements a company sent to its clients each year. Therefore, $f(x)$ represents the estimated number of advertisements the company sent to its clients each year. It's also given that x represents the number of years since 1997. Therefore, $x = 0$ represents 0 years since 1997, or 1997. Thus, the best interpretation of the *y*-intercept of the graph of $y = f(x)$ is that the estimated number of advertisements the company sent to its clients in 1997 was $9{,}000$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2c6f214f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 2c6f214f

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If w represents the nth term of the sequence, which equation gives w in terms of n?

A. $w = 4(9^n)$

B. $w = 4(9^{n-1})$

C. $w = 9(4^n)$

D. $w = 9(4^{n-1})$

ID: 2c6f214f Answer

Correct Answer: D

Rationale

Choice D is correct. Since w represents the nth term of the sequence and 9 is the first term of the sequence, the value of w is 9 when the value of n is 1. Since each term after the first is 4 times the preceding term, the value of w is $9(4)$ when the value of n is 2. Therefore, the value of w is $9(4)(4)$, or $9(4)^2$, when the value of n is 3. More generally, the value of w is $9\left(4^{n-1}\right)$ for a given value of n. Therefore, the equation $w = 9\left(4^{n-1}\right)$ gives w in terms of n.

Choice A is incorrect. This equation describes a sequence for which the first term is 36, rather than 9, and each term after the first is 9, rather than 4, times the preceding term.

Choice B is incorrect. This equation describes a sequence for which the first term is 4, rather than 9, and each term after the first is 9, rather than 4, times the preceding term.

Choice C is incorrect. This equation describes a sequence for which the first term is 36, rather than 9.

Question Difficulty: Hard

Question ID 4661e2a9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 4661e2a9

$x - y = 1$

$x + y = x^2 - 3$

Which ordered pair is a solution to the system of equations above?

A. $(1 + \sqrt{3}, \sqrt{3})$

B. $(\sqrt{3}, -\sqrt{3})$

C. $(1 + \sqrt{5}, \sqrt{5})$

D. $(\sqrt{5}, -1 + \sqrt{5})$

ID: 4661e2a9 Answer

Correct Answer: A

Rationale

Choice A is correct. The solution to the given system of equations can be found by solving the first equation for x, which gives $x = y + 1$, and substituting that value of x into the second equation which gives $y + 1 + y = (y + 1)^2 - 3$. Rewriting this equation by adding like terms and expanding $(y + 1)^2$ gives $2y + 1 = y^2 + 2y - 2$. Subtracting $2y$ from both sides of this equation gives $1 = y^2 - 2$. Adding to 2 to both sides of this equation gives $3 = y^2$. Therefore, it follows that $y = \pm\sqrt{3}$. Substituting $\sqrt{3}$ for y in the first equation yields $x - \sqrt{3} = 1$. Adding $\sqrt{3}$ to both sides of this equation yields $x = 1 + \sqrt{3}$. Therefore, the ordered pair $(1 + \sqrt{3}, \sqrt{3})$ is a solution to the given system of equations.

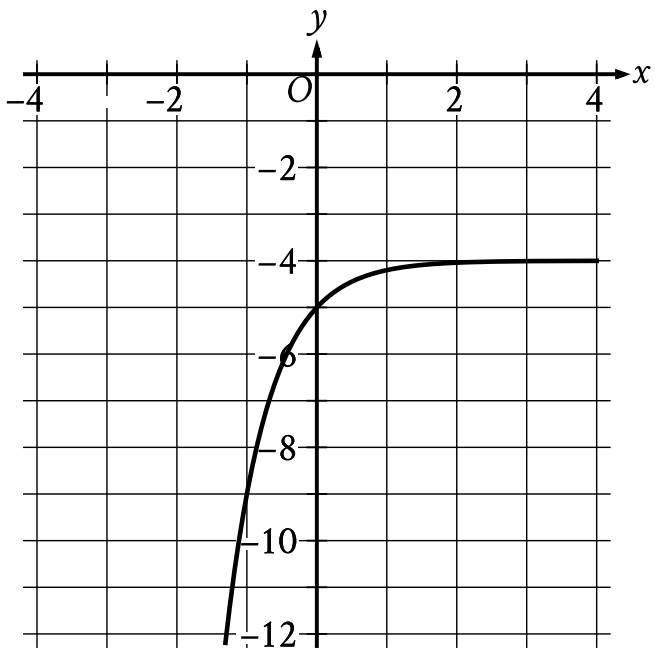
Choice B is incorrect. Substituting $\sqrt{3}$ for x and $-\sqrt{3}$ for y in the first equation yields $\sqrt{3} - (-\sqrt{3}) = 1$, or $2\sqrt{3} = 1$, which isn't a true statement. Choice C is incorrect. Substituting $1 + \sqrt{5}$ for x and $\sqrt{5}$ for y in the second equation yields $(1 + \sqrt{5}) + \sqrt{5} = (1 + \sqrt{5})^2 - 3$, or $1 + 2\sqrt{5} = 2\sqrt{5} + 3$, which isn't a true statement. Choice D is incorrect. Substituting $\sqrt{5}$ for x and $(-1 + \sqrt{5})$ for y in the second equation yields $\sqrt{5} + (-1 + \sqrt{5}) = (\sqrt{5})^2 - 3$, or $2\sqrt{5} - 1 = 2$, which isn't a true statement.

Question Difficulty: Hard

Question ID 6abec9a8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 6abec9a8



What is the y-intercept of the graph shown?

A. $(-1, -9)$

B. $(0, -5)$

C. $(0, -4)$

D. $(0, 0)$

ID: 6abec9a8 Answer

Correct Answer: B

Rationale

Choice B is correct. The *y*-intercept of a graph in the *xy*-plane is the point (x, y) on the graph where $x = 0$. At $x = 0$, the corresponding value of y is -5. Therefore, the *y*-intercept of the graph shown is $(0, -5)$.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect. This is the *y*-intercept of a graph in the *xy*-plane that intersects the *y*-axis at $y = -4$, not $y = -5$.

Choice D is incorrect. This is the *y*-intercept of a graph in the *xy*-plane that intersects the *y*-axis at $y = 0$, not $y = -5$.

Question Difficulty: Easy

Question ID ad2ec615

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: ad2ec615

Which of the following is equivalent to the expression $x^4 - x^2 - 6$?

A. $(x^2 + 1)(x^2 - 6)$

B. $(x^2 + 2)(x^2 - 3)$

C. $(x^2 + 3)(x^2 - 2)$

D. $(x^2 + 6)(x^2 - 1)$

ID: ad2ec615 Answer

Correct Answer: B

Rationale

Choice B is correct. The term x^4 can be factored as $(x^2)(x^2)$. Factoring −6 as $(2)(-3)$ yields values that add to −1, the coefficient of x^2 in the expression.

Choices A, C, and D are incorrect and may result from finding factors of −6 that don't add to the coefficient of x^2 in the original expression.

Question Difficulty: Medium

Question ID 42c71eb5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 42c71eb5

$(2x+5)^2-(x-2)+2(x+3)$

Which of the following is equivalent to the expression above?

A. $4x^2+21x+33$

B. $4x^2+21x+29$

C. $4x^2+x+29$

D. $4x^2+x+33$

ID: 42c71eb5 Answer

Correct Answer: A

Rationale

Choice A is correct. The given expression can be rewritten as $(2x+5)^2+(-1)(x-2)+2(x+3)$. Applying the distributive property, the expression $(-1)(x-2)+2(x+3)$ can be rewritten as $-1(x)+(-1)(-2)+2(x)+2(3)$, or $-x+2+2x+6$. Adding like terms yields $x+8$. Substituting $x+8$ for $(-1)(x-2)+2(x+3)$ in the given expression yields $(2x+5)^2+x+8$. By the rules of exponents, the expression $(2x+5)^2$ is equivalent to $(2x+5)(2x+5)$. Applying the distributive property, this expression can be rewritten as $2x(2x)+2x(5)+5(2x)+5(5)$, or $4x^2+10x+10x+25$. Adding like terms gives $4x^2+20x+25$. Substituting $4x^2+20x+25$ for $(2x+5)^2$ in the rewritten expression yields $4x^2+20x+25+x+8$, and adding like terms yields $4x^2+21x+33$.

Choices B, C, and D are incorrect. Choices C and D may result from rewriting the expression $(2x+5)^2$ as $4x^2+25$, instead of as $4x^2+20x+25$. Choices B and C may result from rewriting the expression $-(x-2)$ as $-x-2$, instead of $-x+2$.

Question Difficulty: Medium

Question ID 52b1700c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 52b1700c

Time (years)	Total amount (dollars)
0	604.00
1	606.42
2	608.84

Rosa opened a savings account at a bank. The table shows the exponential relationship between the time t, in years, since Rosa opened the account and the total amount n, in dollars, in the account. If Rosa made no additional deposits or withdrawals, which of the following equations best represents the relationship between t and n?

A. $n =$ msup

B. $n =$ msup

C. $n = 604$msup

D. $n = 0.004$msup

ID: 52b1700c Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the relationship between t and n is exponential. The table shows that the value of n increases as the value of t increases. Therefore, the relationship between t and n can be represented by an increasing exponential equation of the form $n = a(1 + b)^t$, where a and b are positive constants. The table shows that when $t = 0$, $n = 604$. Substituting 0 for t and 604 for n in the equation $n = a(1 + b)^t$ yields $604 = a(1 + b)^0$, which is equivalent to $604 = a(1)$, or $604 = a$. Substituting 604 for a in the equation $n = a(1 + b)^t$ yields $n = 604(1 + b)^t$. The table also shows that when $t = 1$, $n = 606.42$. Substituting 1 for t and 606.42 for n in the equation $n = 604(1 + b)^t$ yields $606.42 = 604(1 + b)^1$, or $606.42 = 604(1 + b)$. Dividing both sides of this equation by 604 yields approximately $1.004 = 1 + b$. Subtracting 1 from both sides of this equation yields that the value of b is approximately 0.004. Substituting 0.004 for b in the equation $n = 604(1 + b)^t$ yields $n = 604(1 + 0.004)^t$. Therefore, of the choices, choice C best represents the relationship between t and n.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 371cbf6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 371cbf6b

$(ax+3)(5x^2-bx+4)=20x^3-9x^2-2x+12$

The equation above is true for all x, where a and b are constants. What is the value of ab ?

A. 18

B. 20

C. 24

D. 40

ID: 371cbf6b Answer

Correct Answer: C

Rationale

Choice C is correct. If the equation is true for all x, then the expressions on both sides of the equation will be equivalent. Multiplying the polynomials on the left-hand side of the equation gives $5ax^3-abx^2+4ax+15x^2-3bx+12$. On the right-hand side of the equation, the only x^2-term is $-9x^2$. Since the expressions on both sides of the equation are equivalent, it follows that $-abx^2+15x^2=-9x^2$, which can be rewritten as $(-ab+15)x^2=-9x^2$. Therefore, $-ab+15=-9$, which gives $ab=24$.

Choice A is incorrect. If $ab=18$, then the coefficient of x^2 on the left-hand side of the equation would be $-18+15=-3$, which doesn't equal the coefficient of x^2, -9, on the right-hand side. Choice B is incorrect. If $ab=20$, then the coefficient of x^2 on the left-hand side of the equation would be $-20+15=-5$, which doesn't equal the coefficient of x^2, -9, on the right-hand side. Choice D is incorrect. If $ab=40$, then the coefficient of x^2 on the left-hand side of the equation would be $-40+15=-25$, which doesn't equal the coefficient of x^2, -9, on the right-hand side.

Question Difficulty: Hard

Question ID b4acba95

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: b4acba95

$x^2 - 12x + 27 = 0$ How many distinct real solutions does the given equation have?

A. Exactly two

B. Exactly one

C. Zero

D. Infinitely many

ID: b4acba95 Answer

Correct Answer: A

Rationale

Choice A is correct. The number of solutions of a quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. If the value of the discriminant is positive, then the quadratic equation has exactly two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is negative, then the quadratic equation has zero real solutions. In the given equation, $x^2 - 12x + 27 = 0$, $a = 1$, $b = -12$, and $c = 27$. Substituting these values for a, b, and c in $b^2 - 4ac$ yields $(-12)^2 - 4(1)(27)$, or 36. Since the value of its discriminant is positive, the given equation has exactly two distinct real solutions.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID a05bd3a4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a05bd3a4

Which of the following expressions is equivalent to x^2-5?

A. $(x+\sqrt{5})^2$

B. $(x-\sqrt{5})^2$

C. $(x+\sqrt{5})(x-\sqrt{5})$

D. $(x+5)(x-1)$

ID: a05bd3a4 Answer

Correct Answer: C

Rationale

Choice C is correct. The expression can be written as a difference of squares $x^2 - y^2$, which can be factored as $(x + y)(x - y)$. Here, $y^2 = 5$, so $y=\sqrt{5}$, and the expression therefore factors as $(x+\sqrt{5})(x-\sqrt{5})$.

Choices A and B are incorrect and may result from misunderstanding how to factor a difference of squares. Choice D is incorrect; $(x + 5)(x - 1)$ can be rewritten as $x^2 + 4x - 5$, which is not equivalent to the original expression.

Question Difficulty: Medium

Question ID c3b116d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: c3b116d7

Which of the following expressions is(are) a factor of $3x^2 + 20x - 63$?

$x - 9$ $3x - 7$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: c3b116d7 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression can be factored by first finding two values whose sum is 20 and whose product is $3(-63)$, or -189. Those two values are 27 and -7. It follows that the given expression can be rewritten as $3x^2 + 27x - 7x - 63$. Since the first two terms of this expression have a common factor of $3x$ and the last two terms of this expression have a common factor of -7, this expression can be rewritten as $3x(x + 9) - 7(x + 9)$. Since the two terms of this expression have a common factor of $(x + 9)$, it can be rewritten as $(3x - 7)(x + 9)$. Therefore, expression II, $3x - 7$, is a factor of $3x^2 + 20x - 63$, but expression I, $x - 9$, is not a factor of $3x^2 + 20x - 63$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 40c09d66

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 40c09d66

If $\frac{\sqrt{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$ for all positive values of x, what is the value of $\frac{a}{b}$?

ID: 40c09d66 Answer

Rationale

The correct answer is $\frac{7}{6}$. The value of $\frac{a}{b}$ can be found by first rewriting the left-hand side of the given equation as $\frac{x^{\frac{5}{2}}}{x^{\frac{4}{3}}}$. Using the properties of exponents, this expression can be rewritten as $x^{\left(\frac{5}{2}-\frac{4}{3}\right)}$. This expression can be rewritten by subtracting the fractions in the exponent, which yields $x^{\frac{7}{6}}$. Thus, $\frac{a}{b}$ is $\frac{7}{6}$. Note that 7/6, 1.166, and 1.167 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID b8f13a3a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: b8f13a3a

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 12$ has a *y*-intercept at $\left(0, -\frac{75}{7}\right)$. The product of a and b is $\frac{320}{7}$. What is the value of a?

ID: b8f13a3a Answer

Correct Answer: 20

Rationale

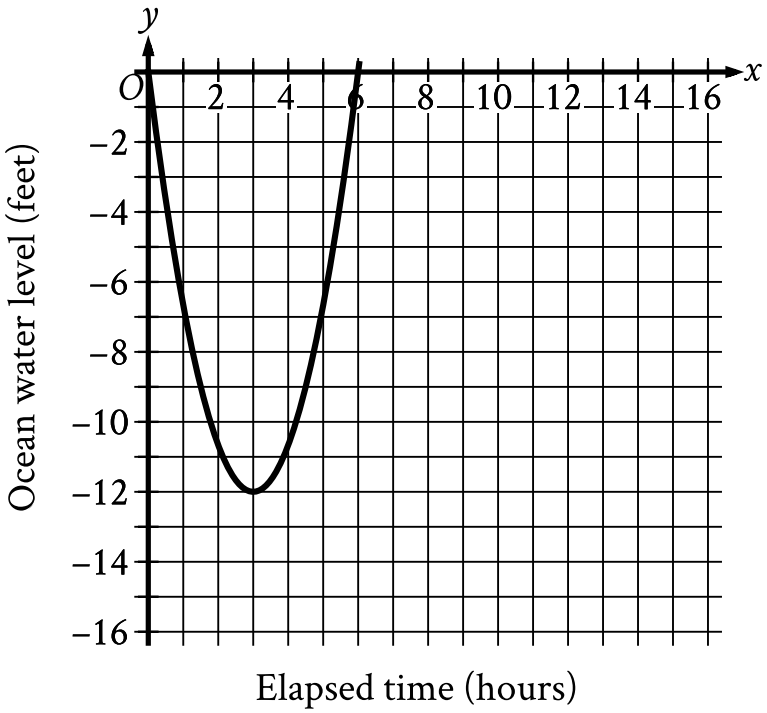
The correct answer is 20. It's given that $f(x) = -a^x + b$. Substituting $-a^x + b$ for $f(x)$ in the equation $y = f(x) - 12$ yields $y = -a^x + b - 12$. It's given that the *y*-intercept of the graph of $y = f(x) - 12$ is $\left(0, -\frac{75}{7}\right)$. Substituting 0 for x and $-\frac{75}{7}$ for y in the equation $y = -a^x + b - 12$ yields $-\frac{75}{7} = -a^0 + b - 12$, which is equivalent to $-\frac{75}{7} = -1 + b - 12$, or $-\frac{75}{7} = b - 13$. Adding 13 to both sides of this equation yields $\frac{16}{7} = b$. It's given that the product of a and b is $\frac{320}{7}$, or $ab = \frac{320}{7}$. Substituting $\frac{16}{7}$ for b in this equation yields $(a)\left(\frac{16}{7}\right) = \frac{320}{7}$. Dividing both sides of this equation by $\frac{16}{7}$ yields $a = 20$.

Question Difficulty: Hard

Question ID 1ee962ec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 1ee962ec



Scientists recorded data about the ocean water levels at a certain location over a period of 6 hours. The graph shown models the data, where $y = 0$ represents sea level. Which table gives values of x and their corresponding values of y based on the model?

A.

x	y
0	−12
0	3
3	6

B.

x	y
0	0
3	12
0	−6

C.

x	y
0	0
3	−12

6	0

D.

x	y
0	0
12	3
-6	0

ID: 1ee962ec Answer

Correct Answer: C

Rationale

Choice C is correct. Each point (x, y) on the graph represents an elapsed time x, in hours, and the corresponding ocean water level y, in feet, at a certain location based on the model. The graph shown passes through the points $(0, 0)$, $(3, -12)$, and $(6, 0)$. Thus, the table in choice C gives the values of x and their corresponding values of y based on the model.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c6a26e14

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: c6a26e14

$|x + 45| = 48$ What is the positive solution to the given equation?

A. 3

B. 48

C. 93

D. 96

ID: c6a26e14 Answer

Correct Answer: A

Rationale

Choice A is correct. The given absolute value equation can be rewritten as two linear equations: $x + 45 = 48$ and $-(x + 45) = 48$, or $x + 45 = -48$. Subtracting 45 from both sides of the equation $x + 45 = 48$ yields $x = 3$. Subtracting 45 from both sides of the equation $x + 45 = -48$ yields $x = -93$. Thus, the given equation has two possible solutions, 3 and -93. Therefore, the positive solution to the given equation is 3.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 07bcecac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 07bcecac

$P(t) = 24.8(1.036)^t$

The function P gives the predicted population, in millions, of a certain country for the period from 1984 to 2018, where t is the number of years after 1984. According to the model, what is the best interpretation of the statement "$P(8)$ is approximately equal to 32.91"?

A. In 1984, the predicted population of this country was approximately 8 million.

B. In 1984, the predicted population of this country was approximately 32.91 million.

C. 8 years after 1984, the predicted population of this country was approximately 32.91 million.

D. 32.91 years after 1984, the predicted population of this country was approximately 8 million.

ID: 07bcecac Answer

Correct Answer: C

Rationale

Choice C is correct. The function P gives the predicted population, in millions, of a certain country for the period from 1984 to 2018, where t is the number of years after 1984. Since the value of $P(8)$ is the value of $P(t)$ when $t = 8$, it follows that "$P(8)$ is approximately equal to 32.91" means that the value of $P(t)$ is approximately equal to 32.91 when $t = 8$. Therefore, the best interpretation of the statement "$P(8)$ is approximately equal to 32.91" is that 8 years after 1984, the predicted population of this country was approximately 32.91 million.

Choice A is incorrect. In 1984, the predicted population of this country was 24.8 million, not approximately 8 million.

Choice B is incorrect. In 1984, the predicted population of this country was 24.8 million, not approximately 32.91 million.

Choice D is incorrect. 32.91 years after 1984, the predicted population of this country was $24.8(1.036)^{32.91}$ million, or approximately 79.42 million, not approximately 8 million.

Question Difficulty: Easy

Question ID ad03127d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: ad03127d

$6r = 7s + t$

The given equation relates the variables r, s, and t. Which equation correctly expresses s in terms of r and t?

A. $s = 42r - t$

B. $s = 7(6r - t)$

C. $s = \frac{6}{7}r - t$

D. $s = \frac{6r-t}{7}$

ID: ad03127d Answer

Correct Answer: D

Rationale

Choice D is correct. Subtracting t from both sides of the given equation yields $6r - t = 7s$. Dividing both sides of this equation by 7 yields $\frac{6r-t}{7} = s$. Therefore, the equation $s = \frac{6r-t}{7}$ correctly expresses s in terms of r and t.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 02add2d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 02add2d2

A company has a newsletter. In January 2018, there were $1{,}300$ customers subscribed to the newsletter. For the next 24 months after January 2018, the total number of customers subscribed to the newsletter each month was 7% greater than the total number subscribed the previous month. Which equation gives the total number of customers, c, subscribed to the company's newsletter m months after January 2018, where $m \leq 24$?

A. $c = 1{,}300$msup (0.07)m次方

B. $c = 1{,}300$msup 1.07。。

C. $c = 1{,}300$msup 1.7

D. $c = 1{,}300$msup 7

ID: 02add2d2 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that in January 2018, there were $1{,}300$ customers subscribed to a company's newsletter and for the next 24 months after January 2018, the total number of customers subscribed to the newsletter each month was 7% greater than the total number subscribed the previous month. It follows that this situation can be represented by the equation $c = a\left(1 + \frac{r}{100}\right)^m$, where c is the total number of customers subscribed to the company's newsletter m months after January 2018, a is the number of customers subscribed to the newsletter in January 2018, and the total number of customers subscribed to the newsletter each month was $r\%$ greater than the total number subscribed the previous month. Substituting $1{,}300$ for a and 7 for r in this equation yields $c = 1{,}300\left(1 + \frac{7}{100}\right)^m$, or $c = 1{,}300(1.07)^m$.

Choice A is incorrect. This equation represents a situation where the total number of customers subscribed each month was 93% less, not 7% greater, than the total number subscribed the previous month.

Choice C is incorrect. This equation represents a situation where the total number of customers subscribed each month was 70%, not 7%, greater than the total number subscribed the previous month.

Choice D is incorrect. This equation represents a situation where the total number of customers subscribed each month was 600%, not 7%, greater than the total number subscribed the previous month.

Question Difficulty: Medium

Question ID f65288e8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: f65288e8

$$\frac{1}{x^2+10x+25}=4$$

If x is a solution to the given equation, which of the following is a possible value of $x+5$?

A. $\frac{1}{2}$

B. $\frac{5}{2}$

C. $\frac{9}{2}$

D. $\frac{11}{2}$

ID: f65288e8 Answer

Correct Answer: A

Rationale

Choice A is correct. The given equation can be rewritten as $\frac{1}{(x+5)^2}=4$. Multiplying both sides of this equation by $(x+5)^2$ yields $1=4(x+5)^2$. Dividing both sides of this equation by 4 yields $\frac{1}{4}=(x+5)^2$. Taking the square root of both sides of this equation yields $\frac{1}{2}=x+5$ or $-\frac{1}{2}=x+5$. Therefore, a possible value of $x+5$ is $\frac{1}{2}$.

Choices B, C, and D are incorrect and may result from computational or conceptual errors.

Question Difficulty: Hard

Question ID 788bfd56

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 788bfd56

The function f is defined by $f(x) = 4 + \sqrt{x}$. What is the value of $f(144)$?

A. 0

B. 16

C. 40

D. 76

ID: 788bfd56 Answer

Correct Answer: B

Rationale

Choice B is correct. The value of $f(144)$ is the value of $f(x)$ when $x = 144$. It's given that the function f is defined by $f(x) = 4 + \sqrt{x}$. Substituting 144 for x in this equation yields $f(144) = 4 + \sqrt{144}$. Since the positive square root of 144 is 12, it follows that this equation can be rewritten as $f(144) = 4 + 12$, or $f(144) = 16$. Therefore, the value of $f(144)$ is 16.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of $f(1{,}296)$, not $f(144)$.

Choice D is incorrect. This is the value of $f(5{,}184)$, not $f(144)$.

Question Difficulty: Easy

Question ID 2c288148

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 2c288148

$\sqrt{k-x} = 58 - x$

In the given equation, k is a constant. The equation has exactly one real solution. What is the minimum possible value of $4k$?

ID: 2c288148 Answer

Correct Answer: 231

Rationale

The correct answer is 231. It's given that $\sqrt{k-x} = 58 - x$. Squaring both sides of this equation yields $k - x = (58 - x)^2$, which is equivalent to the given equation if $58 - x > 0$. It follows that if a solution to the equation $k - x = (58 - x)^2$ satisfies $58 - x > 0$, then it's also a solution to the given equation; if not, it's extraneous. The equation $k - x = (58 - x)^2$ can be rewritten as $k - x = 3{,}364 - 116x + x^2$. Adding x to both sides of this equation yields $k = x^2 - 115x + 3{,}364$. Subtracting k from both sides of this equation yields $0 = x^2 - 115x + (3{,}364 - k)$. The number of solutions to a quadratic equation in the form $0 = ax^2 + bx + c$, where a, b, and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. Substituting -115 for b, 1 for a, and $3{,}364 - k$ for c in $b^2 - 4ac$ yields $(-115)^2 - 4(1)(3{,}364 - k)$, or $4k - 231$. The equation $0 = x^2 - 115x + (3{,}364 - k)$ has exactly one real solution if the discriminant is equal to zero, or $4k - 231 = 0$. Subtracting 231 from both sides of this equation yields $4k = 231$. Dividing both sides of this equation by 4 yields $k = 57.75$. Therefore, if $k = 57.75$, then the equation $0 = x^2 - 115x + (3{,}364 - k)$ has exactly one real solution. Substituting 57.75 for k in this equation yields $0 = x^2 - 115x + (3{,}364 - 57.75)$, or $0 = x^2 - 115x + 3{,}306.25$, which is equivalent to $0 = (x - 57.5)^2$. Taking the square root of both sides of this equation yields $0 = x - 57.5$. Adding 57.5 to both sides of this equation yields $57.5 = x$. To check whether this solution satisfies $58 - x > 0$, the solution, 57.5, can be substituted for x in $58 - x > 0$, which yields $58 - 57.5 > 0$, or $0.5 > 0$. Since 0.5 is greater than 0, it follows that if $k = 57.75$, or $4k = 231$, then the given equation has exactly one real solution. If $4k < 231$, then the discriminant, $4k - 231$, is negative and the given equation has no solutions. Therefore, the minimum possible value of $4k$ is 231.

Question Difficulty: Hard

Question ID 40491607

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 40491607

$f(x) = (x - 1)(x + 3)(x - 2)$

In the *xy*-plane, when the graph of the function f, where $y = f(x)$, is shifted up 6 units, the resulting graph is defined by the function g. If the graph of $y = g(x)$ crosses through the point $(4, b)$, where b is a constant, what is the value of b?

ID: 40491607 Answer

Correct Answer: 48

Rationale

The correct answer is 48. It's given that in the *xy*-plane, when the graph of the function f, where $y = f(x)$, is shifted up 6 units, the resulting graph is defined by the function g. Therefore, function g can be defined by the equation $g(x) = f(x) + 6$. It's given that $f(x) = (x - 1)(x + 3)(x - 2)$. Substituting $(x - 1)(x + 3)(x - 2)$ for $f(x)$ in the equation $g(x) = f(x) + 6$ yields $g(x) = (x - 1)(x + 3)(x - 2) + 6$. For the point $(4, b)$, the value of x is 4. Substituting 4 for x in the equation $g(x) = (x - 1)(x + 3)(x - 2) + 6$ yields $g(4) = (4 - 1)(4 + 3)(4 - 2) + 6$, or $g(4) = 48$. It follows that the graph of $y = g(x)$ crosses through the point $(4, 48)$. Therefore, the value of b is 48.

Question Difficulty: Hard

Question ID 3206b905

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 3206b905

Which of the following expressions is equivalent to $8x^{10} - 8x^9 + 88x$?

A. $x(7x^{10} - 7x^9 + 87x)$

B. $x(8^{10} - 8^9 + 88)$

C. $8x(x^{10} - x^9 + 11x)$

D. $8x(x^9 - x^8 + 11)$

ID: 3206b905 Answer

Correct Answer: D

Rationale

Choice D is correct. Since $8x$ is a common factor of each term in the given expression, the expression can be rewritten as $8x(x^9 - x^8 + 11)$.

Choice A is incorrect. This expression is equivalent to $7x^{11} - 7x^{10} + 87x^2$.

Choice B is incorrect. This expression is equivalent to $8^{10}x - 8^9x + 88x$.

Choice C is incorrect. This expression is equivalent to $8x^{11} - 8x^{10} + 88x^2$.

Question Difficulty: Medium

Question ID f89af023

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f89af023

A rectangular volleyball court has an area of 162 square meters. If the length of the court is twice the width, what is the width of the court, in meters?

A. 9

B. 18

C. 27

D. 54

ID: f89af023 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the volleyball court is rectangular and has an area of 162 square meters. The formula for the area of a rectangle is $A = \ell \cdot w$, where A is the area, ℓ is the length, and w is the width of the rectangle. It's also given that the length of the volleyball court is twice the width, thus $\ell = 2w$. Substituting the given value into the formula for the area of a rectangle and using the relationship between length and width for this rectangle yields $162 = (2w)(w)$. This equation can be rewritten as $162 = 2w^2$. Dividing both sides of this equation by 2 yields $81 = w^2$. Taking the square root of both sides of this equation yields $\pm 9 = w$. Since the width of a rectangle is a positive number, the width of the volleyball court is 9 meters.

Choice B is incorrect because this is the length of the rectangle. Choice C is incorrect because this is the result of using 162 as the perimeter rather than the area. Choice D is incorrect because this is the result of calculating w in the equation $162 = 2w + w$ instead of $162 = (2w)(w)$.

Question Difficulty: Medium

Question ID 7902bed0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 7902bed0

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground h, in meters, of the softball t seconds after it is launched?

A. $h = -t^2 + 3.6$

B. $h = -t^2 + 51.84$

C. $h = -16\text{msup} - 3.6$

D. $h = -16\text{msup} + 51.84$

ID: 7902bed0 Answer

Correct Answer: D

Rationale

Choice D is correct. An equation representing the height above ground h, in meters, of a softball t seconds after it is launched by a machine from ground level can be written in the form $h = -a(t - b)^2 + c$, where a, b, and c are positive constants. In this equation, b represents the time, in seconds, at which the softball reaches its maximum height of c meters above the ground. It's given that this softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds; therefore, $b = 1.8$ and $c = 51.84$. Substituting 1.8 for b and 51.84 for c in the equation $h = -a(t - b)^2 + c$ yields $h = -a(t - 1.8)^2 + 51.84$. It's also given that this softball hits the ground at 3.6 seconds; therefore, $h = 0$ when $t = 3.6$. Substituting 0 for h and 3.6 for t in the equation $h = -a(t - 1.8)^2 + 51.84$ yields $0 = -a(3.6 - 1.8)^2 + 51.84$, which is equivalent to $0 = -a(1.8)^2 + 51.84$, or $0 = -3.24a + 51.84$. Adding $3.24a$ to both sides of this equation yields $3.24a = 51.84$. Dividing both sides of this equation by 3.24 yields $a = 16$. Substituting 16 for a in the equation $h = -a(t - 1.8)^2 + 51.84$ yields $h = -16(t - 1.8)^2 + 51.84$. Therefore, $h = -16(t - 1.8)^2 + 51.84$ represents the height above ground h, in meters, of this softball t seconds after it is launched.

Choice A is incorrect. This equation represents a situation where the maximum height is 3.6 meters above the ground at 0 seconds, not 51.84 meters above the ground at 1.8 seconds.

Choice B is incorrect. This equation represents a situation where the maximum height is 51.84 meters above the ground at 0 seconds, not 1.8 seconds.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 4a0d0399

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 4a0d0399

The function f is defined by $f(x) = a^x + b$, where a and b are constants. In the xy-plane, the graph of $y = f(x)$ has an x-intercept at $(2, 0)$ and a y-intercept at $(0, -323)$. What is the value of b?

ID: 4a0d0399 Answer

Correct Answer: -324

Rationale

The correct answer is -324. It's given that the function f is defined by $f(x) = a^x + b$, where a and b are constants. It's also given that the graph of $y = f(x)$ has a y-intercept at $(0, -323)$. It follows that $f(0) = -323$. Substituting 0 for x and -323 for $f(x)$ in $f(x) = a^x + b$ yields $-323 = a^0 + b$, or $-323 = 1 + b$. Subtracting 1 from each side of this equation yields $-324 = b$. Therefore, the value of b is -324.

Question Difficulty: Hard

Question ID e53add44

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: e53add44

$S(n) = 38{,}000a^n$

The function S above models the annual salary, in dollars, of an employee n years after starting a job, where a is a constant. If the employee's salary increases by 4% each year, what is the value of a ?

A. 0.04

B. 0.4

C. 1.04

D. 1.4

ID: e53add44 Answer

Correct Answer: C

Rationale

Choice C is correct. A model for a quantity S that increases by a certain percentage per time period n is an exponential function in the form $S(n) = I\left(1 + \frac{r}{100}\right)^n$, where I is the initial value at time $n = 0$ for r% annual increase. It's given that the annual increase in an employee's salary is 4%, so $r = 4$. The initial value can be found by substituting 0 for n in the given function, which yields $S(0) = 38{,}000$. Therefore, $I = 38{,}000$. Substituting these values for r and I into the form of the exponential function $S(n) = I\left(1 + \frac{r}{100}\right)^n$ yields $S(n) = 38{,}000\left(1 + \frac{4}{100}\right)^n$, or $S(n) = 38{,}000(1.04)^n$. Therefore, the value of a in the given function is 1.04.

Choices A, B, and D are incorrect and may result from incorrectly representing the annual increase in the exponential function.

Question Difficulty: Medium

Question ID b4a6ed81

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: b4a6ed81

The expression $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, where r is a constant. What is the value of r?

ID: b4a6ed81 Answer

Correct Answer: 6

Rationale

The correct answer is 6. Applying the distributive property to the expression $ry^4(15y - 9)$ yields $15ry^5 - 9ry^4$. Since $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, it follows that $90y^5 - 54y^4$ is also equivalent to $15ry^5 - 9ry^4$. Since these expressions are equivalent, it follows that corresponding coefficients are equivalent. Therefore, $90 = 15r$ and $-54 = -9r$. Solving either of these equations for r will yield the value of r. Dividing both sides of $90 = 15r$ by 15 yields $6 = r$. Therefore, the value of r is 6.

Question Difficulty: Medium

Question ID f2f3fa00

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: f2f3fa00

During a 5-second time interval, the average acceleration a, in meters per second squared, of an object with an initial velocity of 12 meters per second is defined by the equation $a = \frac{v_f - 12}{5}$, where v_f is the final velocity of the object in meters per second. If the equation is rewritten in the form $v_f = xa + y$, where x and y are constants, what is the value of x ?

ID: f2f3fa00 Answer

Rationale

The correct answer is 5. The given equation can be rewritten in the form $v_f = xa + y$, like so: $a = \frac{v_f - 12}{5}$

$v_f - 12 = 5a v_f = 5a + 12$ It follows that the value of x is 5 and the value of y is 12.

Question Difficulty: Hard

Question ID 9654add7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 9654add7

The revenue $f(x)$, in dollars, that a company receives from sales of a product is given by the function *f* above, where *x* is the unit price, in dollars, of the product. The graph of $y = f(x)$ in the *xy*-plane intersects the *x*-axis at 0 and *a*. What does $f(x) = -500x^2 + 25{,}000x$ *a* represent?

A. The revenue, in dollars, when the unit price of the product is $0

B. The unit price, in dollars, of the product that will result in maximum revenue

C. The unit price, in dollars, of the product that will result in a revenue of $0

D. The maximum revenue, in dollars, that the company can make

ID: 9654add7 Answer

Correct Answer: C

Rationale

Choice C is correct. By definition, the y-value when a function intersects the x-axis is 0. It's given that the graph of the function intersects the x-axis at 0 and a, that x is the unit price, in dollars, of a product, and that $f(x)$, where $y = f(x)$, is the revenue, in dollars, that a company receives from the sales of the product. Since the value of a occurs when $y = 0$, a is the unit price, in dollars, of the product that will result in a revenue of $0.

Choice A is incorrect. The revenue, in dollars, when the unit price of the product is $0 is represented by $f(x)$, when $x = 0$.

Choice B is incorrect. The unit price, in dollars, of the product that will result in maximum revenue is represented by the x-coordinate of the maximum of f. Choice D is incorrect. The maximum revenue, in dollars, that the company can make is represented by the y-coordinate of the maximum of f.

Question Difficulty: Hard

Question ID 34847f8a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 34847f8a

$$\frac{2}{x-2}+\frac{3}{x+5}=\frac{rx+t}{(x-2)(x+5)}$$

The equation above is true for all $x>2$, where r and t are positive constants. What is the value of rt?

A. -20

B. 15

C. 20

D. 60

ID: 34847f8a Answer

Correct Answer: C

Rationale

Choice C is correct. To express the sum of the two rational expressions on the left-hand side of the equation as the single rational expression on the right-hand side of the equation, the expressions on the left-hand side must have the same denominator. Multiplying the first expression by $\frac{x+5}{x-5}$ results in $\frac{2(x+5)}{(x-2)(x+5)}$, and multiplying the second expression by $\frac{x-2}{x-2}$ results in $\frac{3(x-2)}{(x-2)(x+5)}$, so the given equation can be rewritten as $\frac{2(x+5)}{(x-2)(x+5)}+\frac{3(x-2)}{(x-2)(x+5)}=\frac{rx+t}{(x-2)(x+5)}$, or $\frac{2x+10}{(x-2)(x+5)}+\frac{3x-6}{(x-2)(x+5)}=\frac{rx+t}{(x-2)(x+5)}$. Since the two rational expressions on the left-hand side of the equation have the same denominator as the rational expression on the right-hand side of the equation, it follows that $(2x+10)+(3x-6)=rx+t$. Combining like terms on the left-hand side yields $5x+4=rx+t$, so it follows that $r=5$ and $t=4$. Therefore, the value of rt is $(5)(4)=20$.

Choice A is incorrect and may result from an error when determining the sign of either r or t. Choice B is incorrect and may result from not distributing the 2 and 3 to their respective terms in $\frac{2(x+5)}{(x-2)(x+5)}+\frac{3(x-2)}{(x-2)(x+5)}=\frac{rx+t}{(x-2)(x+5)}$. Choice D is incorrect and may result from a calculation error.

Question Difficulty: Hard

Question ID cc776a04

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: cc776a04

Which of the following is an equivalent form of $(1.5x-2.4)^2-(5.2x^2-6.4)$?

A. $-2.2x^2+1.6$

B. $-2.2x^2+11.2$

C. $-2.95x^2-7.2x+12.16$

D. $-2.95x^2-7.2x+0.64$

ID: cc776a04 Answer

Correct Answer: C

Rationale

Choice C is correct. The first expression $(1.5x-2.4)^2$ can be rewritten as $(1.5x-2.4)(1.5x-2.4)$. Applying the distributive property to this product yields $(2.25x^2-3.6x-3.6x+5.76)-(5.2x^2-6.4)$. This difference can be rewritten as $(2.25x^2-3.6x-3.6x+5.76)+(-1)(5.2x^2-6.4)$. Distributing the factor of -1 through the second expression yields $2.25x^2-3.6x-3.6x+5.76-5.2x^2+6.4$. Regrouping like terms, the expression becomes $(2.25x^2-5.2x^2)+(-3.6x-3.6x)+(5.76+6.4)$. Combining like terms yields $-2.95x^2-7.2x+12.16$.

Choices A, B, and D are incorrect and likely result from errors made when applying the distributive property or combining the resulting like terms.

Question Difficulty: Medium

Question ID 263f9937

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 263f9937

Growth of a Culture of Bacteria

Day	Number of bacteria per milliliter at end of day
1	2.5×10^5
2	5.0×10^5
3	1.0×10^6

A culture of bacteria is growing at an exponential rate, as shown in the table above. At this rate, on which day would the number of bacteria per milliliter reach 5.12×10^8?

A. Day 5

B. Day 9

C. Day 11

D. Day 12

ID: 263f9937 Answer

Correct Answer: D

Rationale

Choice D is correct. The number of bacteria per milliliter is doubling each day. For example, from day 1 to day 2, the number of bacteria increased from 2.5×10^5 to 5.0×10^5. At the end of day 3 there are 10^6 bacteria per milliliter. At the end of day 4, there will be $10^6 \times 2$ bacteria per milliliter. At the end of day 5, there will be $(10^6 \times 2) \times 2$, or $10^6 \times (2^2)$ bacteria per milliliter, and so on. At the end of day d, the number of bacteria will be $10^6 \times (2^{d-3})$. If the number of bacteria per milliliter will reach 5.12×10^8 at the end of day d, then the equation $10^6\times(2^{d-3})=5.12\times10^8$ must hold. Since 5.12×10^8 can be rewritten as 512×10^6, the equation is equivalent to $2^{d-3}=512$. Rewriting 512 as 2^9 gives $d - 3 = 9$, so $d = 12$. The number of bacteria per milliliter would reach 5.12×10^8 at the end of day 12.

Choices A, B, and C are incorrect. Given the growth rate of the bacteria, the number of bacteria will not reach 5.12×10^8 per milliliter by the end of any of these days.

Question Difficulty: Hard

Question ID 4ac59df6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 4ac59df6

Which expression is equivalent to $(8yz)(y)(7z)$?

A. $56y^2z^2$

B. $56y^2z$

C. $56yz$

D. $16yz$

ID: 4ac59df6 Answer

Correct Answer: A

Rationale

Choice A is correct. The given expression can be rewritten as $(8 \cdot 7)(y \cdot y)(z \cdot z)$, which is equivalent to $(56)(y^2)(z^2)$, or $56y^2z^2$.

Choice B is incorrect. This expression is equivalent to $(8yz)(y)(7)$.

Choice C is incorrect. This expression is equivalent to $(8z)(y)(7)$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 926c246b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 926c246b

$D = 5{,}640(1.9)^t$

The equation above estimates the global data traffic D, in terabytes, for the year that is t years after 2010. What is the best interpretation of the number 5,640 in this context?

A. The estimated amount of increase of data traffic, in terabytes, each year

B. The estimated percent increase in the data traffic, in terabytes, each year

C. The estimated data traffic, in terabytes, for the year that is t years after 2010

D. The estimated data traffic, in terabytes, in 2010

ID: 926c246b Answer

Correct Answer: D

Rationale

Choice D is correct. Since t represents the number of years after 2010, the estimated data traffic, in terabytes, in 2010 can be calculated using the given equation when $t = 0$. Substituting 0 for t in the given equation yields $D = 5{,}640(1.9)^0$, or $5{,}640(1) = 5{,}640$. Thus, 5,640 represents the estimated data traffic, in terabytes, in 2010.

Choice A is incorrect. Since the equation is exponential, the amount of increase of data traffic each year isn't constant. Choice B is incorrect. According to the equation, the percent increase in data traffic each year is 90%. Choice C is incorrect. The estimated data traffic, in terabytes, for the year that is t years after 2010 is represented by D, not the number 5,640.

Question Difficulty: Medium

Question ID 84e5e36c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 84e5e36c

$y = 76$
$y = x^2 - 5$

The graphs of the given equations in the *xy*-plane intersect at the point (x, y). What is a possible value of x?

A. $-\frac{76}{5}$

B. -9

C. 5

D. 76

ID: 84e5e36c Answer

Correct Answer: B

Rationale

Choice B is correct. Since the point (x, y) is an intersection point of the graphs of the given equations in the *xy*-plane, the pair (x, y) should satisfy both equations, and thus is a solution of the given system. According to the first equation, $y = 76$. Substituting 76 in place of y in the second equation yields $x^2 - 5 = 76$. Adding 5 to both sides of this equation yields $x^2 = 81$. Taking the square root of both sides of this equation yields two solutions: $x = 9$ and $x = -9$. Of these two solutions, only -9 is given as a choice.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of coordinate y, rather than x, of the intersection point (x, y).

Question Difficulty: Easy

Question ID ff2c1431

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: ff2c1431

$7m = 5(n + p)$

The given equation relates the positive numbers m, n, and p. Which equation correctly gives n in terms of m and p?

A. $n = \frac{5p}{7m}$

B. $n = \frac{7m}{5} - p$

C. $n = 5(7m) + p$

D. $n = 7m - 5 - p$

ID: ff2c1431 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $7m = 5(n + p)$ relates the positive numbers m, n, and p. Dividing both sides of the given equation by 5 yields $\frac{7m}{5} = n + p$. Subtracting p from both sides of this equation yields $\frac{7m}{5} - p = n$, or $n = \frac{7m}{5} - p$. It follows that the equation $n = \frac{7m}{5} - p$ correctly gives n in terms of m and p.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 137cc6fd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 137cc6fd

$\sqrt[5]{70n}\left(\sqrt[6]{70n}\right)^2$ For what value of x is the given expression equivalent to $(70n)^{30x}$, where $n > 1$?

ID: 137cc6fd Answer

Correct Answer: .0177, .0178, 4/225

Rationale

The correct answer is $\frac{4}{225}$. An expression of the form $\sqrt[k]{a}$, where k is an integer greater than 1 and $a \geq 0$, is equivalent to $a^{\frac{1}{k}}$. Therefore, the given expression, where $n > 1$, is equivalent to $(70n)^{\frac{1}{5}}\left((70n)^{\frac{1}{6}}\right)^2$. Applying properties of exponents, this expression can be rewritten as $(70n)^{\frac{1}{5}}(70n)^{\frac{1}{6}\cdot 2}$, or $(70n)^{\frac{1}{5}}(70n)^{\frac{1}{3}}$, which can be rewritten as $(70n)^{\frac{1}{5}+\frac{1}{3}}$, or $(70n)^{\frac{8}{15}}$. It's given that the expression $\sqrt[5]{70n}\left(\sqrt[6]{70n}\right)^2$ is equivalent to $(70n)^{30x}$, where $n > 1$. It follows that $(70n)^{\frac{8}{15}}$ is equivalent to $(70n)^{30x}$. Therefore, $\frac{8}{15} = 30x$. Dividing both sides of this equation by 30 yields $\frac{8}{450} = x$, or $\frac{4}{225} = x$. Thus, the value of x for which the given expression is equivalent to $(70n)^{30x}$, where $n > 1$, is $\frac{4}{225}$. Note that 4/225, .0177, .0178, 0.017, and 0.018 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 6ce95fc8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 6ce95fc8

$2x^2-2=2x+3$

Which of the following is a solution to the equation above?

A. 2

B. $1-\sqrt{11}$

C. $\frac{1}{2}+\sqrt{11}$

D. $\frac{1+\sqrt{11}}{2}$

ID: 6ce95fc8 Answer

Correct Answer: D

Rationale

Choice D is correct. A quadratic equation in the form $ax^2+bx+c=0$, where a, b, and c are constants, can be solved using the quadratic formula: $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$. Subtracting $2x+3$ from both sides of the given equation yields $2x^2-2x-5=0$. Applying the quadratic formula, where $a=2$, $b=-2$, and $c=-5$, yields $x=\frac{-(-2)\pm\sqrt{(-2)^2-4(2)(-5)}}{2(2)}$. This can be rewritten as $x=\frac{2\pm\sqrt{44}}{4}$. Since $\sqrt{44}=\sqrt{2^2(11)}$, or $2\sqrt{11}$, the equation can be rewritten as $x=\frac{2\pm2\sqrt{11}}{4}$. Dividing 2 from both the numerator and denominator yields $\frac{1+\sqrt{11}}{2}$ or $\frac{1-\sqrt{11}}{2}$. Of these two solutions, only $\frac{1+\sqrt{11}}{2}$ is present among the choices. Thus, the correct choice is D.

Choice A is incorrect and may result from a computational or conceptual error. Choice B is incorrect and may result from using $x=\frac{-b\pm\sqrt{b^2-4ac}}{a}$ instead of $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ as the quadratic formula. Choice C is incorrect and may result from rewriting $\sqrt{44}$ as $4\sqrt{11}$ instead of $2\sqrt{11}$.

Question Difficulty: Hard

Question ID 4dd4efcf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 4dd4efcf

$f(x) = ax^2 + 4x + c$

In the given quadratic function, a and c are constants. The graph of $y = f(x)$ in the *xy*-plane is a parabola that opens upward and has a vertex at the point (h, k), where h and k are constants. If $k < 0$ and $f(-9) = f(3)$, which of the following must be true?

$c < 0$ $a \geq 1$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 4dd4efcf Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the graph of $y = f(x)$ in the *xy*-plane is a parabola with vertex (h, k). If $f(-9) = f(3)$, then for the graph of $y = f(x)$, the point with an *x*-coordinate of -9 and the point with an *x*-coordinate of 3 have the same *y*-coordinate. In the *xy*-plane, a parabola is a symmetric graph such that when two points have the same *y*-coordinate, these points are equidistant from the vertex, and the *x*-coordinate of the vertex is halfway between the *x*-coordinates of these two points. Therefore, for the graph of $y = f(x)$, the points with *x*-coordinates -9 and 3 are equidistant from the vertex, (h, k), and h is halfway between -9 and 3. The value that is halfway between -9 and 3 is $\frac{-9+3}{2}$, or -3. Therefore, $h = -3$. The equation defining f can also be written in vertex form, $f(x) = a(x - h)^2 + k$. Substituting -3 for h in this equation yields $f(x) = a(x - (-3))^2 + k$, or $f(x) = a(x + 3)^2 + k$. This equation is equivalent to $f(x) = a(x^2 + 6x + 9) + k$, or $f(x) = ax^2 + 6ax + 9a + k$. Since $f(x) = ax^2 + 4x + c$, it follows that $6a = 4$ and $9a + k = c$. Dividing both sides of the equation $6a = 4$ by 6 yields $a = \frac{4}{6}$, or $a = \frac{2}{3}$. Since $\frac{2}{3} < 1$, it's not true that $a \geq 1$. Therefore, statement II isn't true. Substituting $\frac{2}{3}$ for a in the equation $9a + k = c$ yields $9(\frac{2}{3}) + k = c$, or $6 + k = c$. Subtracting 6 from both sides of this equation yields $k = c - 6$. If $k < 0$, then $c - 6 < 0$, or $c < 6$. Since c could be any value less than 6, it's not necessarily true that $c < 0$. Therefore, statement I isn't necessarily true. Thus, neither I nor II must be true.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

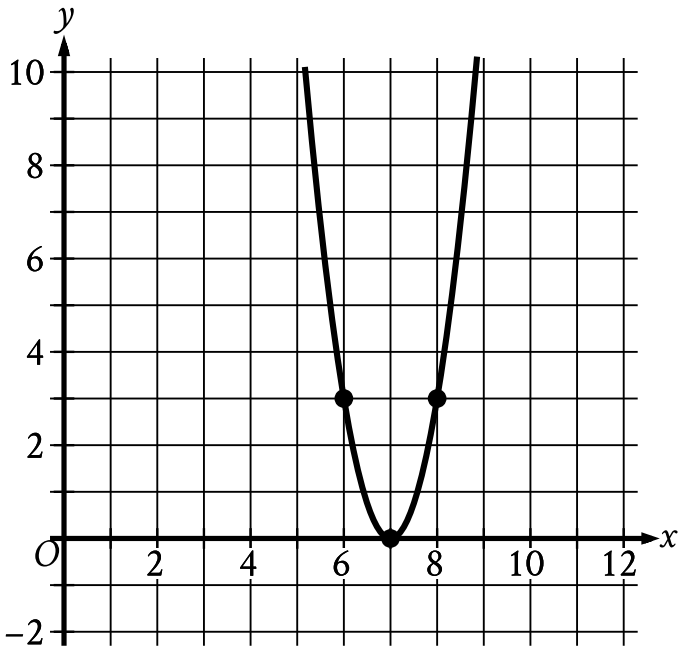
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID cc2601cb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: cc2601cb



The *x*-intercept of the graph shown is $(x, 0)$. What is the value of x?

ID: cc2601cb Answer

Correct Answer: 7

Rationale

The correct answer is 7. It's given that the *x*-intercept of the graph shown is $(x, 0)$. The graph passes through the point $(7, 0)$. Therefore, the value of x is 7.

Question Difficulty: Easy

Question ID 6bdcac03

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 6bdcac03

$x^2 = -841$ How many distinct real solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 6bdcac03 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the square of a real number is never negative, the given equation isn't true for any real value of x. Therefore, the given equation has zero distinct real solutions.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID f5aa5040

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: f5aa5040

In the *xy*-plane, a line with equation $2y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has equation $y = -2x^2 + 9x$, what is the value of c?

ID: f5aa5040 Answer

Correct Answer: 20.25, 81/4

Rationale

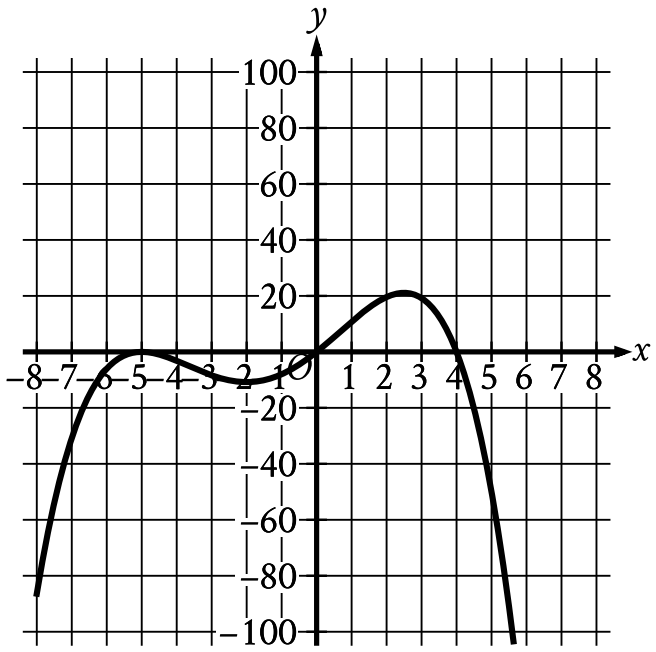
The correct answer is $\frac{81}{4}$. The given linear equation is $2y = c$. Dividing both sides of this equation by 2 yields $y = \frac{c}{2}$. Substituting $\frac{c}{2}$ for y in the equation of the parabola yields $\frac{c}{2} = -2x^2 + 9x$. Adding $2x^2$ and $-9x$ to both sides of this equation yields $2x^2 - 9x + \frac{c}{2} = 0$. Since it's given that the line and the parabola intersect at exactly one point, the equation $2x^2 - 9x + \frac{c}{2} = 0$ must have exactly one solution. An equation of the form $Ax^2 + Bx + C = 0$, where A, B, and C are constants, has exactly one solution when the discriminant, $B^2 - 4AC$, is equal to 0. In the equation $2x^2 - 9x + \frac{c}{2} = 0$, where $A = 2$, $B = -9$, and $C = \frac{c}{2}$, the discriminant is $(-9)^2 - 4(2)\left(\frac{c}{2}\right)$. Setting the discriminant equal to 0 yields $(-9)^2 - 4(2)\left(\frac{c}{2}\right) = 0$, or $81 - 4c = 0$. Adding $4c$ to both sides of this equation yields $81 = 4c$. Dividing both sides of this equation by 4 yields $c = \frac{81}{4}$. Note that 81/4 and 20.25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 252a3b3a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 252a3b3a



Which of the following could be the equation of the graph shown in the *xy*-plane?

A. $y = -\frac{1}{10}x(x-4)(x+5)$

B. $y = -\frac{1}{10}x(x-4)(x+5)^2$

C. $y = -\frac{1}{10}x(x-5)(x+4)$

D. $y = -\frac{1}{10}x\text{msup}(x+4)$

ID: 252a3b3a Answer

Correct Answer: B

Rationale

Choice B is correct. Each of the given choices is an equation of the form $y = -\frac{1}{10}x(x-a)^m(x+b)^n$, where a, b, m, and n are positive constants. In the *xy*-plane, the graph of an equation of this form has *x*-intercepts at $x = 0$, $x = a$, and $x = -b$. The graph shown has *x*-intercepts at $x = 0$, $x = 4$, and $x = -5$. Therefore, $a = 4$ and $b = 5$. Of the given choices, only choices A and B have $a = 4$ and $b = 5$. For an equation in the form $y = -\frac{1}{10}x(x-a)^m(x+b)^n$, if all values of x that are less than $-b$ or greater than a correspond to negative *y*-values, then the sum of all the exponents of the factors on the right-hand side of the equation is even. In the graph shown, all values of x less than -5 or greater than 4 correspond to negative *y*-values. Therefore, the sum of all the exponents of the factors on the right-hand side of the equation $y = -\frac{1}{10}x(x-4)^m(x+5)^n$ must be even. For choice A, the sum of these exponents is $1 + 1 + 1$, or 3, which is odd. For choice B, the sum of these exponents is $1 + 1 + 2$, or 4, which is even. Therefore, $y = -\frac{1}{10}x(x-4)(x+5)^2$ could be the equation of the graph shown.

Choice A is incorrect. For the graph of this equation, all values of x less than -5 correspond to positive, not negative, *y*-values.

Choice C is incorrect. The graph of this equation has *x*-intercepts at $x = -4$, $x = 0$, and $x = 5$, rather than *x*-intercepts at $x = -5$, $x = 0$, and $x = 4$.

Choice D is incorrect. The graph of this equation has *x*-intercepts at $x = -4$, $x = 0$, and $x = 5$, rather than *x*-intercepts at $x = -5$, $x = 0$, and $x = 4$.

Question Difficulty: Medium

Question ID 2992ac30

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 2992ac30

$P(t) = 260(1.04)^{(\frac{6}{4})t}$

The function P models the population, in thousands, of a certain city t years after 2003. According to the model, the population is predicted to increase by 4% every n months. What is the value of n?

A. 8

B. 12

C. 18

D. 72

ID: 2992ac30 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function P models the population, in thousands, of a certain city t years after 2003. The value of the base of the given exponential function, 1.04, corresponds to an increase of 4% for every increase of 1 in the exponent, $(\frac{6}{4})t$. If the exponent is equal to 0, then $(\frac{6}{4})t = 0$. Multiplying both sides of this equation by $(\frac{4}{6})$ yields $t = 0$. If the exponent is equal to 1, then $(\frac{6}{4})t = 1$. Multiplying both sides of this equation by $(\frac{4}{6})$ yields $t = \frac{4}{6}$, or $t = \frac{2}{3}$. Therefore, the population is predicted to increase by 4% every $\frac{2}{3}$ of a year. It's given that the population is predicted to increase by 4% every n months. Since there are 12 months in a year, $\frac{2}{3}$ of a year is equivalent to $(\frac{2}{3})(12)$, or 8, months. Therefore, the value of n is 8.

Choice B is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^t$, not $P(t) = 260(1.04)^{(\frac{6}{4})t}$.

Choice C is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^{(\frac{4}{6})t}$, not $P(t) = 260(1.04)^{(\frac{6}{4})t}$.

Choice D is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^{(\frac{1}{6})t}$, not $P(t) = 260(1.04)^{(\frac{6}{4})t}$.

Question Difficulty: Hard

Question ID 3d7d7534

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 3d7d7534

$(d-30)(d+30)-7=-7$ What is a solution to the given equation?

ID: 3d7d7534 Answer

Correct Answer: 30, -30

Rationale

The correct answer is either -30 or 30. Adding 7 to each side of the given equation yields $(d-30)(d+30)=0$. Since a product of two factors is equal to 0 if and only if at least one of the factors is 0, either $d-30=0$ or $d+30=0$. Adding 30 to each side of the equation $d-30=0$ yields $d=30$. Subtracting 30 from each side of the equation $d+30=0$ yields $d=-30$. Therefore, the solutions to the given equation are -30 and 30. Note that -30 and 30 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 841ef26c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 841ef26c

$f(x) = 4x^2 + 64x + 262$

The function g is defined by $g(x) = f(x + 5)$. For what value of x does $g(x)$ reach its minimum?

A. -13

B. -8

C. -5

D. -3

ID: 841ef26c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $g(x) = f(x + 5)$. Since $f(x) = 4x^2 + 64x + 262$, it follows that $f(x + 5) = 4(x + 5)^2 + 64(x + 5) + 262$. Expanding the quantity $(x + 5)^2$ in this equation yields $f(x + 5) = 4(x^2 + 10x + 25) + 64(x + 5) + 262$. Distributing the 4 and the 64 yields $f(x + 5) = 4x^2 + 40x + 100 + 64x + 320 + 262$. Combining like terms yields $f(x + 5) = 4x^2 + 104x + 682$. Therefore, $g(x) = 4x^2 + 104x + 682$. For a quadratic function defined by an equation of the form $g(x) = a(x - h)^2 + k$, where a, h, and k are constants and a is positive, $g(x)$ reaches its minimum, k, when the value of x is h. The equation $g(x) = 4x^2 + 104x + 682$ can be rewritten in this form by completing the square. This equation is equivalent to $g(x) = 4(x^2 + 26) + 682$, or $g(x) = 4(x^2 + 26x + 169 - 169) + 682$. This equation can be rewritten as $g(x) = 4((x + 13)^2 - 169) + 682$, or $g(x) = 4(x + 13)^2 - 4(169) + 682$, which is equivalent to $g(x) = 4(x + 13)^2 + 6$. This equation is in the form $g(x) = a(x - h)^2 + k$, where $a = 4$, $h = -13$, and $k = 6$. Therefore, $g(x)$ reaches its minimum when the value of x is -13.

Choice B is incorrect. This is the value of x for which $f(x)$, rather than $g(x)$, reaches its minimum.

Choice C is incorrect and may result from conceptual or calculation errors.

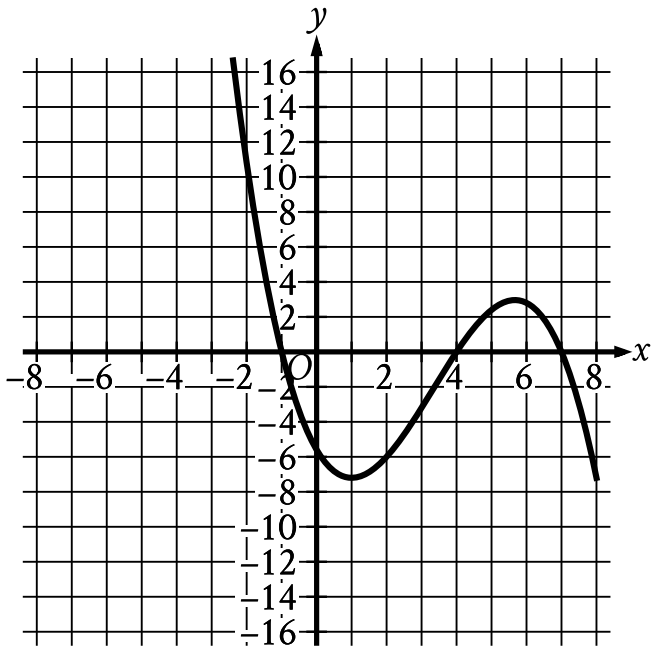
Choice D is incorrect. This is the value of x for which $f(x - 5)$, rather than $f(x + 5)$, reaches its minimum.

Question Difficulty: Hard

Question ID cc6ccd71

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: cc6ccd71



The graph of $y = f(x)$ is shown, where the function f is defined by $f(x) = ax^3 + bx^2 + cx + d$ and a, b, c, and d are constants. For how many values of x does $f(x) = 0$?

A. One

B. Two

C. Three

D. Four

ID: cc6ccd71 Answer

Correct Answer: C

Rationale

Choice C is correct. If a value of x satisfies $f(x) = 0$, the graph of $y = f(x)$ will contain a point $(x, 0)$ and thus touch the *x*-axis. Since there are 3 points at which this graph touches the *x*-axis, there are 3 values of x for which $f(x) = 0$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 70482e20

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 70482e20

Which expression is equivalent to $11x^3 - 5x^3$?

A. $16x^3$

B. $6x^3$

C. $6x^6$

D. $16x^6$

ID: 70482e20 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression can be rewritten as $11x^3 + (-5)x^3$. Since the two terms of this expression are both constant multiples of x^3, they are like terms and can, therefore, be combined through addition. Adding like terms in the expression $11x^3 + (-5)x^3$ yields $6x^3$.

Choice A is incorrect. This is equivalent to $11x^3 + 5x^3$, not $11x^3 - 5x^3$.

Choice C is incorrect. This is equivalent to $11x^6 - 5x^6$, not $11x^3 - 5x^3$.

Choice D is incorrect. This is equivalent to $11x^6 + 5x^6$, not $11x^3 - 5x^3$.

Question Difficulty: Easy

Question ID 8452c42b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 8452c42b

Which expression is equivalent to $50x^2 + 5x^2$?

A. $250x^2$

B. $10x^2$

C. $45x^2$

D. $55x^2$

ID: 8452c42b Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression shows addition of two like terms. Therefore, the given expression is equivalent to $(50 + 5)x^2$, or $55x^2$.

Choice A is incorrect. This expression is equivalent to $(50)(5)x^2$, not $(50 + 5)x^2$.

Choice B is incorrect. This expression is equivalent to $\left(\frac{50}{5}\right)x^2$, not $(50 + 5)x^2$.

Choice C is incorrect. This expression is equivalent to $(50 - 5)x^2$, not $(50 + 5)x^2$.

Question Difficulty: Easy

Question ID b39d74a0

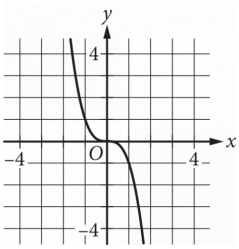
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: b39d74a0

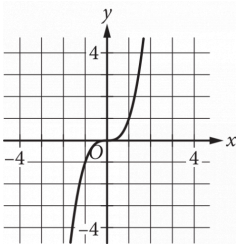
x	y
0	0
1	1
2	8
3	27

The table shown includes some values of x and their corresponding values of y. Which of the following graphs in the xy-plane could represent the relationship between x and y ?

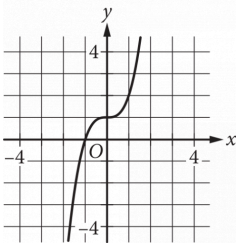
A.



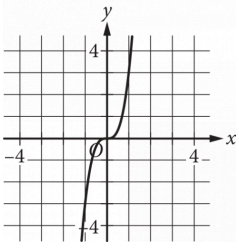
B.



C.



D.



ID: b39d74a0 Answer

Correct Answer: B

Rationale

Choice B is correct. Each pair of values shown in the table gives the ordered pair of coordinates for a point that lies on the graph that represents the relationship between x and y in the xy-plane: $(0,0)$, $(1,1)$, $(2,8)$, and $(3,27)$. Only the graph in choice B passes through the points listed in the table that are visible in the given choices.

Choices A, C, and D are incorrect. None of these graphs passes through the point $(1,1)$.

Question Difficulty: Easy

Question ID ea6d05bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: ea6d05bb

The expression $(3x - 23)(19x + 6)$ is equivalent to the expression $ax^2 + bx + c$, where a, b, and c are constants. What is the value of b?

ID: ea6d05bb Answer

Correct Answer: -419

Rationale

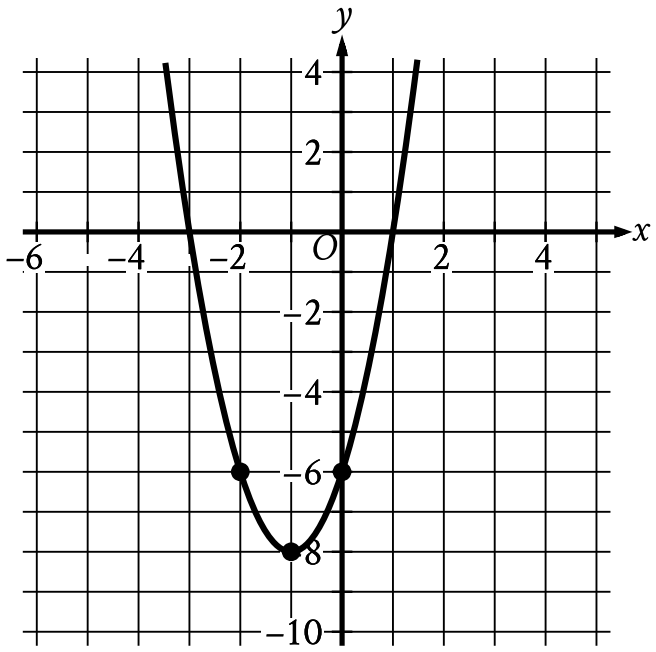
The correct answer is -419. It's given that the expression $(3x - 23)(19x + 6)$ is equivalent to the expression $ax^2 + bx + c$, where a, b, and c are constants. Applying the distributive property to the given expression, $(3x - 23)(19x + 6)$, yields $(3x)(19x) + (3x)(6) - (23)(19x) - (23)(6)$, which can be rewritten as $57x^2 + 18x - 437x - 138$. Combining like terms yields $57x^2 - 419x - 138$. Since this expression is equivalent to $ax^2 + bx + c$, it follows that the value of b is -419.

Question Difficulty: Hard

Question ID 09d21d79

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 09d21d79



The graph of $y = 2x^2 + bx + c$ is shown, where b and c are constants. What is the value of bc?

ID: 09d21d79 Answer

Correct Answer: -24

Rationale

The correct answer is -24. Since the graph passes through the point $(0, -6)$, it follows that when the value of x is 0, the value of y is -6. Substituting 0 for x and -6 for y in the given equation yields $-6 = 2(0)^2 + b(0) + c$, or $-6 = c$. Therefore, the value of c is -6. Substituting -6 for c in the given equation yields $y = 2x^2 + bx - 6$. Since the graph passes through the point $(-1, -8)$, it follows that when the value of x is -1, the value of y is -8. Substituting -1 for x and -8 for y in the equation $y = 2x^2 + bx - 6$ yields $-8 = 2(-1)^2 + b(-1) - 6$, or $-8 = 2 - b - 6$, which is equivalent to $-8 = -4 - b$. Adding 4 to each side of this equation yields $-4 = -b$. Dividing each side of this equation by -1 yields $4 = b$. Since the value of b is 4 and the value of c is -6, it follows that the value of bc is $(4)(-6)$, or -24.

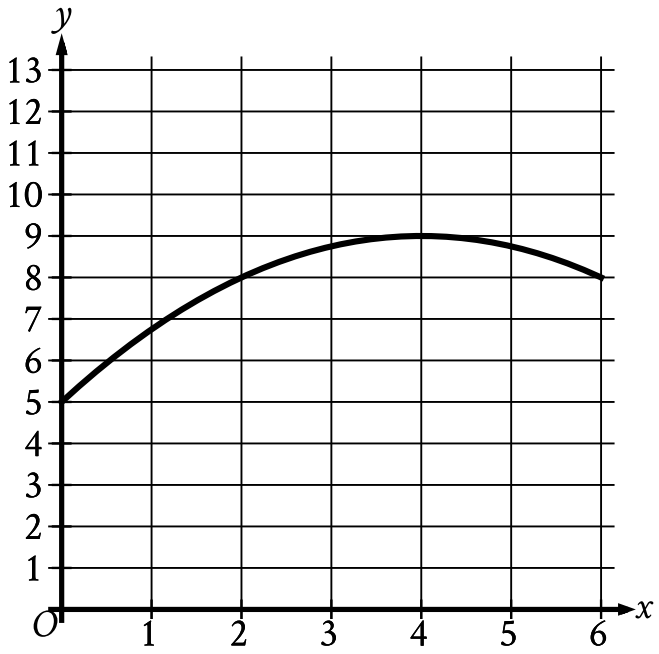
Alternate approach: The given equation represents a parabola in the *xy*-plane with a vertex at $(-1, -8)$. Therefore, the given equation, $y = 2x^2 + bx + c$, which is written in standard form, can be written in vertex form, $y = a(x - h)^2 + k$, where (h, k) is the vertex of the parabola and a is the value of the coefficient on the x^2 term when the equation is written in standard form. It follows that $a = 2$. Substituting 2 for a, -1 for h, and -8 for k in this equation yields $y = 2(x - (-1))^2 + (-8)$, or $y = 2(x + 1)^2 - 8$. Squaring the binomial on the right-hand side of this equation yields $y = 2(x^2 + 2x + 1) - 8$. Multiplying each term inside the parentheses on the right-hand side of this equation by 2 yields $y = 2x^2 + 4x + 2 - 8$, which is equivalent to $y = 2x^2 + 4x - 6$. From the given equation $y = 2x^2 + bx + c$, it follows that the value of b is 4 and the value of c is -6. Therefore, the value of bc is $(4)(-6)$, or -24.

Question Difficulty: Hard

Question ID 95d1c344

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 95d1c344



The graph models the number of active projects a company was working on x months after the end of November 2012, where $0 \leq x \leq 6$. According to the model, what is the predicted number of active projects the company was working on at the end of November 2012?

A. 0

B. 5

C. 8

D. 9

ID: 95d1c344 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph models the number of active projects a company was working on x months after the end of November 2012. Therefore, the value of x that corresponds to the end of November 2012 is 0. The point at which $x = 0$ is the *y*-intercept of the graph. It follows that the *y*-intercept of the graph shown is the point $(0, 5)$. Therefore, according to the model, the predicted number of active projects the company was working on at the end of November 2012 is 5.

Choice A is incorrect. This is the value of x that corresponds to the end of November 2012, not the predicted number of active projects the company was working on at the end of November 2012.

Choice C is incorrect. This is the predicted number of active projects the company was working on 2 months after the end of November 2012.

Choice D is incorrect. This is the predicted number of active projects the company was working on 4 months after the end of November 2012.

Question Difficulty: Medium

Question ID 0536ad4f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 0536ad4f

Which expression is equivalent to $20w - (4w + 3w)$?

A. $10w$

B. $13w$

C. $19w$

D. $21w$

ID: 0536ad4f Answer

Correct Answer: B

Rationale

Choice B is correct. Combining like terms inside the parentheses of the given expression, $20w - (4w + 3w)$, yields $20w - (7w)$. Combining like terms in this resulting expression yields $13w$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 433184f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 433184f1

Which expression is equivalent to $\frac{4}{4x-5} - \frac{1}{x+1}$?

A. $\frac{1}{(x+1)(4x-5)}$

B. $\frac{3}{3x-6}$

C. $-\frac{1}{(x+1)(4x-5)}$

D. $\frac{9}{(x+1)(4x-5)}$

ID: 433184f1 Answer

Correct Answer: D

Rationale

Choice D is correct. The expression $\frac{4}{4x-5} - \frac{1}{x+1}$ can be rewritten as $\frac{4}{4x-5} + \frac{(-1)}{x+1}$. To add the two terms of this expression, the terms can be rewritten with a common denominator. Since $\frac{x+1}{x+1} = 1$, the expression $\frac{4}{4x-5}$ can be rewritten as $\frac{(x+1)(4)}{(x+1)(4x-5)}$. Since $\frac{4x-5}{4x-5} = 1$, the expression $\frac{-1}{x+1}$ can be rewritten as $\frac{(4x-5)(-1)}{(4x-5)(x+1)}$. Therefore, the expression $\frac{4}{4x-5} + \frac{(-1)}{x+1}$ can be rewritten as $\frac{(x+1)(4)}{(x+1)(4x-5)} + \frac{(4x-5)(-1)}{(4x-5)(x+1)}$, which is equivalent to $\frac{(x+1)(4)+(4x-5)(-1)}{(x+1)(4x-5)}$. Applying the distributive property to each term of the numerator yields $\frac{(4x+4)+(-4x+5)}{(x+1)(4x-5)}$, or $\frac{(4x+(-4x))+(4+5)}{(x+1)(4x-5)}$. Adding like terms in the numerator yields $\frac{9}{(x+1)(4x-5)}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID d135f4bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: d135f4bf

The function f is defined by $f(x) = (x - 6)(x - 2)(x + 6)$. In the *xy*-plane, the graph of $y = g(x)$ is the result of translating the graph of $y = f(x)$ up 4 units. What is the value of $g(0)$?

ID: d135f4bf Answer

Correct Answer: 76

Rationale

The correct answer is 76. It's given that the graph of $y = g(x)$ is the result of translating the graph of $y = f(x)$ up 4 units in the *xy*-plane. It follows that the graph of $y = g(x)$ is the same as the graph of $y = f(x) + 4$. Substituting $g(x)$ for y in the equation $y = f(x) + 4$ yields $g(x) = f(x) + 4$. It's given that $f(x) = (x - 6)(x - 2)(x + 6)$. Substituting $(x - 6)(x - 2)(x + 6)$ for $f(x)$ in the equation $g(x) = f(x) + 4$ yields $g(x) = (x - 6)(x - 2)(x + 6) + 4$. Substituting 0 for x in this equation yields $g(0) = (0 - 6)(0 - 2)(0 + 6) + 4$, or $g(0) = 76$. Thus, the value of $g(0)$ is 76.

Question Difficulty: Hard

Question ID 1d3fee25

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 1d3fee25

Which of the following is equivalent to $3(x+5)-6$?

A. $3x-3$

B. $3x-1$

C. $3x+9$

D. $15x-6$

ID: 1d3fee25 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the distributive property to multiply 3 and $(x+5)$ gives $3x+15-6$, which can be rewritten as $3x+9$.

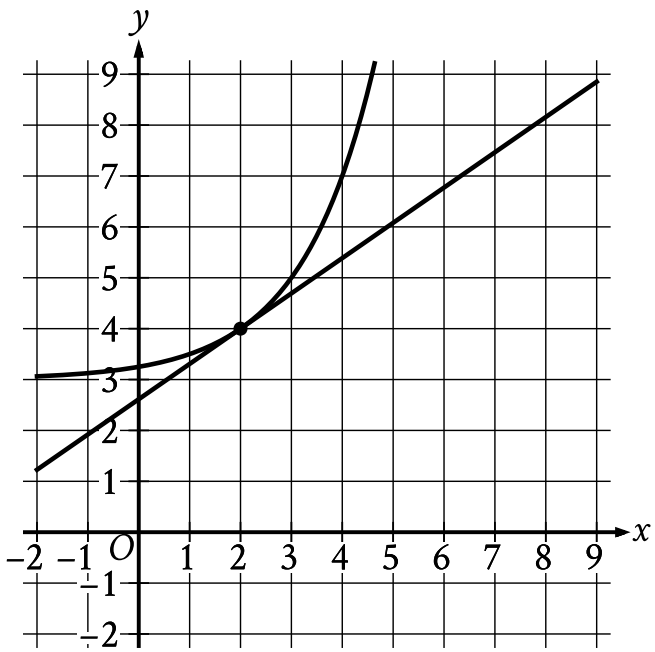
Choice A is incorrect and may result from rewriting the given expression as $3(x+5-6)$. Choice B is incorrect and may result from incorrectly rewriting the expression as $(3x+5)-6$. Choice D is incorrect and may result from incorrectly rewriting the expression as $3(5x)-6$.

Question Difficulty: Easy

Question ID 4ca30186

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 4ca30186



The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution (x, y) to this system?

A. $(0, 0)$

B. $(0, 2)$

C. $(2, 4)$

D. $(4, 0)$

ID: 4ca30186 Answer

Correct Answer: C

Rationale

Choice C is correct. The solution to the system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear equation and the nonlinear equation shown intersect at the point $(2, 4)$. Thus, the solution to the system is $(2, 4)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 911383f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 911383f2

$(x-4)(x+2)(x-1)=0$

What is the product of the solutions to the given equation?

A. 8

B. 3

C. -3

D. -8

ID: 911383f2 Answer

Correct Answer: D

Rationale

Choice D is correct. By the zero-product property, if $(x-4)(x+2)(x-1)=0$, then $x-4=0$, $x+2=0$, or $x-1=0$. Solving each of these equations for x yields $x=4$, $x=-2$, or $x=1$. The product of these solutions is $(4)(-2)(1)=-8$.

Choice A is incorrect and may result from sign errors made when solving the given equation. Choice B is incorrect and may result from finding the sum, not the product, of the solutions. Choice C is incorrect and may result from finding the sum, not the product, of the solutions in addition to making sign errors when solving the given equation.

Question Difficulty: Medium

Question ID d8789a4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: d8789a4c

$$\frac{x^2-c}{x-b}$$

In the expression above, *b* and *c* are positive integers. If the expression is equivalent to $x+b$ and $x \neq b$, which of the following could be the value of *c* ?

A. 4

B. 6

C. 8

D. 10

ID: d8789a4c Answer

Correct Answer: A

Rationale

Choice A is correct. If the given expression is equivalent to $x+b$, then $\frac{x^2-c}{x-b}=x+b$, where x isn't equal to b. Multiplying both sides of this equation by $x-b$ yields $x^2-c=(x+b)(x-b)$. Since the right-hand side of this equation is in factored form for the difference of squares, the value of c must be a perfect square. Only choice A gives a perfect square for the value of c.

Choices B, C, and D are incorrect. None of these values of c produces a difference of squares. For example, when 6 is substituted for c in the given expression, the result is $\frac{x^2-6}{x-b}$. The expression x^2-6 can't be factored with integer values, and therefore $\frac{x^2-6}{x-b}$ isn't equivalent to $x+b$.

Question Difficulty: Hard

Question ID b80d10d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: b80d10d7

$$\frac{2(x+1)}{x+5}=1-\frac{1}{x+5}$$

What is the solution to the equation above?

A. 0

B. 2

C. 3

D. 5

ID: b80d10d7 Answer

Correct Answer: B

Rationale

Choice B is correct. Since $\frac{x+5}{x+5}$ is equivalent to 1, the right-hand side of the given equation can be rewritten as $\frac{x+5}{x+5}-\frac{1}{x+5}$, or $\frac{x+4}{x+5}$. Since the left- and right-hand sides of the equation $\frac{2(x+1)}{x+5}=\frac{x+4}{x+5}$ have the same denominator, it follows that $2(x+1)=x+4$. Applying the distributive property of multiplication to the expression $2(x+1)$ yields $2(x)+2(1)$, or $2x+2$. Therefore, $2x+2=x+4$. Subtracting x and 2 from both sides of this equation yields $x=2$.

Choices A, C, and D are incorrect. If $x=0$, then $\frac{2(0+1)}{0+5}=1-\frac{1}{0+5}$. This can be rewritten as $\frac{2}{5}=\frac{4}{5}$, which is a false statement. Therefore, 0 isn't a solution to the given equation. Substituting 3 and 5 into the given equation yields similarly false statements.

Question Difficulty: Medium

Question ID fde6f3bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: fde6f3bb

$g(x) = \frac{3}{5}x + \frac{7}{6}$ $h(x) = 6x - 5$

The functions g and h are defined by the equations shown. Which expression is equivalent to $g(x) \cdot h(x)$?

A. $\frac{18x^2}{5} - \frac{35}{6}$

B. $\frac{18x^2}{5} + \frac{27x}{11} - \frac{35}{6}$

C. $\frac{18x^2}{5} - 4x - \frac{35}{6}$

D. $\frac{18x^2}{5} + 4x - \frac{35}{6}$

ID: fde6f3bb Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $g(x) = \frac{3}{5}x + \frac{7}{6}$ and $h(x) = 6x - 5$. Substituting $\frac{3}{5}x + \frac{7}{6}$ for $g(x)$ and $6x - 5$ for $h(x)$ in the expression $g(x) \cdot h(x)$ yields $\left(\frac{3}{5}x + \frac{7}{6}\right)(6x - 5)$. This expression can be rewritten as $\frac{3}{5}x(6x - 5) + \frac{7}{6}(6x - 5)$, or $\frac{18x^2}{5} - 3x + 7x - \frac{35}{6}$, which is equivalent to $\frac{18x^2}{5} + 4x - \frac{35}{6}$.

Choice A is incorrect. This expression is equivalent to $\frac{3}{5}x(6x) + \frac{7}{6}(-5)$, not $\left(\frac{3}{5}x + \frac{7}{6}\right)(6x - 5)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This expression is equivalent to $\left(\frac{3}{5}x - \frac{7}{6}\right)(6x + 5)$, not $\left(\frac{3}{5}x + \frac{7}{6}\right)(6x - 5)$.

Question Difficulty: Medium

Question ID d4950429

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: d4950429

A rectangle has a length of x units and a width of $(x - 15)$ units. If the rectangle has an area of 76 square units, what is the value of x?

A. 4

B. 19

C. 23

D. 76

ID: d4950429 Answer

Correct Answer: B

Rationale

Choice B is correct. The area of a rectangle is equal to its length multiplied by its width. Multiplying the given length, x units, by the given width, $(x - 15)$ units, yields $x(x - 15)$ square units. If the rectangle has an area of 76 square units, it follows that $x(x - 15) = 76$, or $x^2 - 15x = 76$. Subtracting 76 from both sides of this equation yields $x^2 - 15x - 76 = 0$. Factoring the left-hand side of this equation yields $(x - 19)(x + 4) = 0$. Applying the zero product property to this equation yields two solutions: $x = 19$ and $x = -4$. Since x is the rectangle's length, in units, which must be positive, the value of x is 19.

Choice A is incorrect. This is the width, in units, of the rectangle, not the value of x.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the area, in square units, of the rectangle, not the value of x.

Question Difficulty: Medium

Question ID 752055d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 752055d1

A scientist initially measures $12{,}000$ bacteria in a growth medium. 4 hours later, the scientist measures $24{,}000$ bacteria. Assuming exponential growth, the formula $P = C(2)^{rt}$ gives the number of bacteria in the growth medium, where r and C are constants and P is the number of bacteria t hours after the initial measurement. What is the value of r?

A. $\frac{1}{12{,}000}$

B. $\frac{1}{4}$

C. 4

D. $12{,}000$

ID: 752055d1 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the formula $P = C(2)^{rt}$ gives the number of bacteria in a growth medium, where r and C are constants and P is the number of bacteria t hours after the initial measurement. It's also given that a scientist initially measures $12{,}000$ bacteria in the growth medium. Since the initial measurement is 0 hours after the initial measurement, it follows that when $t = 0$, $P = 12{,}000$. Substituting 0 for t and $12{,}000$ for P in the given equation yields $12{,}000 = C(2)^{r(0)}$, or $12{,}000 = C(2)^{0}$, which is equivalent to $12{,}000 = C$. It's given that 4 hours later, the scientist measures $24{,}000$ bacteria, or when $t = 4$, $P = 24{,}000$. Substituting 4 for t, $24{,}000$ for P, and $12{,}000$ for C in the given equation yields $24{,}000 = 12{,}000(2)^{4r}$. Dividing each side of this equation by $12{,}000$ yields $2 = 2^{4r}$, or $2^1 = 2^{4r}$, which is equivalent to $1 = 4r$. Dividing both sides of this equation by 4 yields $\frac{1}{4} = r$. Therefore, the value of r is $\frac{1}{4}$.

Choice A is incorrect. This is the value of the reciprocal of C.

Choice C is incorrect. This is the value of the reciprocal of r. Choice D is incorrect. This is the value of C.

Question Difficulty: Medium

Question ID d0a53ef5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: d0a53ef5

$\sqrt{(x-2)^2} = \sqrt{3x+34}$ What is the smallest solution to the given equation?

ID: d0a53ef5 Answer

Correct Answer: -3

Rationale

The correct answer is -3. Squaring both sides of the given equation yields $(x-2)^2 = 3x+34$, which can be rewritten as $x^2 - 4x + 4 = 3x + 34$. Subtracting $3x$ and 34 from both sides of this equation yields $x^2 - 7x - 30 = 0$. This quadratic equation can be rewritten as $(x-10)(x+3) = 0$. According to the zero product property, $(x-10)(x+3)$ equals zero when either $x - 10 = 0$ or $x + 3 = 0$. Solving each of these equations for x yields $x = 10$ or $x = -3$. Therefore, the given equation has two solutions, 10 and -3. Of these two solutions, -3 is the smallest solution to the given equation.

Question Difficulty: Hard

Question ID fcdf87b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: fcdf87b7

$y = x^2 - 4x + 4$

$y = 4 - x$

If the ordered pair (x, y) satisfies the system of equations above,

what is one possible value of x ?

ID: fcdf87b7 Answer

Rationale

The correct answer is either 0 or 3. For an ordered pair to satisfy a system of equations, both the x- and y-values of the ordered pair must satisfy each equation in the system. Both expressions on the right-hand side of the given equations are equal to y, therefore it follows that both expressions on the right-hand side of the equations are equal to each other: $x^2 - 4x + 4 = 4 - x$. This equation can be rewritten as $x^2 - 3x = 0$, and then through factoring, the equation becomes $x(x - 3) = 0$. Because the product of the two factors is equal to 0, it can be concluded that either $x = 0$ or $x - 3 = 0$, or rather, $x = 0$ or $x = 3$. Note that 0 and 3 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 271ffad7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 271ffad7

A quadratic function models a projectile's height, in meters, above the ground in terms of the time, in seconds, after it was launched. The model estimates that the projectile was launched from an initial height of 7 meters above the ground and reached a maximum height of 51.1 meters above the ground 3 seconds after the launch. How many seconds after the launch does the model estimate that the projectile will return to a height of 7 meters?

A. 3

B. 6

C. 7

D. 9

ID: 271ffad7 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that a quadratic function models the projectile's height, in meters, above the ground in terms of the time, in seconds, after it was launched. It follows that an equation representing the model can be written in the form $f(x) = a(x - h)^2 + k$, where $f(x)$ is the projectile's estimated height above the ground, in meters, x seconds after the launch, a is a constant, and k is the maximum height above the ground, in meters, the model estimates the projectile reached h seconds after the launch. It's given that the model estimates the projectile reached a maximum height of 51.1 meters above the ground 3 seconds after the launch. Therefore, $k = 51.1$ and $h = 3$. Substituting 51.1 for k and 3 for h in the equation $f(x) = a(x - h)^2 + k$ yields $f(x) = a(x - 3)^2 + 51.1$. It's also given that the model estimates that the projectile was launched from an initial height of 7 meters above the ground. Therefore, when $x = 0$, $f(x) = 7$. Substituting 0 for x and 7 for $f(x)$ in the equation $f(x) = a(x - 3)^2 + 51.1$ yields $7 = a(0 - 3)^2 + 51.1$, or $7 = 9a + 51.1$. Subtracting 51.1 from both sides of this equation yields $-44.1 = 9a$. Dividing both sides of this equation by 9 yields $-4.9 = a$. Substituting -4.9 for a in the equation $f(x) = a(x - 3)^2 + 51.1$ yields $f(x) = -4.9(x - 3)^2 + 51.1$. Therefore, the equation $f(x) = -4.9(x - 3)^2 + 51.1$ models the projectile's height, in meters, above the ground x seconds after it was launched. The number of seconds after the launch that the model estimates that the projectile will return to a height of 7 meters is the value of x when $f(x) = 7$. Substituting 7 for $f(x)$ in $f(x) = -4.9(x - 3)^2 + 51.1$ yields $7 = -4.9(x - 3)^2 + 51.1$. Subtracting 51.1 from both sides of this equation yields $-44.1 = -4.9(x - 3)^2$. Dividing both sides of this equation by -4.9 yields $9 = (x - 3)^2$. Taking the square root of both sides of this equation yields two equations: $3 = x - 3$ and $-3 = x - 3$. Adding 3 to both sides of the equation $3 = x - 3$ yields $6 = x$. Adding 3 to both sides of the equation $-3 = x - 3$ yields $0 = x$. Since 0 seconds after the launch represents the time at which the projectile was launched, 6 must be the number of seconds the model estimates that the projectile will return to a height of 7 meters.

Alternate approach: It's given that a quadratic function models the projectile's height, in meters, above the ground in terms of the time, in seconds, after it was launched. It's also given that the model estimates that the projectile was launched from an initial height of 7 meters above the ground and reached a maximum height of 51.1 meters above the ground 3 seconds after the launch. Since the model is quadratic, and quadratic functions are symmetric, the model estimates that for any given height less than the maximum height, the time the projectile takes to travel from the given height to the maximum height is the same as the time the projectile takes to travel from the maximum height back to the given height. Thus, since the model estimates the projectile took 3 seconds to travel from 7 meters above the ground to its maximum height of 51.1 meters above the ground, the model also estimates the projectile will take 3 more seconds to travel from its maximum height of 51.1 meters above the ground back to 7 meters above the ground. Thus, the model estimates that the projectile will return to a height of 7 meters 3 seconds after it reaches its maximum height, which is 6 seconds after the launch.

Choice A is incorrect. The model estimates that 3 seconds after the launch, the projectile reached a height of 51.1 meters, not 7 meters.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID ee857afb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: ee857afb

$y = x^2 - 14x + 22$

The given equation relates the variables x and y. For what value of x does the value of y reach its minimum?

ID: ee857afb Answer

Correct Answer: 7

Rationale

The correct answer is 7. When an equation is of the form $y = ax^2 + bx + c$, where a, b, and c are constants, the value of y reaches its minimum when $x = -\frac{b}{2a}$. Since the given equation is of the form $y = ax^2 + bx + c$, it follows that $a = 1$, $b = -14$, and $c = 22$. Therefore, the value of y reaches its minimum when $x = -\frac{(-14)}{2(1)}$, or $x = 7$.

Question Difficulty: Hard

Question ID a520ba07

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a520ba07

$\sqrt[3]{x^3y^6}$

Which of the following expressions is equivalent to the expression above?

A. y^2

B. xy^2

C. y^3

D. xy^3

ID: a520ba07 Answer

Correct Answer: B

Rationale

Choice B is correct. One of the properties of radicals is $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$. Thus, the given expression can be rewritten as $\sqrt[3]{x^3} \cdot \sqrt[3]{y^6}$. Simplifying by taking the cube root of each part gives $x^1 \cdot y^2$, or xy^2.

Choices A, C, and D are incorrect and may be the result of incorrect application of the properties of exponents and radicals.

Question Difficulty: Medium

Question ID 5b6af6b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 5b6af6b1

Which expression is equivalent to $(d-6)(8d^2-3)$?

A. $8d^3-14d^2-3d+18$

B. $8d^3-17d^2+48$

C. $8d^3-48d^2-3d+18$

D. $8d^3-51d^2+48$

ID: 5b6af6b1 Answer

Correct Answer: C

Rationale

Choice C is correct. Applying the distributive property to the given expression yields $d(8d^2-3)-6(8d^2-3)$. Applying the distributive property once again to this expression yields $(d)(8d^2)+(d)(-3)+(-6)(8d^2)+(-6)(-3)$, or $8d^3+(-3d)+(-48d^2)+18$. This expression can be rewritten as $8d^3-48d^2-3d+18$. Thus, $(d-6)(8d^2-3)$ is equivalent to $8d^3-48d^2-3d+18$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 3148fe3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 3148fe3e

$x^2 + y + 10 = 10$ $8x + 16 - y = 0$ The solution to the given system of equations is (x, y). What is the value of x?

A. -16

B. -4

C. 2

D. 8

ID: 3148fe3e Answer

Correct Answer: B

Rationale

Choice B is correct. Adding y to each side of the second equation in the given system of equations yields $8x + 16 = y$. Substituting $8x + 16$ for y in the first equation yields $x^2 + 8x + 16 + 10 = 10$. Subtracting 10 from each side of this equation yields $x^2 + 8x + 16 = 0$. This equation can be rewritten as $(x + 4)^2 = 0$. Taking the square root of each side of this equation yields $x + 4 = 0$. Subtracting 4 from each side of this equation yields $x = -4$. Therefore, the value of x is -4.

Choice A is incorrect. This is the value of y, not x.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 652054da

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 652054da

An oceanographer uses the equation $s = \frac{3}{2}p$ to model the speed *s*, in knots, of an ocean wave, where *p* represents the period of the wave, in seconds. Which of the following represents the period of the wave in terms of the speed of the wave?

A. $p = \frac{2}{3}s$

B. $p = \frac{3}{2}s$

C. $p = \frac{2}{3} + s$

D. $p = \frac{3}{2} + s$

ID: 652054da Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that p represents the period of the ocean wave, so the equation $s = \frac{3}{2}p$ can be solved for p to represent the period of the wave in terms of the speed of the wave. Multiplying both sides of the equation by the reciprocal of $\frac{3}{2}$ will isolate p. This yields $\frac{2}{3}s = \frac{2}{3}\left(\frac{3}{2}p\right)$, which simplifies to $\frac{2}{3}s = p$. Therefore, $p = \frac{2}{3}s$.

Choices B, C, and D are incorrect and may result from errors made when rearranging the equation to solve for p.

Question Difficulty: Medium

Question ID 0380bbdc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 0380bbdc

If $4\sqrt{2x} = 16$, what is the value of $6x$?

A. 24

B. 48

C. 72

D. 96

ID: 0380bbdc Answer

Correct Answer: B

Rationale

Choice B is correct. Dividing each side of the given equation by 4 yields $\sqrt{2x} = 4$. Squaring both sides of this equation yields $2x = 16$. Multiplying each side of this equation by 3 yields $6x = 48$. Therefore, the value of $6x$ is 48.

Choice A is incorrect. This is the value of $3x$, not $6x$. Choice C is incorrect. This is the value of $9x$, not $6x$.

Choice D is incorrect. This is the value of $12x$, not $6x$.

Question Difficulty: Medium

Question ID 837e9da7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 837e9da7

The function f is defined by $f(x) = \frac{1}{6x}$. What is the value of $f(x)$ when $x = 3$?

A. $\frac{1}{3}$

B. $\frac{1}{6}$

C. $\frac{1}{9}$

D. $\frac{1}{18}$

ID: 837e9da7 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $f(x) = \frac{1}{6x}$. Substituting 3 for x in this equation yields $f(3) = \frac{1}{6(3)}$, or $f(3) = \frac{1}{18}$. Therefore, when $x = 3$, the value of $f(x)$ is $\frac{1}{18}$.

Choice A is incorrect. This is the value of $f(x)$ when $x = 0.5$.

Choice B is incorrect. This is the value of $f(x)$ when $x = 1$.

Choice C is incorrect. This is the value of $f(x)$ when $x = 1.5$.

Question Difficulty: Easy

Question ID a255ae72

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a255ae72

If $x^2 = a + b$ and $y^2 = a + c$, which of the following is equal to $(x^2 - y^2)^2$?

A. $a^2 - 2ac + c^2$

B. $b^2 - 2bc + c^2$

C. $4a^2 - 4abc + c^2$

D. $4a^2 - 2abc + b^2c^2$

ID: a255ae72 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $x^2 = a + b$ and $y^2 = a + c$. Using the distributive property, the expression $(x^2 - y^2)^2$ can be rewritten as $(x^2)^2 - 2x^2y^2 + (y^2)^2$. Substituting $a + b$ and $a + c$ for x^2 and y^2, respectively, in this expression yields $(a + b)^2 - 2((a + b)(a + c)) + (a + c)^2$. Expanding this expression yields $(a^2 + 2ab + b^2) - (2a^2 + 2bc + 2ac + 2ab) + (a^2 + 2ac + c^2)$. Combining like terms, this expression can be rewritten as $b^2 - 2bc + c^2$.

Choices A, C, and D are incorrect and may result from an error in using the distributive property, substituting, or combining like terms.

Question Difficulty: Medium

Question ID 3de7a7d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 3de7a7d7

Which of the following is a solution to the equation $2x^2 - 4 = x^2$?

A. 1

B. 2

C. 3

D. 4

ID: 3de7a7d7 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting x^2 from both sides of the given equation yields $x^2 - 4 = 0$. Adding 4 to both sides of the equation gives $x^2 = 4$. Taking the square root of both sides of the equation gives $x = 2$ or $x = -2$. Therefore, $x = 2$ is one solution to the original equation.

Alternative approach: Subtracting x^2 from both sides of the given equation yields $x^2 - 4 = 0$. Factoring this equation gives $x^2 - 4 = (x + 2)(x - 2) = 0$, such that $x = 2$ or $x = -2$. Therefore, $x = 2$ is one solution to the original equation.

Choices A, C, and D are incorrect and may be the result of computation errors.

Question Difficulty: Easy

Question ID 70f98ab4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 70f98ab4

$q - 29r = s$

The given equation relates the positive numbers q, r, and s. Which equation correctly expresses q in terms of r and s?

A. $q = s - 29r$

B. $q = s + 29r$

C. $q = 29rs$

D. $q = -\frac{s}{29r}$

ID: 70f98ab4 Answer

Correct Answer: B

Rationale

Choice B is correct. Adding $29r$ to each side of the given equation yields $q = s + 29r$. Therefore, the equation $q = s + 29r$ correctly expresses q in terms of r and s.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 2c05d312

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 2c05d312

$57x^2 + (57b + a)x + ab = 0$

In the given equation, a and b are positive constants. The product of the solutions to the given equation is kab, where k is a constant. What is the value of k?

A. $\frac{1}{57}$

B. $\frac{1}{19}$

C. 1

D. 57

ID: 2c05d312 Answer

Correct Answer: A

Rationale

Choice A is correct. The left-hand side of the given equation is the expression $57x^2 + (57b + a)x + ab$. Applying the distributive property to this expression yields $57x^2 + 57bx + ax + ab$. Since the first two terms of this expression have a common factor of $57x$ and the last two terms of this expression have a common factor of a, this expression can be rewritten as $57x(x + b) + a(x + b)$. Since the two terms of this expression have a common factor of $(x + b)$, it can be rewritten as $(x + b)(57x + a)$. Therefore, the given equation can be rewritten as $(x + b)(57x + a) = 0$. By the zero product property, it follows that $x + b = 0$ or $57x + a = 0$. Subtracting b from both sides of the equation $x + b = 0$ yields $x = -b$. Subtracting a from both sides of the equation $57x + a = 0$ yields $57x = -a$. Dividing both sides of this equation by 57 yields $x = \frac{-a}{57}$. Therefore, the solutions to the given equation are $-b$ and $\frac{-a}{57}$. It follows that the product of the solutions of the given equation is $(-b)\left(\frac{-a}{57}\right)$, or $\frac{ab}{57}$. It's given that the product of the solutions of the given equation is kab. It follows that $\frac{ab}{57} = kab$, which can also be written as $ab\left(\frac{1}{57}\right) = ab(k)$. It's given that a and b are positive constants. Therefore, dividing both sides of the equation $ab\left(\frac{1}{57}\right) = ab(k)$ by ab yields $\frac{1}{57} = k$. Thus, the value of k is $\frac{1}{57}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1fe32f7d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 1fe32f7d

$-x^2 + bx - 676 = 0$

In the given equation, b is a positive integer. The equation has no real solution. What is the greatest possible value of b?

ID: 1fe32f7d Answer

Correct Answer: 51

Rationale

The correct answer is 51. A quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has no real solution if and only if its discriminant, $-4ac + b^2$, is negative. In the given equation, $a = -1$ and $c = -676$. Substituting -1 for a and -676 for c in this expression yields a discriminant of $b^2 - 4(-1)(-676)$, or $b^2 - 2{,}704$. Since this value must be negative, $b^2 - 2{,}704 < 0$, or $b^2 < 2{,}704$. Taking the positive square root of each side of this inequality yields $b < 52$. Since b is a positive integer, and the greatest integer less than 52 is 51, the greatest possible value of b is 51.

Question Difficulty: Hard

Question ID a45ffacb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: a45ffacb

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 15$ has a *y*-intercept at $\left(0, -\frac{99}{7}\right)$. The product of a and b is $\frac{65}{7}$. What is the value of a?

ID: a45ffacb Answer

Correct Answer: 5

Rationale

The correct answer is 5. It's given that $f(x) = -a^x + b$. Substituting $-a^x + b$ for $f(x)$ in the equation $y = f(x) - 15$ yields $y = -a^x + b - 15$. It's given that the *y*-intercept of the graph of $y = f(x) - 15$ is $\left(0, -\frac{99}{7}\right)$. Substituting 0 for x and $-\frac{99}{7}$ for y in the equation $y = -a^x + b - 15$ yields $-\frac{99}{7} = -a^0 + b - 15$, which is equivalent to $-\frac{99}{7} = -1 + b - 15$, or $-\frac{99}{7} = b - 16$. Adding 16 to both sides of this equation yields $\frac{13}{7} = b$. It's given that the product of a and b is $\frac{65}{7}$, or $ab = \frac{65}{7}$. Substituting $\frac{13}{7}$ for b in this equation yields $(a)\left(\frac{13}{7}\right) = \frac{65}{7}$. Dividing both sides of this equation by $\frac{13}{7}$ yields $a = 5$.

Question Difficulty: Hard

Question ID 95ed0b69

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 95ed0b69

$p = \frac{k}{4j+9}$

The given equation relates the distinct positive numbers p, k, and j. Which equation correctly expresses $4j + 9$ in terms of p and k?

A. $4j + 9 = \frac{k}{p}$

B. $4j + 9 = kp$

C. $4j + 9 = k - p$

D. $4j + 9 = \frac{p}{k}$

ID: 95ed0b69 Answer

Correct Answer: A

Rationale

Choice A is correct. To express $4j + 9$ in terms of p and k, the given equation must be solved for $4j + 9$. Since it's given that j is a positive number, $4j + 9$ is not equal to zero. Therefore, multiplying both sides of the given equation by $4j + 9$ yields the equivalent equation $p(4j + 9) = k$. Since it's given that p is a positive number, p is not equal to zero. Therefore, dividing each side of the equation $p(4j + 9) = k$ by p yields the equivalent equation $4j + 9 = \frac{k}{p}$.

Choice B is incorrect. This equation is equivalent to $p = \frac{4j+9}{k}$.

Choice C is incorrect. This equation is equivalent to $p = k - 4j - 9$.

Choice D is incorrect. This equation is equivalent to $p = k(4j + 9)$.

Question Difficulty: Medium

Question ID 463eec13

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 463eec13

If $x \neq 0$, which of the following expressions is equivalent to $\frac{\sqrt{16x^4y^8}}{x^3}$?

A. $8x^2y^4$

B. $4xy^4$

C. $4x^{-2}y^2$

D. $4x^{-1}y^4$

ID: 463eec13 Answer

Correct Answer: D

Rationale

Choice D is correct. Taking the square root of an exponential expression halves the exponent, so $\frac{\sqrt{16x^4y^8}}{x^3} = \frac{4x^2y^4}{x^3}$, which further reduces to $\frac{4y^4}{x}$. This can be rewritten as $4x^{-1}y^4$.

Choice A is incorrect and may result from neglecting the denominator of the given expression and from incorrectly calculating the square root of 16. Choice B is incorrect and may result from rewriting $\frac{1}{x}$ as x^1 rather than x^{-1}. Choice C is incorrect and may result from taking the square root of the variables in the numerator twice instead of once.

Question Difficulty: Medium

Question ID 821e724e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 821e724e

The function g is defined by $g(x) = (x + 14)(t - x)$, where t is a constant. In the *xy*-plane, the graph of $y = g(x)$ passes through the point $(24, 0)$. What is the value of $g(0)$?

ID: 821e724e Answer

Correct Answer: 336

Rationale

The correct answer is 336. By the zero product property, if $(x + 14)(t - x) = 0$, then $x + 14 = 0$, which gives $x = -14$, or $(t - x) = 0$, which gives $x = t$. Therefore, $g(x) = 0$ when $x = -14$ and when $x = t$. Since the graph of $y = g(x)$ passes through the point $(24, 0)$, it follows that $g(24) = 0$, so $t = 24$. Substituting 24 for t in the equation $g(x) = (x + 14)(t - x)$ yields $g(x) = (x + 14)(24 - x)$. The value of $g(0)$ can be calculated by substituting 0 for x in this equation, which yields $g(0) = (0 + 14)(24 - 0)$, or $g(0) = 336$.

Question Difficulty: Hard

Question ID 341ba5db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 341ba5db

$g(x) = x^2 + 55$ What is the minimum value of the given function?

A. 0

B. 55

C. 110

D. $3{,}025$

ID: 341ba5db Answer

Correct Answer: B

Rationale

Choice B is correct. For a quadratic function defined by an equation of the form $g(x) = a(x - h)^2 + k$, where a, h, and k are constants and $a > 0$, the minimum value of the function is k. In the given function, $a = 1$, $h = 0$, and $k = 55$. Therefore, the minimum value of the given function is 55.

Choice A is incorrect. This is the value of x for which the given function reaches its minimum value, not the minimum value of the function.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 18e35375

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 18e35375

$f(x) = (x - 14)(x + 19)$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -266

B. -19

C. $-\frac{33}{2}$

D. $-\frac{5}{2}$

ID: 18e35375 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $f(x) = (x - 14)(x + 19)$, which can be rewritten as $f(x) = x^2 + 5x - 266$. Since the coefficient of the x^2-term is positive, the graph of $y = f(x)$ in the *xy*-plane opens upward and reaches its minimum value at its vertex. The *x*-coordinate of the vertex is the value of x such that $f(x)$ reaches its minimum. For an equation in the form $f(x) = ax^2 + bx + c$, where a, b, and c are constants, the *x*-coordinate of the vertex is $-\frac{b}{2a}$. For the equation $f(x) = x^2 + 5x - 266$, $a = 1$, $b = 5$, and $c = -266$. It follows that the *x*-coordinate of the vertex is $-\frac{5}{2(1)}$, or $-\frac{5}{2}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{5}{2}$.

Alternate approach: The value of x for the vertex of a parabola is the *x*-value of the midpoint between the two *x*-intercepts of the parabola. Since it's given that $f(x) = (x - 14)(x + 19)$, it follows that the two *x*-intercepts of the graph of $y = f(x)$ in the *xy*-plane occur when $x = 14$ and $x = -19$, or at the points $(14, 0)$ and $(-19, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2), is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. Therefore, the midpoint between $(14, 0)$ and $(-19, 0)$ is $\left(\frac{14+(-19)}{2}, \frac{0+0}{2}\right)$, or $\left(-\frac{5}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{5}{2}$.

Choice A is incorrect. This is the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane.

Choice B is incorrect. This is one of the *x*-coordinates of the *x*-intercepts of the graph of $y = f(x)$ in the *xy*-plane.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c303ad23

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: c303ad23

If $3x^2 - 18x - 15 = 0$, what is the value of $x^2 - 6x$?

ID: c303ad23 Answer

Correct Answer: 5

Rationale

The correct answer is 5. Dividing each side of the given equation by 3 yields $x^2 - 6x - 5 = 0$. Adding 5 to each side of this equation yields $x^2 - 6x = 5$. Therefore, if $3x^2 - 18x - 15 = 0$, the value of $x^2 - 6x$ is 5.

Question Difficulty: Hard

Question ID 974d33dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 974d33dc

Which of the following expressions is equivalent to the sum of (r^3+5r^2+7) and $(r^2+8r+12)$?

A. r^5+13r^3+19

B. $2r^3+13r^2+19$

C. $r^3+5r^2+7r+12$

D. $r^3+6r^2+8r+19$

ID: 974d33dc Answer

Correct Answer: D

Rationale

Choice D is correct. Grouping like terms, the given expressions can be rewritten as $r^3+(5r^2+r^2)+8r+(7+12)$. This can be rewritten as $r^3+6r^2+8r+19$.

Choice A is incorrect and may result from adding the two sets of unlike terms, r^3 and r^2 as well as $5r^2$ and $8r$, and then adding the respective exponents. Choice B is incorrect and may result from adding the unlike terms r^3 and r^2 as if they were r^3 and r^3 and adding the unlike terms $5r^2$ and $8r$ as if they were $5r^2$ and $8r^2$. Choice C is incorrect and may result from errors when combining like terms.

Question Difficulty: Easy

Question ID d4d513ff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: d4d513ff

Which expression is equivalent to $12x + 27$?

A. $12(9x + 1)$

B. $27(12x + 1)$

C. $3(4x + 9)$

D. $3(9x + 24)$

ID: d4d513ff Answer

Correct Answer: C

Rationale

Choice C is correct. Each term in the given expression, $12x + 27$, has a common factor of 3. Therefore, the expression can be rewritten as $3(4x) + 3(9)$, or $3(4x + 9)$. Thus, the expression $3(4x + 9)$ is equivalent to the given expression.

Choice A is incorrect. This expression is equivalent to $108x + 12$, not $12x + 27$.

Choice B is incorrect. This expression is equivalent to $324x + 27$, not $12x + 27$.

Choice D is incorrect. This expression is equivalent to $27x + 72$, not $12x + 27$.

Question Difficulty: Easy

Question ID 48f83c34

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 48f83c34

A right rectangular prism has a height of 9 inches. The length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. Which function V gives the volume of the prism, in cubic inches, in terms of the length of the prism's base?

A. $V(x) = x(x + 9)(x + 7)$

B. $V(x) = x(x + 9)(x - 7)$

C. $V(x) = 9x(x + 7)$

D. $V(x) = 9x(x - 7)$

ID: 48f83c34 Answer

Correct Answer: D

Rationale

Choice D is correct. The volume of a right rectangular prism can be represented by a function V that gives the volume of the prism, in cubic inches, in terms of the length of the prism's base. The volume of a right rectangular prism is equal to the area of its base times its height. It's given that the length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. This means that the width of the prism's base is $x - 7$ inches. It follows that the area of the prism's base, in square inches, is $x(x - 7)$ and the volume, in cubic inches, of the prism is $x(x - 7)(9)$. Thus, the function V that gives the volume of this right rectangular prism, in cubic inches, in terms of the length of the prism's base, x, is $V(x) = 9x(x - 7)$.

Choice A is incorrect. This function would give the volume of the prism if the height were 9 inches more than the length of its base and the width of the base were 7 inches more than its length.

Choice B is incorrect. This function would give the volume of the prism if the height were 9 inches more than the length of its base.

Choice C is incorrect. This function would give the volume of the prism if the width of the base were 7 inches more than its length, rather than the length of the base being 7 inches more than its width.

Question Difficulty: Hard

Question ID 58b109d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 58b109d4

$x^2 + y + 7 = 7\ 20x + 100 - y = 0$ The solution to the given system of equations is (x, y). What is the value of x?

ID: 58b109d4 Answer

Correct Answer: -10

Rationale

The correct answer is -10. Adding y to both sides of the second equation in the given system yields $20x + 100 = y$. Substituting $20x + 100$ for y in the first equation in the given system yields $x^2 + 20x + 100 + 7 = 7$. Subtracting 7 from both sides of this equation yields $x^2 + 20x + 100 = 0$. Factoring the left-hand side of this equation yields $(x + 10)(x + 10) = 0$, or $(x + 10)^2 = 0$. Taking the square root of both sides of this equation yields $x + 10 = 0$. Subtracting 10 from both sides of this equation yields $x = -10$. Therefore, the value of x is -10.

Question Difficulty: Hard

Question ID 6e02cd78

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 6e02cd78

In the *xy*-plane, what is the *y*-coordinate of the point of intersection of the graphs of $y = (x-1)^2$ and $y = 2x - 3$?

ID: 6e02cd78 Answer

Rationale

The correct answer is 1. The point of intersection of the graphs of the given equations is the solution to the system of the two equations. Since $y = (x-1)^2$ and $y = 2x - 3$, it follows that $(x-1)^2 = 2x - 3$, or $(x-1)(x-1) = 2x - 3$. Applying the distributive property to the left-hand side of this equation yields $x^2 - 2x + 1 = 2x - 3$. Subtracting $2x$ from and adding 3 to both sides of this equation yields $x^2 - 4x + 4 = 0$. Factoring the left-hand side of this equation yields $(x-2)(x-2) = 0$. By the zero product property, if $(x-2)(x-2) = 0$, it follows that $x - 2 = 0$. Adding 2 to both sides of $x - 2 = 0$ yields $x = 2$. Substituting 2 for x in either of the given equations yields $y = 1$. For example, substituting 2 for x in the second given equation yields $y = 2(2) - 3$, or $y = 1$. Therefore, the point of intersection of the graphs of the given equations is $(2,1)$. The y-coordinate of this point is 1.

Question Difficulty: Medium

Question ID 15c364bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 15c364bf

A sample of a certain isotope takes 29 years to decay to half its original mass. The function $s(t) = 184(0.5)^{\frac{t}{29}}$ gives the approximate mass of this isotope, in grams, that remains t years after a 184-gram sample starts to decay. Which statement is the best interpretation of $s(87) = 23$ in this context?

A. Approximately 23 grams of the sample remains 87 years after the sample starts to decay.

B. The mass of the sample has decreased by approximately 23 grams 87 years after the sample starts to decay.

C. The mass of the sample has decreased by approximately 87 grams 23 years after the sample starts to decay.

D. Approximately 87 grams of the sample remains 23 years after the sample starts to decay.

ID: 15c364bf Answer

Correct Answer: A

Rationale

Choice A is correct. In the given function, $s(t)$ represents the approximate mass, in grams, of the sample that remains t years after the sample starts to decay. It follows that the best interpretation of $s(87) = 23$ is that approximately 23 grams of the sample remains 87 years after the sample starts to decay.

Choice B is incorrect. The mass of the sample has decreased by approximately $184 - 23$, or 161, grams, not 23 grams, 87 years after the sample starts to decay.

Choice C is incorrect. The mass of the sample has decreased by approximately 78 grams, not 87 grams, 23 years after the sample starts to decay.

Choice D is incorrect. This would be the best interpretation of $s(23) = 87$, not $s(87) = 23$.

Question Difficulty: Medium

Question ID ce508fb0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: ce508fb0

The functions f and g are defined by the given equations. $f(x) = 3 + |-2x - x^2|$ $g(w) = \left|\frac{-w}{w-1}\right| - w + 5$ If $f(-4) = c$, where c is a constant, what is the value of $g(c)$?

ID: ce508fb0 Answer

Correct Answer: -4.9, -49/10

Rationale

The correct answer is -4.9. The value of $f(-4)$ is the value of $f(x)$ when $x = -4$. Substituting -4 for x in the equation $f(x) = 3 + |-2x - x^2|$ yields $f(-4) = 3 + |-2(-4) - (-4)^2|$, or $f(-4) = 3 + |-8|$, which is equivalent to $f(-4) = 3 + 8$, or $f(-4) = 11$. Since it's given that $f(-4) = c$, it follows that $c = 11$ and the value of $g(c)$ is the value of $g(11)$. Substituting 11 for w in the equation $g(w) = \left|\frac{-w}{w-1}\right| - w + 5$ yields $g(11) = \left|\frac{-11}{11-1}\right| - 11 + 5$, or $g(11) = |-1.1| - 6$, which is equivalent to $g(11) = 1.1 - 6$, or $g(11) = -4.9$. Note that -4.9 and -49/10 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 74473be4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 74473be4

Which quadratic equation has no real solutions?

A. $x^2 + 14x - 49 = 0$

B. $x^2 - 14x + 49 = 0$

C. $5x^2 - 14x - 49 = 0$

D. $5x^2 - 14x + 49 = 0$

ID: 74473be4 Answer

Correct Answer: D

Rationale

Choice D is correct. The number of solutions to a quadratic equation in the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. If the value of the discriminant is greater than zero, then the quadratic equation has two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is less than zero, then the quadratic equation has no real solutions. For the quadratic equation in choice D, $5x^2 - 14x + 49 = 0$, $a = 5$, $b = -14$, and $c = 49$. Substituting 5 for a, -14 for b, and 49 for c in $b^2 - 4ac$ yields $(-14)^2 - 4(5)(49)$, or -784. Since -784 is less than zero, it follows that the quadratic equation $5x^2 - 14x + 49 = 0$ has no real solutions.

Choice A is incorrect. The value of the discriminant for this quadratic equation is 392. Since 392 is greater than zero, it follows that this quadratic equation has two real solutions.

Choice B is incorrect. The value of the discriminant for this quadratic equation is 0. Since zero is equal to zero, it follows that this quadratic equation has exactly one real solution.

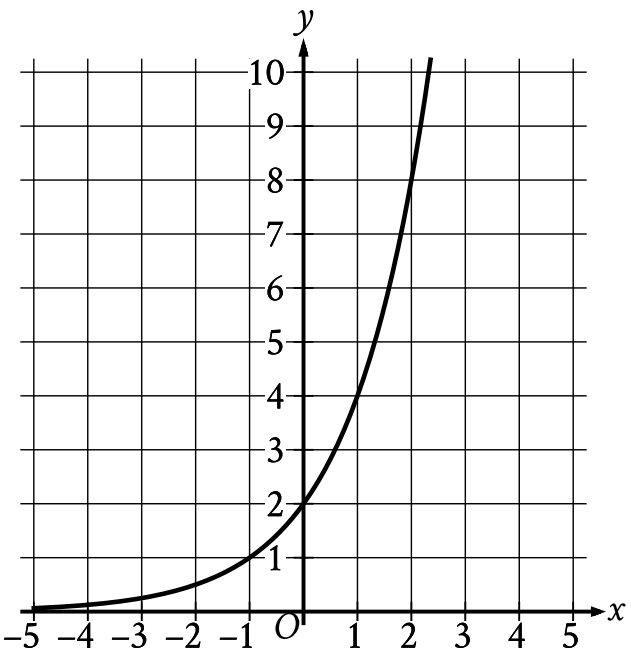
Choice C is incorrect. The value of the discriminant for this quadratic equation is $1{,}176$. Since $1{,}176$ is greater than zero, it follows that this quadratic equation has two real solutions.

Question Difficulty: Hard

Question ID b5c43226

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: b5c43226



What is the *y*-intercept of the graph shown?

A. $(0, 0)$

B. $(0, 2)$

C. $(2, 0)$

D. $(2, 2)$

ID: b5c43226 Answer

Correct Answer: B

Rationale

Choice B is correct. The *y*-intercept of a graph in the *xy*-plane is the point at which the graph crosses the *y*-axis. The graph shown crosses the *y*-axis at the point $(0, 2)$. Therefore, the *y*-intercept of the graph shown is $(0, 2)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7bd10ef3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 7bd10ef3

$2x^2 - 4x = t$

In the equation above, t is a constant. If the equation has no real solutions, which of the following could be the value of t?

A. -3

B. -1

C. 1

D. 3

ID: 7bd10ef3 Answer

Correct Answer: A

Rationale

Choice A is correct. The number of solutions to any quadratic equation in the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be found by evaluating the expression $b^2 - 4ac$, which is called the discriminant. If the value of $b^2 - 4ac$ is a positive number, then there will be exactly two real solutions to the equation. If the value of $b^2 - 4ac$ is zero, then there will be exactly one real solution to the equation. Finally, if the value of $b^2 - 4ac$ is negative, then there will be no real solutions to the equation.

The given equation $2x^2 - 4x = t$ is a quadratic equation in one variable, where t is a constant. Subtracting t from both sides of the equation gives $2x^2 - 4x - t = 0$. In this form, $a = 2$, $b = -4$, and $c = -t$. The values of t for which the equation has no real solutions are the same values of t for which the discriminant of this equation is a negative value. The discriminant is equal to $(-4)^2 - 4(2)(-t)$; therefore, $(-4)^2 - 4(2)(-t) < 0$. Simplifying the left side of the inequality gives $16 + 8t < 0$. Subtracting 16 from both sides of the inequality and then dividing both sides by 8 gives $t < -2$. Of the values given in the options, -3 is the only value that is less than -2. Therefore, choice A must be the correct answer.

Choices B, C, and D are incorrect and may result from a misconception about how to use the discriminant to determine the number of solutions of a quadratic equation in one variable.

Question Difficulty: Hard

Question ID 2fec8bf4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 2fec8bf4

$P(t) = 1{,}800(1.02)^t$

The function P gives the estimated number of marine mammals in a certain area, where t is the number of years since a study began. What is the best interpretation of $P(0) = 1{,}800$ in this context?

A. The estimated number of marine mammals in the area was 102 when the study began.

B. The estimated number of marine mammals in the area was $1{,}800$ when the study began.

C. The estimated number of marine mammals in the area increased by 102 each year during the study.

D. The estimated number of marine mammals in the area increased by $1{,}800$ each year during the study.

ID: 2fec8bf4 Answer

Correct Answer: B

Rationale

Choice B is correct. The function P gives the estimated number of marine mammals in a certain area, where t is the number of years since a study began. Since the value of $P(0)$ is the value of $P(t)$ when $t = 0$, it follows that $P(0) = 1{,}800$ means that the value of $P(t)$ is $1{,}800$ when $t = 0$. Since t is the number of years since the study began, it follows that $t = 0$ is 0 years since the study began, or when the study began. Therefore, the best interpretation of $P(0) = 1{,}800$ in this context is the estimated number of marine mammals in the area was $1{,}800$ when the study began.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

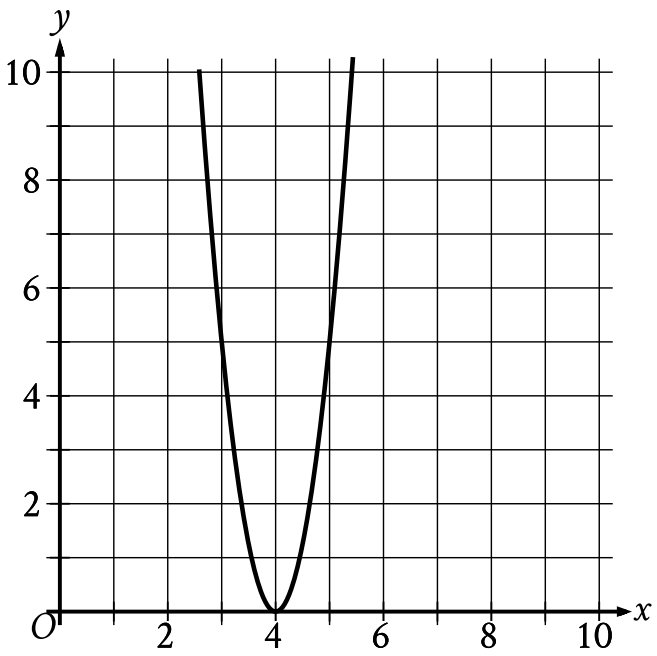
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID e166aca6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: e166aca6



What is the *x*-intercept of the graph shown?

A. $(-5, 0)$

B. $(5, 0)$

C. $(-4, 0)$

D. $(4, 0)$

ID: e166aca6 Answer

Correct Answer: D

Rationale

Choice D is correct. The *x*-intercept of the graph shown is the point (x, y) on the graph where $y = 0$. At $y = 0$, the corresponding value of x is 4. Therefore, the *x*-intercept of the graph shown is $(4, 0)$.

Choice A is incorrect. This is the *x*-intercept of a graph in the *xy*-plane that intersects the *x*-axis at $x = -5$, not $x = 4$.

Choice B is incorrect. This is the *x*-intercept of a graph in the *xy*-plane that intersects the *x*-axis at $x = 5$, not $x = 4$.

Choice C is incorrect. This is the *x*-intercept of a graph in the *xy*-plane that intersects the *x*-axis at $x = -4$, not $x = 4$.

Question Difficulty: Easy

Question ID f28944ff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f28944ff

$q(x) = 32(2^x)$ Which table gives three values of x and their corresponding values of $q(x)$ for function q?

A.

x	-1	0	1
$q(x)$	-64	0	64

B.

x	-1	0	1
$q(x)$	$\frac{1}{16}$	2	64

C.

x	-1	0	1
$q(x)$	$\frac{1}{16}$	32	64

D.

x	-1	0	1
$q(x)$	16	32	64

ID: f28944ff Answer

Correct Answer: D

Rationale

Choice D is correct. Substituting -1 for x in the given function yields $q(-1) = 32(2)^{-1}$, which is equivalent to $q(-1) = 32\left(\frac{1}{2}\right)$, or $q(-1) = 16$. Therefore, when $x = -1$, the corresponding value of $q(x)$ for function q is 16. Substituting 0 for x in the given function yields $q(0) = 32(2)^0$, which is equivalent to $q(0) = 32(1)$, or $q(0) = 32$. Therefore, when $x = 0$, the corresponding value of $q(x)$ for function q is 32. Substituting 1 for x in the given function yields $q(1) = 32(2)^1$, which is equivalent to $q(1) = 32(2)$, or $q(1) = 64$. Therefore, when $x = 1$, the corresponding value of $q(x)$ for function q is 64. Of the choices given, only the table in choice D gives these three values of x and their corresponding values of $q(x)$ for function q.

Choice A is incorrect. This table gives three values of x and their corresponding values of $q(x)$ for the function $q(x) = 32(2x)$.

Choice B is incorrect. This table gives three values of x and their corresponding values of $q(x)$ for the function $q(x) = 2(32)^x$.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 11ccf3e1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 11ccf3e1

$14j + 5k = m$

The given equation relates the numbers j, k, and m. Which equation correctly expresses k in terms of j and m?

A. $k = \frac{m-14j}{5}$

B. $k = \frac{1}{5}m - 14j$

C. $k = \frac{14j-m}{5}$

D. $k = 5m - 14j$

ID: 11ccf3e1 Answer

Correct Answer: A

Rationale

Choice A is correct. Subtracting $14j$ from each side of the given equation results in $5k = m - 14j$. Dividing each side of this equation by 5 results in $k = \frac{m-14j}{5}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID e11294f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: e11294f9

The solutions to $x^2 + 6x + 7 = 0$ are r and s, where $r < s$. The solutions to $x^2 + 8x + 8 = 0$ are t and u, where $t < u$. The solutions to $x^2 + 14x + c = 0$, where c is a constant, are $r + t$ and $s + u$. What is the value of c?

ID: e11294f9 Answer

Correct Answer: 31

Rationale

The correct answer is 31. Subtracting 7 from both sides of the equation $x^2 + 6x + 7 = 0$ yields $x^2 + 6x = -7$. To complete the square, adding $\left(\frac{6}{2}\right)^2$, or 3^2, to both sides of this equation yields $x^2 + 6x + 3^2 = -7 + 3^2$, or $(x + 3)^2 = 2$. Taking the square root of both sides of this equation yields $x + 3 = \pm\sqrt{2}$. Subtracting 3 from both sides of this equation yields $x = -3 \pm \sqrt{2}$. Therefore, the solutions r and s to the equation $x^2 + 6x + 7 = 0$ are $-3 - \sqrt{2}$ and $-3 + \sqrt{2}$. Since $r < s$, it follows that $r = -3 - \sqrt{2}$ and $s = -3 + \sqrt{2}$. Subtracting 8 from both sides of the equation $x^2 + 8x + 8 = 0$ yields $x^2 + 8x = -8$. To complete the square, adding $\left(\frac{8}{2}\right)^2$, or 4^2, to both sides of this equation yields $x^2 + 8x + 4^2 = -8 + 4^2$, or $(x + 4)^2 = 8$. Taking the square root of both sides of this equation yields $x + 4 = \pm\sqrt{8}$, or $x + 4 = \pm 2\sqrt{2}$. Subtracting 4 from both sides of this equation yields $x = -4 \pm 2\sqrt{2}$. Therefore, the solutions t and u to the equation $x^2 + 8x + 8 = 0$ are $-4 - 2\sqrt{2}$ and $-4 + 2\sqrt{2}$. Since $t < u$, it follows that $t = -4 - 2\sqrt{2}$ and $u = -4 + 2\sqrt{2}$. It's given that the solutions to $x^2 + 14x + c = 0$, where c is a constant, are $r + t$ and $s + u$. It follows that this equation can be written as $(x - (r + t))(x - (s + u)) = 0$, which is equivalent to $x^2 - (r + t + s + u)x + (r + t)(s + u) = 0$. Therefore, the value of c is $(r + t)(s + u)$. Substituting $-3 - \sqrt{2}$ for r, $-4 - 2\sqrt{2}$ for t, $-3 + \sqrt{2}$ for s, and $-4 + 2\sqrt{2}$ for u in this equation yields $\left(\left(-3 - \sqrt{2}\right) + \left(-4 - 2\sqrt{2}\right)\right)\left(\left(-3 + \sqrt{2}\right) + \left(-4 + 2\sqrt{2}\right)\right)$, which is equivalent to $\left(-7 - 3\sqrt{2}\right)\left(-7 + 3\sqrt{2}\right)$, or $(-7)(-7) - \left(3\sqrt{2}\right)\left(3\sqrt{2}\right)$, which is equivalent to $49 - 18$, or 31. Therefore, the value of c is 31.

Question Difficulty: Hard

Question ID 50e40f08

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 50e40f08

$f(x) = (x + 6)(x - 4)$

If the given function f is graphed in the *xy*-plane, where $y = f(x)$, what is the *x*-coordinate of an *x*-intercept of the graph?

ID: 50e40f08 Answer

Correct Answer: -6, 4

Rationale

The correct answer is either -6 or 4. The *x*-intercepts of a graph in the *xy*-plane are the points where $y = 0$. Thus, for an *x*-intercept of the graph of $y = f(x)$, $0 = f(x)$. Substituting 0 for $f(x)$ in the equation $f(x) = (x + 6)(x - 4)$ yields $0 = (x + 6)(x - 4)$. By the zero product property, $x + 6 = 0$ and $x - 4 = 0$. Subtracting 6 from both sides of the equation $x + 6 = 0$ yields $x = -6$. Adding 4 to both sides of the equation $x - 4 = 0$ yields $x = 4$. Therefore, the *x*-coordinates of the *x*-intercepts of the graph of $y = f(x)$ are -6 and 4. Note that -6 and 4 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 7028c74f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 7028c74f

$5(x+7)=15(x-17)(x+7)$ What is the sum of the solutions to the given equation?

ID: 7028c74f Answer

Correct Answer: 10.33, 31/3

Rationale

The correct answer is $\frac{31}{3}$. Subtracting $5(x+7)$ from each side of the given equation yields $0=15(x-17)(x+7)-5(x+7)$. Since $5(x+7)$ is a common factor of each of the terms on the right-hand side of this equation, it can be rewritten as $0=5(x+7)(3(x-17)-1)$. This is equivalent to $0=5(x+7)(3x-51-1)$, or $0=5(x+7)(3x-52)$. Dividing both sides of this equation by 5 yields $0=(x+7)(3x-52)$. Since a product of two factors is equal to 0 if and only if at least one of the factors is 0, either $x+7=0$ or $3x-52=0$. Subtracting 7 from both sides of the equation $x+7=0$ yields $x=-7$. Adding 52 to both sides of the equation $3x-52=0$ yields $3x=52$. Dividing both sides of this equation by 3 yields $x=\frac{52}{3}$. Therefore, the solutions to the given equation are -7 and $\frac{52}{3}$. It follows that the sum of the solutions to the given equation is $-7+\frac{52}{3}$, which is equivalent to $-\frac{21}{3}+\frac{52}{3}$, or $\frac{31}{3}$. Note that 31/3 and 10.33 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 03ff48d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 03ff48d2

$x(kx - 56) = -16$

In the given equation, k is an integer constant. If the equation has no real solution, what is the least possible value of k?

ID: 03ff48d2 Answer

Correct Answer: 50

Rationale

The correct answer is 50. An equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has no real solutions if and only if its discriminant, $b^2 - 4ac$, is negative. Applying the distributive property to the left-hand side of the equation $x(kx - 56) = -16$ yields $kx^2 - 56x = -16$. Adding 16 to each side of this equation yields $kx^2 - 56x + 16 = 0$. Substituting k for a, -56 for b, and 16 for c in $b^2 - 4ac$ yields a discriminant of $(-56)^2 - 4(k)(16)$, or $3{,}136 - 64k$. If the given equation has no real solution, it follows that the value of $3{,}136 - 64k$ must be negative. Therefore, $3{,}136 - 64k < 0$. Adding $64k$ to both sides of this inequality yields $3{,}136 < 64k$. Dividing both sides of this inequality by 64 yields $49 < k$, or $k > 49$. Since it's given that k is an integer, the least possible value of k is 50.

Question Difficulty: Hard

Question ID c4259674

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: c4259674

The function f is defined by $f(x) = 4x^{-1}$. What is the value of $f(21)$?

A. -84

B. $\frac{1}{84}$

C. $\frac{4}{21}$

D. $\frac{21}{4}$

ID: c4259674 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that function f is defined by the equation $f(x) = 4x^{-1}$. The value of $f(21)$ is the value of $f(x)$ when $x = 21$. Substituting 21 for x in the given equation yields $f(21) = 4(21)^{-1}$, which is equivalent to $f(21) = 4\left(\frac{1}{21}\right)$, or $f(21) = \frac{4}{21}$.

Choice A is incorrect. This is the value of $f(21)$ when $f(x) = -4x$, rather than $f(x) = 4x^{-1}$.

Choice B is incorrect. This is the value of $f(21)$ when $f(x) = (4x)^{-1}$, rather than $f(x) = 4x^{-1}$.

Choice D is incorrect. This is the value of $f(21)$ when $f(x) = \left(4^{-1}\right)x$, rather than $f(x) = 4x^{-1}$.

Question Difficulty: Medium

Question ID 88867d37

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 88867d37

$(x+2)(x-5)(x+9)=0$ What is a positive solution to the given equation?

A. 3

B. 4

C. 5

D. 18

ID: 88867d37 Answer

Correct Answer: C

Rationale

Choice C is correct. Applying the zero product property to the given equation yields three equations: $x+2=0$, $x-5=0$, and $x+9=0$. Subtracting 2 from both sides of the equation $x+2=0$ yields $x=-2$. Adding 5 to both sides of the equation $x-5=0$ yields $x=5$. Subtracting 9 from both sides of the equation $x+9=0$ yields $x=-9$. Therefore, the solutions to the given equation are -2, 5, and -9. It follows that a positive solution to the given equation is 5.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 13e57f0a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 13e57f0a

$-4x^2 - 7x = -36$ What is the positive solution to the given equation?

A. $\frac{7}{4}$

B. $\frac{9}{4}$

C. 4

D. 7

ID: 13e57f0a Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying each side of the given equation by -16 yields $64x^2 + 112x = 576$. To complete the square, adding 49 to each side of this equation yields $64x^2 + 112x + 49 = 576 + 49$, or $(8x + 7)^2 = 625$. Taking the square root of each side of this equation yields two equations: $8x + 7 = 25$ and $8x + 7 = -25$. Subtracting 7 from each side of the equation $8x + 7 = 25$ yields $8x = 18$. Dividing each side of this equation by 8 yields $x = \frac{18}{8}$, or $x = \frac{9}{4}$. Therefore, $\frac{9}{4}$ is a solution to the given equation. Subtracting 7 from each side of the equation $8x + 7 = -25$ yields $8x = -32$. Dividing each side of this equation by 8 yields $x = -4$. Therefore, the given equation has two solutions, $\frac{9}{4}$ and -4. Since $\frac{9}{4}$ is positive, it follows that $\frac{9}{4}$ is the positive solution to the given equation.

Alternate approach: Adding $4x^2$ and $7x$ to each side of the given equation yields $0 = 4x^2 + 7x - 36$. The right-hand side of this equation can be rewritten as $4x^2 + 16x - 9x - 36$. Factoring out the common factor of $4x$ from the first two terms of this expression and the common factor of -9 from the second two terms yields $4x(x + 4) - 9(x + 4)$. Factoring out the common factor of $(x + 4)$ from these two terms yields the expression $(4x - 9)(x + 4)$. Since this expression is equal to 0, it follows that either $4x - 9 = 0$ or $x + 4 = 0$. Adding 9 to each side of the equation $4x - 9 = 0$ yields $4x = 9$. Dividing each side of this equation by 4 yields $x = \frac{9}{4}$. Therefore, $\frac{9}{4}$ is a positive solution to the given equation. Subtracting 4 from each side of the equation $x + 4 = 0$ yields $x = -4$. Therefore, the given equation has two solutions, $\frac{9}{4}$ and -4. Since $\frac{9}{4}$ is positive, it follows that $\frac{9}{4}$ is the positive solution to the given equation.

Choice A is incorrect. Substituting $\frac{7}{4}$ for x in the given equation yields $-\frac{49}{2} = -36$, which is false.

Choice C is incorrect. Substituting 4 for x in the given equation yields $-92 = -36$, which is false.

Choice D is incorrect. Substituting 7 for x in the given equation yields $-245 = -36$, which is false.

Question Difficulty: Medium

Question ID 02489d55

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 02489d55

Which expression is equivalent to $19(x^2 - 7)$?

A. $19x^2 - 133$

B. $19x^2 - 26$

C. $19x^2 - 7$

D. $19x^2 + 12$

ID: 02489d55 Answer

Correct Answer: A

Rationale

Choice A is correct. The expression $19(x^2 - 7)$ can be rewritten as $19(x^2) - 19(7)$, which is equivalent to $19x^2 - 133$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID be0c419e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: be0c419e

Immanuel purchased a certain rare coin on January 1. The function $f(x) = 65(1.03)^x$, where $0 \leq x \leq 10$, gives the predicted value, in dollars, of the rare coin x years after Immanuel purchased it. What is the best interpretation of the statement "$f(8)$ is approximately equal to 82" in this context?

A. When the rare coin's predicted value is approximately 82 dollars, it is 8% greater than the predicted value, in dollars, on January 1 of the previous year.

B. When the rare coin's predicted value is approximately 82 dollars, it is 8 times the predicted value, in dollars, on January 1 of the previous year.

C. From the day Immanuel purchased the rare coin to 8 years after Immanuel purchased the coin, its predicted value increased by a total of approximately 82 dollars.

D. 8 years after Immanuel purchased the rare coin, its predicted value is approximately 82 dollars.

ID: be0c419e Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function $f(x) = 65(1.03)^x$ gives the predicted value, in dollars, of a certain rare coin x years after Immanuel purchased it. It follows that $f(x)$ represents the predicted value, in dollars, of the coin x years after Immanuel purchased it. Since the value of $f(8)$ is the value of $f(x)$ when $x = 8$, it follows that "$f(8)$ is approximately equal to 82" means that $f(x)$ is approximately equal to 82 when $x = 8$. Therefore, the best interpretation of the statement "$f(8)$ is approximately equal to 82" in this context is 8 years after Immanuel purchased the rare coin, its predicted value is approximately 82 dollars.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID ce579859

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: ce579859

A model estimates that at the end of each year from 2015 to 2020, the number of squirrels in a population was 150% more than the number of squirrels in the population at the end of the previous year. The model estimates that at the end of 2016, there were 180 squirrels in the population. Which of the following equations represents this model, where n is the estimated number of squirrels in the population t years after the end of 2015 and $t \leq 5$?

A. $n = 72$msup

B. $n = 72$msup

C. $n = 180$msup

D. $n = 180$msup

ID: ce579859 Answer

Correct Answer: B

Rationale

Choice B is correct. Since the model estimates that the number of squirrels in the population increased by a fixed percentage, 150%, each year, the model can be represented by an exponential equation of the form $n = a\left(1 + \frac{p}{100}\right)^t$, where a is the estimated number of squirrels in the population at the end of 2015, and the model estimates that at the end of each year, the number is $p\%$ more than the number at the end of the previous year. Since the model estimates that at the end of each year, the number was 150% more than the number at the end of the previous year, $p = 150$. Substituting 150 for p in the equation $n = a\left(1 + \frac{p}{100}\right)^t$ yields $n = a\left(1 + \frac{150}{100}\right)^t$, which is equivalent to $n = a(1 + 1.5)^t$, or $n = a(2.5)^t$. It's given that the estimated number of squirrels at the end of 2016 was 180. This means that when $t = 1, n = 180$. Substituting 1 for t and 180 for n in the equation $n = a(2.5)^t$ yields $180 = a(2.5)^1$, or $180 = 2.5a$. Dividing each side of this equation by 2.5 yields $72 = a$. Substituting 72 for a in the equation $n = a(2.5)^t$ yields $n = 72(2.5)^t$.

Choice A is incorrect. This equation represents a model where at the end of each year, the estimated number of squirrels was 150% of, not 150% more than, the estimated number at the end of the previous year.

Choice C is incorrect. This equation represents a model where at the end of each year, the estimated number of squirrels was 150% of, not 150% more than, the estimated number at the end of the previous year, and the estimated number of squirrels at the end of 2015, not the end of 2016, was 180.

Choice D is incorrect. This equation represents a model where the estimated number of squirrels at the end of 2015, not the end of 2016, was 180.

Question Difficulty: Hard

Question ID 5355c0ef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 5355c0ef

$0.36x^2 + 0.63x + 1.17$

The given expression can be rewritten as $a(4x^2 + 7x + 13)$, where a is a constant. What is the value of a?

ID: 5355c0ef Answer

Correct Answer: .09, 9/100

Rationale

The correct answer is $.09$. It's given that the expression $0.36x^2 + 0.63x + 1.17$ can be rewritten as $a(4x^2 + 7x + 13)$. Applying the distributive property to the expression $a(4x^2 + 7x + 13)$ yields $4ax^2 + 7ax + 13a$. Therefore, $0.36x^2 + 0.63x + 1.17$ can be rewritten as $4ax^2 + 7ax + 13a$. It follows that in the expressions $0.36x^2 + 0.63x + 1.17$ and $4ax^2 + 7ax + 13a$, the coefficients of x^2 are equivalent, the coefficients of x are equivalent, and the constant terms are equivalent. Therefore, $0.36 = 4a$, $0.63 = 7a$, and $1.17 = 13a$. Solving any of these equations for a yields the value of a. Dividing both sides of the equation $0.36 = 4a$ by 4 yields $0.09 = a$. Therefore, the value of a is 0.09. Note that .09 and 9/100 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 2f51abc2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 2f51abc2

$f(x) = |59 - 2x|$

The function f is defined by the given equation. For which of the following values of k does $f(k) = 3k$?

A. $\frac{59}{5}$

B. $\frac{59}{2}$

C. $\frac{177}{5}$

D. 59

ID: 2f51abc2 Answer

Correct Answer: A

Rationale

Choice A is correct. The value of k for which $f(k) = 3k$ can be found by substituting k for x and $3k$ for $f(x)$ in the given equation, $f(x) = |59 - 2x|$, which yields $3k = |59 - 2k|$. For this equation to be true, either $-3k = 59 - 2k$ or $3k = 59 - 2k$. Adding $2k$ to both sides of the equation $-3k = 59 - 2k$ yields $-k = 59$. Dividing both sides of this equation by -1 yields $k = -59$. To check whether -59 is the value of k, substituting -59 for k in the equation $3k = |59 - 2k|$ yields $3(-59) = |59 - 2(-59)|$, which is equivalent to $-177 = |177|$, or $-177 = 177$, which isn't a true statement. Therefore, -59 isn't the value of k. Adding $2k$ to both sides of the equation $3k = 59 - 2k$ yields $5k = 59$. Dividing both sides of this equation by 5 yields $k = \frac{59}{5}$. To check whether $\frac{59}{5}$ is the value of k, substituting $\frac{59}{5}$ for k in the equation $3k = |59 - 2k|$ yields $3\left(\frac{59}{5}\right) = \left|59 - 2\left(\frac{59}{5}\right)\right|$, which is equivalent to $\frac{177}{5} = \left|\frac{177}{5}\right|$, or $\frac{177}{5} = \frac{177}{5}$, which is a true statement. Therefore, the value of k for which $f(k) = 3k$ is $\frac{59}{5}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 17d0e87d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 17d0e87d

$\frac{14x}{7y} = 2\sqrt{w+19}$

The given equation relates the distinct positive real numbers w, x, and y. Which equation correctly expresses w in terms of x and y?

A. $w = \sqrt{\frac{x}{y}} - 19$

B. $w = \sqrt{\frac{28x}{14y}} - 19$

C. $w =$ msup $- 19$

D. $w =$ msup $- 19$

ID: 17d0e87d Answer

Correct Answer: C

Rationale

Choice C is correct. Dividing each side of the given equation by 2 yields $\frac{14x}{14y} = \frac{2\sqrt{w+19}}{2}$, or $\frac{x}{y} = \sqrt{w+19}$. Because it's given that each of the variables is positive, squaring each side of this equation yields the equivalent equation $\left(\frac{x}{y}\right)^2 = w + 19$. Subtracting 19 from each side of this equation yields $\left(\frac{x}{y}\right)^2 - 19 = w$, or $w = \left(\frac{x}{y}\right)^2 - 19$.

Choice A is incorrect. This equation isn't equivalent to the given equation.

Choice B is incorrect. This equation isn't equivalent to the given equation.

Choice D is incorrect. This equation isn't equivalent to the given equation.

Question Difficulty: Hard

Question ID a1bf1c4e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a1bf1c4e

x^2+6x+4

Which of the following is equivalent to the expression above?

A. $(x+3)^2+5$

B. $(x+3)^2-5$

C. $(x-3)^2+5$

D. $(x-3)^2-5$

ID: a1bf1c4e Answer

Correct Answer: B

Rationale

Choice B is correct. The given quadratic expression is in standard form, and each answer choice is in vertex form. Completing the square converts the expression from standard form to vertex form. The first step is to rewrite the expression as follows: $x^2+6x+4=x^2+6x+9+4-9$. The first three terms of the revised expression can be rewritten as a perfect square as follows: $x^2+6x+9+4-9=(x+3)^2+4-9$. Combining the constant terms gives $(x+3)^2-5$.

Choice A is incorrect. Squaring the binomial and simplifying the expression in choice A gives $x^2+6x+9+5$. Combining like terms gives $x^2+6x+14$, not x^2+6x+4. Choice C is incorrect. Squaring the binomial and simplifying the expression in choice C gives $x^2-6x+9+5$. Combining like terms gives $x^2-6x+14$, not x^2+6x+4. Choice D is incorrect. Squaring the binomial and simplifying the expression in choice D gives $x^2-6x+9-5$. Combining like terms gives x^2-6x+4, not x^2+6x+4.

Question Difficulty: Medium

Question ID c81b6c57

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: c81b6c57

In the expression $3(2x^2+px+8)-16x(p+4)$, p is a constant. This expression is equivalent to the expression $6x^2-155x+24$. What is the value of p?

A. -3

B. 7

C. 13

D. 155

ID: c81b6c57 Answer

Correct Answer: B

Rationale

Choice B is correct. Using the distributive property, the first given expression can be rewritten as $6x^2 + 3px + 24 - 16px - 64x + 24$, and then rewritten as $6x^2 + (3p - 16p - 64)x + 24$. Since the expression $6x^2 + (3p - 16p - 64)x + 24$ is equivalent to $6x^2 - 155x + 24$, the coefficients of the x terms from each expression are equivalent to each other; thus $3p - 16p - 64 = -155$. Combining like terms gives $-13p - 64 = -155$. Adding 64 to both sides of the equation gives $-13p = -71$. Dividing both sides of the equation by -13 yields $p = 7$.

Choice A is incorrect. If $p = -3$, then the first expression would be equivalent to $6x^2 - 25x + 24$. Choice C is incorrect. If $p = 13$, then the first expression would be equivalent to $6x^2 - 233x + 24$. Choice D is incorrect. If $p = 155$, then the first expression would be equivalent to $6x^2 - 2{,}079x + 24$.

Question Difficulty: Hard

Question ID 802549ac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 802549ac

$(x+2)(x+3)=(x-2)(x-3)+10$

Which of the following is a solution to the given equation?

A. 1

B. 0

C. -2

D. -5

ID: 802549ac Answer

Correct Answer: A

Rationale

Choice A is correct. Applying the distributive property on the left- and right-hand sides of the given equation yields $x^2+2x+3x+6=x^2-2x-3x+6+10$, or $x^2+5x+6=x^2-5x+16$. Subtracting x^2 from and adding $5x$ to both sides of this equation yields $10x+6=16$. Subtracting 6 from both sides of this equation and then dividing both sides by 10 yields $x=1$.

Choices B, C, and D are incorrect. Substituting 0, -2, or -5 for x in the given equation will result in a false statement. If $x=0$, the given equation becomes $6=16$; if $x=-2$, the given equation becomes $0=30$; and if $x=-5$, the given equation becomes $6=66$. Therefore, the values 0, -2, and -5 aren't solutions to the given equation.

Question Difficulty: Medium

Question ID a4f61d75

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: a4f61d75

$x^2 - ax + 12 = 0$

In the equation above, *a* is a constant and $a > 0$. If the equation has two integer solutions, what is a possible value of *a* ?

ID: a4f61d75 Answer

Rationale

The correct answer is either 7, 8, or 13. Since the given equation has two integer solutions, the expression on the left-hand side of this equation can be factored as $(x + c)(x + d)$, where c and d are also integers. The product of c and d must equal the constant term of the original quadratic expression, which is 12. Additionally, the sum of c and d must be a negative number since it's given that $a > 0$, but the sign preceding a in the given equation is negative. The possible pairs of values for c and d that satisfy both of these conditions are -4 and -3, -6 and -2, and -12 and -1. Since the value of $-a$ is the sum of c and d, the possible values of $-a$ are $-4 + (-3) = -7$, $-6 + (-2) = -8$, and $-12 + (-1) = -13$. It follows that the possible values of a are 7, 8, and 13. Note that 7, 8, and 13 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID a31417d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: a31417d1

From 2005 through 2014, the number of music CDs sold in the United States declined each year by approximately 15% of the number sold the preceding year. In 2005, approximately 600 million CDs were sold in the United States. Of the following, which best models C, the number of millions of CDs sold in the United States, t years after 2005?

A. $C = 600(0.15)^t$

B. $C = 600(0.85)^t$

C. $C = 600(1.15)^t$

D. $C = 600(1.85)^t$

ID: a31417d1 Answer

Correct Answer: B

Rationale

Choice B is correct. A model for a quantity C that decreases by a certain percentage per time period t is an exponential equation in the form $C = I\left(1 - \frac{r}{100}\right)^t$, where I is the initial value at time $t = 0$ for r% annual decline. It's given that C is the number of millions of CDs sold in the United States and that t is the number of years after 2005. It's also given that 600 million CDs were sold at time $t = 0$, so $I = 600$. This number declines by 15% per year, so $r = 15$. Substituting these values into the equation produces $C = 600\left(1 - \frac{15}{100}\right)^t$, or $C = 600(0.85)^t$.

Choice A is incorrect and may result from errors made when representing the percent decline. Choices C and D are incorrect. These equations model exponential increases in CD sales, not exponential decreases.

Question Difficulty: Medium

Question ID 66bce0c1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 66bce0c1

$\sqrt{2x+6}+4=x+3$

What is the solution set of the equation above?

A. $\{-1\}$

B. $\{5\}$

C. $\{-1, 5\}$

D. $\{0, -1, 5\}$

ID: 66bce0c1 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 4 from both sides of $\sqrt{2x+6}+4=x+3$ isolates the radical expression on the left side of the equation as follows: $\sqrt{2x+6}=x-1$. Squaring both sides of $\sqrt{2x+6}=x-1$ yields $2x+6=x^2-2x+1$. This equation can be rewritten as a quadratic equation in standard form: $x^2-4x-5=0$. One way to solve this quadratic equation is to factor the expression x^2-4x-5 by identifying two numbers with a sum of -4 and a product of -5. These numbers are -5 and 1. So the quadratic equation can be factored as $(x-5)(x+1)=0$. It follows that 5 and -1 are the solutions to the quadratic equation. However, the solutions must be verified by checking whether 5 and -1 satisfy the original equation, $\sqrt{2x+6}+4=x+3$. When $x=-1$, the original equation gives $\sqrt{2(-1)+6}+4=(-1)+3$, or $6=2$, which is false. Therefore, -1 does not satisfy the original equation. When $x=5$, the original equation gives $\sqrt{2(5)+6}+4=5+3$, or $8=8$, which is true. Therefore, $x=5$ is the only solution to the original equation, and so the solution set is $\{5\}$.

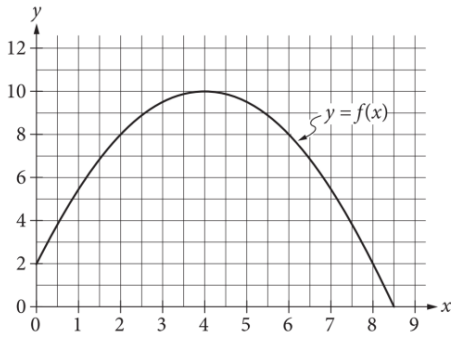
Choices A, C, and D are incorrect because each of these sets contains at least one value that results in a false statement when substituted into the given equation. For instance, in choice D, when 0 is substituted for x into the given equation, the result is $\sqrt{2(0)+6}+4=(0)+3$, or $\sqrt{6}+4=3$. This is not a true statement, so 0 is not a solution to the given equation.

Question Difficulty: Hard

Question ID 97e50fa2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 97e50fa2



The graph of the function *f*, defined by $f(x)=-\frac{1}{2}(x-4)^2+10$, is shown in the *xy*-plane above. If the function *g* (not shown) is defined by $g(x)=-x+10$, what is one possible value of *a* such that $f(a)=g(a)$?

ID: 97e50fa2 Answer

Rationale

The correct answer is either 2 or 8. Substituting $x=a$ in the definitions for f and g gives $f(a)=-\frac{1}{2}(a-4)^2+10$ and $g(a)=-a+10$, respectively. If $f(a)=g(a)$, then $-\frac{1}{2}(a-4)^2+10=-a+10$. Subtracting 10 from both sides of this equation gives $-\frac{1}{2}(a-4)^2=-a$. Multiplying both sides by -2 gives $(a-4)^2=2a$. Expanding $(a-4)^2$ gives $a^2-8a+16=2a$. Combining the like terms on one side of the equation gives $a^2-10a+16=0$. One way to solve this equation is to factor $a^2-10a+16$ by identifying two numbers with a sum of -10 and a product of 16. These numbers are -2 and -8, so the quadratic equation can be factored as $(a-2)(a-8)=0$. Therefore, the possible values of a are either 2 or 8. Note that 2 and 8 are examples of ways to enter a correct answer.

Alternate approach: Graphically, the condition $f(a)=g(a)$ implies the graphs of the functions $y=f(x)$ and $y=g(x)$ intersect at $x=a$. The graph $y=f(x)$ is given, and the graph of $y=g(x)$ may be sketched as a line with y-intercept 10 and a slope of -1 (taking care to note the different scales on each axis). These two graphs intersect at $x=2$ and $x=8$.

Question Difficulty: Hard

Question ID 6d04c89d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 6d04c89d

The expression $\frac{24}{6x+42}$ is equivalent to $\frac{4}{x+b}$, where b is a constant and $x > 0$. What is the value of b?

A. 7

B. 10

C. 24

D. 252

ID: 6d04c89d Answer

Correct Answer: A

Rationale

Choice A is correct. Since the given expressions are equivalent and the numerator of the second expression is $\frac{1}{6}$ of the numerator of the first expression, the denominator of the second expression must also be $\frac{1}{6}$ of the denominator of the first expression. By the distributive property, $\frac{1}{6}(6x + 42)$ is equivalent to $\frac{1}{6}(6x) + \frac{1}{6}(42)$, or $x + 7$. Therefore, the value of b is 7.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID ebb717ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: ebb717ab

$x^2 - 34x + c = 0$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n?

ID: ebb717ab Answer

Correct Answer: 289

Rationale

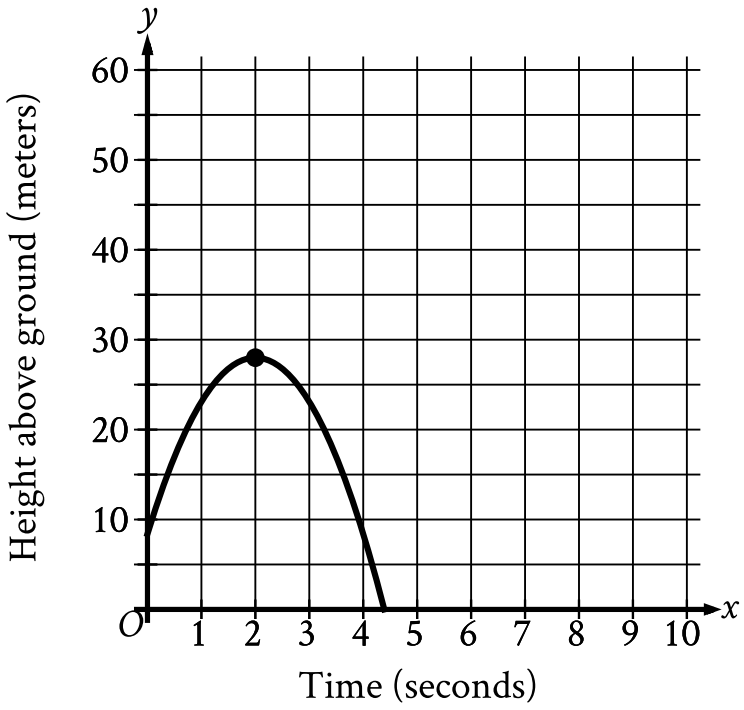
The correct answer is 289. A quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has no real solutions when the value of the discriminant, $b^2 - 4ac$, is less than 0. In the given equation, $x^2 - 34x + c = 0$, $a = 1$ and $b = -34$. Therefore, the discriminant of the given equation can be expressed as $(-34)^2 - 4(1)(c)$, or $1{,}156 - 4c$. It follows that the given equation has no real solutions when $1{,}156 - 4c < 0$. Adding $4c$ to both sides of this inequality yields $1{,}156 < 4c$. Dividing both sides of this inequality by 4 yields $289 < c$, or $c > 289$. It's given that the equation $x^2 - 34x + c = 0$ has no real solutions when $c > n$. Therefore, the least possible value of n is 289.

Question Difficulty: Hard

Question ID 197bed38

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 197bed38



An object was launched upward from a platform. The graph shown models the height above ground, y, in meters, of the object x seconds after it was launched. For which of the following intervals of time was the height of the object increasing for the entire interval?

A. From $x = 0$ to $x = 2$

B. From $x = 0$ to $x = 4$

C. From $x = 2$ to $x = 3$

D. From $x = 3$ to $x = 4$

ID: 197bed38 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the variable y represents the height, in meters, of the object above the ground. The graph shows that the height of the object was increasing from $x = 0$ to $x = 2$, and decreasing from $x = 2$ to $x = 4$. Therefore, the height of the object was increasing for the entire interval of time from $x = 0$ to $x = 2$.

Choice B is incorrect. The height of the object wasn't increasing for this entire interval of time, as it was decreasing from $x = 2$ to $x = 4$.

Choice C is incorrect. The height of the object was decreasing, not increasing, for this entire interval of time.

Choice D is incorrect. The height of the object was decreasing, not increasing, for this entire interval of time.

Question Difficulty: Medium

Question ID 9afe2370

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 9afe2370

The population P of a certain city y years after the last census is modeled by the equation below, where r is a constant and P_0 is the population when $y = 0$.

$P = P_0(1 + r)^y$

If during this time the population of the city decreases by a fixed percent each year, which of the following must be true?

A. $r < -1$

B. $-1 < r < 0$

C. $0 < r < 1$

D. $r > 1$

ID: 9afe2370 Answer

Correct Answer: B

Rationale

Choice B is correct. The term (1 + r) represents a percent change. Since the population is decreasing, the percent change must be between 0% and 100%. When the percent change is expressed as a decimal rather than as a percent, the percentage change must be between 0 and 1. Because (1 + r) represents percent change, this can be expressed as $0 < 1 + r < 1$. Subtracting 1 from all three terms of this compound inequality results in $-1 < r < 0$.

Choice A is incorrect. If $r < -1$, then after 1 year, the population P would be a negative value, which is not possible. Choices C and D are incorrect. For any value of $r > 0$, $1 + r > 1$, and the exponential function models growth for positive values of the exponent. This contradicts the given information that the population is decreasing.

Question Difficulty: Hard

Question ID 60fdb4d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 60fdb4d4

Which expression is equivalent to $(2x^2-4)-(-3x^2+2x-7)$?

A. $5x^2-2x+3$

B. $5x^2+2x-3$

C. $-x^2-2x-11$

D. $-x^2+2x-11$

ID: 60fdb4d4 Answer

Correct Answer: A

Rationale

Choice A is correct. The given expression $(2x^2-4)-(-3x^2+2x-7)$ can be rewritten as $2x^2-4+3x^2-2x+7$. Combining like terms yields $5x^2-2x+3$.

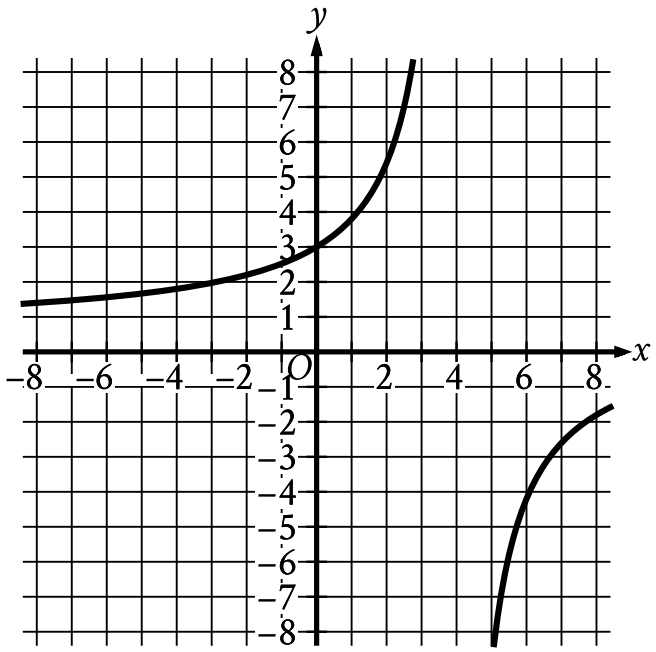
Choices B, C, and D are incorrect and may be the result of errors when applying the distributive property.

Question Difficulty: Easy

Question ID ad376f1a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: ad376f1a



The graph of $y = f(x)$ is shown in the *xy*-plane. What is the value of $f(0)$?

A. -3

B. 0

C. $\frac{3}{5}$

D. 3

ID: ad376f1a Answer

Correct Answer: D

Rationale

Choice D is correct. Because the graph of $y = f(x)$ is shown, the value of $f(0)$ is the value of y on the graph that corresponds with $x = 0$. When $x = 0$, the corresponding value of y is 3. Therefore, the value of $f(0)$ is 3.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID bd4d0e0c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: bd4d0e0c

The function f is defined by $f(x) = 10x^2 - 32x - 152$. What is the value of $f(0)$?

A. -152

B. -32

C. 0

D. 10

ID: bd4d0e0c Answer

Correct Answer: A

Rationale

Choice A is correct. The value of $f(0)$ is the value of $f(x)$ when $x = 0$. The function f is defined by $f(x) = 10x^2 - 32x - 152$. Substituting 0 for x in this equation yields $f(0) = 10(0)^2 - 32(0) - 152$. This equation can be rewritten as $f(0) = 10(0) - 0 - 152$, or $f(0) = -152$. Therefore, the value of $f(0)$ is -152.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

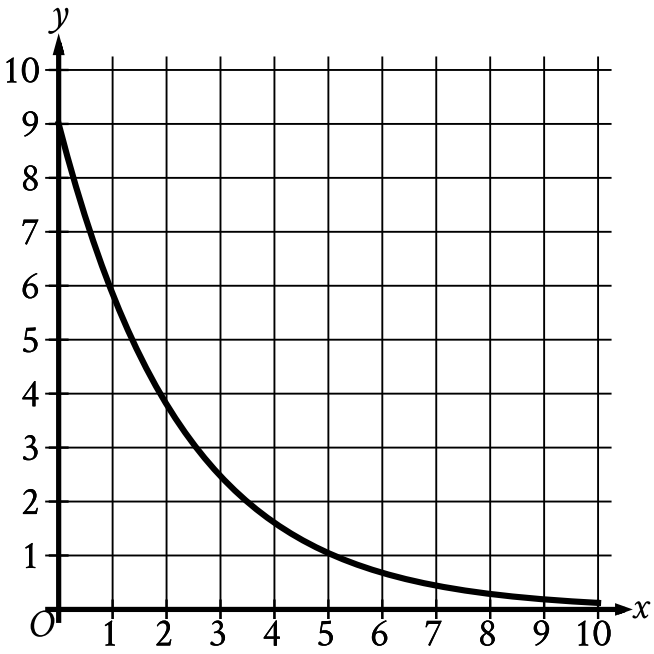
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID db888cd6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: db888cd6



The graph gives the estimated number of catalogs y, in thousands, a company sent to its customers at the end of each year, where x represents the number of years since the end of 1992, where $0 \leq x \leq 10$. Which statement is the best interpretation of the *y*-intercept in this context?

A. The estimated total number of catalogs the company sent to its customers during the first 10 years was $9{,}000$.

B. The estimated total number of catalogs the company sent to its customers from the end of 1992 to the end of 2002 was 90.

C. The estimated number of catalogs the company sent to its customers at the end of 1992 was 9.

D. The estimated number of catalogs the company sent to its customers at the end of 1992 was $9{,}000$.

ID: db888cd6 Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of the graph is the point at which the graph crosses the *y*-axis, or the point for which the value of x is 0. Therefore, the *y*-intercept of the given graph is the point $(0, 9)$. It's given that x represents the number of years since the end of 1992. Therefore, $x = 0$ represents 0 years since the end of 1992, which is the same as the end of 1992. It's also given that y represents the estimated number of catalogs, in thousands, that the company sent to its customers at the end of the year. Therefore, $y = 9$ represents $9{,}000$ catalogs. It follows that the *y*-intercept $(0, 9)$ means that the estimated number of catalogs the company sent to its customers at the end of 1992 was $9{,}000$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 6ecdbcb4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 6ecdbcb4

$f(x) = (x + 6)(x + 5)(x - 4)$ The function f is given. Which table of values represents $y = f(x) - 3$?

A.

x	y
-6	-9
-5	-8
4	1

B.

x	y
-6	-3
-5	-3
4	-3

C.

x	y
-6	-3
-5	-2
4	7

D.

x	y
-6	3
-5	3
4	3

ID: 6ecdbcb4 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $f(x) = (x + 6)(x + 5)(x - 4)$ and $y = f(x) - 3$. Substituting $(x + 6)(x + 5)(x - 4)$ for $f(x)$ in the equation $y = f(x) - 3$ yields $y = (x + 6)(x + 5)(x - 4) - 3$. Substituting -6 for x in this equation yields $y = (-6 + 6)(-6 + 5)(-6 - 4) - 3$, or $y = -3$. Substituting -5 for x in the equation $y = (x + 6)(x + 5)(x - 4) - 3$ yields $y = (-5 + 6)(-5 + 5)(-5 - 4) - 3$, or $y = -3$. Substituting 4 for x in the equation $y = (x + 6)(x + 5)(x - 4) - 3$ yields $y = (4 + 6)(4 + 5)(4 - 4) - 3$, or $y = -3$. Therefore, when $x = -6$ then $y = -3$, when $x = -5$ then $y = -3$, and when $x = 4$ then $y = -3$. Thus, the table of values in choice B represents $y = f(x) - 3$.

Choice A is incorrect. This table represents $y = x - 3$ rather than $y = f(x) - 3$.

Choice C is incorrect. This table represents $y = x + 3$ rather than $y = f(x) - 3$.

Choice D is incorrect. This table represents $y = f(x) + 3$ rather than $y = f(x) - 3$.

Question Difficulty: Medium

Question ID 7cb3a8ee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 7cb3a8ee

$|x - 5| = 10$ What is one possible solution to the given equation?

ID: 7cb3a8ee Answer

Correct Answer: 15, -5

Rationale

The correct answer is 15 or -5. By the definition of absolute value, if $|x - 5| = 10$, then $x - 5 = 10$ or $x - 5 = -10$. Adding 5 to both sides of the first equation yields $x = 15$. Adding 5 to both sides of the second equation yields $x = -5$. Thus, the given equation has two possible solutions, 15 and -5. Note that 15 and -5 are examples of ways to enter a correct answer.

Question Difficulty: Easy

Question ID 967ef685

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 967ef685

Which expression is equivalent to $\frac{42a}{k} + 42ak$, where $k > 0$?

A. $\frac{84a}{k}$

B. $\frac{84ak^2}{k}$

C. $\frac{42a(k+1)}{k}$

D. $\frac{42a(k^2+1)}{k}$

ID: 967ef685 Answer

Correct Answer: D

Rationale

Choice D is correct. Two fractions can be added together when they have a common denominator. Since $k > 0$, multiplying the second term in the given expression by $\frac{k}{k}$ yields $\frac{(42ak)k}{k}$, which is equivalent to $\frac{42ak^2}{k}$. Therefore, the expression $\frac{42a}{k} + 42ak$ can be written as $\frac{42a}{k} + \frac{42ak^2}{k}$ which is equivalent to $\frac{42a+42ak^2}{k}$. Since each term in the numerator of this expression has a factor of $42a$, the expression $\frac{42a+42ak^2}{k}$ can be rewritten as $\frac{42a(1)+42a(k^2)}{k}$, or $\frac{42a(1+k^2)}{k}$, which is equivalent to $\frac{42a(k^2+1)}{k}$.

Choice A is incorrect. This expression is equivalent to $\frac{42a}{k} + \frac{42a}{k}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This expression is equivalent to $\frac{42a}{k} + 42a$.

Question Difficulty: Hard

Question ID 0bebc08c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 0bebc08c

$x = 3$ $y = (15 - x)^2$ A solution to the given system of equations is (x, y). What is the value of xy?

A. 432

B. 54

C. 45

D. 18

ID: 0bebc08c Answer

Correct Answer: A

Rationale

Choice A is correct. The first equation in the given system of equations is $x = 3$. Substituting 3 for x in the second equation in the given system of equations yields $y = (15 - 3)^2$, or $y = 144$. Substituting 3 for x and 144 for y in the expression xy yields $(3)(144)$, or 432. Therefore, the value of xy is 432.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 203774bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 203774bc

The product of two positive integers is 546. If the first integer is 11 greater than twice the second integer, what is the smaller of the two integers?

A. 7

B. 14

C. 39

D. 78

ID: 203774bc Answer

Correct Answer: B

Rationale

Choice B is correct. Let x be the first integer and let y be the second integer. If the first integer is 11 greater than twice the second integer, then $x = 2y + 11$. If the product of the two integers is 546, then $xy = 546$. Substituting $2y + 11$ for x in this equation results in $(2y + 11)y = 546$. Distributing the y to both terms in the parentheses results in $2y^2 + 11y = 546$. Subtracting 546 from both sides of this equation results in $2y^2 + 11y - 546 = 0$. The left-hand side of this equation can be factored by finding two values whose product is $2(-546)$, or $-1{,}092$, and whose sum is 11. The two values whose product is $-1{,}092$ and whose sum is 11 are 39 and -28. Thus, the equation $2y^2 + 11y - 546 = 0$ can be rewritten as $2y^2 + 28y - 39y - 546 = 0$, which is equivalent to $2y(y - 14) + 39(y - 14) = 0$, or $(2y + 39)(y - 14) = 0$. By the zero product property, it follows that $2y + 39 = 0$ and $y - 14 = 0$. Subtracting 39 from both sides of the equation $2y + 39 = 0$ yields $2y = -39$. Dividing both sides of this equation by 2 yields $y = -\frac{39}{2}$. Since y is a positive integer, the value of y is not $-\frac{39}{2}$. Adding 14 to both sides of the equation $y - 14 = 0$ yields $y = 14$. Substituting 14 for y in the equation $xy = 546$ yields $x(14) = 546$. Dividing both sides of this equation by 14 results in $x = 39$. Therefore, the two integers are 14 and 39, so the smaller of the two integers is 14.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the larger of the two integers.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID b7c74b73

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: b7c74b73

$f(x) = 5{,}470(0.64)^{\frac{x}{12}}$

The function f gives the value, in dollars, of a certain piece of equipment after x months of use. If the value of the equipment decreases each year by $p\%$ of its value the preceding year, what is the value of p?

A. 4

B. 5

C. 36

D. 64

ID: b7c74b73 Answer

Correct Answer: C

Rationale

Choice C is correct. For a function of the form $f(x) = a(r)^{\frac{x}{k}}$, where a, r, and k are constants and $r < 1$, the value of $f(x)$ decreases by $100(1 - r)\%$ for every increase of x by k. In the given function, $a = 5{,}470$, $r = 0.64$, and $k = 12$. Therefore, for the given function, the value of $f(x)$ decreases by $100(1 - 0.64)\%$, or 36%, for every increase of x by 12. Since $f(x)$ represents the value, in dollars, of the equipment after x months of use, it follows that the value of the equipment decreases every 12 months by 36% of its value the preceding 12 months. Since there are 12 months in a year, the value of the equipment decreases each year by 36% of its value the preceding year. Thus, the value of p is 36.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c1964c11

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: c1964c11

$p + 34 = q + r$

The given equation relates the variables p, q, and r. Which equation correctly expresses p in terms of q and r?

A. $p = q + r + 34$

B. $p = q + r - 34$

C. $p = -q - r + 34$

D. $p = -q - r - 34$

ID: c1964c11 Answer

Correct Answer: B

Rationale

Choice B is correct. Subtracting 34 from each side of the given equation yields $p = q + r - 34$. Thus, the equation $p = q + r - 34$ correctly expresses p in terms of q and r.

Choice A is incorrect. This equation can be rewritten as $p - 34 = q + r$.

Choice C is incorrect. This equation can be rewritten as $p - 34 = -q - r$.

Choice D is incorrect. This equation can be rewritten as $p + 34 = -q - r$.

Question Difficulty: Easy

Question ID 3d12b1e0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 3d12b1e0

$-16x^2 - 8x + c = 0$

In the given equation, c is a constant. The equation has exactly one solution. What is the value of c?

ID: 3d12b1e0 Answer

Correct Answer: -1

Rationale

The correct answer is -1. A quadratic equation in the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has exactly one solution when its discriminant, $b^2 - 4ac$, is equal to 0. In the given equation, $-16x^2 - 8x + c = 0$, $a = -16$ and $b = -8$. Substituting -16 for a and -8 for b in $b^2 - 4ac$ yields $(-8)^2 - 4(-16)(c)$, or $64 + 64c$. Since the given equation has exactly one solution, $64 + 64c = 0$. Subtracting 64 from both sides of this equation yields $64c = -64$. Dividing both sides of this equation by 64 yields $c = -1$. Therefore, the value of c is -1.

Question Difficulty: Hard

Question ID 2c88af4d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 2c88af4d

The expression $\frac{x^{-2}y^{\frac{1}{2}}}{x^{\frac{1}{3}}y^{-1}}$, where $x > 1$ and $y > 1$, is equivalent to which of the following?

A. $\frac{\sqrt{y}}{\sqrt[3]{x^2}}$

B. $\frac{y\sqrt{y}}{\sqrt[3]{x^2}}$

C. $\frac{y\sqrt{y}}{x\sqrt{x}}$

D. $\frac{y\sqrt{y}}{x^2\sqrt[3]{x}}$

ID: 2c88af4d Answer

Correct Answer: D

Rationale

Choice D is correct. For $x > 1$ and $y > 1$, $x^{\frac{1}{3}}$ and $y^{\frac{1}{2}}$ are equivalent to $\sqrt[3]{x}$ and $\sqrt{y}$, respectively. Also, x^{-2} and y^{-1} are equivalent to $\frac{1}{x^2}$ and $\frac{1}{y}$, respectively. Therefore, the given expression can be rewritten as $\frac{y\sqrt{y}}{x^2\sqrt[3]{x}}$.

Choices A, B, and C are incorrect because these choices are not equivalent to the given expression for $x > 1$ and $y > 1$.

For example, for $x = 2$ and $y = 2$, the value of the given expression is $2^{-\frac{5}{6}}$; the values of the choices, however, are $2^{-\frac{1}{3}}$, $2^{\frac{5}{6}}$, and 1, respectively.

Question Difficulty: Hard

Question ID c4cd5bcc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: c4cd5bcc

In the *xy*-plane, the *y*-coordinate of the *y*-intercept of the graph of the function *f* is *c*. Which of the following must be equal to *c* ?

A. $f(0)$

B. $f(1)$

C. $f(2)$

D. $f(3)$

ID: c4cd5bcc Answer

Correct Answer: A

Rationale

Choice A is correct. A y-intercept is the point in the xy-plane where the graph of the function crosses the y-axis, which is where $x = 0$. It's given that the y-coordinate of the y-intercept of the graph of function f is c. It follows that the coordinate pair representing the y-intercept must be $(0,c)$. Therefore, c must equal $f(0)$.

Choices B, C, and D are incorrect because $f(1)$, $f(2)$, and $f(3)$would represent the y-value of the coordinate where $x = 1$, $x = 2$, and $x = 3$, respectively.

Question Difficulty: Medium

Question ID dc77e0dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: dc77e0dc

$f(t) = 500(0.5)^{\frac{t}{12}}$

The function f models the intensity of an X-ray beam, in number of particles in the X-ray beam, t millimeters below the surface of a sample of iron. According to the model, what is the estimated number of particles in the X-ray beam when it is at the surface of the sample of iron?

A. 500

B. 12

C. 5

D. 2

ID: dc77e0dc Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function f models the intensity of an X-ray beam, in number of particles in the X-ray beam, t millimeters below the surface of a sample of iron. When the X-ray beam is at the surface of the sample of iron, it is 0 millimeters below the surface, so the value of t is 0. Substituting 0 for t in the function $f(t) = 500(0.5)^{\frac{t}{12}}$ yields $f(0) = 500(0.5)^{\frac{0}{12}}$. Since any positive number raised to the power of 0 is equal to 1, it follows that $f(0) = 500(1)$, or $f(0) = 500$. Therefore, the estimated number of particles in the X-ray beam at the surface of the sample of iron is 500.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 062f86db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 062f86db

$5x^2 - 37x - 24 = 0$ What is the positive solution to the given equation?

A. $\frac{3}{5}$

B. 3

C. 8

D. 37

ID: 062f86db Answer

Correct Answer: C

Rationale

Choice C is correct. The left-hand side of the given equation can be factored as $(5x + 3)(x - 8)$. Therefore, the given equation, $5x^2 - 37x - 24 = 0$, can be written as $(5x + 3)(x - 8) = 0$. Applying the zero product property to this equation yields $5x + 3 = 0$ and $x - 8 = 0$. Subtracting 3 from both sides of the equation $5x + 3 = 0$ yields $5x = -3$. Dividing both sides of this equation by 5 yields $x = -\frac{3}{5}$. Adding 8 to both sides of the equation $x - 8 = 0$ yields $x = 8$. Therefore, the two solutions to the given equation, $5x^2 - 37x - 24 = 0$, are $-\frac{3}{5}$ and 8. It follows that 8 is the positive solution to the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 735a0a00

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 735a0a00

$y = 0.25x^2 - 7.5x + 90.25$

The equation gives the estimated stock price y, in dollars, for a certain company x days after a new product launched, where $0 \leq x \leq 20$. Which statement is the best interpretation of $(x, y) = (1, 83)$ in this context?

A. The company's estimated stock price increased $\$83$ every day after the new product launched.

B. The company's estimated stock price increased $\$1$ every 83 days after the new product launched.

C. 1 day after the new product launched, the company's estimated stock price is $\$83$.

D. 83 days after the new product launched, the company's estimated stock price is $\$1$.

ID: 735a0a00 Answer

Correct Answer: C

Rationale

Choice C is correct. In the given equation, x represents the number of days after a new product launched, where $0 \leq x \leq 20$, and y represents the estimated stock price, in dollars, for a certain company. Therefore, the best interpretation of $(x, y) = (1, 83)$ in this context is that 1 day after the new product launched, the company's estimated stock price is $\$83$.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID ffdbcad4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: ffdbcad4

The expression $4x^2 + bx - 45$, where b is a constant, can be rewritten as $(hx + k)(x + j)$, where h, k, and j are integer constants. Which of the following must be an integer?

A. $\frac{b}{h}$

B. $\frac{b}{k}$

C. $\frac{45}{h}$

D. $\frac{45}{k}$

ID: ffdbcad4 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $4x^2 + bx - 45$ can be rewritten as $(hx + k)(x + j)$. The expression $(hx + k)(x + j)$ can be rewritten as $hx^2 + jhx + kx + kj$, or $hx^2 + (jh + k)x + kj$. Therefore, $hx^2 + (jh + k)x + kj$ is equivalent to $4x^2 + bx - 45$. It follows that $kj = -45$. Dividing each side of this equation by k yields $j = \frac{-45}{k}$. Since j is an integer, $-\frac{45}{k}$ must be an integer. Therefore, $\frac{45}{k}$ must also be an integer.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

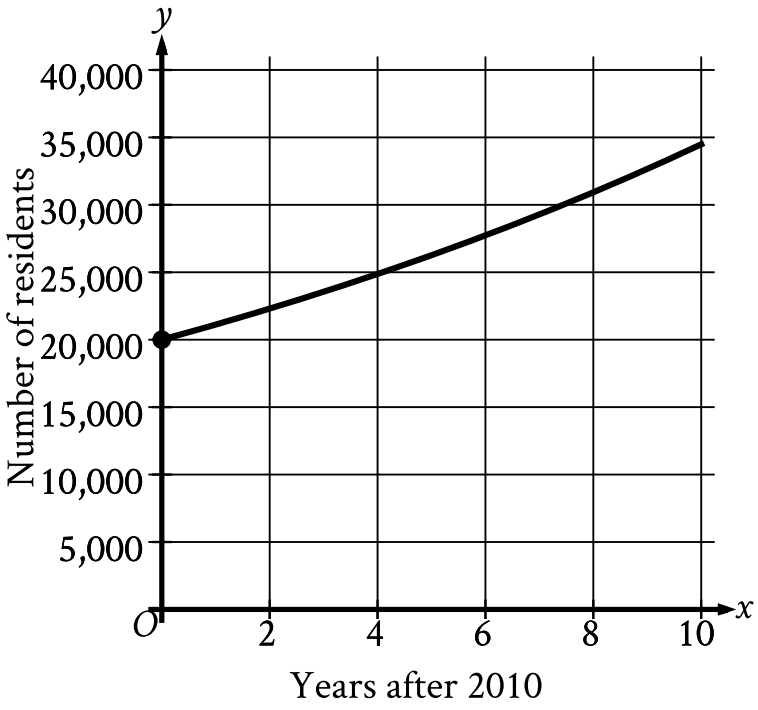
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2d394c28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 2d394c28



The graph shown models the number of residents of a certain city x years after 2010. How many residents does this model estimate the city had in 2010?

A. 0

B. $2{,}000$

C. $20{,}000$

D. $25{,}000$

ID: 2d394c28 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that x represents years after 2010. Therefore, 2010 is represented by $x = 0$. On the model shown, the point with an *x*-coordinate of 0 has a *y*-coordinate of $20{,}000$. Thus, the model estimates that in 2010, the city had $20{,}000$ residents.

Choice A is incorrect. This is the value of x that represents the year 2010.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is approximately the number of residents the model estimates the city had in 2014, not 2010.

Question Difficulty: Easy

Question ID 71014fb1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 71014fb1

$(x-1)^2=-4$ How many distinct real solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 71014fb1 Answer

Correct Answer: D

Rationale

Choice D is correct. Any quantity that is positive or negative in value has a positive value when squared. Therefore, the left-hand side of the given equation is either positive or zero for any value of x. Since the right-hand side of the given equation is negative, there is no value of x for which the given equation is true. Thus, the number of distinct real solutions for the given equation is zero.

Choices A, B, and C are incorrect and may result from conceptual errors.

Question Difficulty: Hard

Question ID 5639dd1a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 5639dd1a

$x^2 = (22)(22)$ What is the positive solution to the given equation?

ID: 5639dd1a Answer

Correct Answer: 22

Rationale

The correct answer is 22. The given equation, $x^2 = (22)(22)$, is equivalent to $x^2 = (22)^2$. Taking the square root of each side of this equation yields $x = \pm 22$. Thus, the positive solution to the given equation is 22.

Question Difficulty: Easy

Question ID 4a5af623

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 4a5af623

Which expression is a factor of $2x^2 + 38x + 10$?

A. 2

B. $5x$

C. $38x$

D. $2x^2$

ID: 4a5af623 Answer

Correct Answer: A

Rationale

Choice A is correct. Since 2 is a common factor of each of the terms in the given expression, the expression can be rewritten as $2(x^2 + 19x + 5)$. Therefore, the factors of the given expression are 2 and $x^2 + 19x + 5$. Of these two factors, only 2 is listed as a choice.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is a term of the given expression, not a factor of the given expression.

Choice D is incorrect. This is a term of the given expression, not a factor of the given expression.

Question Difficulty: Easy

Question ID 22fd3e1f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 22fd3e1f

$f(x)=x^3-9x$

$g(x)=x^2-2x-3$

Which of the following expressions is equivalent to $\frac{f(x)}{g(x)}$, for $x>3$?

A. $\frac{1}{x+1}$

B. $\frac{x+3}{x+1}$

C. $\frac{x(x-3)}{x+1}$

D. $\frac{x(x+3)}{x+1}$

ID: 22fd3e1f Answer

Correct Answer: D

Rationale

Choice D is correct. Since $x^3-9x=x(x+3)(x-3)$ and $x^2-2x-3=(x+1)(x-3)$, the fraction $\frac{f(x)}{g(x)}$ can be written as $\frac{x(x+3)(x-3)}{(x+1)(x-3)}$. It is given that $x>3$, so the common factor $x-3$ is not equal to 0. Therefore, the fraction can be further simplified to $\frac{x(x+3)}{x+1}$.

Choice A is incorrect. The expression $\frac{1}{x+1}$ is not equivalent to $\frac{f(x)}{g(x)}$ because at $x=0$, $\frac{1}{x+1}$ as a value of 1 and $\frac{f(x)}{g(x)}$ has a value of 0.

Choice B is incorrect and results from omitting the factor x in the factorization of $f(x)$. Choice C is incorrect and may result from incorrectly factoring $g(x)$ as $(x+1)(x+3)$ instead of $(x+1)(x-3)$.

Question Difficulty: Hard

Question ID 717a1964

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 717a1964

$z^2 + 10z - 24 = 0$ What is one of the solutions to the given equation?

ID: 717a1964 Answer

Correct Answer: 2, -12

Rationale

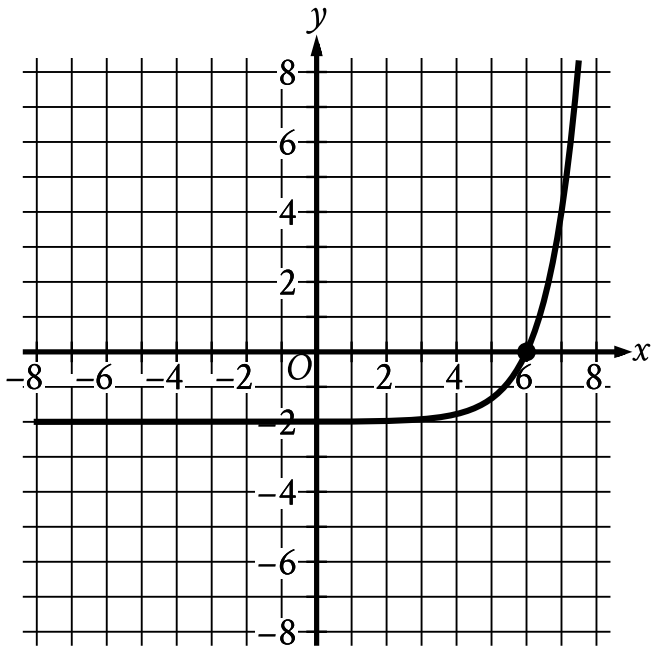
The correct answer is either 2 or -12. The left-hand side of the given equation can be rewritten by factoring. The two values that multiply to -24 and add to 10 are 12 and -2. It follows that the given equation can be rewritten as $(z + 12)(z - 2) = 0$. Setting each factor equal to 0 yields two equations: $z + 12 = 0$ and $z - 2 = 0$. Subtracting 12 from both sides of the equation $z + 12 = 0$ results in $z = -12$. Adding 2 to both sides of the equation $z - 2 = 0$ results in $z = 2$. Note that 2 and -12 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 2b6c12eb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 2b6c12eb



What is the *x*-coordinate of the *x*-intercept of the graph shown?

ID: 2b6c12eb Answer

Correct Answer: 6

Rationale

The correct answer is 6. An *x*-intercept of a graph is a point on the graph where it intersects the *x*-axis, or where the value of y is 0. The graph shown intersects the *x*-axis at the point $(6, 0)$. Therefore, the *x*-coordinate of the *x*-intercept of the graph shown is 6.

Question Difficulty: Easy

Question ID 4dc5c6f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 4dc5c6f9

$y = 18$ $y = -3(x - 18)^2 + 15$

If the given equations are graphed in the *xy*-plane, at how many points do the graphs of the equations intersect?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 4dc5c6f9 Answer

Correct Answer: D

Rationale

Choice D is correct. A point (x, y) is a solution to a system of equations if it lies on the graphs of both equations in the *xy*-plane. In other words, a solution to a system of equations is a point (x, y) at which the graphs intersect. It's given that the first equation is $y = 18$. Substituting 18 for y in the second equation yields $18 = -3(x - 18)^2 + 15$. Subtracting 15 from each side of this equation yields $3 = -3(x - 18)^2$. Dividing each side of this equation by -3 yields $-1 = (x - 18)^2$. Since the square of a real number is at least 0, this equation can't have any real solutions. Therefore, the graphs of the equations intersect at zero points.

Alternate approach: The graph of the second equation is a parabola that opens downward and has a vertex at $(18, 15)$. Therefore, the maximum value of this parabola occurs when $y = 15$. The graph of the first equation is a horizontal line at 18 on the *y*-axis, or $y = 18$. Since 18 is greater than 15, or the horizontal line is above the vertex of the parabola, the graphs of these equations intersect at zero points.

Choice A is incorrect. The graph of $y = 15$, not $y = 18$, and the graph of the second equation intersect at exactly one point.

Choice B is incorrect. The graph of any horizontal line such that the value of y is less than 15, not greater than 15, and the graph of the second equation intersect at exactly two points.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 78d5f91a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 78d5f91a

$f(x)=x^3+3x^2-6x-1$

For the function f defined above, what is the value of $f(-1)$?

A. -11

B. -7

C. 7

D. 11

ID: 78d5f91a Answer

Correct Answer: C

Rationale

Choice C is correct. Substituting -1 for x in the given function f gives $f(-1)=(-1)^3+3(-1)^2-6(-1)-1$, which simplifies to $f(-1)=-1+3(1)-6(-1)-1$. This further simplifies to $f(-1)=-1+3+6-1$, or $f(-1)=7$.

Choice A is incorrect and may result from correctly substituting -1 for x in the function but incorrectly simplifying the resulting expression to $f(-1)=-1-3-6-1$, or -11. Choice B is incorrect and may result from arithmetic errors. Choice D is incorrect and may result from correctly substituting -1 for x in the function but incorrectly simplifying the expression to $f(-1)=1+3+6+1$, or 11.

Question Difficulty: Medium

Question ID d675744f

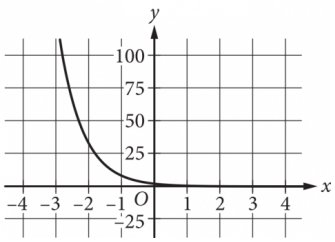
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: d675744f

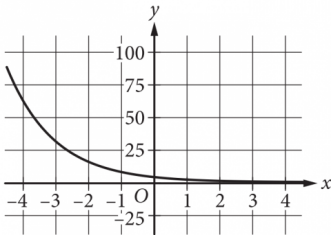
$y = 4(2^x)$

Which of the following is the graph in the *xy*-plane of the given equation?

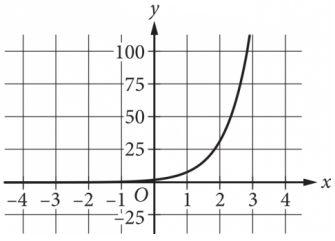
A.



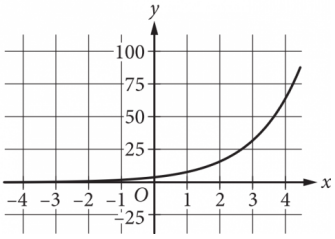
B.



C.



D.



ID: d675744f Answer

Correct Answer: D

Rationale

Choice D is correct. The y-intercept of the graph of an equation is the point $(0,b)$, where b is the value of y when $x = 0$. For the given equation, $y = 4$ when $x = 0$. It follows that the y-intercept of the graph of the given equation is $(0,4)$. Additionally, for the given equation, the value of y doubles for each increase of 1 in the value of x. Therefore, the graph contains the points $(1,8)$, $(2,16)$, $(3,32)$, and $(4,64)$. Only the graph shown in choice D passes through these points.

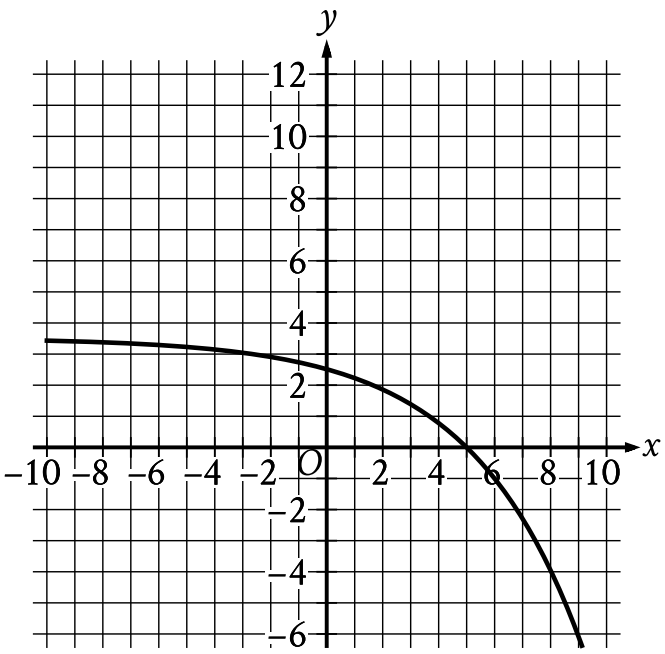
Choices A and B are incorrect because these are graphs of decreasing, not increasing, exponential functions. Choice C is incorrect because the value of y increases by a growth factor greater than 2 for each increase of 1 in the value of x.

Question Difficulty: Medium

Question ID 79e6ec70

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 79e6ec70



What is the *x*-intercept of the graph shown?

A. $(-5, 0)$

B. $(5, 0)$

C. $(-2, 0)$

D. $(2, 0)$

ID: 79e6ec70 Answer

Correct Answer: B

Rationale

Choice B is correct. An *x*-intercept of a graph in the *xy*-plane is a point at which the graph crosses the *x*-axis. The graph shown crosses the *x*-axis at the point $(5, 0)$. Therefore, the *x*-intercept of the graph shown is $(5, 0)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a0b4103e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: a0b4103e

The expression $\frac{1}{3}x^2-2$ can be rewritten as $\frac{1}{3}(x-k)(x+k)$, where k is a positive constant. What is the value of k?

A. 2

B. 6

C. $\sqrt{2}$

D. $\sqrt{6}$

ID: a0b4103e Answer

Correct Answer: D

Rationale

Choice D is correct. Factoring out the coefficient $\frac{1}{3}$, the given expression can be rewritten as $\frac{1}{3}(x^2-6)$. The expression x^2-6 can be approached as a difference of squares and rewritten as $(x-\sqrt{6})(x+\sqrt{6})$. Therefore, k must be $\sqrt{6}$.

Choice A is incorrect. If k were 2, then the expression given would be rewritten as $\frac{1}{3}(x-2)(x+2)$, which is equivalent to $\frac{1}{3}x^2-\frac{4}{3}$, not $\frac{1}{3}x^2-2$.

Choice B is incorrect. This may result from incorrectly factoring the expression and finding $(x-6)(x+6)$ as the factored form of the expression. Choice C is incorrect. This may result from incorrectly distributing the $\frac{1}{3}$ and rewriting the expression as $\frac{1}{3}(x^2-2)$.

Question Difficulty: Hard

Question ID 5377d9cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 5377d9cf

If $f(x)=\frac{x^2-6x+3}{x-1}$,

what is $f(-1)$?

A. −5

B. −2

C. 2

D. 5

ID: 5377d9cf Answer

Correct Answer: A

Rationale

Choice A is correct. Substituting −1 for x in the equation that defines f gives $f(-1)=\frac{(-1)^2-6(-1)+3}{(-1)-1}$. Simplifying the expressions in the numerator and denominator yields $\frac{1+6+3}{-2}$, which is equal to $\frac{10}{-2}$ or −5.

Choices B, C, and D are incorrect and may result from misapplying the order of operations when substituting −1 for x.

Question Difficulty: Easy

Question ID 2cd6b22d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 2cd6b22d

$5x^2 + 10x + 16 = 0$ How many distinct real solutions does the given equation have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 2cd6b22d Answer

Correct Answer: D

Rationale

Choice D is correct. The number of solutions of a quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. If the value of the discriminant is positive, then the quadratic equation has exactly two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is negative, then the quadratic equation has zero real solutions. In the given equation, $5x^2 + 10x + 16 = 0$, $a = 5$, $b = 10$, and $c = 16$. Substituting these values for a, b, and c in $b^2 - 4ac$ yields $(10)^2 - 4(5)(16)$, or -220. Since the value of its discriminant is negative, the given equation has zero real solutions. Therefore, the number of distinct real solutions the given equation has is zero.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID f2d60b99

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: f2d60b99

The function $f(x) = \frac{1}{9}(x - 7)^2 + 3$ gives a metal ball's height above the ground $f(x)$, in inches, x seconds after it started moving on a track, where $0 \leq x \leq 10$. Which of the following is the best interpretation of the vertex of the graph of $y = f(x)$ in the *xy*-plane?

A. The metal ball's minimum height was 3 inches above the ground.

B. The metal ball's minimum height was 7 inches above the ground.

C. The metal ball's height was 3 inches above the ground when it started moving.

D. The metal ball's height was 7 inches above the ground when it started moving.

ID: f2d60b99 Answer

Correct Answer: A

Rationale

Choice A is correct. The graph of a quadratic equation in the form $y = a(x - h)^2 + k$, where a, h, and k are positive constants, is a parabola that opens upward with vertex (h, k). The given function $f(x) = \frac{1}{9}(x - 7)^2 + 3$ is in the form $y = a(x - h)^2 + k$, where $y = f(x)$, $a = \frac{1}{9}$, $h = 7$, and $k = 3$. Therefore, the graph of $y = f(x)$ is a parabola that opens upward with vertex $(7, 3)$. Since the parabola opens upward, the vertex is the lowest point on the graph. It follows that the *y*-coordinate of the vertex of the graph of $y = f(x)$ is the minimum value of $f(x)$. Therefore, the minimum value of $f(x)$ is 3. It's given that $f(x) = \frac{1}{9}(x - 7)^2 + 3$ represents the metal ball's height above the ground, in inches, x seconds after it started moving on a track. Therefore, the best interpretation of the vertex of the graph of $y = f(x)$ is that the metal ball's minimum height was 3 inches above the ground.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID e9349667

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: e9349667

$y = x^2 + 2x + 1$

$x + y + 1 = 0$

If (x_1, y_1) and (x_2, y_2) are the two solutions to the system of equations above, what is the value of $y_1 + y_2$?

A. -3

B. -2

C. -1

D. 1

ID: e9349667 Answer

Correct Answer: D

Rationale

Choice D is correct. The system of equations can be solved using the substitution method. Solving the second equation for y gives y = −x − 1. Substituting the expression −x − 1 for y into the first equation gives $-x - 1 = x^2 + 2x + 1$. Adding x + 1 to both sides of the equation yields $x^2 + 3x + 2 = 0$. The left-hand side of the equation can be factored by finding two numbers whose sum is 3 and whose product is 2, which gives (x + 2)(x + 1) = 0. Setting each factor equal to 0 yields x + 2 = 0 and x + 1 = 0, and solving for x yields x = −2 or x = −1. These values of x can be substituted for x in the equation y = −x − 1 to find the corresponding y-values: y = −(−2) − 1 = 2 − 1 = 1 and y = −(−1) − 1 = 1 − 1 = 0. It follows that (−2, 1) and (−1, 0) are the solutions to the given system of equations. Therefore, $(x_1, y_1) = (-2, 1)$, $(x_2, y_2) = (-1, 0)$, and $y_1 + y_2 = 1 + 0 = 1$.

Choice A is incorrect. The solutions to the system of equations are $(x_1, y_1) = (-2, 1)$ and $(x_2, y_2) = (-1, 0)$. Therefore, −3 is the sum of the x-coordinates of the solutions, not the sum of the y-coordinates of the solutions. Choices B and C are incorrect and may be the result of computation or substitution errors.

Question Difficulty: Hard

Question ID 67f4b449

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 67f4b449

The function $f(w) = 6w^2$ gives the area of a rectangle, $\textbf{in square feet } (\text{ft}^2)$, if its width is w ft and its length is 6 times its width. Which of the following is the best interpretation of $f(14) = 1{,}176$?

A. If the width of the rectangle is 14 ft, then the area of the rectangle is $1{,}176$ ft^2.

B. If the width of the rectangle is 14 ft, then the length of the rectangle is $1{,}176$ ft.

C. If the width of the rectangle is $1{,}176$ ft, then the length of the rectangle is 14 ft.

D. If the width of the rectangle is $1{,}176$ ft, then the area of the rectangle is 14 ft^2.

ID: 67f4b449 Answer

Correct Answer: A

Rationale

Choice A is correct. The function f gives the area of the rectangle, in ft^2, if its width is w ft. Since the value of $f(14)$ is the value of $f(w)$ if $w = 14$, it follows that $f(14) = 1{,}176$ means that $f(w)$ is $1{,}176$ if $w = 14$. In the given context, this means that if the width of the rectangle is 14 ft, then the area of the rectangle is $1{,}176$ ft^2.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from interpreting $f(w)$ as the width, in ft, of the rectangle if its area is w ft^2, rather than as the area, in ft^2, of the rectangle if its width is w ft.

Question Difficulty: Medium

Question ID 49efde89

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 49efde89

The expression $2x^2 + ax$ is equivalent to $x(2x + 7)$ for some constant *a*. What is the value of *a* ?

A. 2

B. 3

C. 4

D. 7

ID: 49efde89 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $2x^2 + ax$ is equivalent to $x(2x + 7)$ for some constant a. Distributing the x over each term in the parentheses gives $2x^2 + 7x$, which is in the same form as the first given expression, $2x^2 + ax$. The coefficient of the second term in $2x^2 + 7x$ is 7. Therefore, the value of a is 7.

Choice A is incorrect. If the value of a were 2, then $2x^2 + ax$ would be equivalent to $2x^2 + 2x$, which isn't equivalent to $x(2x + 7)$. Choice B is incorrect. If the value of a were 3, then $2x^2 + ax$ would be equivalent to $2x^2 + 3x$, which isn't equivalent to $x(2x + 7)$. Choice C is incorrect. If the value of a were 4, then $2x^2 + ax$ would be equivalent to $2x^2 + 4x$, which isn't equivalent to $x(2x + 7)$.

Question Difficulty: Easy

Question ID 44076c7d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 44076c7d

x	$f(x)$
-1	10
0	14
1	20

For the quadratic function f, the table shows three values of x and their corresponding values of $f(x)$. Which equation defines f?

A. $f(x) = 3x^2 + 3x + 14$

B. $f(x) = 5x^2 + x + 14$

C. $f(x) = 9x^2 - x + 14$

D. $f(x) = x^2 + 5x + 14$

ID: 44076c7d Answer

Correct Answer: D

Rationale

Choice D is correct. The equation of a quadratic function can be written in the form $f(x) = a(x - h)^2 + k$, where a, h, and k are constants. It's given in the table that when $x = -1$, the corresponding value of $f(x)$ is 10. Substituting -1 for x and 10 for $f(x)$ in the equation $f(x) = a(x - h)^2 + k$ gives $10 = a(-1 - h)^2 + k$, which is equivalent to $10 = a(1 + 2h + h^2) + k$, or $10 = a + 2ah + ah^2 + k$. It's given in the table that when $x = 0$, the corresponding value of $f(x)$ is 14. Substituting 0 for x and 14 for $f(x)$ in the equation $f(x) = a(x - h)^2 + k$ gives $14 = a(0 - h)^2 + k$, or $14 = ah^2 + k$. It's given in the table that when $x = 1$, the corresponding value of $f(x)$ is 20. Substituting 1 for x and 20 for $f(x)$ in the equation $f(x) = a(x - h)^2 + k$ gives $20 = a(1 - h)^2 + k$, which is equivalent to $20 = a(1 - 2h + h^2) + k$, or $20 = a - 2ah + ah^2 + k$. Adding $20 = a - 2ah + ah^2 + k$ to the equation $10 = a + 2ah + ah^2 + k$ gives $30 = 2a + 2ah^2 + 2k$. Dividing both sides of this equation by 2 gives $15 = a + ah^2 + k$. Since $14 = ah^2 + k$, substituting 14 for $ah^2 + k$ into the equation $15 = a + ah^2 + k$ gives $15 = a + 14$. Subtracting 14 from both sides of this equation gives $a = 1$. Substituting 1 for a in the equations $14 = ah^2 + k$ and $20 = ah^2 - 2ah + a + k$ gives $14 = h^2 + k$ and $20 = 1 - 2h + h^2 + k$, respectively. Since $14 = h^2 + k$, substituting 14 for $h^2 + k$ in the equation $20 = 1 - 2h + h^2 + k$ gives $20 = 1 - 2h + 14$, or $20 = 15 - 2h$. Subtracting 15 from both sides of this equation gives $5 = -2h$. Dividing both sides of this equation by -2 gives $-\frac{5}{2} = h$. Substituting $-\frac{5}{2}$ for h into the equation $14 = h^2 + k$ gives $14 = \left(-\frac{5}{2}\right)^2 + k$, or $14 = \frac{25}{4} + k$. Subtracting $\frac{25}{4}$ from both sides of this equation gives $\frac{31}{4} = k$. Substituting 1 for a, $-\frac{5}{2}$ for h, and $\frac{31}{4}$ for k in the equation $f(x) = a(x - h)^2 + k$ gives $f(x) = \left(x + \frac{5}{2}\right)^2 + \frac{31}{4}$, which is equivalent to $f(x) = x^2 + 5x + \frac{25}{4} + \frac{31}{4}$, or $f(x) = x^2 + 5x + 14$. Therefore, $f(x) = x^2 + 5x + 14$ defines f.

Choice A is incorrect. If $f(x) = 3x^2 + 3x + 14$, then when $x = -1$, the corresponding value of $f(x)$ is 14, not 10.

Choice B is incorrect. If $f(x) = 5x^2 + x + 14$, then when $x = -1$, the corresponding value of $f(x)$ is 18, not 10.

Choice C is incorrect. If $f(x) = 9x^2 - x + 14$, then when $x = -1$, the corresponding value of $f(x)$ is 24, not 10, and when $x = 1$, the corresponding value of $f(x)$ is 22, not 20.

Question Difficulty: Medium

Question ID 1f353a9e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1f353a9e

$f(t) = 8{,}000(0.65)^t$

The given function f models the number of coupons a company sent to their customers at the end of each year, where t represents the number of years since the end of 1998, and $0 \leq t \leq 5$. If $y = f(t)$ is graphed in the *ty*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of coupons the company sent to their customers during the 5 years was $1{,}428$.

B. The minimum estimated number of coupons the company sent to their customers during the 5 years was $8{,}000$.

C. The estimated number of coupons the company sent to their customers at the end of 1998 was $1{,}428$.

D. The estimated number of coupons the company sent to their customers at the end of 1998 was $8{,}000$.

ID: 1f353a9e Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of a graph in the *ty*-plane is the point where $t = 0$. For the given function f, the *y*-intercept of the graph of $y = f(t)$ in the *ty*-plane can be found by substituting 0 for t in the equation $y = 8{,}000(0.65)^t$, which gives $y = 8{,}000(0.65)^0$. This is equivalent to $y = 8{,}000(1)$, or $y = 8{,}000$. Therefore, the *y*-intercept of the graph of $y = f(t)$ is $(0, 8{,}000)$. It's given that the function f models the number of coupons a company sent to their customers at the end of each year. Therefore, $f(t)$ represents the estimated number of coupons the company sent to their customers at the end of each year. It's also given that t represents the number of years since the end of 1998. Therefore, $t = 0$ represents 0 years since the end of 1998, or the end of 1998. Thus, the best interpretation of the *y*-intercept of the graph of $y = f(t)$ is that the estimated number of coupons the company sent to their customers at the end of 1998 was $8{,}000$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

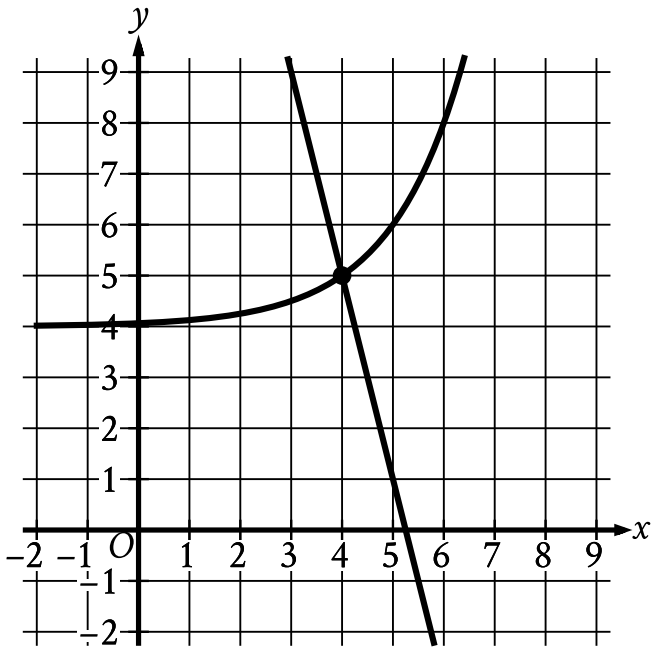
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 3f8d5876

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 3f8d5876



The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution (x, y) to this system?

A. $(0, 0)$

B. $(0, 4)$

C. $(4, 5)$

D. $(5, 0)$

ID: 3f8d5876 Answer

Correct Answer: C

Rationale

Choice C is correct. The solution to the system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear equation and the nonlinear equation shown intersect at the point $(4, 5)$. Thus, the solution to the system is $(4, 5)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID b03adde3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: b03adde3

If $u-3=\frac{6}{t-2}$, what is t in terms of u?

A. $t=\frac{1}{u}$

B. $t=\frac{2u+9}{u}$

C. $t=\frac{1}{u-3}$

D. $t=\frac{2u}{u-3}$

ID: b03adde3 Answer

Correct Answer: D

Rationale

Choice D is correct. Multiplying both sides of the given equation by $t-2$ yields $(t-2)(u-3)=6$. Dividing both sides of this equation by $u-3$ yields $t-2=\frac{6}{u-3}$. Adding 2 to both sides of this equation yields $t=\frac{6}{u-3}+2$, which can be rewritten as $t=\frac{6}{u-3}+\frac{2(u-3)}{u-3}$. Since the fractions on the right-hand side of this equation have a common denominator, adding the fractions yields $t=\frac{6+2(u-3)}{u-3}$. Applying the distributive property to the numerator on the right-hand side of this equation yields $t=\frac{6+2u-6}{u-3}$, which is equivalent to $t=\frac{2u}{u-3}$.

Choices A, B, and C are incorrect and may result from various misconceptions or miscalculations.

Question Difficulty: Hard

Question ID 1ce9ffcd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 1ce9ffcd

$-9x^2 + 30x + c = 0$

In the given equation, c is a constant. The equation has exactly one solution. What is the value of c?

A. 3

B. 0

C. -25

D. -53

ID: 1ce9ffcd Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the equation $-9x^2 + 30x + c = 0$ has exactly one solution. A quadratic equation of the form $ax^2 + bx + c = 0$ has exactly one solution if and only if its discriminant, $-4ac + b^2$, is equal to zero. It follows that for the given equation, $a = -9$ and $b = 30$. Substituting -9 for a and 30 for b into $b^2 - 4ac$ yields $30^2 - 4(-9)(c)$, or $900 + 36c$. Since the discriminant must equal zero, $900 + 36c = 0$. Subtracting $36c$ from both sides of this equation yields $900 = -36c$. Dividing each side of this equation by -36 yields $-25 = c$. Therefore, the value of c is -25.

Choice A is incorrect. If the value of c is 3, this would yield a discriminant that is greater than zero. Therefore, the given equation would have two solutions, rather than exactly one solution.

Choice B is incorrect. If the value of c is 0, this would yield a discriminant that is greater than zero. Therefore, the given equation would have two solutions, rather than exactly one solution.

Choice D is incorrect. If the value of c is -53, this would yield a discriminant that is less than zero. Therefore, the given equation would have no real solutions, rather than exactly one solution.

Question Difficulty: Hard

Question ID 104bff62

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 104bff62

$\frac{x^2}{\sqrt{x^2-c^2}} = \frac{c^2}{\sqrt{x^2-c^2}} + 39$

In the given equation, c is a positive constant. Which of the following is one of the solutions to the given equation?

A. $-c$

B. $-c^2 - 39^2$

C. $-\sqrt{39^2 - c^2}$

D. $-\sqrt{c^2 + 39^2}$

ID: 104bff62 Answer

Correct Answer: D

Rationale

Choice D is correct. If $x^2 - c^2 \leq 0$, then neither side of the given equation is defined and there can be no solution. Therefore, $x^2 - c^2 > 0$. Subtracting $\frac{c^2}{\sqrt{x^2-c^2}}$ from both sides of the given equation yields $\frac{x^2}{\sqrt{x^2-c^2}} - \frac{c^2}{\sqrt{x^2-c^2}} = 39$, or $\frac{x^2-c^2}{\sqrt{x^2-c^2}} = 39$. Squaring both sides of this equation yields $\left(\frac{x^2-c^2}{\sqrt{x^2-c^2}}\right)^2 = 39^2$, or $\frac{(x^2-c^2)(x^2-c^2)}{x^2-c^2} = 39^2$. Since $x^2 - c^2$ is positive and, therefore, nonzero, the expression $\frac{x^2-c^2}{x^2-c^2}$ is defined and equivalent to 1. It follows that the equation $\frac{(x^2-c^2)(x^2-c^2)}{x^2-c^2} = 39^2$ can be rewritten as $\left(\frac{x^2-c^2}{x^2-c^2}\right)(x^2 - c^2) = 39^2$, or $(1)(x^2 - c^2) = 39^2$, which is equivalent to $x^2 - c^2 = 39^2$. Adding c^2 to both sides of this equation yields $x^2 = c^2 + 39^2$. Taking the square root of both sides of this equation yields two solutions: $x = \sqrt{c^2 + 39^2}$ and $x = -\sqrt{c^2 + 39^2}$. Therefore, of the given choices, $-\sqrt{c^2 + 39^2}$ is one of the solutions to the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 270cf326

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 270cf326

Which of the following functions has(have) a minimum value at -3?

$f(x) = -6(3)^x - 3$ $g(x) = -3(6)^x$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 270cf326 Answer

Correct Answer: D

Rationale

Choice D is correct. A function of the form $f(x) = a(b)^x + c$, where $a < 0$ and $b > 1$, is a decreasing function. Both of the given functions are of this form; therefore, both are decreasing functions. If a function f is decreasing as the value of x increases, the corresponding value of $f(x)$ decreases; therefore, the function doesn't have a minimum value. Thus, neither of the given functions has a minimum value.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a267bd29

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: a267bd29

$w^2 + 12w - 40 = 0$ Which of the following is a solution to the given equation?

A. $6 - 2\sqrt{19}$

B. $2\sqrt{19}$

C. $\sqrt{19}$

D. $-6 + 2\sqrt{19}$

ID: a267bd29 Answer

Correct Answer: D

Rationale

Choice D is correct. Adding 40 to both sides of the given equation yields $w^2 + 12w = 40$. To complete the square, adding $\left(\frac{12}{2}\right)^2$, or 6^2, to both sides of this equation yields $w^2 + 12w + 6^2 = 40 + 6^2$, or $(w + 6)^2 = 76$. Taking the square root of both sides of this equation yields $w + 6 = \pm\sqrt{76}$, or $w + 6 = \pm 2\sqrt{19}$. Subtracting 6 from both sides of this equation yields $w = -6 \pm 2\sqrt{19}$. Therefore, the solutions to the given equation are $-6 + 2\sqrt{19}$ and $-6 - 2\sqrt{19}$. Of these two solutions, only $-6 + 2\sqrt{19}$ is given as a choice.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 75915e3c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 75915e3c

$f(x) = 2(3^x)$

For the function *f* defined above, what is the value of $f(2)$?

A. 9

B. 12

C. 18

D. 36

ID: 75915e3c Answer

Correct Answer: C

Rationale

Choice C is correct. The value of $f(2)$ is found by evaluating the expression $2(3^x)$ when $x = 2$. Substituting 2 for x in the given equation yields $f(2) = 2(3^2)$. Simplifying 3^2 in the equation results in $f(2) = 2(9)$. Evaluating the right-hand side of the equation yields $f(2) = 18$. Therefore, the value of $f(2)$ is 18.

Choice A is incorrect and may result from evaluating the expression as (3^2). Choice B is incorrect and may result from evaluating the expression as $2(3 \cdot 2)$. Choice D is incorrect and may result from evaluating the expression as $(2 \cdot 3)^2$.

Question Difficulty: Easy

Question ID f44a29a8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f44a29a8

An object's kinetic energy, in joules, is equal to the product of one-half the object's mass, in kilograms, and the square of the object's speed, in meters per second. What is the speed, in meters per second, of an object with a mass of 4 kilograms and kinetic energy of 18 joules?

A. 3

B. 6

C. 9

D. 36

ID: f44a29a8 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that an object's kinetic energy, in joules, is equal to the product of one-half the object's mass, in kilograms, and the square of the object's speed, in meters per second. This relationship can be represented by the equation $K = \frac{1}{2}mv^2$, where K is the kinetic energy, m is the mass, and v is the speed. Substituting a mass of 4 kilograms for m and a kinetic energy of 18 joules for K results in the equation $18 = \left(\frac{1}{2}\right)(4)v^2$, or $18 = 2v^2$. Dividing both sides of this equation by 2 yields $9 = v^2$. Taking the square root of both sides yields $v = -3$ and $v = 3$. Since speed can't be expressed as a negative number, the speed of the object is 3 meters per second.

Choice B is incorrect and may result from computation errors. Choice C is incorrect. This is the value of v^2 rather than v. Choice D is incorrect. This is the value of $4v^2$ rather than v.

Question Difficulty: Medium

Question ID 92f812bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 92f812bb

In the *xy*-plane, a parabola has vertex $(9, -14)$ and intersects the *x*-axis at two points. If the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, which of the following could be the value of $a + b + c$?

A. -23

B. -19

C. -14

D. -12

ID: 92f812bb Answer

Correct Answer: D

Rationale

Choice D is correct. The equation of a parabola in the *xy*-plane can be written in the form $y = a(x - h)^2 + k$, where a is a constant and (h, k) is the vertex of the parabola. If a is positive, the parabola will open upward, and if a is negative, the parabola will open downward. It's given that the parabola has vertex $(9, -14)$. Substituting 9 for h and -14 for k in the equation $y = a(x - h)^2 + k$ gives $y = a(x - 9)^2 - 14$, which can be rewritten as $y = a(x - 9)(x - 9) - 14$, or $y = a(x^2 - 18x + 81) - 14$. Distributing the factor of a on the right-hand side of this equation yields $y = ax^2 - 18ax + 81a - 14$. Therefore, the equation of the parabola, $y = ax^2 - 18ax + 81a - 14$, can be written in the form $y = ax^2 + bx + c$, where $a = a$, $b = -18a$, and $c = 81a - 14$. Substituting $-18a$ for b and $81a - 14$ for c in the expression $a + b + c$ yields $(a) + (-18a) + (81a - 14)$, or $64a - 14$. Since the vertex of the parabola, $(9, -14)$, is below the *x*-axis, and it's given that the parabola intersects the *x*-axis at two points, the parabola must open upward. Therefore, the constant a must have a positive value. Setting the expression $64a - 14$ equal to the value in choice D yields $64a - 14 = -12$. Adding 14 to both sides of this equation yields $64a = 2$. Dividing both sides of this equation by 64 yields $a = \frac{2}{64}$, which is a positive value. Therefore, if the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, the value of $a + b + c$ could be -12.

Choice A is incorrect. If the equation of a parabola with a vertex at $(9, -14)$ is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants and $a + b + c = -23$, then the value of a will be negative, which means the parabola will open downward, not upward, and will intersect the *x*-axis at zero points, not two points.

Choice B is incorrect. If the equation of a parabola with a vertex at $(9, -14)$ is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants and $a + b + c = -19$, then the value of a will be negative, which means the parabola will open downward, not upward, and will intersect the *x*-axis at zero points, not two points.

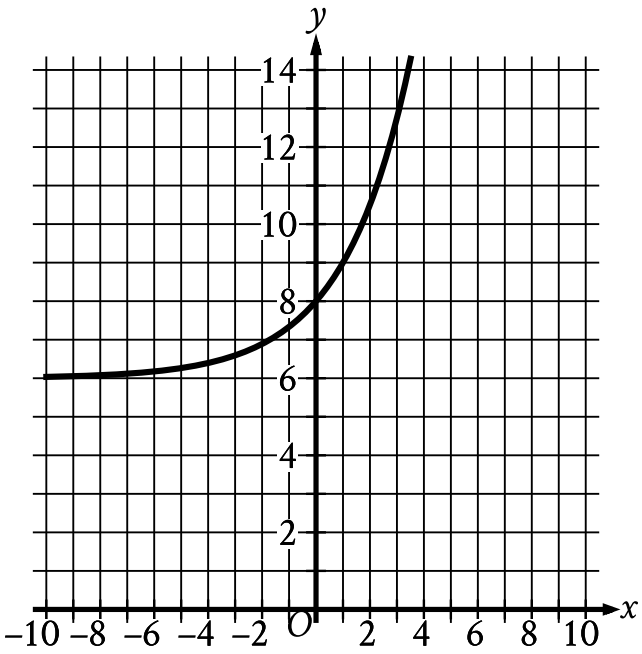
Choice C is incorrect. If the equation of a parabola with a vertex at $(9, -14)$ is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants and $a + b + c = -14$, then the value of a will be 0, which is inconsistent with the equation of a parabola.

Question Difficulty: Hard

Question ID f547a8b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: f547a8b1



What is the *y*-intercept of the graph shown?

A. $(-8, 0)$

B. $(-6, 0)$

C. $(0, 6)$

D. $(0, 8)$

ID: f547a8b1 Answer

Correct Answer: D

Rationale

Choice D is correct. The *y*-intercept of a graph in the *xy*-plane is the point at which the graph crosses the *y*-axis. The graph shown crosses the *y*-axis at the point $(0, 8)$. Therefore, the *y*-intercept of the graph shown is $(0, 8)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID b8c4a1cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: b8c4a1cd

$8j = k + 15m$

The given equation relates the distinct positive numbers j, k, and m. Which equation correctly expresses j in terms of k and m?

A. $j = \frac{k}{8} + 15m$

B. $j = k + \frac{15m}{8}$

C. $j = 8(k + 15m)$

D. $j = \frac{k+15m}{8}$

ID: b8c4a1cd Answer

Correct Answer: D

Rationale

Choice D is correct. To express j in terms of k and m, the given equation must be solved for j. Dividing each side of the given equation by 8 yields $j = \frac{k+15m}{8}$.

Choice A is incorrect. This is equivalent to $8j = k + 120m$. Choice B is incorrect. This is equivalent to $8j = 8k + 15m$.

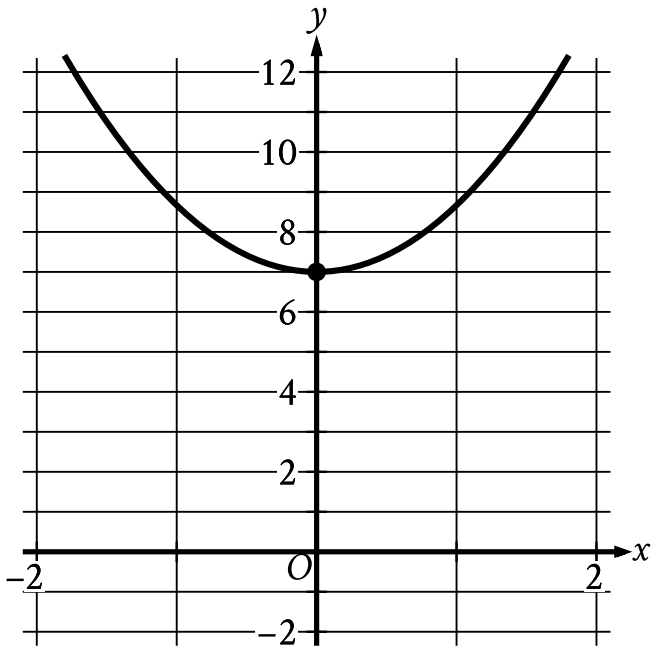
Choice C is incorrect. This is equivalent to $\frac{j}{8} = k + 15m$.

Question Difficulty: Easy

Question ID 2f4eafcc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 2f4eafcc



The parabola shown intersects the *y*-axis at the point (x, y). What is the value of y?

ID: 2f4eafcc Answer

Correct Answer: 7

Rationale

The correct answer is 7. It's given that the parabola intersects the *y*-axis at the point (x, y). The graph shows that the parabola intersects the *y*-axis at the point $(0, 7)$. Therefore, the value of y is 7.

Question Difficulty: Easy

Question ID 7dbd46d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 7dbd46d9

$8x + y = -11$ $2x^2 = y + 341$

The graphs of the equations in the given system of equations intersect at the point (x, y) in the xy-plane. What is a possible value of x?

A. -15

B. -11

C. 2

D. 8

ID: 7dbd46d9 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graphs of the equations in the given system of equations intersect at the point (x, y). Therefore, this intersection point is a solution to the given system. The solution can be found by isolating y in each equation. The given equation $8x + y = -11$ can be rewritten to isolate y by subtracting $8x$ from both sides of the equation, which gives $y = -8x - 11$. The given equation $2x^2 = y + 341$ can be rewritten to isolate y by subtracting 341 from both sides of the equation, which gives $2x^2 - 341 = y$. With each equation solved for y, the value of y from one equation can be substituted into the other, which gives $2x^2 - 341 = -8x - 11$. Adding $8x$ and 11 to both sides of this equation results in $2x^2 + 8x - 330 = 0$. Dividing both sides of this equation by 2 results in $x^2 + 4x - 165 = 0$. This equation can be rewritten by factoring the left-hand side, which yields $(x + 15)(x - 11) = 0$. By the zero-product property, if $(x + 15)(x - 11) = 0$, then $(x + 15) = 0$, or $(x - 11) = 0$. It follows that $x = -15$, or $x = 11$. Since only -15 is given as a choice, a possible value of x is -15.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 0121a235

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 0121a235

x	$p(x)$
-2	5
-1	0
0	-3
1	-1
2	0

The table above gives selected values of a polynomial function p. Based on the values in the table, which of the following must be a factor of p ?

A. $(x-3)$

B. $(x+3)$

C. $(x-1)(x+2)$

D. $(x+1)(x-2)$

ID: 0121a235 Answer

Correct Answer: D

Rationale

Choice D is correct. According to the table, when x is -1 or 2, $p(x)=0$. Therefore, two x-intercepts of the graph of p are $(-1,0)$ and $(2,0)$. Since $(-1,0)$ and $(2,0)$ are x-intercepts, it follows that $(x+1)$ and $(x-2)$ are factors of the polynomial equation. This is because when $x=-1$, the value of $x+1$ is 0. Similarly, when $x=2$, the value of $x-2$ is 0. Therefore, the product $(x+1)(x-2)$ is a factor of the polynomial function p.

Choice A is incorrect. The factor $x-3$ corresponds to an x-intercept of $(3,0)$, which isn't present in the table. Choice B is incorrect. The factor $x+3$ corresponds to an x-intercept of $(-3,0)$, which isn't present in the table. Choice C is incorrect. The factors $x-1$ and $x+2$ correspond to x-intercepts $(1,0)$ and $(-2,0)$, respectively, which aren't present in the table.

Question Difficulty: Hard

Question ID 9da41c80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 9da41c80

A ball is dropped from an initial height of 22 feet and bounces off the ground repeatedly. The function h estimates that the maximum height reached after each time the ball hits the ground is 85% of the maximum height reached after the previous time the ball hit the ground. Which equation defines h, where $h(n)$ is the estimated maximum height of the ball after it has hit the ground n times and n is a whole number greater than 1 and less than 10?

A. $h(n) = 22(0.22)^n$

B. $h(n) = 22(0.85)^n$

C. $h(n) = 85$msup

D. $h(n) = 85(0.85)^n$

ID: 9da41c80 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that for the function h, $h(n)$ is the estimated maximum height, in feet, of the ball after it has hit the ground n times. It's also given that the function h estimates that the maximum height reached after each time the ball hits the ground is 85% of the maximum height reached after the previous time the ball hit the ground. It follows that h is a decreasing exponential function that can be written in the form $h(n) = a\left(\frac{p}{100}\right)^n$, where a is the initial height, in feet, the ball was dropped from and the function estimates that the maximum height reached after each time the ball hits the ground is $p\%$ of the maximum height reached after the previous time the ball hit the ground. It's given that the ball is dropped from an initial height of 22 feet. Therefore, $a = 22$. Since the function h estimates that the maximum height reached after each time the ball hits the ground is 85% of the maximum height reached after the previous time the ball hit the ground, $p = 85$. Substituting 22 for a and 85 for p in the equation $h(n) = a\left(\frac{p}{100}\right)^n$ yields $h(n) = 22\left(\frac{85}{100}\right)^n$, or $h(n) = 22(0.85)^n$.

Choice A is incorrect. This function estimates that the maximum height reached after each time the ball hits the ground is 22%, not 85%, of the maximum height reached after the previous time the ball hit the ground.

Choice C is incorrect. This function estimates that the ball is dropped from an initial height of 85 feet, not 22 feet, and that the maximum height reached after each time the ball hits the ground is 22%, not 85%, of the maximum height reached after the previous time the ball hit the ground.

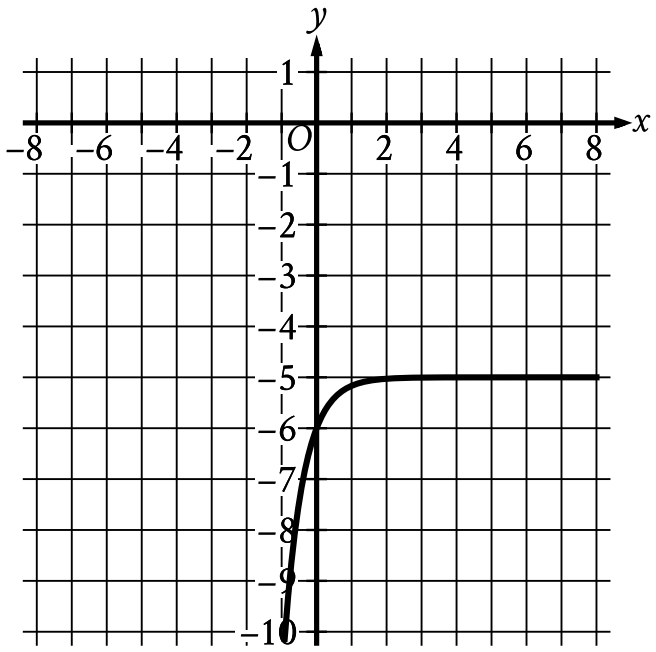
Choice D is incorrect. This function estimates that the ball is dropped from an initial height of 85 feet, not 22 feet.

Question Difficulty: Easy

Question ID 7160cbb3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 7160cbb3



What is the *y*-intercept of the graph shown?

A. $(0, -6)$

B. $(-6, 0)$

C. $(0, 0)$

D. $(-5, -5)$

ID: 7160cbb3 Answer

Correct Answer: A

Rationale

Choice A is correct. The *y*-intercept of a graph in the *xy*-plane is the point (x, y) on the graph where $x = 0$. For the graph shown, at $x = 0$, the corresponding value of *y* is -6. Therefore, the *y*-intercept of the graph shown is $(0, -6)$.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID d71f6dbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: d71f6dbf

The height, in feet, of an object x seconds after it is thrown straight up in the air can be modeled by the function $h(x) = -16x^2 + 20x + 5$. Based on the model, which of the following statements best interprets the equation $h(1.4) = 1.64$?

A. The height of the object 1.4 seconds after being thrown straight up in the air is 1.64 feet.

B. The height of the object 1.64 seconds after being thrown straight up in the air is 1.4 feet.

C. The height of the object 1.64 seconds after being thrown straight up in the air is approximately 1.4 times as great as its initial height.

D. The speed of the object 1.4 seconds after being thrown straight up in the air is approximately 1.64 feet per second.

ID: d71f6dbf Answer

Correct Answer: A

Rationale

Choice A is correct. The value 1.4 is the value of x, which represents the number of seconds after the object was thrown straight up in the air. When the function h is evaluated for x = 1.4, the function has a value of 1.64, which is the height, in feet, of the object.

Choices B and C are incorrect and may result from misidentifying seconds as feet and feet as seconds. Additionally, choice C may result from incorrectly including the initial height of the object as the input x. Choice D is incorrect and may result from misidentifying height as speed.

Question Difficulty: Medium

Question ID 630897df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 630897df

The speed of sound in dry air, v, can be modeled by the formula $v = 331.3 + 0.606T$, where T is the temperature in degrees Celsius and v is measured in meters per second. Which of the following correctly expresses T in terms of v?

A. $T = \frac{v + 0.606}{331.3}$

B. $T = \frac{v - 0.606}{331.3}$

C. $T = \frac{v + 331.3}{0.606}$

D. $T = \frac{v - 331.3}{0.606}$

ID: 630897df Answer

Correct Answer: D

Rationale

Choice D is correct. To express T in terms of v, subtract 331.3 from both sides of the equation, which gives v − 331.3 = 0.606T. Dividing both sides of the equation by 0.606 gives $\frac{v - 331.3}{0.606} = T$.

Choices A, B, and C are incorrect and are the result of incorrect steps while solving for T.

Question Difficulty: Medium

Question ID 20722644

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 20722644

The function f is defined by $f(x) = x^3 + 9$. What is the value of $f(2)$?

A. 14

B. 15

C. 17

D. 18

ID: 20722644 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x) = x^3 + 9$. Substituting 2 for x in this equation yields $f(2) = (2)^3 + 9$. This is equivalent to $f(2) = 8 + 9$, or $f(2) = 17$.

Choice A is incorrect. This is the value of $2 + 3 + 9$, not $2^3 + 9$.

Choice B is incorrect. This is the value of $2(3) + 9$, not $2^3 + 9$.

Choice D is incorrect. This is the value of $3^2 + 9$, not $2^3 + 9$.

Question Difficulty: Easy

Question ID 5805e747

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 5805e747

Which expression is equivalent to $(7x^3 + 7x) - (6x^3 - 3x)$?

A. $x^3 + 10x$

B. $-13x^3 + 10x$

C. $-13x^3 + 4x$

D. $x^3 + 4x$

ID: 5805e747 Answer

Correct Answer: A

Rationale

Choice A is correct. Applying the distributive property, the given expression can be written as $7x^3 + 7x - 6x^3 + 3x$. Grouping like terms in this expression yields $(7x^3 - 6x^3) + (7x + 3x)$. Combining like terms in this expression yields $x^3 + 10x$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 158591f0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 158591f0

$x(x+1)-56=4x(x-7)$ What is the sum of the solutions to the given equation?

ID: 158591f0 Answer

Correct Answer: 29/3, 9.666, 9.667

Rationale

The correct answer is $\frac{29}{3}$. Applying the distributive property to the left-hand side of the given equation, $x(x+1)-56$, yields x^2+x-56. Applying the distributive property to the right-hand side of the given equation, $4x(x-7)$, yields $4x^2-28x$. Thus, the equation becomes $x^2+x-56=4x^2-28x$. Combining like terms on the left- and right-hand sides of this equation yields $0=\left(4x^2-x^2\right)+(-28x-x)+56$, or $3x^2-29x+56=0$. For a quadratic equation in the form $ax^2+bx+c=0$, where a, b, and c are constants, the quadratic formula gives the solutions to the equation in the form $x=\frac{\left(-b\pm\sqrt{b^2-4ac}\right)}{2a}$. Substituting 3 for a, -29 for b, and 56 for c from the equation $3x^2-29x+56=0$ into the quadratic formula yields $x=\frac{\left(29\pm\sqrt{(-29)^2-4(3)(56)}\right)}{2(3)}$, or $x=\frac{29}{6}\pm\frac{13}{6}$. It follows that the solutions to the given equation are $\frac{29}{6}+\frac{13}{6}$ and $\frac{29}{6}-\frac{13}{6}$. Adding these two solutions gives the sum of the solutions: $\frac{29}{6}+\frac{13}{6}+\frac{29}{6}-\frac{13}{6}$, which is equivalent to $\frac{29}{6}+\frac{29}{6}$, or $\frac{29}{3}$. Note that 29/3, 9.666, and 9.667 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID bba18ecb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: bba18ecb

When the quadratic function f is graphed in the *xy*-plane, where $y = f(x)$, its vertex is $(-3, 6)$. One of the *x*-intercepts of this graph is $\left(-\frac{17}{4}, 0\right)$. What is the other *x*-intercept of the graph?

A. $\left(-\frac{29}{4}, 0\right)$

B. $\left(-\frac{7}{4}, 0\right)$

C. $\left(\frac{5}{4}, 0\right)$

D. $\left(\frac{17}{4}, 0\right)$

ID: bba18ecb Answer

Correct Answer: B

Rationale

Choice B is correct. Since the line of symmetry for the graph of a quadratic function contains the vertex of the graph, the *x*-coordinate of the vertex of the graph of $y = f(x)$ is the *x*-coordinate of the midpoint of its two *x*-intercepts. The midpoint of two points with *x*-coordinates x_1 and x_2 has *x*-coordinate x_m, where $x_m = \frac{x_1 + x_2}{2}$. It's given that the vertex is $(-3, 6)$ and one of the *x*-intercepts is $\left(-\frac{17}{4}, 0\right)$. Substituting -3 for x_m and $-\frac{17}{4}$ for x_1 in the equation $x_m = \frac{x_1 + x_2}{2}$ yields $-3 = \frac{-\frac{17}{4} + x_2}{2}$. Multiplying each side of this equation by 2 yields $-6 = -\frac{17}{4} + x_2$. Adding $\frac{17}{4}$ to each side of this equation yields $-\frac{7}{4} = x_2$. Therefore, the other *x*-intercept is $\left(-\frac{7}{4}, 0\right)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 70753f99

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 70753f99

The function f is defined by $f(x)=(x+3)(x+1)$. The graph of f in the xy-plane is a parabola. Which of the following intervals contains the x-coordinate of the vertex of the graph of f?

A. $-4<x<-3$

B. $-3<x<1$

C. $1<x<3$

D. $3<x<4$

ID: 70753f99 Answer

Correct Answer: B

Rationale

Choice B is correct. The graph of a quadratic function in the xy-plane is a parabola. The axis of symmetry of the parabola passes through the vertex of the parabola. Therefore, the vertex of the parabola and the midpoint of the segment between the two x-intercepts of the graph have the same x-coordinate. Since $f(-3)=f(-1)=0$, the x-coordinate of the vertex is $\frac{(-3)+(-1)}{2}=-2$. Of the shown intervals, only the interval in choice B contains -2. Choices A, C, and D are incorrect and may result from either calculation errors or misidentification of the graph's x-intercepts.

Question Difficulty: Hard

Question ID c6e85cd7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: c6e85cd7

If $4^{8c} = \sqrt[3]{4^7}$, what is the value of c?

ID: c6e85cd7 Answer

Correct Answer: .2916, .2917, 7/24

Rationale

The correct answer is $\frac{7}{24}$. An expression of the form $\sqrt[n]{a^m}$, where m and n are integers greater than 1 and $a \geq 0$, is equivalent to $a^{\frac{m}{n}}$. Therefore, the expression on the right-hand side of the given equation, $\sqrt[3]{4^7}$, is equivalent to $4^{\frac{7}{3}}$. Thus, $4^{8c} = 4^{\frac{7}{3}}$. It follows that $8c = \frac{7}{3}$. Dividing both sides of this equation by 8 yields $c = \frac{7}{24}$. Note that 7/24, .2916, .2917, 0.219, and 0.292 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 568aaf27

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 568aaf27

$x+y=12$

$y=x^2$

If (x,y) is a solution to the system of equations above, which of the following is a possible value of x?

A. 0

B. 1

C. 2

D. 3

ID: 568aaf27 Answer

Correct Answer: D

Rationale

Choice D is correct. Substituting x^2 from the second equation for y in the first equation yields $x+x^2=12$. Subtracting 12 from both sides of this equation and rewriting the equation results in $x^2+x-12=0$. Factoring the left-hand side of this equation yields $(x-3)(x+4)=0$. Using the zero product property to solve for x, it follows that $x-3=0$ and $x+4=0$. Solving each equation for x yields $x=3$ and $x=-4$, respectively. Thus, two possible values of x are 3 and -4. Of the choices given, 3 is the only possible value of x.

Choices A, B, and C are incorrect. Substituting 0 for x in the first equation gives $0+y=12$, or $y=12$; then, substituting 12 for y and 0 for x in the second equation gives $12=0^2$, or $12=0$, which is false. Similarly, substituting 1 or 2 for x in the first equation yields $y=11$ or $y=10$, respectively; then, substituting 11 or 10 for y in the second equation yields a false statement.

Question Difficulty: Easy

Question ID 6676f055

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 6676f055

$f(\theta) = -0.28(\theta - 27)^2 + 880$

An engineer wanted to identify the best angle for a cooling fan in an engine in order to get the greatest airflow. The engineer discovered that the function above models the airflow $f(\theta)$, in cubic feet per minute, as a function of the angle of the fan θ, in degrees. According to the model, what angle, in degrees, gives the greatest airflow?

A. −0.28

B. 0.28

C. 27

D. 880

ID: 6676f055 Answer

Correct Answer: C

Rationale

Choice C is correct. The function f is quadratic, so it will have either a maximum or a minimum at the vertex of the graph. Since the coefficient of the quadratic term (−0.28) is negative, the vertex will be at a maximum. The equation $f(\theta) = -0.28(\theta - 27)^2 + 880$ is given in vertex form, so the vertex is at $\theta = 27$. Therefore, an angle of 27 degrees gives the greatest airflow.

Choices A and B are incorrect and may be the result of misidentifying which value in a quadratic equation in vertex form represents the vertex. Choice D is incorrect. This choice identifies the maximum value of $f(\theta)$ rather than the value of θ for which $f(\theta)$ is maximized.

Question Difficulty: Medium

Question ID 29ed5d39

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 29ed5d39

$p = 20 + \frac{16}{n}$

The given equation relates the numbers p and n, where n is not equal to 0 and $p > 20$. Which equation correctly expresses n in terms of p?

A. $n = \frac{p-20}{16}$

B. $n = \frac{p}{16} + 20$

C. $n = \frac{p}{16} - 20$

D. $n = \frac{16}{p-20}$

ID: 29ed5d39 Answer

Correct Answer: D

Rationale

Choice D is correct. To express n in terms of p, the given equation must be solved for n. Subtracting 9 from both sides of the given equation yields $p - 9 = \frac{14}{n}$. Since n is not equal to 0, multiplying both sides of this equation by n yields $(p - 9)(n) = 14$. It's given that $p > 9$, which means $p - 9$ is not equal to 0. Therefore, dividing both sides of $(p - 9)(n) = 14$ by $(p - 9)$ yields $\frac{(p-9)(n)}{p-9} = \frac{14}{p-9}$, or $n = \frac{14}{p-9}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 90bcaa61

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 90bcaa61

The function $f(t) = 60{,}000(2)^{\frac{t}{410}}$ gives the number of bacteria in a population t minutes after an initial observation. How much time, in minutes, does it take for the number of bacteria in the population to double?

ID: 90bcaa61 Answer

Correct Answer: 410

Rationale

The correct answer is 410. It's given that t minutes after an initial observation, the number of bacteria in a population is $60{,}000(2)^{\frac{t}{410}}$. This expression consists of the initial number of bacteria, $60{,}000$, multiplied by the expression $2^{\frac{t}{410}}$. The time it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{410}}$ to double. Since the base of the expression $2^{\frac{t}{410}}$ is 2, the expression $2^{\frac{t}{410}}$ will double when the exponent increases by 1. Since the exponent of the expression $2^{\frac{t}{410}}$ is $\frac{t}{410}$, the exponent will increase by 1 when t increases by 410. Therefore the time, in minutes, it takes for the number of bacteria in the population to double is 410.

Question Difficulty: Medium

Question ID 895628b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 895628b5

$y = (x - 2)(x + 4)$ $y = 6x - 12$ Which ordered pair (x, y) is the solution to the given system of equations?

A. $(0, 2)$

B. $(-4, 2)$

C. $(2, 0)$

D. $(2, -4)$

ID: 895628b5 Answer

Correct Answer: C

Rationale

Choice C is correct. The second equation in the given system of equations is $y = 6x - 12$. Substituting $6x - 12$ for y in the first equation of the given system yields $6x - 12 = (x - 2)(x + 4)$. Factoring 6 out of the left-hand side of this equation yields $6(x - 2) = (x - 2)(x + 4)$. An expression with a factor of the form $(x - a)$ is equal to zero when $x = a$. Each side of this equation has a factor of $(x - 2)$, so each side of the equation is equal to zero when $x = 2$. Substituting 2 for x into the equation $6(x - 2) = (x - 2)(x + 4)$ yields $6(2 - 2) = (2 - 2)(2 + 4)$, or $0 = 0$, which is true. Substituting 2 for x into the second equation in the given system of equations yields $y = 6(2) - 12$, or $y = 0$. Therefore, the solution to the system of equations is the ordered pair $(2, 0)$.

Choice A is incorrect and may result from switching the order of the solutions for x and y.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 26eb61c1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 26eb61c1

Which expression is equivalent to $6x^8y^2 + 12x^2y^2$?

A. $6x^2y^2(2x^6)$

B. $6x^2y^2(x^4)$

C. $6x^2y^2(x^6 + 2)$

D. $6x^2y^2(x^4 + 2)$

ID: 26eb61c1 Answer

Correct Answer: C

Rationale

Choice C is correct. Since each term of the given expression has a common factor of $6x^2y^2$, it may be rewritten as $6x^2y^2(x^6) + 6x^2y^2(2)$, or $6x^2y^2(x^6 + 2)$.

Choice A is incorrect. This expression is equivalent to $12x^8y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice B is incorrect. This expression is equivalent to $6x^6y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice D is incorrect. This expression is equivalent to $6x^6y^2 + 12x^2y^2$, not $6x^8y^2 + 12x^2y^2$.

Question Difficulty: Medium

Question ID c9417793

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: c9417793

$|x - 9| + 45 = 63$ What is the sum of the solutions to the given equation?

ID: c9417793 Answer

Correct Answer: 18

Rationale

The correct answer is 18. Subtracting 45 from each side of the given equation yields $|x - 9| = 18$. By the definition of absolute value, if $|x - 9| = 18$, then $x - 9 = 18$ or $x - 9 = -18$. Adding 9 to each side of the equation $x - 9 = 18$ yields $x = 27$. Adding 9 to each side of the equation $x - 9 = -18$ yields $x = -9$. Therefore, the solutions to the given equation are 27 and -9, and it follows that the sum of the solutions to the given equation is $27 + (-9)$, or 18.

Question Difficulty: Hard

Question ID 8f65cddc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 8f65cddc

$\frac{1}{7b} = \frac{11x}{y}$

The given equation relates the positive numbers b, x, and y. Which equation correctly expresses x in terms of b and y?

A. $x = \frac{7by}{11}$

B. $x = y - 77b$

C. $x = \frac{y}{77b}$

D. $x = 77by$

ID: 8f65cddc Answer

Correct Answer: C

Rationale

Choice C is correct. Multiplying each side of the given equation by y yields the equivalent equation $\frac{y}{7b} = 11x$. Dividing each side of this equation by 11 yields $\frac{y}{77b} = x$, or $x = \frac{y}{77b}$.

Choice A is incorrect. This equation is not equivalent to the given equation.

Choice B is incorrect. This equation is not equivalent to the given equation.

Choice D is incorrect. This equation is not equivalent to the given equation.

Question Difficulty: Medium

Question ID dd8ac009

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: dd8ac009

Time (years)	Total amount (dollars)
0	670.00
1	674.02
2	678.06

Sara opened a savings account at a bank. The table shows the exponential relationship between the time t, in years, since Sara opened the account and the total amount d, in dollars, in the account. If Sara made no additional deposits or withdrawals, which of the following equations best represents the relationship between t and d?

A. $d = 0.006$msup

B. $d = 670$msup

C. $d =$ msup

D. $d =$ msup

ID: dd8ac009 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the relationship between t and d is exponential. The table shows that the value of d increases as the value of t increases. Therefore, the relationship between t and d can be represented by an increasing exponential equation of the form $d = a(1 + b)^t$, where a and b are positive constants. The table shows that when $t = 0$, $d = 670$. Substituting 0 for t and 670 for d in the equation $d = a(1 + b)^t$ yields $670 = a(1 + b)^0$, which is equivalent to $670 = a(1)$, or $670 = a$. Substituting 670 for a in the equation $d = a(1 + b)^t$ yields $d = 670(1 + b)^t$. The table also shows that when $t = 1$, $d = 674.02$. Substituting 1 for t and 674.02 for d in the equation $d = 670(1 + b)^t$ yields $674.02 = 670(1 + b)^1$, or $674.02 = 670(1 + b)$. Dividing both sides of this equation by 670 yields $1.006 = 1 + b$. Subtracting 1 from both sides of this equation yields $b = 0.006$. Substituting 0.006 for b in the equation $d = 670(1 + b)^t$ yields $d = 670(1 + 0.006)^t$. Therefore, of the choices, choice B best represents the relationship between t and d.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 58dcc59f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 58dcc59f

A landscaper is designing a rectangular garden. The length of the garden is to be 5 feet longer than the width. If the area of the garden will be 104 square feet, what will be the length, in feet, of the garden?

ID: 58dcc59f Answer

Rationale

The correct answer is 13. Let w represent the width of the rectangular garden, in feet. Since the length of the garden will be 5 feet longer than the width of the garden, the length of the garden will be $w+5$ feet. Thus the area of the garden will be $w(w+5)$. It is also given that the area of the garden will be 104 square feet. Therefore, $w(w+5)=104$, which is equivalent to $w^2+5w-104=0$. Factoring this equation results in $(w+13)(w-8)=0$. Therefore, $w=8$ and $w=-13$. Because width cannot be negative, the width of the garden must be 8 feet. This means the length of the garden must be $8+5=13$ feet.

Question Difficulty: Hard

Question ID 2d1614a1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 2d1614a1

$P(t) = 290(1.04)^{(\frac{4}{6})t}$

The function P models the population, in thousands, of a certain city t years after 2005. According to the model, the population is predicted to increase by $n\%$ every 18 months. What is the value of n?

A. 0.38

B. 1.04

C. 4

D. 6

ID: 2d1614a1 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the function P models the population of the city t years after 2005. Since there are 12 months in a year, 18 months is equivalent to $\frac{18}{12}$ years. Therefore, the expression $\frac{18}{12}x$ can represent the number of years in x 18-month periods. Substituting $\frac{18}{12}x$ for t in the given equation yields $P(\frac{18}{12}x) = 290(1.04)^{(\frac{4}{6})(\frac{18}{12}x)}$, which is equivalent to $P(\frac{18}{12}x) = 290(1.04)^{x}$. Therefore, for each 18-month period, the predicted population of the city is 1.04 times, or 104% of, the previous population. This means that the population is predicted to increase by 4% every 18 months.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. Each year, the predicted population of the city is 1.04 times the previous year's predicted population, which is not the same as an increase of 1.04%.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 9ed9f54d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 9ed9f54d

Which of the following is equivalent to $2(x^2-x)+3(x^2-x)$?

A. $5x^2-5x$

B. $5x^2+5x$

C. $5x$

D. $5x^2$

ID: 9ed9f54d Answer

Correct Answer: A

Rationale

Choice A is correct. Since (x^2-x) is a common term in the original expression, like terms can be added: $2(x^2-x)+3(x^2-x)=5(x^2-x)$. Distributing the constant term 5 yields $5x^2-5x$.

Choice B is incorrect and may result from not distributing the negative signs in the expressions within the parentheses. Choice C is incorrect and may result from not distributing the negative signs in the expressions within the parentheses and from incorrectly eliminating the x^2-term. Choice D is incorrect and may result from incorrectly eliminating the x-term.

Question Difficulty: Easy

Question ID 30281058

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 30281058

In the *xy*-plane, the graph of $y = x^2 - 9$ intersects line *p* at $(1, a)$ and $(5, b)$, where *a* and *b* are constants. What is the slope of line *p* ?

A. 6

B. 2

C. -2

D. -6

ID: 30281058 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graph of $y = x^2 - 9$ and line p intersect at $(1, a)$ and $(5, b)$. Therefore, the value of y when $x = 1$ is the value of a, and the value of y when $x = 5$ is the value of b. Substituting 1 for x in the given equation yields $y = (1)^2 - 9$, or $y = -8$. Similarly, substituting 5 for x in the given equation yields $y = (5)^2 - 9$, or $y = 16$. Therefore, the intersection points are $(1, -8)$ and $(5, 16)$. The slope of line p is the ratio of the change in y to the change in x between these two points: $\frac{16 - (-8)}{5 - 1} = \frac{24}{4}$, or 6.

Choices B, C, and D are incorrect and may result from conceptual or calculation errors in determining the values of a, b, or the slope of line p.

Question Difficulty: Hard

Question ID 42f19012

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 42f19012

Which expression is equivalent to $a^{\frac{11}{12}}$, where $a > 0$?

A. $\sqrt[12]{a^{132}}$

B. $\sqrt[144]{a^{132}}$

C. $\sqrt[121]{a^{132}}$

D. $\sqrt[11]{a^{132}}$

ID: 42f19012 Answer

Correct Answer: B

Rationale

Choice B is correct. Since $\frac{12}{12} = 1$, multiplying the exponent of the given expression by $\frac{12}{12}$ yields an equivalent expression: $a^{\left(\frac{11}{12}\right)\left(\frac{12}{12}\right)} = a^{\left(\frac{132}{144}\right)}$. Since $\frac{132}{144} = 132\left(\frac{1}{144}\right)$, the expression $a^{\frac{132}{144}}$ can be rewritten as $a^{(132)\left(\frac{1}{144}\right)}$. Applying properties of exponents, this expression can be rewritten as $\left(a^{132}\right)^{\frac{1}{144}}$. An expression of the form $(m)^{\frac{1}{k}}$, where $m > 0$ and $k > 0$, is equivalent to $\sqrt[k]{m}$. Therefore, $\left(a^{132}\right)^{\frac{1}{144}}$ is equivalent to $\sqrt[144]{a^{132}}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 294db8ec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 294db8ec

Which of the following is equivalent to $2x^3+4$?

A. $4(x^3+4)$

B. $4(x^3+2)$

C. $2(x^3+4)$

D. $2(x^3+2)$

ID: 294db8ec Answer

Correct Answer: D

Rationale

Choice D is correct. The expression $2x^3+4$ has two terms, $2x^3$ and 4. The greatest common factor of these two terms is 2. Factoring 2 from each of these terms yields $2(x^3)+2(2)$, or $2(x^3+2)$.

Choices A and B are incorrect because 4 is not a factor of the term $2x^3$. Choice C is incorrect and may result from factoring 2 from $2x^3$ but not from 4.

Question Difficulty: Easy

Question ID 84dd43f8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 84dd43f8

For the function f, $f(0) = 86$, and for each increase in x by 1, the value of $f(x)$ decreases by 80%. What is the value of $f(2)$?

ID: 84dd43f8 Answer

Correct Answer: 3.44, 86/25

Rationale

The correct answer is 3.44. It's given that $f(0) = 86$ and that for each increase in x by 1, the value of $f(x)$ decreases by 80%. Because the output of the function decreases by a constant percentage for each 1-unit increase in the value of x, this relationship can be represented by an exponential function of the form $f(x) = a(b)^x$, where a represents the initial value of the function and b represents the rate of decay, expressed as a decimal. Because $f(0) = 86$, the value of a must be 86. Because the value of $f(x)$ decreases by 80% for each 1-unit increase in x, the value of b must be $(1 - 0.80)$, or 0.2. Therefore, the function f can be defined by $f(x) = 86(0.2)^x$. Substituting 2 for x in this function yields $f(2) = 86(0.2)^2$, which is equivalent to $f(2) = 86(0.04)$, or $f(2) = 3.44$. Either 3.44 or $86/25$ may be entered as the correct answer.

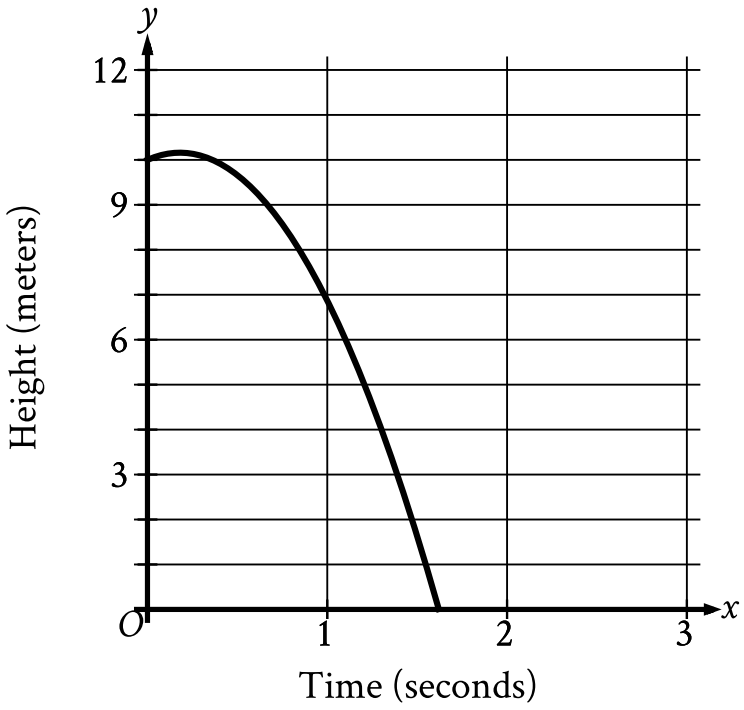
Alternate approach: It's given that $f(0) = 86$ and that for each increase in x by 1, the value of $f(x)$ decreases by 80%. Therefore, when $x = 1$, the value of $f(x)$ is $(100 - 80)\%$, or 20%, of 86, which can be expressed as $(0.20)(86)$. Since $(0.20)(86) = 17.2$, the value of $f(1)$ is 17.2. Similarly, when $x = 2$, the value of $f(x)$ is 20% of 17.2, which can be expressed as $(0.20)(17.2)$. Since $(0.20)(17.2) = 3.44$, the value of $f(2)$ is 3.44. Either 3.44 or $86/25$ may be entered as the correct answer.

Question Difficulty: Hard

Question ID 9ff88bb5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 9ff88bb5



A competitive diver dives from a platform into the water. The graph shown gives the height above the water y, in meters, of the diver x seconds after diving from the platform. What is the best interpretation of the *x*-intercept of the graph?

A. The diver reaches a maximum height above the water at 1.6 seconds.

B. The diver hits the water at 1.6 seconds.

C. The diver reaches a maximum height above the water at 0.2 seconds.

D. The diver hits the water at 0.2 seconds.

ID: 9ff88bb5 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph shows the height above the water y, in meters, of a diver x seconds after diving from a platform. The *x*-intercept of a graph is the point at which the graph intersects the *x*-axis, or when the value of y is 0. The graph shown intersects the *x*-axis between $x = 1$ and $x = 2$. In other words, the diver is 0 meters above the water, or hits the water, between 1 and 2 seconds after diving from the platform. Of the given choices, only choice B includes an interpretation where the diver hits the water between 1 and 2 seconds. Therefore, the best interpretation of the *x*-intercept of the graph is the diver hits the water at 1.6 seconds.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect. This is the best interpretation of the maximum value, not the *x*-intercept, of the graph.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 94ff3e2d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 94ff3e2d

The function h is defined by $h(x) = \frac{8}{5x+6}$. What is the value of $h(2)$?

ID: 94ff3e2d Answer

Correct Answer: .5, 1/2

Rationale

The correct answer is $\frac{1}{2}$. The value of $h(2)$ is the value of $h(x)$ when $x = 2$. Substituting 2 for x in the given equation yields $h(2) = \frac{8}{5(2)+6}$, which is equivalent to $h(2) = \frac{8}{16}$, or $h(2) = \frac{1}{2}$. Therefore, the value of $h(2)$ is $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

Question Difficulty: Easy

Question ID 59d1f4b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 59d1f4b5

$M = 1{,}800(1.02)^t$

The equation above models the number of members, *M,* of a gym *t* years after the gym opens. Of the following, which equation models the number of members of the gym *q* quarter years after the gym opens?

A. $M = 1{,}800(1.02)^{\frac{q}{4}}$

B. $M = 1{,}800(1.02)^{4q}$

C. $M = 1{,}800(1.005)^{4q}$

D. $M = 1{,}800(1.082)^{q}$

ID: 59d1f4b5 Answer

Correct Answer: A

Rationale

Choice A is correct. In 1 year, there are 4 quarter years, so the number of quarter years, q, is 4 times the number of years, t ; that is, $q = 4t$. This is equivalent to $t = \frac{q}{4}$, and substituting this into the expression for M in terms of t gives $M = 1{,}800(1.02)^{\frac{q}{4}}$.

Choices B and D are incorrect and may be the result of incorrectly using $t = 4q$ instead of $q = 4t$. (Choices B and D are nearly the same since 1.02^{4q} is equivalent to $(1.02^4)^q$, which is approximately 1.082^q.) Choice C is incorrect and may be the result of incorrectly using $t = 4q$ and unnecessarily dividing 0.02 by 4.

Question Difficulty: Hard

Question ID 281a4f3b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 281a4f3b

A certain college had 3,000 students enrolled in 2015. The college predicts that after 2015, the number of students enrolled each year will be 2% less than the number of students enrolled the year before. Which of the following functions models the relationship between the number of students enrolled, $f(x)$, and the number of years after 2015, x ?

A. $f(x) = 0.02(3{,}000)^x$

B. $f(x) = 0.98(3{,}000)^x$

C. $f(x) = 3{,}000(0.02)^x$

D. $f(x) = 3{,}000(0.98)^x$

ID: 281a4f3b Answer

Correct Answer: D

Rationale

Choice D is correct. Because the change in the number of students decreases by the same percentage each year, the relationship between the number of students and the number of years can be modeled with a decreasing exponential function in the form $f(x) = a(1-r)^x$, where $f(x)$ is the number of students, a is the number of students in 2015, r is the rate of decrease each year, and x is the number of years since 2015. It's given that 3,000 students were enrolled in 2015 and that the rate of decrease is predicted to be 2%, or 0.02. Substituting these values into the decreasing exponential function yields $f(x) = 3{,}000(1-0.02)^x$, which is equivalent to $f(x) = 3{,}000(0.98)^x$.

Choices A, B, and C are incorrect and may result from conceptual errors when translating the given information into a decreasing exponential function.

Question Difficulty: Medium

Question ID 4fb8a648

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 4fb8a648

$y = x + 9$ $y = x^2 + 16x + 63$

A solution to the given system of equations is (x, y). What is the greatest possible value of x?

A. -6

B. 7

C. 9

D. 63

ID: 4fb8a648 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $y = x + 9$ and $y = x^2 + 16x + 63$; therefore, it follows that $x + 9 = x^2 + 16x + 63$. This equation can be rewritten as $x + 9 = (x + 9)(x + 7)$. Subtracting $(x + 9)$ from both sides of this equation yields $0 = (x + 9)(x + 7) - (x + 9)$. This equation can be rewritten as $0 = (x + 9)((x + 7) - 1)$, or $0 = (x + 9)(x + 6)$. By the zero product property, $x + 9 = 0$ or $x + 6 = 0$. Subtracting 9 from both sides of the equation $x + 9 = 0$ yields $x = -9$. Subtracting 6 from both sides of the equation $x + 6 = 0$ yields $x = -6$. Therefore, the given system of equations has solutions, (x, y), that occur when $x = -9$ and $x = -6$. Since -6 is greater than -9, the greatest possible value of x is -6.

Choice B is incorrect. This is the negative of the greatest possible value of x when $y = 0$ for the second equation in the given system of equations.

Choice C is incorrect. This is the value of y when $x = 0$ for the first equation in the given system of equations.

Choice D is incorrect. This is the value of y when $x = 0$ for the second equation in the given system of equations.

Question Difficulty: Hard

Question ID 72ae8a87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 72ae8a87

The function $f(x) = 200{,}000(1.21)^x$ gives a company's predicted annual revenue, in dollars, x years after the company started selling light bulbs online, where $0 < x \leq 10$. What is the best interpretation of the statement "$f(5)$ is approximately equal to $518{,}748$" in this context?

A. 5 years after the company started selling light bulbs online, its predicted annual revenue is approximately $518{,}748$ dollars.

B. 5 years after the company started selling light bulbs online, its predicted annual revenue will have increased by a total of approximately $518{,}748$ dollars.

C. When the company's predicted annual revenue is approximately $518{,}748$ dollars, it is 5 times the predicted annual revenue for the previous year.

D. When the company's predicted annual revenue is approximately $518{,}748$ dollars, it is 5% greater than the predicted annual revenue for the previous year.

ID: 72ae8a87 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the function $f(x) = 200{,}000(1.21)^x$ gives a company's predicted annual revenue, in dollars, x years after the company started selling light bulbs online. It follows that $f(x)$ represents the company's predicted annual revenue, in dollars, x years after the company started selling light bulbs online. Since the value of $f(5)$ is the value of $f(x)$ when $x = 5$, it follows that "$f(5)$ is approximately equal to $518{,}748$" means that $f(x)$ is approximately equal to $518{,}748$ when $x = 5$. Therefore, the best interpretation of the statement "$f(5)$ is approximately equal to $518{,}748$" in this context is 5 years after the company started selling light bulbs online, its predicted annual revenue is approximately $518{,}748$ dollars.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID f237ccfc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: f237ccfc

The sum of $-2x^2+x+31$ and $3x^2+7x-8$ can be written in the form ax^2+bx+c, where *a*, *b*, and *c* are constants. What is the value of $a+b+c$?

ID: f237ccfc Answer

Rationale

The correct answer is 32. The sum of the given expressions is $(-2x^2+x+31)+(3x^2+7x-8)$. Combining like terms yields $x^2+8x+23$. Based on the form of the given equation, $a=1$, $b=8$, and $c=23$. Therefore, $a+b+c=32$.

Alternate approach: Because $a+b+c$ is the value of ax^2+bx+c when $x=1$, it is possible to first make that substitution into each polynomial before adding them. When $x=1$, the first polynomial is equal to $-2+1+31=30$ and the second polynomial is equal to $3+7-8=2$. The sum of 30 and 2 is 32.

Question Difficulty: Medium

Question ID a391ed22

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: a391ed22

$$\left(\frac{1}{2}x+\frac{3}{2}\right)\left(\frac{3}{2}x+\frac{1}{2}\right)$$

The expression above is equivalent to ax^2+bx+c, where *a*, *b*, and *c* are constants. What is the value of *b*?

ID: a391ed22 Answer

Rationale

The correct answer is $\frac{5}{2}$. The expression $\left(\frac{1}{2}x+\frac{3}{2}\right)\left(\frac{3}{2}x+\frac{1}{2}\right)$ can be written in the form ax^2+bx+c, where a, b, and c are constants, by multiplying out the expression using the distributive property of multiplication over addition. The result is $\left(\frac{1}{2}x\right)\left(\frac{3}{2}x\right)+\left(\frac{1}{2}x\right)\left(\frac{1}{2}\right)+\left(\frac{3}{2}\right)\left(\frac{3}{2}x\right)+\left(\frac{3}{2}\right)\left(\frac{1}{2}\right)$. This expression can be rewritten by multiplying as indicated to give $\frac{3}{4}x^2+\frac{1}{4}x+\frac{9}{4}x+\frac{3}{4}$, which can be simplified to $\frac{3}{4}x^2+\frac{10}{4}x+\frac{3}{4}$, or $\frac{3}{4}x^2+\frac{5}{2}x+\frac{3}{4}$. This is in the form ax^2+bx+c, where the value of b is $\frac{5}{2}$. Note that 5/2 and 2.5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 01668cd6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 01668cd6

The functions f and g are defined by the given equations, where $x \geq 0$. Which of the following equations displays, as a constant or coefficient, the maximum value of the function it defines, where $x \geq 0$?

$$f(x) = 33(0.4)^{x+3} \quad g(x) = 33(0.16)(0.4)^{x-2}$$

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 01668cd6 Answer

Correct Answer: B

Rationale

Choice B is correct. Functions f and g are both exponential functions with a base of 0.40. Since 0.40 is less than 1, functions f and g are both decreasing exponential functions. This means that $f(x)$ and $g(x)$ decrease as x increases. Since $f(x)$ and $g(x)$ decrease as x increases, the maximum value of each function occurs at the least value of x for which the function is defined. It's given that functions f and g are defined for $x \geq 0$. Therefore, the maximum value of each function occurs at $x = 0$. Substituting 0 for x in the equation defining f yields $f(0) = 33(0.4)^{0+3}$, which is equivalent to $f(0) = 33(0.4)^3$, or $f(0) = 2.112$. Therefore, the maximum value of f is 2.112. Since the equation $f(x) = 33(0.4)^{x+3}$ doesn't display the value 2.112, the equation defining f doesn't display the maximum value of f. Substituting 0 for x in the equation defining g yields $g(0) = 33(0.16)(0.4)^{0-2}$, which can be rewritten as $g(0) = 33(0.16)\left(\frac{1}{0.4^2}\right)$, or $g(0) = 33(0.16)\left(\frac{1}{0.16}\right)$, which is equivalent to $g(0) = 33$. Therefore, the maximum value of g is 33. Since the equation $g(x) = 33(0.16)(0.4)^{x-2}$ displays the value 33, the equation defining g displays the maximum value of g. Thus, only equation II displays, as a constant or coefficient, the maximum value of the function it defines.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 95eeeb5b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 95eeeb5b

The function f is defined by $f(x) = ax^2 + bx + c$, where a, b, and c are constants. The graph of $y = f(x)$ in the *xy*-plane passes through the points $(7, 0)$ and $(-3, 0)$. If a is an integer greater than 1, which of the following could be the value of $a + b$?

A. -6

B. -3

C. 4

D. 5

ID: 95eeeb5b Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the graph of $y = f(x)$ in the *xy*-plane passes through the points $(7, 0)$ and $(-3, 0)$. It follows that when the value of x is either 7 or -3, the value of $f(x)$ is 0. It's also given that the function f is defined by $f(x) = ax^2 + bx + c$, where a, b, and c are constants. It follows that the function f is a quadratic function and, therefore, may be written in factored form as $f(x) = a(x - u)(x - v)$, where the value of $f(x)$ is 0 when x is either u or v. Since the value of $f(x)$ is 0 when the value of x is either 7 or -3, and the value of $f(x)$ is 0 when the value of x is either u or v, it follows that u and v are equal to 7 and -3. Substituting 7 for u and -3 for v in the equation $f(x) = a(x - u)(x - v)$ yields $f(x) = a(x - 7)(x - (-3))$, or $f(x) = a(x - 7)(x + 3)$. Distributing the right-hand side of this equation yields $f(x) = a(x^2 - 7x + 3x - 21)$, or $f(x) = ax^2 - 4ax - 21a$. Since it's given that $f(x) = ax^2 + bx + c$, it follows that $b = -4a$. Adding a to each side of this equation yields $a + b = -3a$. Since $a + b = -3a$, if a is an integer, the value of $a + b$ must be a multiple of 3. If a is an integer greater than 1, it follows that $a \geq 2$. Therefore, $-3a \leq -3(2)$. It follows that the value of $a + b$ is less than or equal to $-3(2)$, or -6. Of the given choices, only -6 is a multiple of 3 that's less than or equal to -6.

Choice B is incorrect. This is the value of $a + b$ if a is equal to, not greater than, 1.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c77ef2fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: c77ef2fb

Blood volume, V_B, in a human can be determined using the equation $V_B = \frac{V_P}{1-H}$, where V_P is the plasma volume and H is the hematocrit (the fraction of blood volume that is red blood cells). Which of the following correctly expresses the hematocrit in terms of the blood volume and the plasma volume?

A. $H = 1 - \frac{V_P}{V_B}$

B. $H = \frac{V_B}{V_P}$

C. $H = 1 + \frac{V_B}{V_P}$

D. $H = V_B - V_P$

ID: c77ef2fb Answer

Correct Answer: A

Rationale

Choice A is correct. The hematocrit can be expressed in terms of the blood volume and the plasma volume by solving the given equation $V_B = \frac{V_P}{1-H}$ for H. Multiplying both sides of this equation by $(1-H)$ yields $V_B(1-H) = V_p$. Dividing both sides by V_B yields $1-H = \frac{V_P}{V_B}$. Subtracting 1 from both sides yields $-H = -1 + \frac{V_p}{V_B}$. Dividing both sides by -1 yields $H = 1 - \frac{V_P}{V_B}$.

Choices B, C, and D are incorrect and may result from errors made when manipulating the equation.

Question Difficulty: Medium

Question ID 7399c3b0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 7399c3b0

$k^2 - 53 = 91$ What is the positive solution to the given equation?

A. 144

B. 72

C. 38

D. 12

ID: 7399c3b0 Answer

Correct Answer: D

Rationale

Choice D is correct. Adding 53 to each side of the given equation yields $k^2 = 144$. Taking the square root of each side of this equation yields $k = \pm 12$. Therefore, the positive solution to the given equation is 12.

Choice A is incorrect. This is the positive solution to the equation $k^2 - 53 = 20{,}683$, not $k^2 - 53 = 91$.

Choice B is incorrect. This is the positive solution to the equation $k^2 - 53 = 5{,}131$, not $k^2 - 53 = 91$.

Choice C is incorrect. This is the positive solution to the equation $k^2 - 53 = 1{,}391$, not $k^2 - 53 = 91$.

Question Difficulty: Easy

Question ID 5ae186b4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 5ae186b4

$\frac{-54}{w} = 6$ What is the solution to the given equation?

ID: 5ae186b4 Answer

Correct Answer: -9

Rationale

The correct answer is -9. Since w is in the denominator of a fraction in the given equation, w can't be equal to 0. Since w isn't equal to 0, multiplying both sides of the given equation by w yields an equivalent equation, $-54 = 6w$. Dividing both sides of this equation by 6 yields $-9 = w$. Therefore, -9 is the solution to the given equation.

Question Difficulty: Medium

Question ID b76a2815

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: b76a2815

$$P = \frac{W}{t}$$

The power P produced by a machine is represented by the equation above, where W is the work performed during an amount of time t. Which of the following correctly expresses W in terms of P and t?

A. $W = Pt$

B. $W = \frac{P}{t}$

C. $W = \frac{t}{P}$

D. $W = P + t$

ID: b76a2815 Answer

Correct Answer: A

Rationale

Choice A is correct. Multiplying both sides of the equation by t yields $P \cdot t = (\frac{W}{t}) \cdot t$, or $Pt = W$, which expresses W in terms of P and t. This is equivalent to W = Pt.

Choices B, C, and D are incorrect. Each of the expressions given in these answer choices gives W in terms of P and t but doesn't maintain the given relationship between W, P, and t. These expressions may result from performing different operations with t on each side of the equation. In choice B, W has been multiplied by t, and P has been divided by t. In choice C, W has been multiplied by t, and the quotient of P divided by t has been reciprocated. In choice D, W has been multiplied by t, and P has been added to t. However, in order to maintain the relationship between the variables in the given equation, the same operation must be performed with t on each side of the equation.

Question Difficulty: Easy

Question ID 364a2d25

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 364a2d25

$$x + y = 17$$
$$xy = 72$$

If one solution to the system of equations above is (x, y), what is one possible value of x?

ID: 364a2d25 Answer

Rationale

The correct answer is either 8 or 9. The first equation can be rewritten as $y = 17 - x$. Substituting $17 - x$ for y in the second equation gives $x(17 - x) = 72$. By applying the distributive property, this can be rewritten as $17x - x^2 = 72$. Subtracting 72 from both sides of the equation yields $x^2 - 17x + 72 = 0$. Factoring the left-hand side of this equation yields $(x - 8)(x - 9) = 0$. Applying the Zero Product Property, it follows that $x - 8 = 0$ and $x - 9 = 0$. Solving each equation for x yields $x = 8$ and $x = 9$ respectively. Note that 8 and 9 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID bdb0aa23

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: bdb0aa23

Which expression is equivalent to $5x^5 - 6x^4 + 8x^3$?

A. $x^4(5x - 6)$

B. $x^3(5x^2 - 6x + 8)$

C. $8x^3(5x^2 - 6x + 1)$

D. $6x^5(-6x^4 + 8x^3 + 1)$

ID: bdb0aa23 Answer

Correct Answer: B

Rationale

Choice B is correct. Since x^3 is a common factor of each term in the given expression, the expression can be rewritten as $x^3(5x^2 - 6x + 8)$.

Choice A is incorrect. This expression is equivalent to $5x^5 - 6x^4$.

Choice C is incorrect. This expression is equivalent to $40x^5 - 48x^4 + 8x^3$.

Choice D is incorrect. This expression is equivalent to $-36x^9 + 48x^8 + 6x^5$.

Question Difficulty: Easy

Question ID 100030d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 100030d9

A rubber ball bounces upward one-half the height that it falls each time it hits the ground. If the ball was originally dropped from a distance of 20.0 feet above the ground, what was its maximum height above the ground, in feet, between the third and fourth time it hit the ground?

ID: 100030d9 Answer

Rationale

The correct answer is 2.5. After hitting the ground once, the ball bounces to $20.0 \div 2 = 10.0$ feet. After hitting the ground a second time, the ball bounces to $10.0 \div 2 = 5.0$ feet. After hitting the ground for the third time, the ball bounces to $5.0 \div 2 = 2.5$ feet. Note that 2.5 and 5/2 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 09f58996

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 09f58996

The function f is defined by $f(x) = 6 + \sqrt{x}$. What is the value of $f(36)$?

ID: 09f58996 Answer

Correct Answer: 12

Rationale

The correct answer is 12. The value of $f(36)$ is the value of $f(x)$ when $x = 36$. Substituting 36 for x in the given equation yields $f(36) = 6 + \sqrt{36}$, which is equivalent to $f(36) = 6 + 6$, or $f(36) = 12$. Thus, the value of $f(36)$ is 12.

Question Difficulty: Easy

Question ID beb86a0c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: beb86a0c

Which expression is equivalent to $9x^2 + 5x$?

A. $x(9x + 5)$

B. $5x(9x + 1)$

C. $9x(x + 5)$

D. $x^2(9x + 5)$

ID: beb86a0c Answer

Correct Answer: A

Rationale

Choice A is correct. Since x is a factor of each term in the given expression, the expression is equivalent to $x(9x) + x(5)$, or $x(9x + 5)$.

Choice B is incorrect. This expression is equivalent to $45x^2 + 5x$, not $9x^2 + 5x$.

Choice C is incorrect. This expression is equivalent to $9x^2 + 45x$, not $9x^2 + 5x$.

Choice D is incorrect. This expression is equivalent to $9x^3 + 5x^2$, not $9x^2 + 5x$.

Question Difficulty: Easy

Question ID 5910bfff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 5910bfff

$D = T - \frac{9}{25}(100 - H)$

The formula above can be used to approximate the dew point D, in degrees Fahrenheit, given the temperature T, in degrees Fahrenheit, and the relative humidity of H percent, where $H > 50$. Which of the following expresses the relative humidity in terms of the temperature and the dew point?

A. $H = \frac{25}{9}(D - T) + 100$

B. $H = \frac{25}{9}(D - T) - 100$

C. $H = \frac{25}{9}(D + T) + 100$

D. $H = \frac{25}{9}(D + T) - 100$

ID: 5910bfff Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $D = T - \frac{9}{25}(100 - H)$. Solving this formula for H expresses the relative humidity in terms of the temperature and the dew point. Subtracting T from both sides of this equation yields $D - T = -\frac{9}{25}(100 - H)$. Multiplying both sides by $-\frac{25}{9}$ yields $-\frac{25}{9}(D - T) = 100 - H$. Subtracting 100 from both sides yields $-\frac{25}{9}(D - T) - 100 = -H$. Multiplying both sides by -1 results in the formula $\frac{25}{9}(D - T) + 100 = H$.

Choices B, C, and D are incorrect and may result from errors made when rewriting the given formula.

Question Difficulty: Hard

Question ID 7ba694f3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 7ba694f3

The number of bacteria in a liquid medium doubles every day. There are $44{,}000$ bacteria in the liquid medium at the start of an observation. Which represents the number of bacteria, y, in the liquid medium t days after the start of the observation?

A. $y = \frac{1}{2}$msup

B. $y = 2$msup

C. $y = 44{,}000$msup

D. $y = 44{,}000$msup

ID: 7ba694f3 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the number of bacteria doubles every day, the relationship between t and y can be represented by an exponential equation of the form $y = a(b)^t$, where a is the number of bacteria at the start of the observation and the number of bacteria increases by a factor of b every day. It's given that there are $44{,}000$ bacteria at the start of the observation. Therefore, $a = 44{,}000$. It's also given that the number of bacteria doubles, or increases by a factor of 2, every day. Therefore, $b = 2$. Substituting $44{,}000$ for a and 2 for b in the equation $y = a(b)^t$ yields $y = 44{,}000(2)^t$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This equation represents a situation where the number of bacteria is decreasing by half, not doubling, every day.

Question Difficulty: Medium

Question ID fbb96bb1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: fbb96bb1

$x - 29 = (x - a)(x - 29)$

Which of the following are solutions to the given equation, where a is a constant and $a > 30$?

a $a + 1$ 29

A. I and II only

B. I and III only

C. II and III only

D. I, II, and III

ID: fbb96bb1 Answer

Correct Answer: C

Rationale

Choice C is correct. Subtracting the expression $(x - 29)$ from both sides of the given equation yields $0 = (x - a)(x - 29) - (x - 29)$, which can be rewritten as $0 = (x - a)(x - 29) + (-1)(x - 29)$. Since the two terms on the right-hand side of this equation have a common factor of $(x - 29)$, it can be rewritten as $0 = (x - 29)(x - a + (-1))$, or $0 = (x - 29)(x - a - 1)$. Since $x - a - 1$ is equivalent to $x - (a + 1)$, the equation $0 = (x - 29)(x - a - 1)$ can be rewritten as $0 = (x - 29)(x - (a + 1))$. By the zero product property, it follows that $x - 29 = 0$ or $x - (a + 1) = 0$. Adding 29 to both sides of the equation $x - 29 = 0$ yields $x = 29$. Adding $a + 1$ to both sides of the equation $x - (a + 1) = 0$ yields $x = a + 1$. Therefore, the two solutions to the given equation are 29 and $a + 1$. Thus, only $a + 1$ and 29, not a, are solutions to the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6e06a0a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 6e06a0a7

Which of the following expressions is equivalent to $2a^2(a+3)$?

A. $5a^3$

B. $8a^5$

C. $2a^3+3$

D. $2a^3+6a^2$

ID: 6e06a0a7 Answer

Correct Answer: D

Rationale

Choice D is correct. Expanding the given expression using the distributive property yields $2a^2(a)+2a^2(3)$. Combining like terms yields $2a^2(a^1)+(2\times3)(a^2)$, or $2a^{2+1}+6a^2$, which is equivalent to $2a^3+6a^2$.

Choices A and B are incorrect and may result from incorrectly combining like terms. Choice C is incorrect and may result from distributing $2a^2$ only to a, and not to 3, in the given expression.

Question Difficulty: Easy

Question ID ad038c19

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: ad038c19

Which of the following is equivalent to $\left(a+\frac{b}{2}\right)^2$?

A. $a^2+\frac{b^2}{2}$

B. $a^2+\frac{b^2}{4}$

C. $a^2+\frac{ab}{2}+\frac{b^2}{2}$

D. $a^2+ab+\frac{b^2}{4}$

ID: ad038c19 Answer

Correct Answer: D

Rationale

Choice D is correct. The expression $\left(a+\frac{b}{2}\right)^2$ can be rewritten as $\left(a+\frac{b}{2}\right)\left(a+\frac{b}{2}\right)$. Using the distributive property, the expression yields $\left(a+\frac{b}{2}\right)\left(a+\frac{b}{2}\right)=a^2+\frac{ab}{2}+\frac{ab}{2}+\frac{b^2}{4}$. Combining like terms gives $a^2+ab+\frac{b^2}{4}$.

Choices A, B, and C are incorrect and may result from errors using the distributive property on the given expression or combining like terms.

Question Difficulty: Hard

Question ID c7a187a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: c7a187a7

$f(x) = x^2 - 18x - 360$

If the given function f is graphed in the *xy*-plane, where $y = f(x)$, what is an *x*-intercept of the graph?

A. $(-12, 0)$

B. $(-30, 0)$

C. $(-360, 0)$

D. $(12, 0)$

ID: c7a187a7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $y = f(x)$. The *x*-intercepts of a graph in the *xy*-plane are the points where $y = 0$. Thus, for an *x*-intercept of the graph of function f, $0 = f(x)$. Substituting 0 for $f(x)$ in the equation $f(x) = x^2 - 18x - 360$ yields $0 = x^2 - 18x - 360$. Factoring the right-hand side of this equation yields $0 = (x + 12)(x - 30)$. By the zero product property, $x + 12 = 0$ and $x - 30 = 0$. Subtracting 12 from both sides of the equation $x + 12 = 0$ yields $x = -12$. Adding 30 to both sides of the equation $x - 30 = 0$ yields $x = 30$. Therefore, the *x*-intercepts of the graph of $y = f(x)$ are $(-12, 0)$ and $(30, 0)$. Of these two *x*-intercepts, only $(-12, 0)$ is given as a choice.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

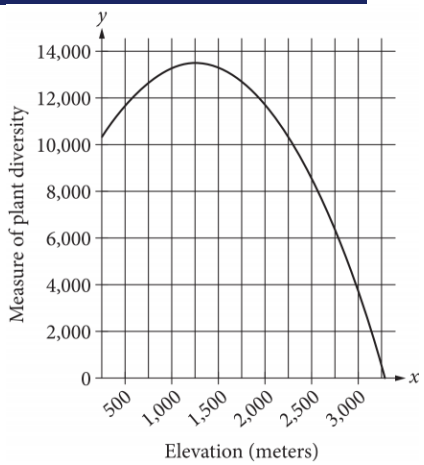
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID ebe4bde0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: ebe4bde0



The quadratic function graphed above models a particular measure of plant diversity as a function of the elevation in a region of Switzerland. According to the model, which of the following is closest to the elevation, in meters, at which plant diversity is greatest?

A. 13,500

B. 3,000

C. 1,250

D. 250

ID: ebe4bde0 Answer

Correct Answer: C

Rationale

Choice C is correct. Each point (x, y) on the graph represents the elevation x, in meters, and the corresponding measure of plant diversity y in a region of Switzerland. Therefore, the point on the graph with the greatest y-coordinate represents the location that has the greatest measure of plant diversity in the region. The greatest y-coordinate of any point on the graph is approximately 13,500. The x-coordinate of that point is approximately 1,250. Therefore, the closest elevation at which the plant diversity is the greatest is 1,250 meters.

Choice A is incorrect. This value is closest to the greatest y-coordinate of any point on the graph and therefore represents the greatest measure of plant diversity, not the elevation where the greatest measure of plant diversity occurs. Choice B is incorrect. At an elevation of 3,000 meters the measure of plant diversity is approximately 4,000. Because there are points on the graph with greater y-coordinates, 4,000 can't be the greatest measure of plant diversity, and 3,000 meters isn't the elevation at which the greatest measure of plant diversity occurs. Choice D is incorrect. At an elevation of 250 meters, the measure of plant diversity is approximately 11,000. Because there are points on the graph with greater y-coordinates, 11,000 can't be the greatest measure of plant diversity and 250 meters isn't the elevation at which the greatest measure of plant diversity occurs.

Question Difficulty: Easy

Question ID ef926848

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: ef926848

Square P has a side length of x inches. Square Q has a perimeter that is 176 inches greater than the perimeter of square P. The function f gives the area of square Q, in square inches. Which of the following defines f?

A. $f(x) = (x + 44)^2$

B. $f(x) = (x + 176)^2$

C. $f(x) = (176x + 44)^2$

D. $f(x) = (176x + 176)^2$

ID: ef926848 Answer

Correct Answer: A

Rationale

Choice A is correct. Let x represent the side length, in inches, of square P. It follows that the perimeter of square P is $4x$ inches. It's given that square Q has a perimeter that is 176 inches greater than the perimeter of square P. Thus, the perimeter of square Q is 176 inches greater than $4x$ inches, or $4x + 176$ inches. Since the perimeter of a square is 4 times the side length of the square, each side length of Q is $\frac{4x+176}{4}$, or $x + 44$ inches. Since the area of a square is calculated by multiplying the length of two sides, the area of square Q is $(x + 44)(x + 44)$, or $(x + 44)^2$ square inches. It follows that function f is defined by $f(x) = (x + 44)^2$.

Choice B is incorrect. This function represents a square with side lengths $(x + 176)$ inches.

Choice C is incorrect. This function represents a square with side lengths $(176x + 44)$ inches.

Choice D is incorrect. This function represents a square with side lengths $(176x + 176)$ inches.

Question Difficulty: Hard

Question ID 77c0cced

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 77c0cced

$y = 2x^2 - 21x + 64$ $y = 3x + a$

In the given system of equations, a is a constant. The graphs of the equations in the given system intersect at exactly one point, (x, y), in the *xy*-plane. What is the value of x?

A. -8

B. -6

C. 6

D. 8

ID: 77c0cced Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the graphs of the equations in the given system intersect at exactly one point, (x, y), in the *xy*-plane. Therefore, (x, y) is the only solution to the given system of equations. The given system of equations can be solved by subtracting the second equation, $y = 3x + a$, from the first equation, $y = 2x^2 - 21x + 64$. This yields $y - y = (2x^2 - 21x + 64) - (3x + a)$, or $0 = 2x^2 - 24x + 64 - a$. Since the given system has only one solution, this equation has only one solution. A quadratic equation in the form $rx^2 + sx + t = 0$, where r, s, and t are constants, has one solution if and only if the discriminant, $s^2 - 4rt$, is equal to zero. Substituting 2 for r, -24 for s, and $-a + 64$ for t in the expression $s^2 - 4rt$ yields $(-24)^2 - (4)(2)(64 - a)$. Setting this expression equal to zero yields $(-24)^2 - (4)(2)(64 - a) = 0$, or $8a + 64 = 0$. Subtracting 64 from both sides of this equation yields $8a = -64$. Dividing both sides of this equation by 8 yields $a = -8$. Substituting -8 for a in the equation $0 = 2x^2 - 24x + 64 - a$ yields $0 = 2x^2 - 24x + 64 + 8$, or $0 = 2x^2 - 24x + 72$. Factoring 2 from the right-hand side of this equation yields $0 = 2(x^2 - 12x + 36)$. Dividing both sides of this equation by 2 yields $0 = x^2 - 12x + 36$, which is equivalent to $0 = (x - 6)(x - 6)$, or $0 = (x - 6)^2$. Taking the square root of both sides of this equation yields $0 = x - 6$. Adding 6 to both sides of this equation yields $x = 6$.

Choice A is incorrect. This is the value of a, not x.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 635f54ee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 635f54ee

The surface area of a cube is $6\left(\frac{a}{4}\right)^2$, where a is a positive constant. Which of the following gives the perimeter of one face of the cube?

A. $\frac{a}{4}$

B. a

C. $4a$

D. $6a$

ID: 635f54ee Answer

Correct Answer: B

Rationale

Choice B is correct. A cube has 6 faces of equal area, so if the total surface area of a cube is $6\left(\frac{a}{4}\right)^2$, then the area of one face is $\left(\frac{a}{4}\right)^2$. Likewise, the area of one face of a cube is the square of one of its edges; therefore, if the area of one face is $\left(\frac{a}{4}\right)^2$, then the length of one edge of the cube is $\frac{a}{4}$. Since the perimeter of one face of a cube is four times the length of one edge, the perimeter is $4\left(\frac{a}{4}\right)=a$.

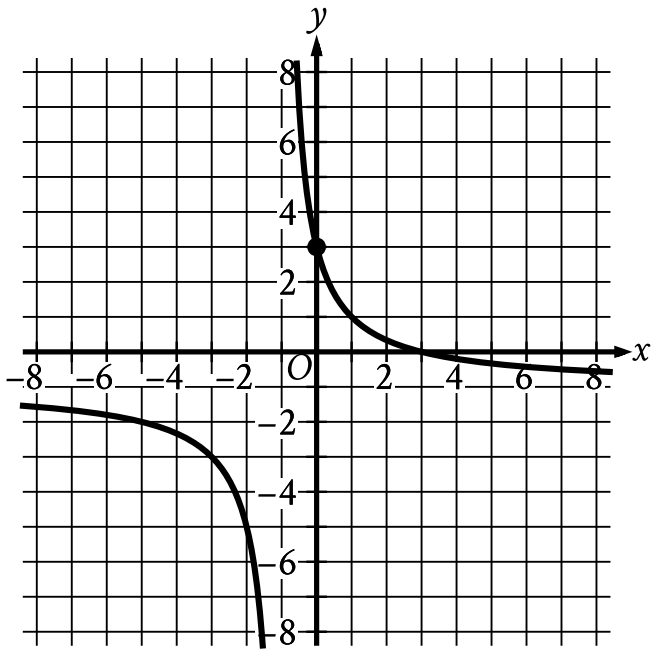
Choice A is incorrect because if the perimeter of one face of the cube is $\frac{a}{4}$, then the total surface area of the cube is $6\left(\frac{\frac{a}{4}}{4}\right)^2=6\left(\frac{a}{16}\right)^2$, which is not $6\left(\frac{a}{4}\right)^2$. Choice C is incorrect because if the perimeter of one face of the cube is 4a, then the total surface area of the cube is $6\left(\frac{4a}{4}\right)^2=6a^2$, which is not $6\left(\frac{a}{4}\right)^2$. Choice D is incorrect because if the perimeter of one face of the cube is 6a, then the total surface area of the cube is $6\left(\frac{6a}{4}\right)^2=6\left(\frac{3a}{2}\right)^2$, which is not $6\left(\frac{a}{4}\right)^2$.

Question Difficulty: Hard

Question ID c99d154a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: c99d154a



What is the *y*-coordinate of the *y*-intercept of the graph shown?

ID: c99d154a Answer

Correct Answer: 3

Rationale

The correct answer is 3. A *y*-intercept of a graph in the *xy*-plane is a point (x, y) on the graph where $x = 0$. For the graph shown, at $x = 0$, the corresponding value of y is 3. Therefore, the *y*-coordinate of the *y*-intercept of the graph shown is 3.

Question Difficulty: Easy

Question ID a26c29f7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: a26c29f7

The function f is defined by $f(x) = 7x^3$. In the *xy*-plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Which equation defines function g?

A. $g(x) = \frac{7}{2}x^3$

B. $g(x) = 7x^{\frac{3}{2}}$

C. $g(x) = 7x^3 + 2$

D. $g(x) = 7x^3 - 2$

ID: a26c29f7 Answer

Correct Answer: D

Rationale

Choice D is correct. If the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down k units in the *xy*-plane, the function g can be defined by an equation of the form $g(x) = f(x) - k$. It's given that $f(x) = 7x^3$ and the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Substituting $7x^3$ for $f(x)$ and 2 for k in the equation $g(x) = f(x) - k$ yields $g(x) = 7x^3 - 2$.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect. This equation defines a function g for which the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ up, not down, 2 units.

Question Difficulty: Medium

Question ID 0980fcdd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 0980fcdd

$$x^2 = 6x + y$$
$$y = -6x + 36$$

A solution to the given system of equations is (x,y). Which of the following is a possible value of *xy* ?

A. 0

B. 6

C. 12

D. 36

ID: 0980fcdd Answer

Correct Answer: A

Rationale

Choice A is correct. Solutions to the given system of equations are ordered pairs (x,y) that satisfy both equations in the system. Adding the left-hand and right-hand sides of the equations in the system yields $x^2 + y = 6x + -6x + y + 36$, or $x^2 + y = y + 36$. Subtracting y from both sides of this equation yields $x^2 = 36$. Taking the square root of both sides of this equation yields $x = 6$ and $x = -6$. Therefore, there are two solutions to this system of equations, one with an x-coordinate of 6 and the other with an x-coordinate of -6. Substituting 6 for x in the second equation yields $y = -6(6) + 36$, or $y = 0$; therefore, one solution is $(6,0)$. Similarly, substituting -6 for x in the second equation yields $y = -6(-6) + 36$, or $y = 72$; therefore, the other solution is $(-6,72)$. It follows then that if (x,y) is a solution to the system, then possible values of xy are $(6)(0) = 0$ and $(-6)(72) = -432$. Only 0 is among the given choices.

Choice B is incorrect. This is the x-coordinate of one of the solutions, $(6,0)$. Choice C is incorrect and may result from conceptual or computational errors. Choice D is incorrect. This is the square of the x-coordinate of one of the solutions, $(6,0)$.

Question Difficulty: Medium

Question ID e1391dd6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: e1391dd6

According to Moore's law, the number of transistors included on microprocessors doubles every 2 years. In 1985, a microprocessor was introduced that had 275,000 transistors. Based on this information, in which of the following years does Moore's law estimate the number of transistors to reach 1.1 million?

A. 1987

B. 1989

C. 1991

D. 1994

ID: e1391dd6 Answer

Rationale

Choice B is correct. Let x be the number of years after 1985. It follows that $\frac{x}{2}$ represents the number of 2-year periods that will occur within an x-year period. According to Moore's law, every 2 years, the number of transistors included on microprocessors is estimated to double. Therefore, x years after 1985, the number of transistors will double $\frac{x}{2}$ times. Since the number of transistors included on a microprocessor was 275,000, or .275 million, in 1985, the estimated number of transistors, in millions, included x years after 1985 can be modeled as $0.275 \cdot 2^{\frac{x}{2}}$. The year in which the number of transistors is estimated to be 1.1 million is represented by the value of x when $1.1 = 0.275 \cdot 2^{\frac{x}{2}}$. Dividing both sides of this equation by .275 yields $4 = 2^{\frac{x}{2}}$, which can be rewritten as $2^2 = 2^{\frac{x}{2}}$. Since the exponential equation has equal bases on each side, it follows that the exponents must also be equal: $2 = \frac{x}{2}$. Multiplying both sides of the equation $2 = \frac{x}{2}$ by 2 yields $x = 4$. Therefore, according to Moore's law, 4 years after 1985, or in 1989, the number of transistors included on microprocessors is estimated to reach 1.1 million.

Alternate approach: According to Moore's law, 2 years after 1985 (in 1987), the number of transistors included on a microprocessor is estimated to be $2 \cdot 275{,}000$, or 550,000, and 2 years after 1987 (in 1989), the number of transistors included on microprocessors is estimated to be $2 \cdot 550{,}000$, or 1,100,000. Therefore, the year that Moore's law estimates the number of transistors on microprocessors to reach 1.1 million is 1989.

Choices A, C, and D are incorrect. According to Moore's law, the number of transistors included on microprocessors is estimated to reach 550,000 in 1987, 2.2 million in 1991, and about 6.2 million in 1994.

Question Difficulty: Medium

Question ID 3c600337

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 3c600337

The function f is defined by $f(x) = 270(0.1)^x$. What is the value of $f(0)$?

A. 0

B. 1

C. 27

D. 270

ID: 3c600337 Answer

Correct Answer: D

Rationale

Choice D is correct. The value of $f(0)$ is the value of $f(x)$ when $x = 0$. Substituting 0 for x in the given function yields $f(0) = 270(0.1)^0$, or $f(0) = 270(1)$, which is equivalent to $f(0) = 270$. Therefore, the value of $f(0)$ is 270.

Choice A is incorrect. This is the value of x, not $f(x)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the value of $f(1)$, not $f(0)$.

Question Difficulty: Medium

Question ID 3ea87153

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 3ea87153

The function g is defined by $g(x) = x^2 + 9$. For which value of x is $g(x) = 25$?

A. 4

B. 5

C. 9

D. 13

ID: 3ea87153 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $g(x) = x^2 + 9$. Substituting 25 for $g(x)$ in this equation yields $25 = x^2 + 9$. Subtracting 9 from both sides of this equation yields $16 = x^2$. Taking the square root of each side of this equation yields $x = \pm 4$. It follows that $g(x) = 25$ when the value of x is 4 or -4. Only 4 is listed among the choices.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 87a3de81

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 87a3de81

$x^2+x-12=0$

If *a* is a solution of the equation above and $a>0$, what is the value of *a*?

ID: 87a3de81 Answer

Rationale

The correct answer is 3. The solution to the given equation can be found by factoring the quadratic expression. The factors can be determined by finding two numbers with a sum of 1 and a product of -12. The two numbers that meet these constraints are 4 and -3. Therefore, the given equation can be rewritten as $(x+4)(x-3)=0$. It follows that the solutions to the equation are $x=-4$ or $x=3$. Since it is given that $a>0$, a must equal 3.

Question Difficulty: Medium

Question ID 499cb491

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 499cb491

Which expression is equivalent to $5x^2 - 50xy^2$?

A. $5x(x - 10y^2)$

B. $5x(x - 50y^2)$

C. $5x^2(10xy^2)$

D. $5x^2(50xy^2)$

ID: 499cb491 Answer

Correct Answer: A

Rationale

Choice A is correct. Since each term of the given expression has a factor of $5x$, it can be rewritten as $5x(x) - 5x(10y^2)$, or $5x(x - 10y^2)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID d46da42c

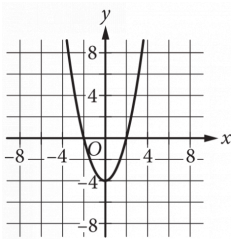
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: d46da42c

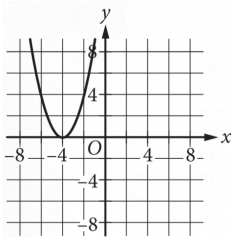
$f(x)=x^2+4$

The function f is defined as shown. Which of the following graphs in the xy-plane could be the graph of $y=f(x)$?

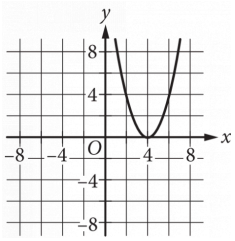
A.



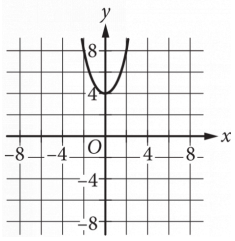
B.



C.



D.



ID: d46da42c Answer

Correct Answer: D

Rationale

Choice D is correct. For the quadratic function $f(x)=x^2+4$, the vertex of the graph is $(0,4)$, and because the x^2 term is positive, the vertex is the minimum of the function. Choice D is the only option that meets these conditions.

Choices A, B, and C are incorrect. The vertex of each of these graphs doesn't correspond to the minimum of the given function.

Question Difficulty: Easy

Question ID 4209aefe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 4209aefe

The function $f(x) = 206(1.034)^x$ models the value, in dollars, of a certain bank account by the end of each year from 1957 through 1972, where x is the number of years after 1957. Which of the following is the best interpretation of "$f(5)$ is approximately equal to 243" in this context?

A. The value of the bank account is estimated to be approximately 5 dollars greater in 1962 than in 1957.

B. The value of the bank account is estimated to be approximately 243 dollars in 1962.

C. The value, in dollars, of the bank account is estimated to be approximately 5 times greater in 1962 than in 1957.

D. The value of the bank account is estimated to increase by approximately 243 dollars every 5 years between 1957 and 1972.

ID: 4209aefe Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the function $f(x) = 206(1.034)^x$ models the value, in dollars, of a certain bank account by the end of each year from 1957 through 1972, where x is the number of years after 1957. It follows that $f(x)$ represents the estimated value, in dollars, of the bank account x years after 1957. Since the value of $f(5)$ is the value of $f(x)$ when $x = 5$, it follows that "$f(5)$ is approximately equal to 243" means that $f(x)$ is approximately equal to 243 when $x = 5$. In the given context, this means that the value of the bank account is estimated to be approximately 243 dollars 5 years after 1957. Therefore, the best interpretation of the statement "$f(5)$ is approximately equal to 243" in this context is the value of the bank account is estimated to be approximately 243 dollars in 1962.

Choice A is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 482a445b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 482a445b

Which expression is equivalent to $(x^2 + 11)^2 + (x - 5)(x + 5)$?

A. $x^4 + 23x^2 - 14$

B. $x^4 + 23x^2 + 96$

C. $x^4 + 12x^2 + 121$

D. $x^4 + x^2 + 146$

ID: 482a445b Answer

Correct Answer: B

Rationale

Choice B is correct. The expression $(x^2 + 11)^2$ can be written as $(x^2 + 11)(x^2 + 11)$, which is equivalent to $x^2(x^2 + 11) + 11(x^2 + 11)$. Distributing x^2 and 11 to $(x^2 + 11)$ yields $x^4 + 11x^2 + 11x^2 + 121$, or $x^4 + 22x^2 + 121$. The expression $(x - 5)(x + 5)$ is equivalent to $(x - 5)x + (x - 5)5$. Distributing x and 5 to $(x - 5)$ yields $x^2 - 5x + 5x - 25$, or $x^2 - 25$. Therefore, the expression $(x^2 + 11)^2 + (x - 5)(x + 5)$ is equivalent to $(x^4 + 22x^2 + 121) + (x^2 - 25)$, or $x^4 + 22x^2 + 121 + x^2 - 25$. Combining like terms in this expression yields $x^4 + 23x^2 + 96$.

Choice A is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields -14, whereas substituting 0 for x in the given expression yields 96.

Choice C is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 121, whereas substituting 0 for x in the given expression yields 96.

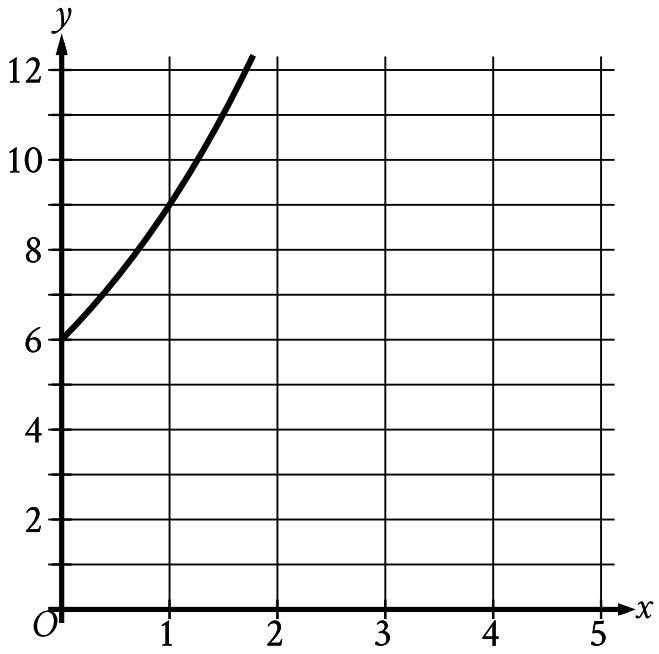
Choice D is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 146, whereas substituting 0 for x in the given expression yields 96.

Question Difficulty: Medium

Question ID f1fa0821

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f1fa0821



The graph gives the estimated population y, in thousands, of a town x years since 2003, where $0 \leq x \leq 5$. Which of the following best describes the increase in the estimated population from $x = 0$ to $x = 1$?

A. The estimated population at $x = 1$ is 0.5 times the estimated population at $x = 0$.

B. The estimated population at $x = 1$ is 1.5 times the estimated population at $x = 0$.

C. The estimated population at $x = 1$ is 2.5 times the estimated population at $x = 0$.

D. The estimated population at $x = 1$ is 3.5 times the estimated population at $x = 0$.

ID: f1fa0821 Answer

Correct Answer: B

Rationale

Choice B is correct. On the graph shown, the *y*-axis represents estimated population, in thousands. The graph shows that when $x = 0$, the *y*-coordinate is 6. Therefore, the estimated population at $x = 0$ is 6 thousand. The graph also shows that when $x = 1$, the *y*-coordinate is 9. Therefore, the estimated population at $x = 1$ is 9 thousand. Dividing 9 thousand by 6 thousand yields 1.5; therefore, 9 thousand is 1.5 times 6 thousand. It follows that the estimated population at $x = 1$ is 1.5 times the estimated population at $x = 0$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 1697ffcf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 1697ffcf

In the *xy*-plane, the graph of $y = 3x^2 - 14x$ intersects the graph of $y = x$ at the points $(0, 0)$ and (a, a). What is the value of *a* ?

ID: 1697ffcf Answer

Rationale

The correct answer is 5. The intersection points of the graphs of $y = 3x^2 - 14x$ and $y = x$ can be found by solving the system consisting of these two equations. To solve the system, substitute x for y in the first equation. This gives $x = 3x^2 - 14x$. Subtracting x from both sides of the equation gives $0 = 3x^2 - 15x$. Factoring $3x$ out of each term on the left-hand side of the equation gives $0 = 3x(x - 5)$. Therefore, the possible values for x are 0 and 5. Since $y = x$, the two intersection points are $(0,0)$ and $(5,5)$. Therefore, $a = 5$.

Question Difficulty: Hard

Question ID 5bf0f84a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 5bf0f84a

$h(t) = -16t^2 + 110t + 72$

The function above models the height h, in feet, of an object above ground t seconds after being launched straight up in the air. What does the number 72 represent in the function?

A. The initial height, in feet, of the object

B. The maximum height, in feet, of the object

C. The initial speed, in feet per second, of the object

D. The maximum speed, in feet per second, of the object

ID: 5bf0f84a Answer

Correct Answer: A

Rationale

Choice A is correct. The variable t represents the seconds after the object is launched. Since $h(0) = 72$, this means that the height, in feet, at 0 seconds, or the initial height, is 72 feet.

Choices B, C, and D are incorrect and may be the result of misinterpreting the function in context.

Question Difficulty: Medium

Question ID c048055c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: c048055c

A model predicts that the population of Springfield was $15{,}000$ in 2005. The model also predicts that each year for the next 5 years, the population p increased by 4% of the previous year's population. Which equation best represents this model, where x is the number of years after 2005, for $x \leq 5$?

A. $p = 0.96$msup

B. $p = 1.04$msup

C. $p = 15{,}000$msup

D. $p = 15{,}000$msup

ID: c048055c Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that a model predicts the population of Springfield in 2005 was $15{,}000$. The model also predicts that each year for the next 5 years, the population increased by 4% of the previous year's population. The predicted population in one of these years can be found by multiplying the predicted population from the previous year by 1.04. Since the predicted population in 2005 was $15{,}000$, the predicted population 1 year later is $15{,}000(1.04)$. The predicted population 2 years later is this value times 1.04, which is $15{,}000(1.04)(1.04)$, or $15{,}000(1.04)^2$. The predicted population 3 years later is this value times 1.04, or $15{,}000(1.04)^3$. More generally, the predicted population, p, x years after 2005 is represented by the equation $p = 15{,}000(1.04)^x$.

Choice A is incorrect. Substituting 0 for x in this equation indicates the predicted population in 2005 was 0.96 rather than $15{,}000$.

Choice B is incorrect. Substituting 0 for x in this equation indicates the predicted population in 2005 was 1.04 rather than $15{,}000$.

Choice C is incorrect. This equation indicates the predicted population is decreasing, rather than increasing, by 4% each year.

Question Difficulty: Medium

Question ID 70ebd3d0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 70ebd3d0

$N(d) = 115(0.90)^d$

The function N defined above can be used to model the number of species of brachiopods at various ocean depths d, where d is in hundreds of meters. Which of the following does the model predict?

A. For every increase in depth by 1 meter, the number of brachiopod species decreases by 115.

B. For every increase in depth by 1 meter, the number of brachiopod species decreases by 10%.

C. For every increase in depth by 100 meters, the number of brachiopod species decreases by 115.

D. For every increase in depth by 100 meters, the number of brachiopod species decreases by 10%.

ID: 70ebd3d0 Answer

Correct Answer: D

Rationale

Choice D is correct. The function N is exponential, so it follows that $N(d)$ changes by a fixed percentage for each increase in d by 1. Since d is measured in hundreds of meters, it also follows that the number of brachiopod species changes by a fixed percentage for each increase in ocean depth by 100 meters. Since the base of the exponent in the model is 0.90, which is less than 1, the number of brachiopod species decreases as the ocean depth increases. Specifically, the number of brachiopod species at a depth of $d + 100$ meters is 90% of the number of brachiopod species at a depth of d meters. This means that for each increase in ocean depth by 100 meters, the number of brachiopod species decreases by 10%.

Choices A and C are incorrect. These describe situations where the number of brachiopod species are decreasing linearly rather than exponentially. Choice B is incorrect and results from interpreting the decrease in the number of brachiopod species as 10% for every 1-meter increase in ocean depth rather than for every 100-meter increase in ocean depth.

Question Difficulty: Medium

Question ID 70fb357b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 70fb357b

$y = 576^{(2x+2)}$

The graph of the given equation in the *xy*-plane has a *y*-intercept of (r, s). Which of the following equivalent equations displays the value of s as a constant, a coefficient, or the base?

A. $y =$ msup

B. $y =$ msup

C. $y = \frac{1}{24}$ msup

D. $y = \frac{1}{576}$ msup

ID: 70fb357b Answer

Correct Answer: A

Rationale

Choice A is correct. The *y*-intercept of a graph in the *xy*-plane is the point where $x = 0$. Substituting 0 for x in the given equation, $y = 576^{(2x+2)}$, yields $y = 576^{(2(0)+2)}$, which is equivalent to $y = 576^2$, or $y = 331{,}776$. Therefore, the graph of the given equation in the *xy*-plane has a *y*-intercept of $(0, 331{,}776)$. It follows that $r = 0$ and $s = 331{,}776$. Thus, the equivalent equation $y = 331{,}776^{(x+1)}$ displays the value of s as the base.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 20291f47

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 20291f47

Which expression is equivalent to $\frac{y+12}{x-8}+\frac{y(x-8)}{x^2y-8xy}$?

A. $\frac{xy+y+4}{x^3y-16x^2y+64xy}$

B. $\frac{xy+9y+12}{x^2y-8xy+x-8}$

C. $\frac{xy^2+13xy-8y}{x^2y-8xy}$

D. $\frac{xy^2+13xy-8y}{x^3y-16x^2y+64xy}$

ID: 20291f47 Answer

Correct Answer: C

Rationale

Choice C is correct. Factoring the denominator in the second term of the given expression gives $\frac{y+12}{x-8}+\frac{y(x-8)}{xy(x-8)}$. This expression can be rewritten with common denominators by multiplying the first term by $\frac{xy}{xy}$, giving $\frac{xy(y+12)}{xy(x-8)}+\frac{y(x-8)}{xy(x-8)}$. Adding these two terms yields $\frac{xy(y+12)+y(x-8)}{xy(x-8)}$. Using the distributive property to rewrite this expression gives $\frac{xy^2+12xy+xy-8y}{x^2y-8xy}$. Combining the like terms in the numerator of this expression gives $\frac{xy^2+13xy-8y}{x^2y-8xy}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 42f8e4b4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 42f8e4b4

One of the factors of $2x^3 + 42x^2 + 208x$ is $x + b$, where b is a positive constant. What is the smallest possible value of b?

ID: 42f8e4b4 Answer

Correct Answer: 8

Rationale

The correct answer is 8. Since each term of the given expression, $2x^3 + 42x^2 + 208x$, has a factor of $2x$, the expression can be rewritten as $2x(x^2) + 2x(21x) + 2x(104)$, or $2x(x^2 + 21x + 104)$. Since the values 8 and 13 have a sum of 21 and a product of 104, the expression $x^2 + 21x + 104$ can be factored as $(x + 8)(x + 13)$. Therefore, the given expression can be factored as $2x(x + 8)(x + 13)$. It follows that the factors of the given expression are 2, x, $x + 8$, and $x + 13$. Of these factors, only $x + 8$ and $x + 13$ are of the form $x + b$, where b is a positive constant. Therefore, the possible values of b are 8 and 13. Thus, the smallest possible value of b is 8.

Question Difficulty: Hard

Question ID a67a439d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: a67a439d

$x + 7 = 10$ $(x + 7)^2 = y$ Which ordered pair (x, y) is a solution to the given system of equations?

A. $(3, 100)$

B. $(3, 3)$

C. $(3, 10)$

D. $(3, 70)$

ID: a67a439d Answer

Correct Answer: A

Rationale

Choice A is correct. The solution to a system of equations is the ordered pair (x, y) that satisfies all equations in the system. It's given by the first equation in the system that $x + 7 = 10$. Substituting 10 for $x + 7$ into the second equation yields $10^2 = y$, or $y = 100$. The *x*-coordinate of the solution to the system of equations can be found by subtracting 7 from both sides of the equation $x + 7 = 10$, which yields $x = 3$. Therefore, the ordered pair $(3, 100)$ is a solution to the given system of equations.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID de39858a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: de39858a

The function h is defined by $h(x) = a^x + b$, where a and b are positive constants. The graph of $y = h(x)$ in the xy-plane passes through the points $(0, 10)$ and $(-2, \frac{325}{36})$. What is the value of ab?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 54

D. 60

ID: de39858a Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the function h is defined by $h(x) = a^x + b$ and that the graph of $y = h(x)$ in the xy-plane passes through the points $(0, 10)$ and $(-2, \frac{325}{36})$. Substituting 0 for x and 10 for $h(x)$ in the equation $h(x) = a^x + b$ yields $10 = a^0 + b$, or $10 = 1 + b$. Subtracting 1 from both sides of this equation yields $9 = b$. Substituting -2 for x and $\frac{325}{36}$ for $h(x)$ in the equation $h(x) = a^x + 9$ yields $\frac{325}{36} = a^{-2} + 9$. Subtracting 9 from both sides of this equation yields $\frac{1}{36} = a^{-2}$, which can be rewritten as $a^2 = 36$. Taking the square root of both sides of this equation yields $a = 6$ and $a = -6$, but because it's given that a is a positive constant, a must equal 6. Because the value of a is 6 and the value of b is 9, the value of ab is $(6)(9)$, or 54.

Choice A is incorrect and may result from finding the value of $a^{-2}b$ rather than the value of ab.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from correctly finding the value of a as 6, but multiplying it by the y-value in the first ordered pair rather than by the value of b.

Question Difficulty: Hard

Question ID 2683b5db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 2683b5db

$T = 0.01(P - 40{,}000)$

In a city, the property tax T, in dollars, is calculated using the formula above, where P is the value of the property, in dollars. Which of the following expresses the value of the property in terms of the property tax?

A. $P = 100T - 400$

B. $P = 100T + 400$

C. $P = 100T - 40{,}000$

D. $P = 100T + 40{,}000$

ID: 2683b5db Answer

Correct Answer: D

Rationale

Choice D is correct. To express the value of the property in terms of the property tax, the given equation must be solved for P. Multiplying both sides of the equation by 100 gives $100T = P - 40{,}000$. Adding 40,000 to both sides of the equation gives $100T + 40{,}000 = P$. Therefore, $P = 100T + 40{,}000$.

Choice A is incorrect and may result from multiplying 40,000 by 0.01, then subtracting 400 from, instead of adding 400 to, the left-hand side of the equation. Choice B is incorrect and may result from multiplying 40,000 by 0.01. Choice C is incorrect and may result from subtracting instead of adding 40,000 from the left-hand side of the equation.

Question Difficulty: Medium

Question ID d41cf4d3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: d41cf4d3

The function f is defined by $f(x) = a\sqrt{x+b}$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x)$ passes through the point $(-24, 0)$, and $f(24) < 0$. Which of the following must be true?

A. $f(0) = 24$

B. $f(0) = -24$

C. $a > b$

D. $a < b$

ID: d41cf4d3 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $f(24) < 0$. Substituting 24 for $f(x)$ in the equation $f(x) = a\sqrt{x+b}$ yields $f(24) = a\sqrt{24+b}$. Therefore, $a\sqrt{24+b} < 0$. Since $\sqrt{24+b}$ can't be negative, it follows that $a < 0$. It's also given that the graph of $y = f(x)$ passes through the point $(-24, 0)$. It follows that when $x = -24$, $f(x) = 0$. Substituting -24 for x and 0 for $f(x)$ in the equation $f(x) = a\sqrt{x+b}$ yields $0 = a\sqrt{-24+b}$. By the zero product property, either $a = 0$ or $\sqrt{-24+b} = 0$. Since $a < 0$, it follows that $\sqrt{24+b} = 0$. Squaring both sides of this equation yields $-24 + b = 0$. Adding 24 to both sides of this equation yields $b = 24$. Since $a < 0$ and b is 24, it follows that $a < b$ must be true.

Choice A is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which must be negative.

Choice B is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which could be -24, but doesn't have to be.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1178f2df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1178f2df

x	y
21	-8
23	8
25	-8

The table shows three values of x and their corresponding values of y, where $y = f(x) + 4$ and f is a quadratic function. What is the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

ID: 1178f2df Answer

Correct Answer: -2112

Rationale

The correct answer is $-2{,}112$. It's given that f is a quadratic function. It follows that f can be defined by an equation of the form $f(x) = a(x - h)^2 + k$, where a, h, and k are constants. It's also given that the table shows three values of x and their corresponding values of y, where $y = f(x) + 4$. Substituting $a(x - h)^2 + k$ for $f(x)$ in this equation yields $y = a(x - h)^2 + k + 4$. This equation represents a quadratic relationship between x and y, where $k + 4$ is either the maximum or the minimum value of y, which occurs when $x = h$. For quadratic relationships between x and y, the maximum or minimum value of y occurs at the value of x halfway between any two values of x that have the same corresponding value of y. The table shows that *x*-values of 21 and 25 correspond to the same *y*-value, -8. Since 23 is halfway between 21 and 25, the maximum or minimum value of y occurs at an *x*-value of 23. The table shows that when $x = 23$, $y = 8$. It follows that $h = 23$ and $k + 4 = 8$. Subtracting 4 from both sides of the equation $k + 4 = 8$ yields $k = 4$. Substituting 23 for h and 4 for k in the equation $y = a(x - h)^2 + k + 4$ yields $y = a(x - 23)^2 + 4 + 4$, or $y = a(x - 23)^2 + 8$. The value of a can be found by substituting any *x*-value and its corresponding *y*-value for x and y, respectively, in this equation. Substituting 25 for x and -8 for y in this equation yields $-8 = a(25 - 23)^2 + 8$, or $-8 = a(2)^2 + 8$. Subtracting 8 from both sides of this equation yields $-16 = a(2)^2$, or $-16 = 4a$. Dividing both sides of this equation by 4 yields $-4 = a$. Substituting -4 for a, 23 for h, and 4 for k in the equation $f(x) = a(x - h)^2 + k$ yields $f(x) = -4(x - 23)^2 + 4$. The *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane is the point on the graph where $x = 0$. Substituting 0 for x in the equation $f(x) = -4(x - 23)^2 + 4$ yields $f(0) = -4(0 - 23)^2 + 4$, or $f(0) = -4(-23)^2 + 4$. This is equivalent to $f(0) = -2{,}112$, so the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane is $(0, -2{,}112)$. Thus, the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane is $-2{,}112$.

Question Difficulty: Hard

Question ID ce940f80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: ce940f80

$\frac{x^2}{25} = 36$ What is a solution to the given equation?

A. 6

B. 30

C. 450

D. 900

ID: ce940f80 Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying the left- and right-hand sides of the given equation by 25 yields $x^2 = 900$. Taking the square root of the left- and right-hand sides of this equation yields $x = 30$ or $x = -30$. Of these two solutions, only 30 is given as a choice.

Choice A is incorrect. This is a solution to the equation $x^2 = 36$.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 45df91ee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 45df91ee

$g(x) = 11\left(\frac{1}{12}\right)^x$ If the given function g is graphed in the *xy*-plane, where $y = g(x)$, what is the *y*-intercept of the graph?

A. $(0, 11)$

B. $(0, 132)$

C. $(0, 1)$

D. $(0, 12)$

ID: 45df91ee Answer

Correct Answer: A

Rationale

Choice A is correct. The *x*-coordinate of any *y*-intercept of a graph is 0. Substituting 0 for x in the given equation yields $g(0) = 11\left(\frac{1}{12}\right)^0$. Since any nonzero number raised to the 0th power is 1, this gives $g(0) = 11 \cdot 1$, or $g(0) = 11$. The *y*-intercept of the graph is, therefore, the point $(0, 11)$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 67e866b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 67e866b5

Which expression is equivalent to $9x^2 + 7x^2 + 9x$?

A. $63x^4 + 9x$

B. $9x^2 + 16x$

C. $25x^5$

D. $16x^2 + 9x$

ID: 67e866b5 Answer

Correct Answer: D

Rationale

Choice D is correct. In the given expression, the first two terms, $9x^2$ and $7x^2$, are like terms. Combining these like terms yields $9x^2 + 7x^2$, or $16x^2$. It follows that the expression $9x^2 + 7x^2 + 9x$ is equivalent to $16x^2 + 9x$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 40f2e601

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 40f2e601

$P = N(19 - C)$

The given equation relates the positive numbers P, N, and C. Which equation correctly expresses C in terms of P and N?

A. $C = \frac{19+P}{N}$

B. $C = \frac{19-P}{N}$

C. $C = 19 + \frac{P}{N}$

D. $C = 19 - \frac{P}{N}$

ID: 40f2e601 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the values of P, N, and C are positive. Therefore, dividing each side of the given equation by N yields $\frac{P}{N} = 19 - C$. Subtracting 19 from each side of this equation yields $\frac{P}{N} - 19 = -C$. Dividing each side of this equation by -1 yields $19 - \frac{P}{N} = C$, or $C = 19 - \frac{P}{N}$.

Choice A is incorrect. This equation is equivalent to $P = NC - 19$, not $P = N(19 - C)$.

Choice B is incorrect. This equation is equivalent to $P = 19 - NC$, not $P = N(19 - C)$.

Choice C is incorrect. This equation is equivalent to $P = N(C - 19)$, not $P = N(19 - C)$.

Question Difficulty: Medium

Question ID fd65f47f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: fd65f47f

Which expression is equivalent to $(2x^2 + x - 9) + (x^2 + 6x + 1)$?

A. $2x^2 + 7x + 10$

B. $2x^2 + 6x - 8$

C. $3x^2 + 7x - 10$

D. $3x^2 + 7x - 8$

ID: fd65f47f Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression is equivalent to $(2x^2 + x + (-9)) + (x^2 + 6x + 1)$, which can be rewritten as $(2x^2 + x^2) + (x + 6x) + (-9 + 1)$. Adding like terms in this expression yields $3x^2 + 7x + (-8)$, or $3x^2 + 7x - 8$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 97158b3a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 97158b3a

The area *A*, in square centimeters, of a rectangular painting can be represented by the expression $w(w+29)$, where w is the width, in centimeters, of the painting. Which expression represents the length, in centimeters, of the painting?

A. w

B. 29

C. $(w+29)$

D. $w(w+29)$

ID: 97158b3a Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the expression $w(w+29)$ represents the area, in square centimeters, of a rectangular painting, where w is the width, in centimeters, of the painting. The area of a rectangle can be calculated by multiplying its length by its width. It follows that the length, in centimeters, of the painting is represented by the expression $(w+29)$.

Choice A is incorrect. This expression represents the width, in centimeters, of the painting, not its length, in centimeters.

Choice B is incorrect. This is the difference between the length, in centimeters, and the width, in centimeters, of the painting, not its length, in centimeters.

Choice D is incorrect. This expression represents the area, in square centimeters, of the painting, not its length, in centimeters.

Question Difficulty: Medium

Question ID 84e8cc72

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 84e8cc72

A quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. The model indicates the object has an initial height of 10 feet above the ground and reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched. Based on the model, what is the height, in feet, of the object above the ground 10 seconds after being launched?

A. 234

B. 778

C. 970

D. $1{,}014$

ID: 84e8cc72 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. This quadratic function can be defined by an equation of the form $f(x) = a(x - h)^2 + k$, where $f(x)$ is the height of the object x seconds after it was launched, and a, h, and k are constants such that the function reaches its maximum value, k, when $x = h$. Since the model indicates the object reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched, $f(x)$ reaches its maximum value, $1{,}034$, when $x = 8$. Therefore, $k = 1{,}034$ and $h = 8$. Substituting 8 for h and $1{,}034$ for k in the function $f(x) = a(x - h)^2 + k$ yields $f(x) = a(x - 8)^2 + 1{,}034$. Since the model indicates the object has an initial height of 10 feet above the ground, the value of $f(x)$ is 10 when $x = 0$. Substituting 0 for x and 10 for $f(x)$ in the equation $f(x) = a(x - 8)^2 + 1{,}034$ yields $10 = a(0 - 8)^2 + 1{,}034$, or $10 = 64a + 1{,}034$. Subtracting $1{,}034$ from both sides of this equation yields $64a = -1{,}024$. Dividing both sides of this equation by 64 yields $a = -16$. Therefore, the model can be represented by the equation $f(x) = -16(x - 8)^2 + 1{,}034$. Substituting 10 for x in this equation yields $f(10) = -16(10 - 8)^2 + 1{,}034$, or $f(10) = 970$. Therefore, based on the model, 10 seconds after being launched, the height of the object above the ground is 970 feet.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

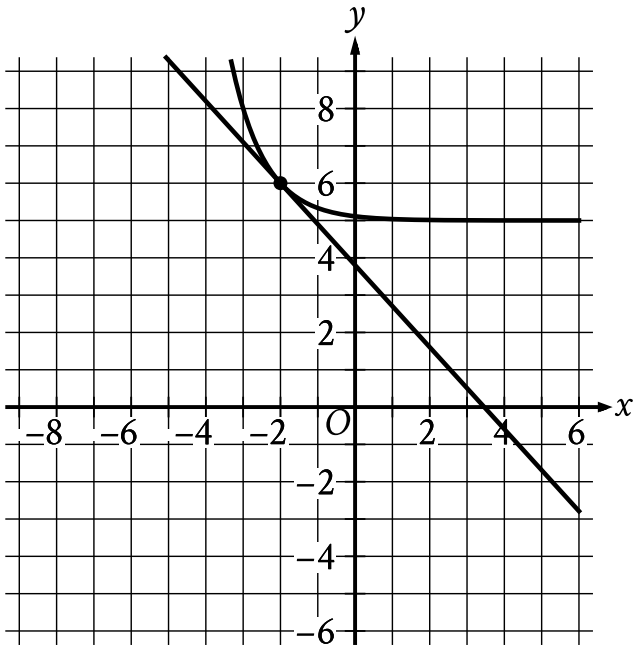
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 5c7d5744

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 5c7d5744



The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution (x, y) to this system?

A. $(6, 0)$

B. $(-2, 6)$

C. $(0, -2)$

D. $(0, 0)$

ID: 5c7d5744 Answer

Correct Answer: B

Rationale

Choice B is correct. The solution (x, y) to the system of two equations corresponds to the point where the graphs of the equations intersect in the *xy*-plane. The graphs of the linear equation and the nonlinear equation shown intersect at the point $(-2, 6)$. Thus, the solution (x, y) to this system is $(-2, 6)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 12e7faf8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 12e7faf8

The equation $\frac{x^2+6x-7}{x+7}=ax+d$ is true for all $x \neq -7$, where *a* and *d* are integers. What is the value of $a+d$?

A. -6

B. -1

C. 0

D. 1

ID: 12e7faf8 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the expression x^2+6x-7 can be factored as $(x+7)(x-1)$, the given equation can be rewritten as $\frac{(x+7)(x-1)}{x+7}=ax+d$. Since $x \neq -7$, $x+7$ is also not equal to 0, so both the numerator and denominator of $\frac{(x+7)(x-1)}{x+7}$ can be divided by $x+7$. This gives $x-1=ax+d$. Equating the coefficient of x on each side of the equation gives $a=1$. Equating the constant terms gives $d=-1$. The sum is $1+(-1)=0$.

Choice A is incorrect and may result from incorrectly simplifying the equation. Choices B and D are incorrect. They are the values of d and a, respectively, not $a+d$.

Question Difficulty: Hard

Question ID 24016dee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 24016dee

Which expression is equivalent to $(8x^3 + 8) - (x^3 - 2)$?

A. $8x^3 + 6$

B. $7x^3 + 10$

C. $8x^3 + 10$

D. $7x^3 + 6$

ID: 24016dee Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression is equivalent to $8x^3 + 8 - x^3 - (-2)$, or $8x^3 + 8 - x^3 + 2$. Combining like terms in this expression yields $7x^3 + 10$.

Choice A is incorrect. This expression is equivalent to $(8x^3 + 8) - 2$, not $(8x^3 + 8) - (x^3 - 2)$.

Choice C is incorrect. This expression is equivalent to $(8x^3 + 8) - (-2)$, not $(8x^3 + 8) - (x^3 - 2)$.

Choice D is incorrect. This expression is equivalent to $(8x^3 + 8) - (x^3 + 2)$, not $(8x^3 + 8) - (x^3 - 2)$.

Question Difficulty: Medium

Question ID 89fc23af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 89fc23af

Which of the following expressions is equivalent to $\frac{x^2-2x-5}{x-3}$?

A. $x-5-\frac{20}{x-3}$

B. $x-5-\frac{10}{x-3}$

C. $x+1-\frac{8}{x-3}$

D. $x+1-\frac{2}{x-3}$

ID: 89fc23af Answer

Correct Answer: D

Rationale

Choice D is correct. The numerator of the given expression can be rewritten in terms of the denominator, $x-3$, as follows: $x^2-2x-5=x^2-3x+x-3-2$, which is equivalent to $x(x-3)+(x-3)-2$. So the given expression is equivalent to $\frac{x(x-3)+(x-3)-2}{x-3}=\frac{x(x-3)}{x-3}+\frac{x-3}{x-3}-\frac{2}{x-3}$. Since the given expression is defined for $x\neq 3$, the expression can be rewritten as $x+1-\frac{2}{x-3}$.

Long division can also be used as an alternate approach. Choices A, B, and C are incorrect and may result from errors made when dividing the two polynomials or making use of structure.

Question Difficulty: Hard

Question ID d8ace155

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: d8ace155

A company opens an account with an initial balance of $\$36{,}100.00$. The account earns interest, and no additional deposits or withdrawals are made. The account balance is given by an exponential function A, where $A(t)$ is the account balance, in dollars, t years after the account is opened. The account balance after 13 years is $\$68{,}071.93$. Which equation could define A?

A. $A(t) = 36{,}100.00(1.05)^t$

B. $A(t) = 31{,}971.93(1.05)^t$

C. $A(t) = 31{,}971.93(0.05)^t$

D. $A(t) = 36{,}100.00(0.05)^t$

ID: d8ace155 Answer

Correct Answer: A

Rationale

Choice A is correct. Since it's given that the account balance, $A(t)$, in dollars, after t years can be modeled by an exponential function, it follows that function A can be written in the form $A(t) = Nr^t$, where N is the initial value of the function and r is a constant related to the growth of the function. It's given that the initial balance of the account is $\$36{,}100.00$, so it follows that the initial value of the function, or N, must be $36{,}100.00$. Substituting $36{,}100.00$ for N in the equation $A(t) = Nr^t$ yields $A(t) = 36{,}100.00r^t$. It's given that the account balance after 13 years, or when $t = 13$, is $\$68{,}071.93$. It follows that $A(13) = 68{,}071.93$, or $36{,}100.00r^{13} = 68{,}071.93$. Dividing each side of the equation $36{,}100.00r^{13} = 68{,}071.93$ by $36{,}100.00$ yields $r^{13} = \frac{68{,}071.93}{36{,}100.00}$. Taking the 13th root of both sides of this equation yields $r = \sqrt[13]{\frac{68{,}071.93}{36{,}100.00}}$, or r is approximately equal to 1.05. Substituting 1.05 for r in the equation $A(t) = 36{,}100.00r^t$ yields $A(t) = 36{,}100.00(1.05)^t$, so the equation $A(t) = 36{,}100.00(1.05)^t$ could define A.

Choice B is incorrect. Substituting 0 for t in this function indicates an initial balance of $\$31{,}971.93$, rather than $\$36{,}100.00$.

Choice C is incorrect. Substituting 0 for t in this function indicates an initial balance of $\$31{,}971.93$, rather than $\$36{,}100.00$. Additionally, this function indicates the account balance is decreasing, rather than increasing, over time.

Choice D is incorrect. This function indicates the account balance is decreasing, rather than increasing, over time.

Question Difficulty: Medium

Question ID c3a72da5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: c3a72da5

Which of the following is equivalent to the sum of $3x^4+2x^3$ and $4x^4+7x^3$?

A. $16x^{14}$

B. $7x^8+9x^6$

C. $12x^4+14x^3$

D. $7x^4+9x^3$

ID: c3a72da5 Answer

Correct Answer: D

Rationale

Choice D is correct. Adding the two expressions yields $3x^4+2x^3+4x^4+7x^3$. Because the pair of terms $3x^4$ and $4x^4$ and the pair of terms $2x^3$ and $7x^3$ each contain the same variable raised to the same power, they are like terms and can be combined as $7x^4$ and $9x^3$, respectively. The sum of the given expressions therefore simplifies to $7x^4+9x^3$.

Choice A is incorrect and may result from adding the coefficients and the exponents in the given expressions. Choice B is incorrect and may result from adding the exponents as well as the coefficients of the like terms in the given expressions. Choice C is incorrect and may result from multiplying, rather than adding, the coefficients of the like terms in the given expressions.

Question Difficulty: Medium

Question ID 911c415b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 911c415b

$(7532+100y^2)+10(10y^2-110)$

The expression above can be written in the form ay^2+b, where a and b are constants. What is the value of $a+b$?

ID: 911c415b Answer

Rationale

The correct answer is 6632. Applying the distributive property to the expression yields $(7532+100y^2)+(100y^2-1100)$. Then adding together $7532+100y^2$ and $100y^2-1100$ and collecting like terms results in $200y^2+6432$. This is written in the form ay^2+b, where $a=200$ and $b=6432$. Therefore $a+b=200+6432=6632$.

Question Difficulty: Hard

Question ID 1863e3be

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 1863e3be

The y-intercept of the graph of $y = x^2 + 31$ in the *xy*-plane is $(0, y)$. What is the value of y?

ID: 1863e3be Answer

Correct Answer: 31

Rationale

The correct answer is 31. It's given that the *y*-intercept of the graph of $y = x^2 + 31$ in the *xy*-plane is $(0, y)$. Substituting 0 for x in the given equation yields $y = (0)^2 + 31$, or $y = 31$. Thus, the value of y is 31.

Question Difficulty: Easy

Question ID dba7432e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: dba7432e

x	$f(x)$
0	5
1	$\frac{5}{2}$
2	$\frac{5}{4}$
3	$\frac{5}{8}$

The table above gives the values of the function f for some values of x. Which of the following equations could define f?

A. $f(x) = 5(2^{x+1})$

B. $f(x) = 5(2^{x})$

C. $f(x) = 5(2^{-(x+1)})$

D. $f(x) = 5(2^{-x})$

ID: dba7432e Answer

Correct Answer: D

Rationale

Choice D is correct. Each choice has a function with coefficient 5 and base 2, so the exponents must be analyzed. When the input value of x increases, the output value of f(x) decreases, so the exponent must be negative. An exponent of −x yields the values in the table: $5 = 5(2^{-0})$, $\frac{5}{2} = 5(2^{-1})$, $\frac{5}{4} = (2^{-2})$, and $\frac{5}{8} = 5(2^{-3})$.

Choices A and B are incorrect and may result from choosing equations that yield an increasing, rather than decreasing, output value of f(x) when the input value of x increases. Choice C is incorrect and may result from choosing an equation that doesn't yield the values in the table.

Question Difficulty: Medium

Question ID b74f2feb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: b74f2feb

The expression $6\sqrt[5]{3^5x^{45}} \cdot \sqrt[8]{2^8x}$ is equivalent to ax^b, where a and b are positive constants and $x > 1$. What is the value of $a + b$?

ID: b74f2feb Answer

Correct Answer: 361/8, 45.12, 45.13

Rationale

The correct answer is $\frac{361}{8}$. The rational exponent property is $\sqrt[n]{y^m} = y^{\frac{m}{n}}$, where $y > 0$, m and n are integers, and $n > 0$. This property can be applied to rewrite the given expression $6\sqrt[5]{3^5x^{45}} \cdot \sqrt[8]{2^8x}$ as $6\left(3^{\frac{5}{5}}\right)\left(x^{\frac{45}{5}}\right)\left(2^{\frac{8}{8}}\right)\left(x^{\frac{1}{8}}\right)$, or $6(3)\left(x^9\right)(2)\left(x^{\frac{1}{8}}\right)$. This expression can be rewritten by multiplying the constants, which gives $36\left(x^9\right)\left(x^{\frac{1}{8}}\right)$. The multiplication exponent property is $y^n \cdot y^m = y^{n+m}$, where $y > 0$. This property can be applied to rewrite the expression $36\left(x^9\right)\left(x^{\frac{1}{8}}\right)$ as $36x^{9+\frac{1}{8}}$, or $36x^{\frac{73}{8}}$. Therefore, $6\sqrt[5]{3^5x^{45}} \cdot \sqrt[8]{2^8x} = 36x^{\frac{73}{8}}$. It's given that $6\sqrt[5]{3^5x^{45}} \cdot \sqrt[8]{2^8x}$ is equivalent to ax^b; therefore, $a = 36$ and $b = \frac{73}{8}$. It follows that $a + b = 36 + \frac{73}{8}$. Finding a common denominator on the right-hand side of this equation gives $a + b = \frac{288}{8} + \frac{73}{8}$, or $a + b = \frac{361}{8}$. Note that 361/8, 45.12, and 45.13 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 16de54c7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 16de54c7

$2x^2+5x-12$

If the given expression is rewritten in the form $(2x-3)(x+k)$, where k is a constant, what is the value of k?

ID: 16de54c7 Answer

Rationale

The correct answer is 4. It's given that $2x^2+5x-12$ can be rewritten as $(2x-3)(x+k)$; it follows that $(2x-3)(x+k)=2x^2+5x-12$. Expanding the left-hand side of this equation yields $2x^2+2kx-3x-3k=2x^2+5x-12$. Subtracting $2x^2$ from both sides of this equation yields $2kx-3x-3k=5x-12$. Using properties of equality, $2kx-3x=5x$ and $-3k=-12$. Either equation can be solved for k. Dividing both sides of $-3k=-12$ by -3 yields $k=4$. The equation $2kx-3x=5x$ can be rewritten as $x(2k-3)=5x$. It follows that $2k-3=5$. Solving this equation for k also yields $k=4$. Therefore, the value of k is 4.

Question Difficulty: Medium

Question ID 2f958af9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 2f958af9

The formula above expresses the square of the speed v of a wave moving along a string in terms of tension T, mass m, and length L of the string. What is T in terms of m, v, and L ?

$$v^2 = \frac{LT}{m}$$

A. $T = \frac{mv^2}{L}$

B. $T = \frac{m}{v^2 L}$

C. $T = \frac{mL}{v^2}$

D. $T = \frac{L}{mv^2}$

ID: 2f958af9 Answer

Correct Answer: A

Rationale

Choice A is correct. To write the formula as T in terms of m, v, and L means to isolate T on one side of the equation. First, multiply both sides of the equation by m, which gives $mv^2 = \frac{mLT}{m}$, which simplifies to $mv^2 = LT$. Next, divide both sides of the equation by L, which gives $\frac{mv^2}{L} = \frac{LT}{L}$, which simplifies to $T = \frac{mv^2}{L}$.

Choices B, C, and D are incorrect and may be the result of incorrectly applying operations to each side of the equation.

Question Difficulty: Medium

Question ID 5edc8c98

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 5edc8c98

$64x^2 - (16a + 4b)x + ab = 0$

In the given equation, a and b are positive constants. The sum of the solutions to the given equation is $k(4a + b)$, where k is a constant. What is the value of k?

ID: 5edc8c98 Answer

Correct Answer: .0625, 1/16

Rationale

The correct answer is $\frac{1}{16}$. Let p and q represent the solutions to the given equation. Then, the given equation can be rewritten as $64(x - p)(x - q) = 0$, or $64x^2 - 64(p + q) + pq = 0$. Since this equation is equivalent to the given equation, it follows that $-(16a + 4b) = -64(p + q)$. Dividing both sides of this equation by -64 yields $\frac{16a+4b}{64} = p + q$, or $\frac{1}{16}(4a + b) = p + q$. Therefore, the sum of the solutions to the given equation, $p + q$, is equal to $\frac{1}{16}(4a + b)$. Since it's given that the sum of the solutions to the given equation is $k(4a + b)$, where k is a constant, it follows that $k = \frac{1}{16}$. Note that 1/16, .0625, 0.062, and 0.063 are examples of ways to enter a correct answer.

Alternate approach: The given equation can be rewritten as $64x^2 - 4(4a + b)x + ab = 0$, where a and b are positive constants. Dividing both sides of this equation by 4 yields $16x^2 - (4a + b)x + \frac{ab}{4} = 0$. The solutions for a quadratic equation in the form $Ax^2 + Bx + C = 0$, where A, B, and C are constants, can be calculated using the quadratic formula, $x = \frac{-B+\sqrt{B^2-4AC}}{2A}$ and $x = \frac{-B-\sqrt{B^2-4AC}}{2A}$. It follows that the sum of the solutions to a quadratic equation in the form $Ax^2 + Bx + C = 0$ is $\frac{-B+\sqrt{B^2-4AC}}{2A} + \frac{-B-\sqrt{B^2-4AC}}{2A}$, which can be rewritten as $\frac{-B+-B+\sqrt{B^2-4AC}-\sqrt{B^2-4AC}}{2A}$, which is equivalent to $\frac{-2B}{2A}$, or $-\frac{B}{A}$. In the equation $16x^2 - (4a + b)x + \frac{ab}{4} = 0$, $A = 16$, $B = -(4a + b)$, and $C = \frac{ab}{4}$. Substituting 16 for A and $-(4a + b)$ for B in $-\frac{B}{A}$ yields $-\frac{-(4a+b)}{16}$, which can be rewritten as $\frac{1}{16}(4a + b)$. Thus, the sum of the solutions to the given equation is $\frac{1}{16}(4a + b)$. Since it's given that the sum of the solutions to the given equation is $k(4a + b)$, where k is a constant, it follows that $k = \frac{1}{16}$.

Question Difficulty: Hard

Question ID c7789423

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: c7789423

$|x - 2| = 9$ What is one possible solution to the given equation?

ID: c7789423 Answer

Correct Answer: 11, -7

Rationale

The correct answer is 11 or -7. By the definition of absolute value, if $|x - 2| = 9$, then $x - 2 = 9$ or $x - 2 = -9$. Adding 2 to both sides of the equation $x - 2 = 9$ yields $x = 11$. Adding 2 to both sides of the equation $x - 2 = -9$ yields $x = -7$. Thus, the given equation, $|x - 2| = 9$, has two possible solutions, 11 and -7. Note that 11 and -7 are examples of ways to enter a correct answer.

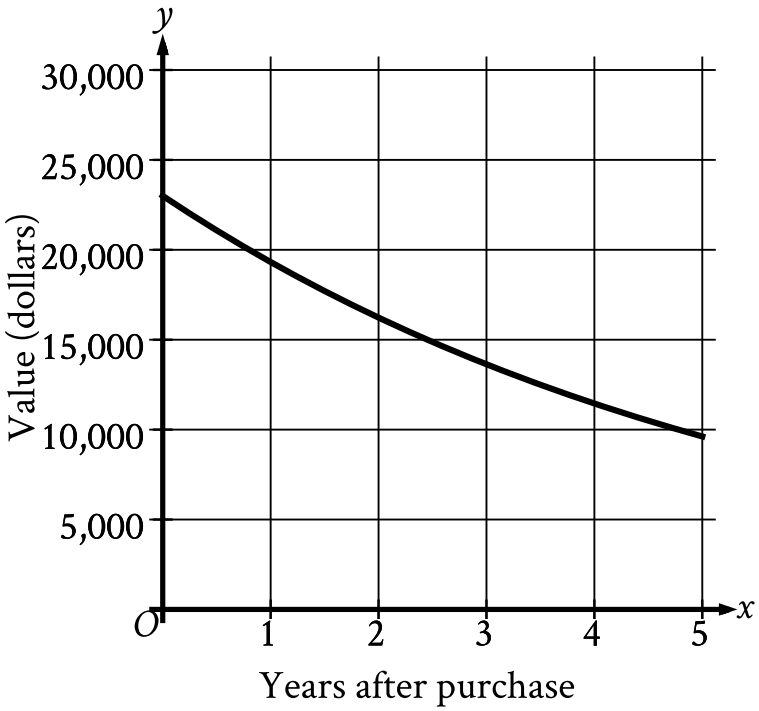
Question Difficulty: Easy

Question ID ca4ee54e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: ca4ee54e

The graph shows the predicted value y, in dollars, of a certain sport utility vehicle x years after it is first purchased.



Which of the following is closest to the predicted value of the sport utility vehicle 3 years after it is first purchased?

A. $9,619

B. $13,632

C. $19,320

D. $23,000

ID: ca4ee54e Answer

Correct Answer: B

Rationale

Choice B is correct. For the graph shown, the horizontal axis represents the number of years after a certain sport utility vehicle is first purchased, and the vertical axis represents the predicted value, in dollars, of the sport utility vehicle. According to the graph, 3 years after the sport utility vehicle is purchased, the predicted value of the sport utility vehicle is between $\$10{,}000$ and $\$15{,}000$. Of the given choices, only $\$13{,}632$ is between $\$10{,}000$ and $\$15{,}000$. Therefore, $\$13{,}632$ is closest to the predicted value of the sport utility vehicle 3 years after it is first purchased.

Choice A is incorrect. This is closest to the predicted value of the sport utility vehicle 5 years after it is first purchased.

Choice C is incorrect. This is closest to the predicted value of the sport utility vehicle 1 year after it is first purchased.

Choice D is incorrect. This is closest to the predicted value of the sport utility vehicle when it is first purchased.

Question Difficulty: Easy

Question ID d9137a84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: d9137a84

Which expression represents the product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5+y^8z^{-7}\right)$?

A. $x^{-2}z^{10}+y^{11}z^{-2}$

B. $x^{-2}z^{10}+x^{-6}z^{-2}$

C. $x^{-2}y^3z^{10}+y^8z^{-7}$

D. $x^{-2}y^3z^{10}+x^{-6}y^{11}z^{-2}$

ID: d9137a84 Answer

Correct Answer: D

Rationale

Choice D is correct. The product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5+y^8z^{-7}\right)$ can be represented by the expression $\left(x^{-6}y^3z^5\right)\left(x^4z^5+y^8z^{-7}\right)$. Applying the distributive property to this expression yields $\left(x^{-6}y^3z^5\right)\left(x^4z^5\right)+\left(x^{-6}y^3z^5\right)\left(y^8z^{-7}\right)$, or $x^{-6}x^4y^3z^5z^5+x^{-6}y^3y^8z^5z^{-7}$. This expression is equivalent to $x^{-6+4}y^3z^{5+5}+x^{-6}y^{3+8}z^{5-7}$, or $x^{-2}y^3z^{10}+x^{-6}y^{11}z^{-2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 876a731c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 876a731c

$$y = x^2$$

$$2y + 6 = 2(x + 3)$$

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A. 1

B. 2

C. 3

D. 9

ID: 876a731c Answer

Correct Answer: A

Rationale

Choice A is correct. Substituting x^2 for y in the second equation gives $2(x^2) + 6 = 2(x + 3)$. This equation can be solved as follows:

$2x^2 + 6 = 2x + 6$	Apply the distributive property.
$2x^2 + 6 - 2x - 6 = 0$	Subtract 2x and 6 from both sides of the equation.
$2x^2 - 2x = 0$	Combine like terms.
$2x(x - 1) = 0$	Factor both terms on the left side of the equation by 2x.

Thus, $x = 0$ and $x = 1$ are the solutions to the system. Since $x > 0$, only $x = 1$ needs to be considered. The value of y when $x = 1$ is $y = x^2 = 1^2 = 1$. Therefore, the value of xy is $(1)(1) = 1$.

Choices B, C, and D are incorrect and likely result from a computational or conceptual error when solving this system of equations.

Question Difficulty: Medium

Question ID cd358b89

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: cd358b89

Function f is defined by $f(x) = (x + 6)(x + 5)(x + 1)$. Function g is defined by $g(x) = f(x - 1)$. The graph of $y = g(x)$ in the *xy*-plane has *x*-intercepts at $(a, 0)$, $(b, 0)$, and $(c, 0)$, where a, b, and c are distinct constants. What is the value of $a + b + c$?

A. -15

B. -9

C. 11

D. 15

ID: cd358b89 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $g(x) = f(x - 1)$. Since $f(x) = (x + 6)(x + 5)(x + 1)$, it follows that $f(x - 1) = (x - 1 + 6)(x - 1 + 5)(x - 1 + 1)$. Combining like terms yields $f(x - 1) = (x + 5)(x + 4)(x)$. Therefore, $g(x) = x(x + 5)(x + 4)$. The *x*-intercepts of a graph in the *xy*-plane are the points where $y = 0$. The *x*-coordinates of the *x*-intercepts of the graph of $y = g(x)$ in the *xy*-plane can be found by solving the equation $0 = x(x + 5)(x + 4)$. Applying the zero product property to this equation yields three equations: $x = 0$, $x + 5 = 0$, and $x + 4 = 0$. Solving each of these equations for x yields $x = 0$, $x = -5$, and $x = -4$, respectively. Therefore, the *x*-intercepts of the graph of $y = g(x)$ are $(0, 0)$, $(-5, 0)$, and $(-4, 0)$. It follows that the values of a, b, and c are 0, -5, and -4. Thus, the value of $a + b + c$ is $0 + (-5) + (-4)$, which is equal to -9.

Choice A is incorrect. This is the value of $a + b + c$ if $g(x) = f(x + 1)$.

Choice C is incorrect. This is the value of $a + b + c - 1$ if $g(x) = (x - 6)(x - 5)(x - 1)$.

Choice D is incorrect. This is the value of $a + b + c$ if $f(x) = (x - 6)(x - 5)(x - 1)$.

Question Difficulty: Hard

Question ID ff2e5c76

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: ff2e5c76

$x^2 - 40x - 10 = 0$ What is the sum of the solutions to the given equation?

A. 0

B. 5

C. 10

D. 40

ID: ff2e5c76 Answer

Correct Answer: D

Rationale

Choice D is correct. Adding 10 to each side of the given equation yields $x^2 - 40x = 10$. To complete the square, adding $\left(\frac{40}{2}\right)^2$, or 20^2, to each side of this equation yields $x^2 - 40x + 20^2 = 10 + 20^2$, or $(x - 20)^2 = 410$. Taking the square root of each side of this equation yields $x - 20 = \pm\sqrt{410}$. Adding 20 to each side of this equation yields $x = 20 \pm \sqrt{410}$. Therefore, the solutions to the given equation are $x = 20 + \sqrt{410}$ and $x = 20 - \sqrt{410}$. The sum of these solutions is $\left(20 + \sqrt{410}\right) + \left(20 - \sqrt{410}\right)$, or 40.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID f89e1d6f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: f89e1d6f

If $a = c + d$, which of the following is equivalent to the expression $x^2 - c^2 - 2cd - d^2$?

A. $(x + a)^2$

B. $(x - a)^2$

C. $(x + a)(x - a)$

D. $x^2 - ax - a^2$

ID: f89e1d6f Answer

Correct Answer: C

Rationale

Choice C is correct. Factoring −1 from the second, third, and fourth terms gives $x^2 - c^2 - 2cd - d^2 = x^2 - (c^2 + 2cd + d^2)$. The expression $c^2 + 2cd + d^2$ is the expanded form of a perfect square: $c^2 + 2cd + d^2 = (c + d)^2$. Therefore, $x^2 - (c^2 + 2cd + d^2) = x^2 - (c + d)^2$. Since $a = c + d$, $x^2 - (c + d)^2 = x^2 - a^2$. Finally, because $x^2 - a^2$ is the difference of squares, it can be expanded as $x^2 - a^2 = (x + a)(x - a)$.

Choices A and B are incorrect and may be the result of making an error in factoring the difference of squares $x^2 - a^2$. Choice D is incorrect and may be the result of incorrectly combining terms.

Question Difficulty: Hard

Question ID c8bf5313

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: c8bf5313

$x = 8\ y = x^2 + 8$

The graphs of the equations in the given system of equations intersect at the point (x, y) in the *xy*-plane. What is the value of y?

A. 8

B. 24

C. 64

D. 72

ID: c8bf5313 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the graphs of the equations in the given system intersect at the point (x, y), the point (x, y) represents a solution to the given system of equations. The first equation of the given system of equations states that $x = 8$. Substituting 8 for x in the second equation of the given system of equations yields $y = 8^2 + 8$, or $y = 72$. Therefore, the value of y is 72.

Choice A is incorrect. This is the value of x, not y.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c1eead73

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: c1eead73

The function g is defined by $g(x) = |x + 18|$. What is the value of $g(4)$?

A. -18

B. -4

C. 14

D. 22

ID: c1eead73 Answer

Correct Answer: D

Rationale

Choice D is correct. The value of $g(4)$ is the value of $g(x)$ when $x = 4$. Substituting 4 for x in the given equation yields $g(4) = |4 + 18|$, which is equivalent to $g(4) = |22|$, or $g(4) = 22$. Therefore, the value of $g(4)$ is 22.

Choice A is incorrect. This would be the value of $g(4)$ if function g was defined by $g(x) = -|18|$, not $g(x) = |x + 18|$.

Choice B is incorrect. This would be the value of $g(4)$ if function g was defined by $g(x) = -|x|$, not $g(x) = |x + 18|$.

Choice C is incorrect. This would be the value of $g(4)$ if function g was defined by $g(x) = |-x + 18|$, not $g(x) = |x + 18|$.

Question Difficulty: Easy

Question ID df0ef054

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: df0ef054

$(2x^3+3x)(x^3-2x)$

Which of the following is equivalent to the expression above?

A. x^3+5x

B. $3x^3+x$

C. $2x^6-x^4-6x^2$

D. $3x^6-x^4-6x^2$

ID: df0ef054 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the distributive property to multiply the terms in the parentheses yields $(2x^3\cdot x^3)+(2x^3\cdot -2x)+(3x\cdot x^3)+(3x\cdot -2x)$, which is equivalent to $2x^6-4x^4+3x^4-6x^2$. Combining like terms results in $2x^6-x^4-6x^2$.

Choices A and D are incorrect and may result from conceptual errors when multiplying the terms in the given expression. Choice B is incorrect and may result from adding, instead of multiplying, $(2x^3+3x)$ and (x^3-2x).

Question Difficulty: Easy

Question ID f1c81b3b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f1c81b3b

The exponential function g is defined by $g(x) = 19 \cdot a^x$, where a is a positive constant. If $g(3) = 2{,}375$, what is the value of $g(4)$?

ID: f1c81b3b Answer

Correct Answer: 11875

Rationale

The correct answer is $11{,}875$. It's given that the exponential function g is defined by $g(x) = 19 \cdot a^x$, where a is a positive constant, and $g(3) = 2{,}375$. It follows that when $x = 3$, $g(x) = 2{,}375$. Substituting 3 for x and $2{,}375$ for $g(x)$ in the given equation yields $2{,}375 = 19 \cdot a^3$. Dividing each side of this equation by 19 yields $125 = a^3$. Taking the cube root of both sides of this equation gives $a = 5$. Substituting 4 for x and 5 for a in the equation $g(x) = 19 \cdot a^x$ yields $g(4) = 19 \cdot 5^4$, or $g(4) = 11,875$. Therefore, the value of $g(4)$ is $11{,}875$.

Question Difficulty: Medium

Question ID bef4b1c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: bef4b1c6

$\frac{55}{x+6} = x$ What is the positive solution to the given equation?

ID: bef4b1c6 Answer

Correct Answer: 5

Rationale

The correct answer is 5. Multiplying both sides of the given equation by $x + 6$ results in $55 = x(x + 6)$. Applying the distributive property of multiplication to the right-hand side of this equation results in $55 = x^2 + 6x$. Subtracting 55 from both sides of this equation results in $0 = x^2 + 6x - 55$. The right-hand side of this equation can be rewritten by factoring. The two values that multiply to -55 and add to 6 are 11 and -5. It follows that the equation $0 = x^2 + 6x - 55$ can be rewritten as $0 = (x + 11)(x - 5)$. Setting each factor equal to 0 yields two equations: $x + 11 = 0$ and $x - 5 = 0$. Subtracting 11 from both sides of the equation $x + 11 = 0$ results in $x = -11$. Adding 5 to both sides of the equation $x - 5 = 0$ results in $x = 5$. Therefore, the positive solution to the given equation is 5.

Question Difficulty: Medium

Question ID c19d1fb0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: c19d1fb0

An egg is thrown from a rooftop. The equation $h = -4.9t^2 + 9t + 18$ represents this situation, where h is the height of the egg above the ground, in meters, t seconds after it is thrown. According to the equation, what is the height, in meters, from which the egg was thrown?

ID: c19d1fb0 Answer

Correct Answer: 18

Rationale

The correct answer is 18. It's given that an egg is thrown from a rooftop and that the equation $h = -4.9t^2 + 9t + 18$ represents this situation, where h is the height of the egg above the ground, in meters, t seconds after it is thrown. If follows that the height, in meters, from which the egg was thrown is the value of h when $t = 0$. Substituting 0 for t in the equation $h = -4.9t^2 + 9t + 18$ yields $h(0) = -4.9(0)^2 + 9(0) + 18$, or $h = 18$. Therefore, according to the equation, the height, in meters, from which the egg was thrown is 18.

Question Difficulty: Medium

Question ID 4b642eef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 4b642eef

The total distance *d*, in meters, traveled by an object moving in a straight line can be modeled by a quadratic function that is defined in terms of *t*, where *t* is the time in seconds. At a time of 10.0 seconds, the total distance traveled by the object is 50.0 meters, and at a time of 20.0 seconds, the total distance traveled by the object is 200.0 meters. If the object was at a distance of 0 meters when $t = 0$, then what is the total distance traveled, in meters, by the object after 30.0 seconds?

ID: 4b642eef Answer

Rationale

The correct answer is 450. The quadratic equation that models this situation can be written in the form $d = at^2 + bt + c$, where a, b, and c are constants. It's given that the distance, d, the object traveled was 0 meters when $t = 0$ seconds. These values can be substituted into the equation to solve for a, b, and c: $0 = a(0)^2 + b(0) + c$. Therefore, $c = 0$, and it follows that $d = at^2 + bt$. Since it's also given that d is 50 when t is 10 and d is 200 when t is 20, these values for d and t can be substituted to create a system of two linear equations: $50 = a(10)^2 + b(10)$ and $200 = a(20)^2 + b(20)$, or $10a + b = 5$ and $20a + b = 10$. Subtracting the first equation from the second equation yields $10a = 5$, or $a = \frac{1}{2}$. Substituting $\frac{1}{2}$ for a in the first equation and solving for b yields $b = 0$. Therefore, the equation that represents this situation is $d = \frac{1}{2}t^2$. Evaluating this function when $t = 30$ seconds yields $d = \frac{1}{2}(30)^2 = 450$, or $d = 450$ meters.

Question Difficulty: Hard

Question ID 3e9cc0c2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 3e9cc0c2

Which of the following is equivalent to $(1-p)(1+p+p^2+p^3+p^4+p^5+p^6)$?

A. $1-p^8$

B. $1-p^7$

C. $1-p^6$

D. $1-p^5$

ID: 3e9cc0c2 Answer

Correct Answer: B

Rationale

Choice B is correct. Multiplying (1 − p) by each term of the polynomial within the second pair of parentheses gives (1 − p)1 = 1 − p; (1 − p)p = p − p^2; (1 − p)p^2 = p^2 − p^3; (1 − p)p^3 = p^3 − p^4; (1 − p)p^4 = p^4 − p^5; (1 − p)p^5 = p^5 − p^6; and (1 − p)p^6 = p^6 − p^7. Adding these seven expressions together and combining like terms gives 1 + (p − p) + (p^2 − p^2) + (p^3 − p^3) + (p^4 − p^4) + (p^5 − p^5) + (p^6 − p^6) − p^7, which can be simplified to 1 − p^7.

Choices A, C, and D are incorrect and may result from incorrectly identifying the highest power of p in the expressions or incorrectly combining like terms.

Question Difficulty: Medium

Question ID 2c5c22d0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 2c5c22d0

$y = x^2 + 3x - 7$

$y - 5x + 8 = 0$

How many solutions are there to the system of equations above?

A. There are exactly 4 solutions.

B. There are exactly 2 solutions.

C. There is exactly 1 solution.

D. There are no solutions.

ID: 2c5c22d0 Answer

Correct Answer: C

Rationale

Choice C is correct. The second equation of the system can be rewritten as $y = 5x - 8$. Substituting $5x - 8$ for y in the first equation gives $5x - 8 = x^2 + 3x - 7$. This equation can be solved as shown below:

$x^2 + 3x - 7 - 5x + 8 = 0 x^2 - 2x + 1 = 0 (x - 1)^2 = 0 x = 1$

Substituting 1 for x in the equation $y = 5x - 8$ gives $y = -3$. Therefore, $(1, -3)$ is the only solution to the system of equations.

Choice A is incorrect. In the xy-plane, a parabola and a line can intersect at no more than two points. Since the graph of the first equation is a parabola and the graph of the second equation is a line, the system cannot have more than 2 solutions. Choice B is incorrect. There is a single ordered pair (x, y) that satisfies both equations of the system. Choice D is incorrect because the ordered pair $(1, -3)$ satisfies both equations of the system.

Question Difficulty: Hard

Question ID 7348f046

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 7348f046

$(2x+3)-(x-7)$

Which of the following is equivalent to the given expression?

A. $x-4$

B. $3x-4$

C. $x+10$

D. $2x^2+21$

ID: 7348f046 Answer

Correct Answer: C

Rationale

Choice C is correct. Distributing the negative sign to the terms in the second parentheses yields $(2x+3)-x+7$. This expression can be rewritten as $2x-x+3+7$. Combining like terms results in $x+10$.

Choice A is incorrect and may result from not distributing the negative sign to the 7. Choice B is incorrect and may result from adding $(x-7)$ to $2x+3$ instead of subtracting $(x-7)$. Choice D is incorrect and may result from adding the product of $2x$ and x to the product of 3 and 7.

Question Difficulty: Medium

Question ID 0aaef7aa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 0aaef7aa

The function p is defined by $p(n) = 7n^3$. What is the value of n when $p(n)$ is equal to 56?

A. 2

B. $\frac{8}{3}$

C. 7

D. 8

ID: 0aaef7aa Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $p(n) = 7n^3$. Substituting 56 for $p(n)$ in this equation yields $56 = 7n^3$. Dividing each side of this equation by 7 yields $8 = n^3$. Taking the cube root of each side of this equation yields $2 = n$. Therefore, when $p(n)$ is equal to 56, the value of n is 2.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 928498f3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 928498f3

$6x^2+5x-7=0$

What are the solutions to the given equation?

A. $\frac{-5\pm\sqrt{25+168}}{12}$

B. $\frac{-6\pm\sqrt{25+168}}{12}$

C. $\frac{-5\pm\sqrt{36-168}}{12}$

D. $\frac{-6\pm\sqrt{36-168}}{12}$

ID: 928498f3 Answer

Correct Answer: A

Rationale

Choice A is correct. The quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, can be used to find the solutions to an equation in the form $ax^2 + bx + c = 0$. In the given equation, $a = 6$, $b = 5$, and $c = -7$. Substituting these values into the quadratic formula gives $\frac{-5 \pm \sqrt{5^2 - 4(6)(-7)}}{2(6)}$, or $\frac{-5 \pm \sqrt{25 + 168}}{12}$.

Choice B is incorrect and may result from using $\frac{-a \pm \sqrt{b^2 - 4ac}}{2a}$ as the quadratic formula. Choice C is incorrect and may result from using $\frac{-b \pm \sqrt{a^2 + 4ac}}{2a}$ as the quadratic formula. Choice D is incorrect and may result from using $\frac{-a \pm \sqrt{a^2 + 4ac}}{2a}$ as the quadratic formula.

Question Difficulty: Medium

Question ID b7cd6ca6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: b7cd6ca6

The equation $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant, where t is the number of years since the restaurant opened. Which of the following is the best interpretation of the number 5 in this context?

A. The estimated number of employees when the restaurant opened

B. The increase in the estimated number of employees each year

C. The number of years the restaurant has been open

D. The percent increase in the estimated number of employees each year

ID: b7cd6ca6 Answer

Correct Answer: A

Rationale

Choice A is correct. For an exponential function of the form $E(t) = a(b)^t$, where a and b are constants, the initial value of the function—that is, the value of the function when $t = 0$—is a and the value of the function increases by a factor of b each time t increases by 1. Since the function $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant and t is the number of years since the restaurant opened, the best interpretation of the number 5 in this context is the estimated number of employees when $t = 0$, or when the restaurant opened.

Choice B is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 04b985e6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 04b985e6

The kinetic energy, in joules, of an object with mass 9 kilograms traveling at a speed of v meters per second is given by the function K, where $K(v) = \frac{9}{2}v^2$. Which of the following is the best interpretation of $K(34) = 5{,}202$ in this context?

A. The object traveling at 34 meters per second has a kinetic energy of $5{,}202$ joules.

B. The object traveling at 340 meters per second has a kinetic energy of $5{,}202$ joules.

C. The object traveling at $5{,}202$ meters per second has a kinetic energy of 34 joules.

D. The object traveling at $23{,}409$ meters per second has a kinetic energy of 34 joules.

ID: 04b985e6 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the kinetic energy, in joules, of an object with a mass of 9 kilograms traveling at a speed of v meters per second is given by the function K, where $K(v) = \frac{9}{2}v^2$. It follows that in the equation $K(34) = 5{,}202$, 34 is the value of v, or the speed of the object, in meters per second, and $5{,}202$ is the kinetic energy, in joules, of the object at that speed. Therefore, the best interpretation of $K(34) = 5{,}202$ in this context is the object traveling at 34 meters per second has a kinetic energy of $5{,}202$ joules.

Choice B is incorrect. The object traveling at 340 meters per second has a kinetic energy of $520{,}200$ joules.

Choice C is incorrect. The object traveling at $5{,}202$ meters per second has a kinetic energy of $121{,}773{,}618$ joules.

Choice D is incorrect. The object traveling at $23{,}409$ meters per second has a kinetic energy of $2{,}465{,}915{,}764.5$ joules.

Question Difficulty: Easy

Question ID b47419f4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: b47419f4

$\left(\frac{1}{2}x+3\right)-\left(\frac{2}{3}x-5\right)$

Which of the following is equivalent to the expression above?

A. $-\frac{1}{6}x+8$

B. $-\frac{1}{6}x-2$

C. $-\frac{1}{3}x^2+\frac{1}{2}x+15$

D. $-\frac{1}{3}x^2-\frac{9}{2}x-15$

ID: b47419f4 Answer

Correct Answer: A

Rationale

Choice A is correct. By distributing the minus sign through the expression $\left(\frac{2}{3}x-5\right)$, the given expression can be rewritten as $\left(\frac{1}{2}x+3\right)-\frac{2}{3}x+5$, which is equivalent to $\frac{1}{2}x-\frac{2}{3}x+3+5$. Combining like terms gives $\left(\frac{1}{2}-\frac{2}{3}\right)x+(3+5)$, or $-\frac{1}{6}x+8$.

Choice B is incorrect and may be the result of failing to distribute the minus sign appropriately through the second term and simplifying the expression $\frac{1}{2}x+3-\frac{2}{3}x-5$. Choice C is incorrect and may be the result of multiplying the expressions $\left(\frac{1}{2}x+3\right)$ and $\left(-\frac{2}{3}x+5\right)$. Choice D is incorrect and may be the result of multiplying the expressions $\left(\frac{1}{2}x+3\right)$ and $\left(-\frac{2}{3}x-5\right)$.

Question Difficulty: Medium

Question ID fc3dfa26

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: fc3dfa26

$$\frac{4x^2}{x^2-9}-\frac{2x}{x+3}=\frac{1}{x-3}$$

What value of x satisfies the equation above?

A. -3

B. $-\frac{1}{2}$

C. $\frac{1}{2}$

D. 3

ID: fc3dfa26 Answer

Correct Answer: C

Rationale

Choice C is correct. Each fraction in the given equation can be expressed with the common denominator x^2-9. Multiplying $\frac{2x}{x+3}$ by $\frac{x-3}{x-3}$ yields $\frac{2x^2-6x}{x^2-9}$, and multiplying $\frac{1}{x-3}$ by $\frac{x+3}{x+3}$ yields $\frac{x+3}{x^2-9}$. Therefore, the given equation can be written as $\frac{4x^2}{x^2-9}-\frac{2x^2-6x}{x^2-9}=\frac{x+3}{x^2-9}$. Multiplying each fraction by the denominator results in the equation $4x^2-(2x^2-6x)=x+3$, or $2x^2+6x=x+3$. This equation can be solved by setting a quadratic expression equal to 0, then solving for x. Subtracting $x+3$ from both sides of this equation yields $2x^2+5x-3=0$. The expression $2x^2+5x-3$ can be factored, resulting in the equation $(2x-1)(x+3)=0$. By the zero product property, $2x-1=0$ or $x+3=0$. To solve for x in $2x-1=0$, 1 can be added to both sides of the equation, resulting in $2x=1$. Dividing both sides of this equation by 2 results in $x=\frac{1}{2}$. Solving for x in $x+3=0$ yields $x=-3$. However, this value of x would result in the second fraction of the original equation having a denominator of 0. Therefore, $x=-3$ is an extraneous solution. Thus, the only value of x that satisfies the given equation is $x=\frac{1}{2}$.

Choice A is incorrect and may result from solving $x+3=0$ but not realizing that this solution is extraneous because it would result in a denominator of 0 in the second fraction. Choice B is incorrect and may result from a sign error when solving $2x-1=0$ for x. Choice D is incorrect and may result from a calculation error.

Question Difficulty: Hard

Question ID 8838a672

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 8838a672

$(4x^3-5x^2+3)-(6x^3+2x^2-x)$

Which of the following expressions is equivalent to the expression above?

A. $-10x^3-3x^2+x+3$

B. $-2x^3-7x^2+x+3$

C. $-2x^3-3x^2+x+3$

D. $10x^3-7x^2-x+3$

ID: 8838a672 Answer

Correct Answer: B

Rationale

Choice B is correct. Using the distributive property, the given expression can be rewritten as $4x^3-5x^2+3-6x^3-2x^2+x$. Combining like terms, this expression can be rewritten as $(4-6)x^3+(-5-2)x^2+x+3$, which is equivalent to $-2x^3-7x^2+x+3$.

Choices A, C, and D are incorrect and may result from an error when applying the distributive property or an error when combining like terms.

Question Difficulty: Medium

Question ID eb268057

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: eb268057

$x^2 = 64$

Which of the following values of x satisfies the given equation?

A. -8

B. 4

C. 32

D. 128

ID: eb268057 Answer

Correct Answer: A

Rationale

Choice A is correct. Solving for x by taking the square root of both sides of the given equation yields $x = 8$ or $x = -8$. Of the choices given, -8 satisfies the given equation.

Choice B is incorrect and may result from a calculation error when solving for x. Choice C is incorrect and may result from dividing 64 by 2 instead of taking the square root. Choice D is incorrect and may result from multiplying 64 by 2 instead of taking the square root.

Question Difficulty: Easy

Question ID f76c1858

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: f76c1858

$7x^2 - 20x - 32 = 0$ What is the positive solution to the given equation?

ID: f76c1858 Answer

Correct Answer: 4

Rationale

The correct answer is 4. The left-hand side of the given equation can be factored as $(7x + 8)(x - 4)$. Therefore, the given equation, $7x^2 - 20x - 32 = 0$, can be written as $(7x + 8)(x - 4) = 0$. Applying the zero product property to this equation yields $7x + 8 = 0$ and $x - 4 = 0$. Subtracting 8 from both sides of the equation $7x + 8 = 0$ yields $7x = -8$. Dividing both sides of this equation by 7 yields $x = -\frac{8}{7}$. Adding 4 to both sides of the equation $x - 4 = 0$ yields $x = 4$. Therefore, the two solutions to the given equation, $7x^2 - 20x - 32 = 0$, are $-\frac{8}{7}$ and 4. It follows that 4 is the positive solution to the given equation.

Question Difficulty: Medium

Question ID 6d9e01a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 6d9e01a2

$f(x) = 4x^2 - 50x + 126$

The given equation defines the function f. For what value of x does $f(x)$ reach its minimum?

ID: 6d9e01a2 Answer

Correct Answer: 25/4, 6.25

Rationale

The correct answer is $\frac{25}{4}$. The given equation can be rewritten in the form $f(x) = a(x - h)^2 + k$, where a, h, and k are constants. When $a > 0$, h is the value of x for which $f(x)$ reaches its minimum. The given equation can be rewritten as $f(x) = 4\left(x^2 - \frac{50}{4}x\right) + 126$, which is equivalent to $f(x) = 4\left(x^2 - \frac{50}{4}x + \left(\frac{50}{8}\right)^2 - \left(\frac{50}{8}\right)^2\right) + 126$. This equation can be rewritten as $f(x) = 4\left(\left(x - \frac{50}{8}\right)^2 - \left(\frac{50}{8}\right)^2\right) + 126$, or $f(x) = 4\left(x - \frac{50}{8}\right)^2 - 4\left(\frac{50}{8}\right)^2 + 126$, which is equivalent to $f(x) = 4\left(x - \frac{25}{4}\right)^2 - \frac{121}{4}$. Therefore, $h = \frac{25}{4}$, so the value of x for which $f(x)$ reaches its minimum is $\frac{25}{4}$. Note that 25/4 and 6.25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 9f2ecade

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 9f2ecade

$h(x) = x^3 + ax^2 + bx + c$

The function h is defined above, where a, b, and c are integer constants. If the zeros of the function are -5, 6, and 7, what is the value of c ?

ID: 9f2ecade Answer

Rationale

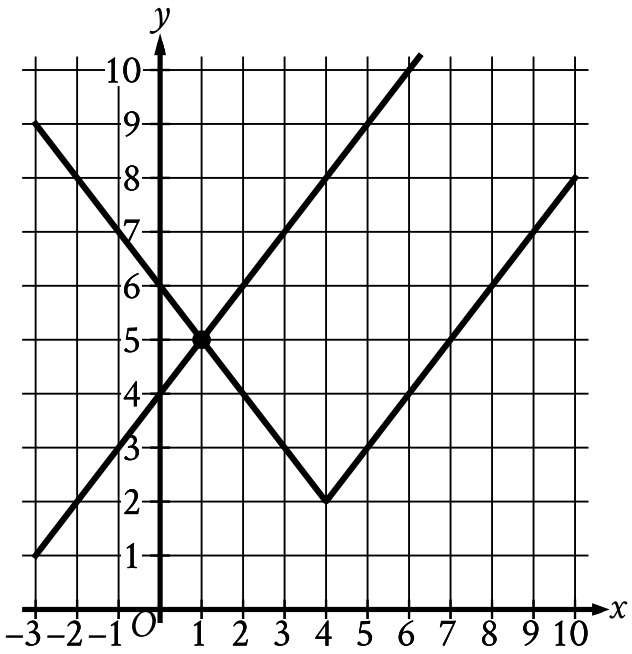
The correct answer is 210. Since -5, 6, and 7 are zeros of the function, the function can be rewritten as $h(x) = (x+5)(x-6)(x-7)$. Expanding the function yields $h(x) = x^3 - 8x^2 - 23x + 210$. Thus, $a = -8$, $b = -23$, and $c = 210$. Therefore, the value of c is 210.

Question Difficulty: Hard

Question ID dd3a910a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: dd3a910a



The graph of a system of an absolute value function and a linear function is shown. What is the solution (x, y) to this system of two equations?

A. $(-1, 5)$

B. $(0, 4)$

C. $(1, 5)$

D. $(4, 2)$

ID: dd3a910a Answer

Correct Answer: C

Rationale

Choice C is correct. The solution to the system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear function and the absolute value function shown intersect at the point $(1, 5)$. Thus, the solution to the system is $(1, 5)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the *y*-intercept of the graph of the linear function.

Choice D is incorrect. This is the vertex of the graph of the absolute value function.

Question Difficulty: Easy

Question ID 2cf7f039

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 2cf7f039

The function f is defined by $f(x) = 8\sqrt{x}$. For what value of x does $f(x) = 48$?

A. 6

B. 8

C. 36

D. 64

ID: 2cf7f039 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x) = 8\sqrt{x}$. Substituting 48 for $f(x)$ in this equation yields $48 = 8\sqrt{x}$. Dividing both sides of this equation by 8 yields $6 = \sqrt{x}$. This can be rewritten as $\sqrt{x} = 6$. Squaring both sides of this equation yields $x = 36$. Therefore, the value of x for which $f(x) = 48$ is 36.

Choice A is incorrect. If $x = 6$, $f(x) = 8\sqrt{6}$, not 48. Choice B is incorrect. If $x = 8$, $f(x) = 8\sqrt{8}$, not 48.

Choice D is incorrect. If $x = 64$, $f(x) = 8\sqrt{64}$, which is equivalent to 64, not 48.

Question Difficulty: Easy

Question ID 0b3d25c5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 0b3d25c5

Which of the following is equivalent to $\sqrt[4]{x^2+8x+16}$, where $x>0$?

A. $(x+4)^4$

B. $(x+4)^2$

C. $(x+4)$

D. $(x+4)^{\frac{1}{2}}$

ID: 0b3d25c5 Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression can also be written as $(x^2+8x+16)^{\frac{1}{4}}$. The trinomial $x^2+8x+16$ can be rewritten in factored form as $(x+4)^2$. Thus, the entire expression can be rewritten as $((x+4)^2)^{\frac{1}{4}}$. Simplifying the exponents yields $(x+4)^{\frac{1}{2}}$.

Choices A, B, and C are incorrect and may result from errors made when simplifying the exponents in the expression $((x+4)^2)^{\frac{1}{4}}$.

Question Difficulty: Medium

Question ID 6011a3f8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 6011a3f8

$64x^2 + bx + 25 = 0$

In the given equation, b is a constant. For which of the following values of b will the equation have more than one real solution?

A. -91

B. -80

C. 5

D. 40

ID: 6011a3f8 Answer

Correct Answer: A

Rationale

Choice A is correct. A quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has either no real solutions, exactly one real solution, or exactly two real solutions. That is, for the given equation to have more than one real solution, it must have exactly two real solutions. When the value of the discriminant, or $b^2 - 4ac$, is greater than 0, the given equation has exactly two real solutions. In the given equation, $64x^2 + bx + 25 = 0$, $a = 64$ and $c = 25$. Therefore, the given equation has exactly two real solutions when $(b)^2 - 4(64)(25) > 0$, or $b^2 - 6{,}400 > 0$. Adding $6{,}400$ to both sides of this inequality yields $b^2 > 6{,}400$. Taking the square root of both sides of $b^2 > 6{,}400$ yields two possible inequalities: $b < -80$ or $b > 80$. Of the choices, only choice A satisfies $b < -80$ or $b > 80$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 0e61101e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 0e61101e

$f(x) = 9(4)^x$

The function f is defined by the given equation. If $g(x) = f(x + 2)$, which of the following equations defines the function g?

A. $g(x) = 18(4)^x$

B. $g(x) = 144(4)^x$

C. $g(x) = 18(8)^x$

D. $g(x) = 81(16)^x$

ID: 0e61101e Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $f(x) = 9(4)^x$ and $g(x) = f(x + 2)$. Substituting $x + 2$ for x in $f(x) = 9(4)^x$ gives $f(x + 2) = 9(4)^{x+2}$. Rewriting this equation using properties of exponents gives $f(x + 2) = 9(4)^x(4)^2$, which is equivalent to $f(x + 2) = 9(4)^x(16)$. Multiplying 9 and 16 in this equation gives $f(x + 2) = 144(4)^x$. Since $g(x) = f(x + 2)$, $g(x) = 144(4)^x$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID e117d3b8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: e117d3b8

If *a* and *c* are positive numbers, which of the following is equivalent to $\sqrt{(a+c)^3}\cdot\sqrt{a+c}$?

A. $a+c$

B. a^2+c^2

C. $a^2+2ac+c^2$

D. a^2c^2

ID: e117d3b8 Answer

Correct Answer: C

Rationale

Choice C is correct. Using the property that $\sqrt{x}\sqrt{y}=\sqrt{xy}$ for positive numbers x and y, with $x = (a + c)^3$ and $y = a + c$, it follows that $\sqrt{(a+c)^3}\cdot\sqrt{a+c}=\sqrt{(a+c)^4}$. By rewriting $(a + c)^4$ as $((a + c)^2)^2$, it is possible to simplify the square root expression as follows: $\sqrt{((a+c)^2)^2}=(a+c)^2=a^2+2ac+c^2$.

Choice A is incorrect and may be the result of $\sqrt{(a+c)^3}\div\sqrt{(a+c)}$. Choice B is incorrect and may be the result of incorrectly rewriting $(a + c)^2$ as $a^2 + c^2$. Choice D is incorrect and may be the result of incorrectly applying properties of exponents.

Question Difficulty: Hard

Question ID 7a6d06bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 7a6d06bf

A rectangle has an area of 155 square inches. The length of the rectangle is 4 inches less than 7 times the width of the rectangle. What is the width of the rectangle, in inches?

ID: 7a6d06bf Answer

Correct Answer: 5

Rationale

The correct answer is 5. Let x represent the width, in inches, of the rectangle. It's given that the length of the rectangle is 4 inches less than 7 times its width, or $7x - 4$ inches. The area of a rectangle is equal to its width multiplied by its length. Multiplying the width, x inches, by the length, $7x - 4$ inches, yields $x(7x - 4)$ square inches. It's given that the rectangle has an area of 155 square inches, so it follows that $x(7x - 4) = 155$, or $7x^2 - 4x = 155$. Subtracting 155 from both sides of this equation yields $7x^2 - 4x - 155 = 0$. Factoring the left-hand side of this equation yields $(7x + 31)(x - 5) = 0$. Applying the zero product property to this equation yields two solutions: $x = -\frac{31}{7}$ and $x = 5$. Since x is the rectangle's width, in inches, which must be positive, the value of x is 5. Therefore, the width of the rectangle, in inches, is 5.

Question Difficulty: Hard

Question ID 04bbce67

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 04bbce67

$f(x) = (x + 7)^2 + 4$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

ID: 04bbce67 Answer

Correct Answer: -7

Rationale

The correct answer is -7. For a quadratic function defined by an equation of the form $f(x) = a(x - h)^2 + k$, where a, h, and k are constants and $a > 0$, the function reaches its minimum when $x = h$. In the given function, $a = 1$, $h = -7$, and $k = 4$. Therefore, the value of x for which $f(x)$ reaches its minimum is -7.

Question Difficulty: Hard

Question ID e8779461

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: e8779461

$y = x^2 + 14x + 48$ $x + 8 = 11$ The solution to the given system of equations is (x, y). What is the value of y?

ID: e8779461 Answer

Correct Answer: 99

Rationale

The correct answer is 99. In the given system of equations, the second equation is $x + 8 = 11$. Subtracting 8 from both sides of this equation yields $x = 3$. In the given system of equations, the first equation is $y = x^2 + 14x + 48$. Substituting 3 for x in this equation yields $y = (3)^2 + 14(3) + 48$, or $y = 99$. Therefore, the solution to the given system of equations is $(x, y) = (3, 99)$. Thus, the value of y is 99.

Question Difficulty: Medium

Question ID 98f735f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 98f735f2

The total revenue from sales of a product can be calculated using the formula $T = PQ$, where T is the total revenue, P is the price of the product, and Q is the quantity of the product sold. Which of the following equations gives the quantity of product sold in terms of P and T?

A. $Q = \frac{P}{T}$

B. $Q = \frac{T}{P}$

C. $Q = PT$

D. $Q = T - P$

ID: 98f735f2 Answer

Correct Answer: B

Rationale

Choice B is correct. Solving the given equation for Q gives the quantity of the product sold in terms of P and T. Dividing both sides of the given equation by P yields $\frac{T}{P} = Q$, or $Q = \frac{T}{P}$. Therefore, $Q = \frac{T}{P}$ gives the quantity of product sold in terms of P and T.

Choice A is incorrect and may result from an error when dividing both sides of the given equation by P. Choice C is incorrect and may result from multiplying, rather than dividing, both sides of the given equation by P. Choice D is incorrect and may result from subtracting P from both sides of the equation rather than dividing both sides by P.

Question Difficulty: Easy

Question ID 79ba511a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 79ba511a

The function f is defined by $f(x) = x^3 + 15$. What is the value of $f(2)$?

A. 20

B. 21

C. 23

D. 24

ID: 79ba511a Answer

Correct Answer: C

Rationale

Choice C is correct. The value of $f(2)$ is the value of $f(x)$ when $x = 2$. Substituting 2 for x in the given function yields $f(2) = (2)^3 + 15$, or $f(2) = 8 + 15$, which is equivalent to $f(2) = 23$. Therefore, the value of $f(2)$ is 23.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of $f(2)$ when $f(x) = x(3) + 15$, rather than $f(x) = x^3 + 15$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID dcf63c94

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: dcf63c94

$f(x) = 272(2)^x$

The function f is defined by the given equation. If $h(x) = f(x - 4)$, which of the following equations defines function h ?

A. $h(x) = 17(2)^x$

B. $h(x) = 68(2)^x$

C. $h(x) = 272(16)^x$

D. $h(x) = 272(8)^x$

ID: dcf63c94 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $f(x) = 272(2)^x$ and $h(x) = f(x - 4)$. Substituting $x - 4$ for x in $f(x) = 272(2)^x$ yields $f(x - 4) = 272(2)^{x-4}$. Substituting $h(x)$ for $f(x - 4)$ in this equation yields $h(x) = 272(2)^{x-4}$. Using the properties of exponents, the function $h(x) = 272(2)^{x-4}$ can be rewritten as $h(x) = \frac{272(2)^x}{2^4}$, which is equivalent to $h(x) = \frac{272(2)^x}{16}$, or $h(x) = 17(2)^x$. Therefore, of the given choices, an equation that defines function h is $h(x) = 17(2)^x$.

Choice B is incorrect. This equation defines function h if $h(x) = f(x - 2)$, not $h(x) = f(x - 4)$.

Choice C is incorrect. This equation defines function h if $h(x) = f(4x)$, not $h(x) = f(x - 4)$.

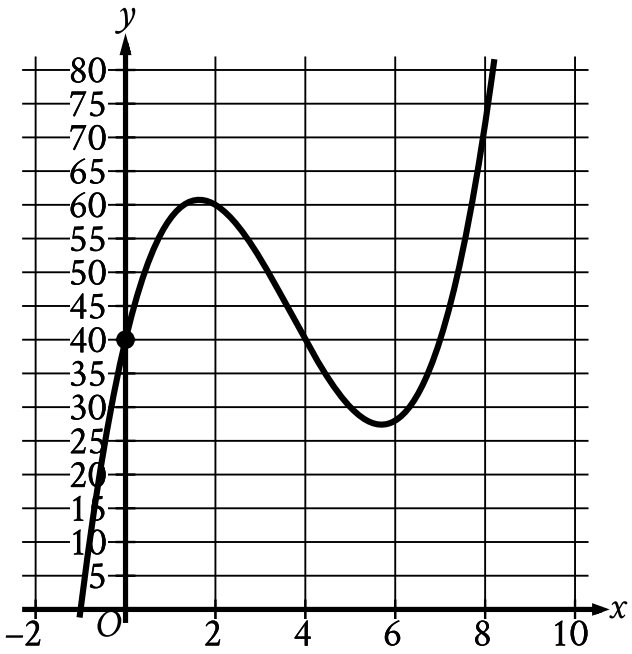
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 26f5269a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 26f5269a



The *y*-intercept of the graph shown is (x, y). What is the value of y?

ID: 26f5269a Answer

Correct Answer: 40

Rationale

The correct answer is 40. The *y*-intercept of a graph in the *xy*-plane is the point (x, y) on the graph where $x = 0$. The *y*-intercept of the graph shown is $(0, 40)$. Therefore, the value of y is 40.

Question Difficulty: Easy

Question ID 6f5540a5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 6f5540a5

Kao measured the temperature of a cup of hot chocolate placed in a room with a constant temperature of 70 degrees Fahrenheit (°F). The temperature of the hot chocolate was 185°F at 6:00 p.m. when it started cooling. The temperature of the hot chocolate was 156°F at 6:05 p.m. and 135°F at 6:10 p.m. The hot chocolate's temperature continued to decrease. Of the following functions, which best models the temperature $T(m)$, in degrees Fahrenheit, of Kao's hot chocolate *m* minutes after it started cooling?

A. $T(m) = 185(1.25)^m$

B. $T(m) = 185(0.85)^m$

C. $T(m) = (185 - 70)(0.75)^{\frac{m}{5}}$

D. $T(m) = 70 + 115(0.75)^{\frac{m}{5}}$

ID: 6f5540a5 Answer

Correct Answer: D

Rationale

Choice D is correct. The hot chocolate cools from 185°F over time, never going lower than the room temperature, 70°F. Since the base of the exponent in this function, 0.75, is less than 1, $T(m)$ decreases as time increases. Using the function, the temperature, in °F, at 6:00 p.m. can be estimated as $T(0)$ and is equal to $70+115(0.75)^{\frac{0}{5}}=185$. The temperature, in °F, at 6:05 p.m. can be estimated as $T(5)$ and is equal to $70+115(0.75)^{\frac{5}{5}}$, which is approximately 156°F. Finally, the temperature, in °F, at 6:10 p.m. can be estimated as $T(10)$ and is equal to $70+115(0.75)^{\frac{10}{5}}$, which is approximately 135°F. Since these three given values of m and their corresponding values for $T(m)$ can be verified using the function $T(m)=70+115(0.75)^{\frac{m}{5}}$, this is the best function out of the given choices to model the temperature of Kao's hot chocolate after m minutes.

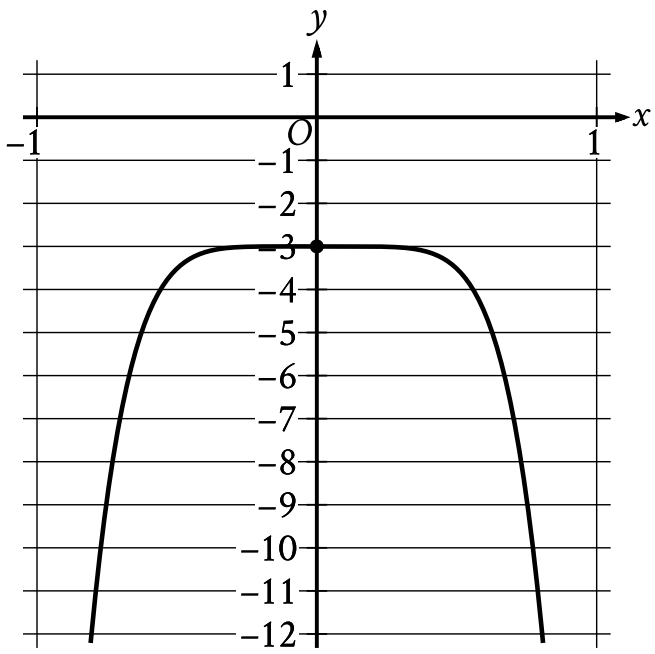
Choice A is incorrect because the base of the exponent, 1.25, results in the value of $T(m)$ increasing over time rather than decreasing. Choice B is incorrect because when m is large enough, $T(m)$ becomes less than 70. Choice C is incorrect because the maximum value of $T(m)$ at 6:00 p.m. is 115°F, not 185°F.

Question Difficulty: Hard

Question ID 50418728

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 50418728



The graph of the polynomial function f, where $y = f(x)$, is shown. The *y*-intercept of the graph is $(0, y)$. What is the value of y?

ID: 50418728 Answer

Correct Answer: -3

Rationale

The correct answer is -3. The *y*-intercept of the graph of a function in the *xy*-plane is the point where the graph crosses the *y*-axis. The graph of the polynomial function shown crosses the *y*-axis at the point $(0, -3)$. It's given that the *y*-intercept of the graph is $(0, y)$. Thus, the value of y is -3.

Question Difficulty: Easy

Question ID 9cb9beec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 9cb9beec

$y = -1.50\ y = x^2 + 8x + a$

In the given system of equations, a is a positive constant. The system has exactly one distinct real solution. What is the value of a?

ID: 9cb9beec Answer

Correct Answer: 14.5, 29/2

Rationale

The correct answer is $\frac{29}{2}$. According to the first equation in the given system, the value of y is -1.5. Substituting -1.5 for y in the second equation in the given system yields $-1.5 = x^2 + 8x + a$. Adding 1.5 to both sides of this equation yields $0 = x^2 + 8x + a + 1.5$. If the given system has exactly one distinct real solution, it follows that $0 = x^2 + 8x + a + 1.5$ has exactly one distinct real solution. A quadratic equation in the form $0 = px^2 + qx + r$, where p, q, and r are constants, has exactly one distinct real solution if and only if the discriminant, $q^2 - 4pr$, is equal to 0. The equation $0 = x^2 + 8x + a + 1.5$ is in this form, where $p = 1$, $q = 8$, and $r = a + 1.5$. Therefore, the discriminant of the equation $0 = x^2 + 8x + a + 1.5$ is $(8)^2 - 4(1)(a + 1.5)$, or $58 - 4a$. Setting the discriminant equal to 0 to solve for a yields $58 - 4a = 0$. Adding $4a$ to both sides of this equation yields $58 = 4a$. Dividing both sides of this equation by 4 yields $\frac{58}{4} = a$, or $\frac{29}{2} = a$. Therefore, if the given system of equations has exactly one distinct real solution, the value of a is $\frac{29}{2}$. Note that 29/2 and 14.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID f5e8ccf1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: f5e8ccf1

$f(x) = (x+4)(x-1)(2x-3)$

The function f is defined above. Which of the following is NOT an x-intercept of the graph of the function in the xy-plane?

A. $(-4, 0)$

B. $\left(-\frac{2}{3}, 0\right)$

C. $(1, 0)$

D. $\left(\frac{3}{2}, 0\right)$

ID: f5e8ccf1 Answer

Correct Answer: B

Rationale

Choice B is correct. The graph of the function f in the xy-plane has x-intercepts at the points (x,y), where $y=f(x)=0$. Substituting 0 for $f(x)$ in the given equation yields $0=(x+4)(x-1)(2x-3)$. By the zero product property, if $0=(x+4)(x-1)(2x-3)$, then $x+4=0$, $x-1=0$, or $2x-3=0$. Solving each of these linear equations for x, it follows that $x=-4$, $x=1$, and $x=\frac{3}{2}$, respectively. This means that the graph of the function f in the xy-plane has three x-intercepts: $(-4,0)$, $(1,0)$, and $\left(\frac{3}{2},0\right)$. Therefore, $\left(-\frac{2}{3},0\right)$ isn't an x-intercept of the graph of the function f.

Alternate approach: Substitution may be used. Since by definition an x-intercept of any graph is a point in the form $(k,0)$ where k is a constant, and since all points in the options are in this form, it need only be checked whether the points in the options lie on the graph of the function f. Substituting $-\frac{2}{3}$ for x and 0 for $f(x)$ in the given equation yields $0=\left(-\frac{2}{3}+4\right)\left(-\frac{2}{3}-1\right)\left(2\left(-\frac{2}{3}\right)-3\right)$, or $0=\frac{650}{27}$. Therefore, the point $\left(-\frac{2}{3},0\right)$ doesn't lie on the graph of the function f and can't be an x-intercept of the graph.

Choices A, C, and D are incorrect because each of these points is an x-intercept of the graph of the function f in the xy-plane. By definition, an x-intercept is a point on the graph of the form $(k,0)$, where k is a constant. Substituting -4 for x and 0 for $f(x)$ in the given equation yields $0=(-4+4)(-4-1)(2(-4)-3)$, or $0=0$. Since this is a true statement, the point $(-4,0)$ lies on the graph of the function f and is an x-intercept of the graph. Performing similar substitution using the points $(1,0)$ and $\left(\frac{3}{2},0\right)$ also yields the true statement $0=0$, illustrating that these points also lie on the graph of the function f and are x-intercepts of the graph.

Question Difficulty: Medium

Question ID 127b2759

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 127b2759

Which expression is equivalent to $8 + d^2 + 3$?

A. $d^2 + 24$

B. $d^2 + 11$

C. $d^2 + 5$

D. $d^2 - 11$

ID: 127b2759 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression can be rewritten as $d^2 + 8 + 3$. Adding 8 and 3 in this expression yields $d^2 + 11$.

Choice A is incorrect. This expression is equivalent to $d^2 + 8(3)$.

Choice C is incorrect. This expression is equivalent to $8 + d^2 - 3$.

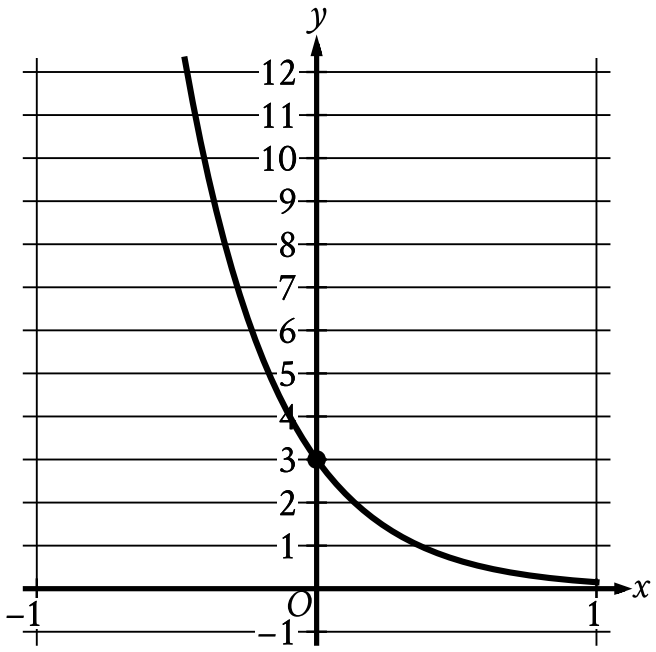
Choice D is incorrect. This expression is equivalent to $-8 + d^2 - 3$.

Question Difficulty: Easy

Question ID 02c67921

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 02c67921



The graph of the exponential function f is shown, where $y = f(x)$. The *y*-intercept of the graph is $(0, y)$. What is the value of y?

ID: 02c67921 Answer

Correct Answer: 3

Rationale

The correct answer is 3. It's given that the *y*-intercept of the graph shown is $(0, y)$. The graph passes through the point $(0, 3)$. Therefore, the value of y is 3.

Question Difficulty: Easy

Question ID 1073d70c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1073d70c

At the time that an article was first featured on the home page of a news website, there were 40 comments on the article. An exponential model estimates that at the end of each hour after the article was first featured on the home page, the number of comments on the article had increased by 190% of the number of comments on the article at the end of the previous hour. Which of the following equations best represents this model, where C is the estimated number of comments on the article t hours after the article was first featured on the home page and $t \leq 4$?

A. $C = 40$msup

B. $C = 40$msup

C. $C = 40$msup

D. $C = 40$msup

ID: 1073d70c Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that an exponential model estimates that the number of comments on an article increased by a fixed percentage at the end of each hour. Therefore, the model can be represented by an exponential equation of the form $C = Ka^t$, where C is the estimated number of comments on the article t hours after the article was first featured on the home page and K and a are constants. It's also given that when the article was first featured on the home page of the news website, there were 40 comments on the article. This means that when $t = 0$, $C = 40$. Substituting 0 for t and 40 for C in the equation $C = Ka^t$ yields $40 = Ka^0$, or $40 = K$. It's also given that the number of comments on the article at the end of an hour had increased by 190% of the number of comments on the article at the end of the previous hour. Multiplying the percent increase by the number of comments on the article at the end of the previous hour yields the number of estimated additional comments the article has on its home page: $(40)\left(\frac{190}{100}\right)$, or 76 comments. Thus, the estimated number of comments for the following hour is the sum of the comments from the end of the previous hour and the number of additional comments, which is $40 + 76$, or 116. This means that when $t = 1$, $C = 116$. Substituting 1 for t, 116 for C, and 40 for K in the equation $C = Ka^t$ yields $116 = 40a^1$, or $116 = 40a$. Dividing both sides of this equation by 40 yields $2.9 = a$. Substituting 40 for K and 2.9 for a in the equation $C = Ka^t$ yields $C = 40(2.9)^t$. Thus, the equation that best represents this model is $C = 40(2.9)^t$.

Choice A is incorrect. This model represents a situation where the number of comments at the end of each hour increased by 19% of the number of comments at the end of the previous hour, rather than 190%.

Choice B is incorrect. This model represents a situation where the number of comments at the end of each hour increased by 90% of the number of comments at the end of the previous hour, rather than 190%.

Choice C is incorrect. This model represents a situation where the number of comments at the end of each hour was 19 times the number of comments at the end of the previous hour, rather than increasing by 190% of the number of comments at the end of the previous hour.

Question Difficulty: Hard

Question ID fb96a5b3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: fb96a5b3

Which of the following expressions is equivalent to $2(ab-3)+2$?

A. $2ab-1$

B. $2ab-4$

C. $2ab-5$

D. $2ab-8$

ID: fb96a5b3 Answer

Correct Answer: B

Rationale

Choice B is correct. Applying the distributive property to the given expression yields $2(ab)+2(-3)+2$, or $2ab-6+2$. Adding the like terms -6 and 2 results in the expression $2ab-4$.

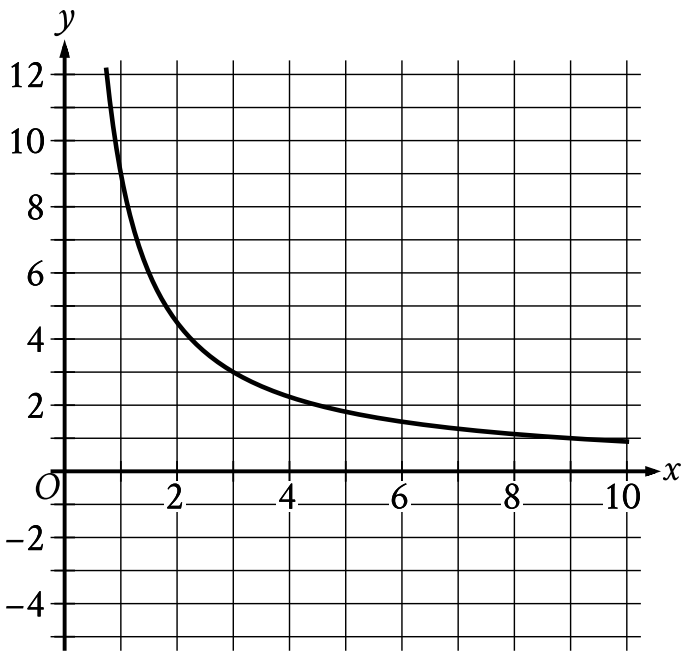
Choice A is incorrect and may result from multiplying ab by 2 without multiplying -3 by 2 when applying the distributive property. Choices C and D are incorrect and may result from computational or conceptual errors.

Question Difficulty: Easy

Question ID aa95fb33

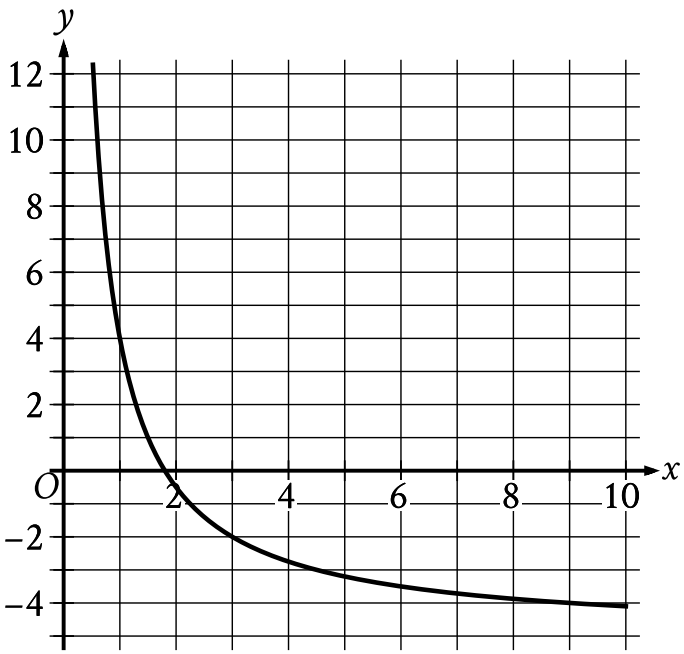
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: aa95fb33

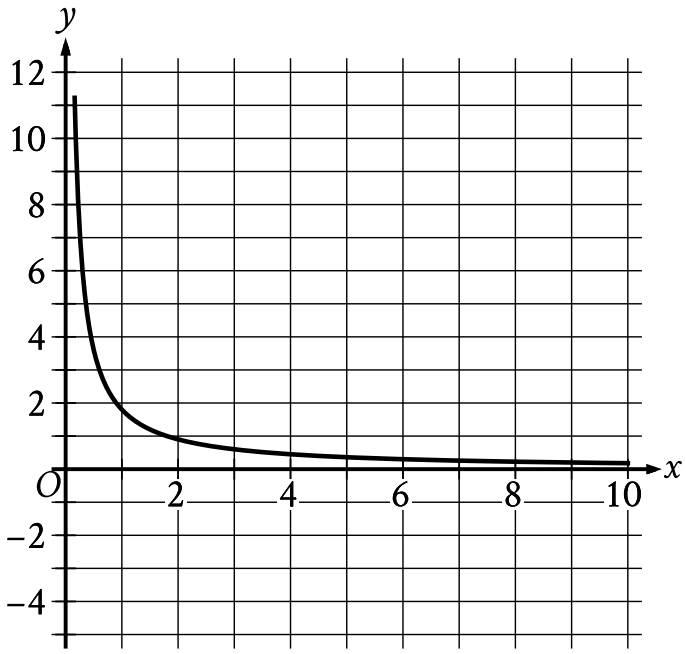


The graph of the rational function f is shown, where $y = f(x)$ and $x \geq 0$. Which of the following is the graph of $y = f(x) + 5$, where $x \geq 0$?

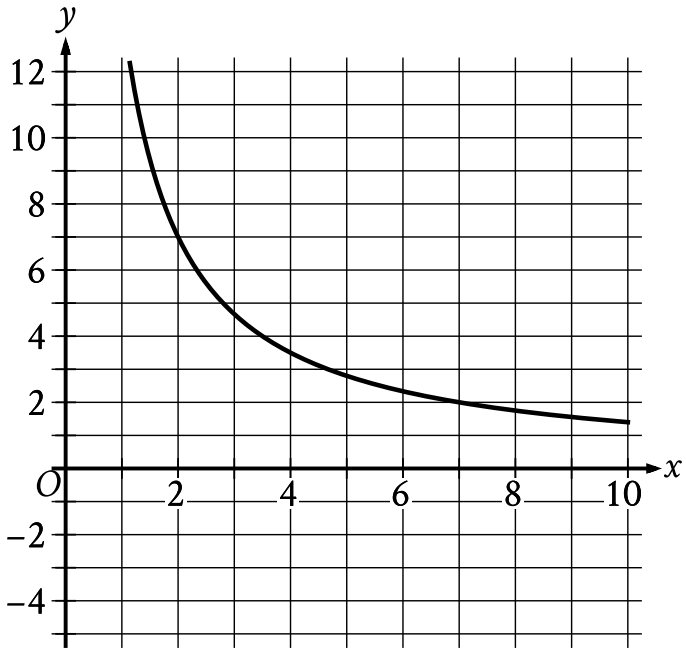
A.



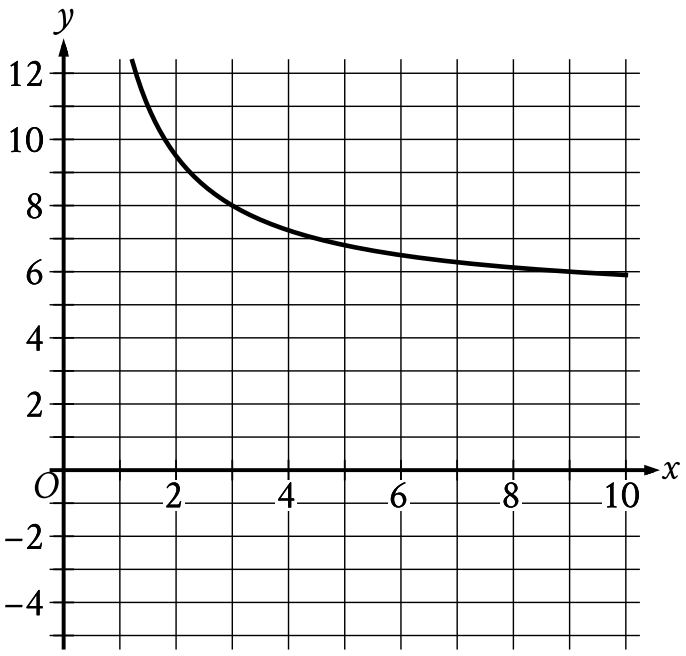
B.



C.



D.



ID: aa95fb33 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the graph of the rational function f is shown, where $y = f(x)$ and $x \geq 0$. The graph shown passes through the point $(3, 3)$. It follows that when the value of x is 3, the value of $f(x)$ is 3. When the value of $f(x)$ is 3, the value of $f(x) + 5$ is $3 + 5$, or 8. Therefore, the graph of $y = f(x) + 5$ passes through the point $(3, 8)$. Of the given choices, choice D is the only graph that passes through the point $(3, 8)$ and is therefore the graph of $y = f(x) + 5$.

Choice A is incorrect. This is the graph of $y = f(x) - 5$, rather than $y = f(x) + 5$.

Choice B is incorrect. This is the graph of $y = \frac{f(x)}{5}$, rather than $y = f(x) + 5$.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 1fe10d97

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1fe10d97

$p(t) = 90{,}000(1.06)^t$

The given function p models the population of Lowell t years after a census. Which of the following functions best models the population of Lowell m months after the census?

A. $r(m) = \frac{90{,}000}{12}(1.06)^m$

B. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^m$

C. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^{\frac{m}{12}}$

D. $r(m) = 90{,}000(1.06)^{\frac{m}{12}}$

ID: 1fe10d97 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function p models the population of Lowell t years after a census. Since there are 12 months in a year, m months after the census is equivalent to $\frac{m}{12}$ years after the census. Substituting $\frac{m}{12}$ for t in the equation $p(t) = 90{,}000(1.06)^t$ yields $p\left(\frac{m}{12}\right) = 90{,}000(1.06)^{\frac{m}{12}}$. Therefore, the function r that best models the population of Lowell m months after the census is $r(m) = 90{,}000(1.06)^{\frac{m}{12}}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 7355b9d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 7355b9d9

If $k - x$ is a factor of the expression $-x^2 + \frac{1}{29}nk^2$, where n and k are constants and $k > 0$, what is the value of n?

A. -29

B. $-\frac{1}{29}$

C. $\frac{1}{29}$

D. 29

ID: 7355b9d9 Answer

Correct Answer: D

Rationale

Choice D is correct. If $k - x$ is a factor of the expression $-x^2 + \left(\frac{1}{29}\right)nk^2$, then the expression can be written as $(k - x)(ax + b)$, where a and b are constants. This expression can be rewritten as $akx + bk - ax^2 - bx$, or $-ax^2 + (ak - b)x + bk$. Since this expression is equivalent to $-x^2 + \left(\frac{1}{29}\right)nk^2$, it follows that $-a = -1$, $ak - b = 0$, and $bk = \left(\frac{1}{29}\right)nk^2$. Dividing each side of the equation $-a = -1$ by -1 yields $a = 1$. Substituting 1 for a in the equation $ak - b = 0$ yields $k - b = 0$. Adding b to each side of this equation yields $k = b$. Substituting k for b in the equation $bk = \left(\frac{1}{29}\right)nk^2$ yields $k^2 = \left(\frac{1}{29}\right)nk^2$. Since k is positive, dividing each side of this equation by k^2 yields $1 = \left(\frac{1}{29}\right)n$. Multiplying each side of this equation by 29 yields $29 = n$.

Alternate approach: The expression $x^2 - y^2$ can be written as $(x - y)(x + y)$, which is a difference of two squares. It follows that $\left(\frac{1}{29}\right)nk^2 - x^2$ is equivalent to $\left(\left(\sqrt{\frac{1}{29}n}\right)k - x\right)\left(\left(\sqrt{\frac{1}{29}n}\right)k + x\right)$. It's given that $k - x$ is a factor of $-x^2 + \left(\frac{1}{29}\right)nk^2$, so the factor $\left(\sqrt{\frac{1}{29}n}\right)k - x$ is equal to $k - x$. Adding x to both sides of the equation $\left(\sqrt{\frac{1}{29}n}\right)k - x = k - x$ yields $\left(\sqrt{\frac{1}{29}n}\right)k = k$. Since k is positive, dividing both sides of this equation by k yields $\sqrt{\frac{1}{29}n} = 1$. Squaring both sides of this equation yields $\frac{1}{29}n = 1$. Multiplying both sides of this equation by 29 yields $n = 29$.

Choice A is incorrect. This value of n gives the expression $-x^2 + \left(\frac{1}{29}\right)(-29)k^2$, or $-x^2 - k^2$. This expression doesn't have $k - x$ as a factor.

Choice B is incorrect. This value of n gives the expression $-x^2 + \left(\frac{1}{29}\right)\left(-\frac{1}{29}\right)k^2$, or $-x^2 + \left(-\frac{1}{841}\right)k^2$. This expression doesn't have $k - x$ as a factor.

Choice C is incorrect. This value of n gives the expression $-x^2 + \left(\frac{1}{29}\right)\left(\frac{1}{29}\right)k^2$, or $-x^2 + \left(\frac{1}{841}\right)k^2$. This expression doesn't have $k - x$ as a factor.

Question Difficulty: Hard

Question ID b73ee6cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: b73ee6cf

The population of a town is currently 50,000, and the population is estimated to increase each year by 3% from the previous year. Which of the following equations can be used to estimate the number of years, *t*, it will take for the population of the town to reach 60,000 ?

A. $50{,}000 = 60{,}000(0.03)^t$

B. $50{,}000 = 60{,}000(3)^t$

C. $60{,}000 = 50{,}000(0.03)^t$

D. $60{,}000 = 50{,}000(1.03)^t$

ID: b73ee6cf Answer

Correct Answer: D

Rationale

Choice D is correct. Stating that the population will increase each year by 3% from the previous year is equivalent to saying that the population each year will be 103% of the population the year before. Since the initial population is 50,000, the population after t years is given by $50{,}000(1.03)^t$. It follows that the equation $60{,}000 = 50{,}000(1.03)^t$ can be used to estimate the number of years it will take for the population to reach 60,000.

Choice A is incorrect. This equation models how long it will take the population to decrease from 60,000 to 50,000, which is impossible given the growth factor. Choice B is incorrect and may result from misinterpreting a 3% growth as growth by a factor of 3. Additionally, this equation attempts to model how long it will take the population to decrease from 60,000 to 50,000. Choice C is incorrect and may result from misunderstanding how to model percent growth by multiplying the initial amount by a factor greater than 1.

Question Difficulty: Hard

Question ID 08d03fe4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 08d03fe4

For the exponential function f, the value of $f(1)$ is k, where k is a constant. Which of the following equivalent forms of the function f shows the value of k as the coefficient or the base?

A. $f(x) = 50(2)^{x+1}$

B. $f(x) = 80(2)^{x}$

C. $f(x) = 128(2)^{x-1}$

D. $f(x) = 205(2)^{x-2}$

ID: 08d03fe4 Answer

Correct Answer: C

Rationale

Choice C is correct. For the form of the function in choice C, $f(x) = 128(1.6)^{x-1}$, the value of $f(1)$ can be found as $128(1.6)^{1-1}$, which is equivalent to $128(1.6)^{0}$, or 128. Therefore, $k = 128$, which is shown in $f(x) = 128(1.6)^{x-1}$ as the coefficient.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID df747160

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: df747160

Which expression is equivalent to $17(x^2 - 100y^2)$?

A. $17(x - 2y)(x - 50y)$

B. $17(x - 2y)(x + 50y)$

C. $17(x - 10y)(x - 10y)$

D. $17(x - 10y)(x + 10y)$

ID: df747160 Answer

Correct Answer: D

Rationale

Choice D is correct. Expressions in the form $a^2 - b^2$ follow the difference of two squares pattern and can be factored as $(a - b)(a + b)$. In the given expression, $17(x^2 - 100y^2)$, the expression $x^2 - 100y^2$ follows the difference of two squares pattern. It follows that the expression $x^2 - 100y^2$ can be rewritten as $(x - 10y)(x + 10y)$. Therefore, the expression $17(x - 10y)(x + 10y)$ is equivalent to $17(x^2 - 100y^2)$.

Choice A is incorrect. This expression is equivalent to $17(x^2 - 52xy + 100y^2)$, not $17(x^2 - 100y^2)$.

Choice B is incorrect. This expression is equivalent to $17(x^2 + 48xy - 100y^2)$, not $17(x^2 - 100y^2)$.

Choice C is incorrect. This expression is equivalent to $17(x^2 - 20xy + 100y^2)$, not $17(x^2 - 100y^2)$.

Question Difficulty: Easy

Question ID 3918e8bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 3918e8bc

An object is kicked from a platform. The equation $h = -4.9t^2 + 7t + 9$ represents this situation, where h is the height of the object above the ground, in meters, t seconds after it is kicked. Which number represents the height, in meters, from which the object was kicked?

A. 0

B. 4.9

C. 7

D. 9

ID: 3918e8bc Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the equation $h = -4.9t^2 + 7t + 9$ represents this situation, where h is the height, in meters, of the object t seconds after it is kicked. It follows that the height, in meters, from which the object was kicked is the value of h when $t = 0$. Substituting 0 for t in the equation $h = -4.9t^2 + 7t + 9$ yields $h = -4.9(0)^2 + 7(0) + 9$, or $h = 9$. Therefore, the object was kicked from a height of 9 meters.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 1dd13816

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 1dd13816

$(5x^3 - 3) - (-4x^3 + 8)$

The given expression is equivalent to $bx^3 - 11$, where b is a constant. What is the value of b?

ID: 1dd13816 Answer

Correct Answer: 9

Rationale

The correct answer is 9. The given expression can be rewritten as $(5x^3 - 3) + (-1)(-4x^3 + 8)$. By applying the distributive property, this expression can be rewritten as $5x^3 - 3 + 4x^3 + (-8)$, which is equivalent to $(5x^3 + 4x^3) + (-3 + (-8))$. Adding like terms in this expression yields $9x^3 - 11$. Since it's given that $(5x^3 - 3) - (-4x^3 + 8)$ is equivalent to $bx^3 - 11$, it follows that $9x^3 - 11$ is equivalent to $bx^3 - 11$. Therefore, the coefficients of x^3 in these two expressions must be equivalent, and the value of b must be 9.

Question Difficulty: Medium

Question ID e597050f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: e597050f

Which expression is equivalent to $9x + 6x + 2y + 3y$?

A. $3x + 5y$

B. $6x + 8y$

C. $12x + 8y$

D. $15x + 5y$

ID: e597050f Answer

Correct Answer: D

Rationale

Choice D is correct. Combining like terms in the given expression yields $(9x + 6x) + (2y + 3y)$, or $15x + 5y$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7eed640d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 7eed640d

$h(x) = -16x^2 + 100x + 10$

The quadratic function above models the height above the ground *h*, in feet, of a projectile *x* seconds after it had been launched vertically. If $y = h(x)$ is graphed in the *xy*-plane, which of the following represents the real-life meaning of the positive *x*-intercept of the graph?

A. The initial height of the projectile

B. The maximum height of the projectile

C. The time at which the projectile reaches its maximum height

D. The time at which the projectile hits the ground

ID: 7eed640d Answer

Correct Answer: D

Rationale

Choice D is correct. The positive x-intercept of the graph of $y = h(x)$ is a point (x,y) for which $y = 0$. Since $y = h(x)$ models the height above the ground, in feet, of the projectile, a y-value of 0 must correspond to the height of the projectile when it is 0 feet above ground or, in other words, when the projectile is on the ground. Since x represents the time since the projectile was launched, it follows that the positive x-intercept, $(x,0)$, represents the time at which the projectile hits the ground.

Choice A is incorrect and may result from misidentifying the y-intercept as a positive x-intercept. Choice B is incorrect and may result from misidentifying the y-value of the vertex of the graph of the function as an x-intercept. Choice C is incorrect and may result from misidentifying the x-value of the vertex of the graph of the function as an x-intercept.

Question Difficulty: Hard

Question ID 30a07668

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 30a07668

$y = 4x$ $y = x^2 - 12$ A solution to the given system of equations is (x, y), where $x > 0$. What is the value of x?

ID: 30a07668 Answer

Correct Answer: 6

Rationale

The correct answer is 6. It's given that $y = 4x$ and $y = x^2 - 12$. Since $y = 4x$, substituting $4x$ for y in the second equation of the given system yields $4x = x^2 - 12$. Subtracting $4x$ from both sides of this equation yields $0 = x^2 - 4x - 12$. This equation can be rewritten as $0 = (x - 6)(x + 2)$. By the zero product property, $x - 6 = 0$ or $x + 2 = 0$. Adding 6 to both sides of the equation $x - 6 = 0$ yields $x = 6$. Subtracting 2 from both sides of the equation $x + 2 = 0$ yields $x = -2$. Therefore, solutions to the given system of equations occur when $x = 6$ and when $x = -2$. It's given that a solution to the given system of equations is (x, y), where $x > 0$. Since 6 is greater than 0, it follows that the value of x is 6.

Question Difficulty: Medium

Question ID 2d2ab76b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 2d2ab76b

$y = x^2 - 1$

$y = 3$

When the equations above are graphed in the *xy*-plane, what are the coordinates (*x*, *y*) of the points of intersection of the two graphs?

A. $(2,3)$ and $(-2,3)$

B. $(2,4)$ and $(-2,4)$

C. $(3,8)$ and $(-3,8)$

D. $(\sqrt{2},3)$ and $(-\sqrt{2},3)$

ID: 2d2ab76b Answer

Correct Answer: A

Rationale

Choice A is correct. The two equations form a system of equations, and the solutions to the system correspond to the points of intersection of the graphs. The solutions to the system can be found by substitution. Since the second equation gives y = 3, substituting 3 for y in the first equation gives $3 = x^2 - 1$. Adding 1 to both sides of the equation gives $4 = x^2$. Solving by taking the square root of both sides of the equation gives x = ±2. Since y = 3 for all values of x for the second equation, the solutions are (2, 3) and (−2, 3). Therefore, the points of intersection of the two graphs are (2, 3) and (−2, 3).

Choices B, C, and D are incorrect and may be the result of calculation errors.

Question Difficulty: Medium

Question ID de362c2f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: de362c2f

The function f is defined by $f(x) = 5x^2$. What is the value of $f(8)$?

A. 40

B. 50

C. 80

D. 320

ID: de362c2f Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the function f is defined by $f(x) = 5x^2$. Substituting 8 for x in $f(x) = 5x^2$ yields $f(8) = 5(8)^2$, which is equivalent to $f(8) = 5(64)$, or $f(8) = 320$. Therefore, the value of $f(8)$ is 320.

Choice A is incorrect. This is the value of $f(8)$ if $f(x) = 5x$.

Choice B is incorrect. This is the value of $f(8)$ if $f(x) = 5(x + 2)$.

Choice C is incorrect. This is the value of $f(8)$ if $f(x) = (5x)(2)$.

Question Difficulty: Easy

Question ID 5dd53f73

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 5dd53f73

Which expression is equivalent to $34x + 34y$?

A. $34xy$

B. $34(x + y)$

C. $68y$

D. $68x$

ID: 5dd53f73 Answer

Correct Answer: B

Rationale

Choice B is correct. Since 34 is a common factor of each term in the given expression, the expression can be rewritten as $34(x + y)$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This expression is equivalent to $34y + 34y$.

Choice D is incorrect. This expression is equivalent to $34x + 34x$.

Question Difficulty: Easy

Question ID da602115

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: da602115

If $|4x - 4| = 112$, what is the positive value of $x - 1$?

ID: da602115 Answer

Correct Answer: 28

Rationale

The correct answer is 28. The given absolute value equation can be rewritten as two linear equations: $4x - 4 = 112$ and $-(4x - 4) = 112$, or $4x - 4 = -112$. Adding 4 to both sides of the equation $4x - 4 = 112$ results in $4x = 116$. Dividing both sides of this equation by 4 results in $x = 29$. Adding 4 to both sides of the equation $4x - 4 = -112$ results in $4x = -108$. Dividing both sides of this equation by 4 results in $x = -27$. Therefore, the two values of $x - 1$ are $29 - 1$, or 28, and $-27 - 1$, or -28. Thus, the positive value of $x - 1$ is 28.

Alternate approach: The given equation can be rewritten as $|4(x - 1)| = 112$, which is equivalent to $4|x - 1| = 112$. Dividing both sides of this equation by 4 yields $|x - 1| = 28$. This equation can be rewritten as two linear equations: $x - 1 = 28$ and $-(x - 1) = 28$, or $x - 1 = -28$. Therefore, the positive value of $x - 1$ is 28.

Question Difficulty: Medium

Question ID 43926bd9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 43926bd9

x	$f(x)$
1	a
2	a^5
3	a^9

For the exponential function *f*, the table above shows several values of *x* and their corresponding values of $f(x)$, where *a* is a constant greater than 1. If *k* is a constant and $f(k) = a^{29}$, what is the value of *k* ?

ID: 43926bd9 Answer

Rationale

The correct answer is 8. The values of $f(x)$ for the exponential function f shown in the table increase by a factor of a^4 for each increase of 1 in x. This relationship can be represented by the equation $f(x) = a^{4x+b}$, where b is a constant. It's given that when $x = 2$, $f(x) = a^5$. Substituting 2 for x and a^5 for $f(x)$ into $f(x) = a^{4x+b}$ yields $a^5 = a^{4(2)+b}$. Since $4(2)+b = 5$, it follows that $b = -3$. Thus, an equation that defines the function f is $f(x) = a^{4x-3}$. It follows that the value of k such that $f(k) = a^{29}$ can be found by solving the equation $4k-3 = 29$, which yields $k = 8$.

Question Difficulty: Hard

Question ID 1e8d7183

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 1e8d7183

Which expression is equivalent to $256w^2 - 676$?

A. $(16w - 26)(16w - 26)$

B. $(8w - 13)(8w + 13)$

C. $(8w - 13)(8w - 13)$

D. $(16w - 26)(16w + 26)$

ID: 1e8d7183 Answer

Correct Answer: D

Rationale

Choice D is correct. The given expression follows the difference of two squares pattern, $x^2 - y^2$, which factors as $(x - y)(x + y)$. Therefore, the expression $256w^2 - 676$ can be written as $(16w)^2 - 26^2$, or $(16w)(16w) - (26)(26)$, which factors as $(16w - 26)(16w + 26)$.

Choice A is incorrect. This expression is equivalent to $256w^2 - 832w + 676$.

Choice B is incorrect. This expression is equivalent to $64w^2 - 169$.

Choice C is incorrect. This expression is equivalent to $64w^2 - 208w + 169$.

Question Difficulty: Easy

Question ID 044c1cb7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 044c1cb7

$h(x) = x^2 - 3$ Which table gives three values of x and their corresponding values of $h(x)$ for the given function h?

A.

x	1	2	3
$h(x)$	4	5	6

B.

x	1	2	3
$h(x)$	-2	1	6

C.

x	1	2	3
$h(x)$	-1	1	3

D.

x	1	2	3
$h(x)$	-2	1	3

ID: 044c1cb7 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $h(x) = x^2 - 3$. Each table gives 1, 2, and 3 as the three given values of x. Substituting 1 for x in the equation $h(x) = x^2 - 3$ yields $h(1) = (1)^2 - 3$, or $h(1) = -2$. Substituting 2 for x in the equation $h(x) = x^2 - 3$ yields $h(2) = (2)^2 - 3$, or $h(2) = 1$. Finally, substituting 3 for x in the equation $h(x) = x^2 - 3$ yields $h(3) = (3)^2 - 3$, or $h(3) = 6$. Therefore, $h(x)$ is -2 when x is 1, $h(x)$ is 1 when x is 2, and $h(x)$ is 6 when x is 3. Choice B is a table with these values of x and their corresponding values of $h(x)$.

Choice A is incorrect. This is a table of values for the function $h(x) = x + 3$, not $h(x) = x^2 - 3$.

Choice C is incorrect. This is a table of values for the function $h(x) = 2x - 3$, not $h(x) = x^2 - 3$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 7e5a3640

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 7e5a3640

Bacteria are growing in a liquid growth medium. There were $300{,}000$ cells per milliliter during an initial observation. The number of cells per milliliter doubles every 3 hours. How many cells per milliliter will there be 15 hours after the initial observation?

A. $1{,}500{,}000$

B. $2{,}400{,}000$

C. $4{,}500{,}000$

D. $9{,}600{,}000$

ID: 7e5a3640 Answer

Correct Answer: D

Rationale

Choice D is correct. Let y represent the number of cells per milliliter x hours after the initial observation. Since the number of cells per milliliter doubles every 3 hours, the relationship between x and y can be represented by an exponential equation of the form $y = a(b)^{\frac{x}{k}}$, where a is the number of cells per milliliter during the initial observation and the number of cells per milliliter increases by a factor of b every k hours. It's given that there were $300{,}000$ cells per milliliter during the initial observation. Therefore, $a = 300{,}000$. It's also given that the number of cells per milliliter doubles, or increases by a factor of 2, every 3 hours. Therefore, $b = 2$ and $k = 3$. Substituting $300{,}000$ for a, 2 for b, and 3 for k in the equation $y = a(b)^{\frac{x}{k}}$ yields $y = 300{,}000(2)^{\frac{x}{3}}$. The number of cells per milliliter there will be 15 hours after the initial observation is the value of y in this equation when $x = 15$. Substituting 15 for x in the equation $y = 300{,}000(2)^{\frac{x}{3}}$ yields $y = 300{,}000(2)^{\frac{15}{3}}$, or $y = 300{,}000(2)^5$. This is equivalent to $y = 300{,}000(32)$, or $y = 9{,}600{,}000$. Therefore, 15 hours after the initial observation, there will be $9{,}600{,}000$ cells per milliliter.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 0354c7de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 0354c7de

$5x+15$

Which of the following is equivalent to the given expression?

A. $5(x+3)$

B. $5(x+10)$

C. $5(x+15)$

D. $5(x+20)$

ID: 0354c7de Answer

Correct Answer: A

Rationale

Choice A is correct. Since 5 is a factor of both terms, $5x$ and 15, the given expression can be factored and rewritten as $5(x+3)$.

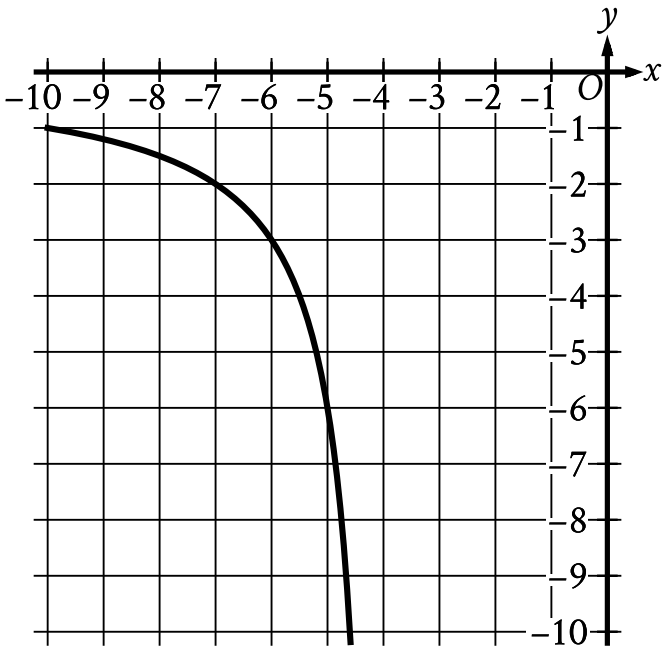
Choice B is incorrect and may result from subtracting 5 from the constant when factoring 5 from the given expression.
Choice C is incorrect and may result from factoring 5 from only the first term, not both terms, of the given expression.
Choice D is incorrect and may result from adding 5 to the constant when factoring 5 from the given expression.

Question Difficulty: Easy

Question ID 4d037075

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 4d037075



The rational function f is defined by an equation in the form $f(x) = \frac{a}{x+b}$, where a and b are constants. The partial graph of $y = f(x)$ is shown. If $g(x) = f(x + 4)$, which equation could define function g?

A. $g(x) = \frac{6}{x}$

B. $g(x) = \frac{6}{x+4}$

C. $g(x) = \frac{6}{x+8}$

D. $g(x) = \frac{6(x+4)}{x+4}$

ID: 4d037075 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $f(x) = \frac{a}{x+b}$ and that the graph shown is a partial graph of $y = f(x)$. Substituting y for $f(x)$ in the equation $f(x) = \frac{a}{x+b}$ yields $y = \frac{a}{x+b}$. The graph passes through the point $(-7, -2)$. Substituting -7 for x and -2 for y in the equation $y = \frac{a}{x+b}$ yields $-2 = \frac{a}{-7+b}$. Multiplying each side of this equation by $-7 + b$ yields $-2(-7 + b) = a$, or $14 - 2b = a$. The graph also passes through the point $(-5, -6)$. Substituting -5 for x and -6 for y in the equation $y = \frac{a}{x+b}$ yields $-6 = \frac{a}{-5+b}$. Multiplying each side of this equation by $-5 + b$ yields $-6(-5 + b) = a$, or $30 - 6b = a$. Substituting $14 - 2b$ for a in this equation yields $30 - 6b = 14 - 2b$. Adding $6b$ to each side of this equation yields $30 = 14 + 4b$. Subtracting 14 from each side of this equation yields $16 = 4b$. Dividing each side of this equation by 4 yields $4 = b$. Substituting 4 for b in the equation $14 - 2b = a$ yields $14 - 2(4) = a$, or $6 = a$. Substituting 6 for a and 4 for b in the equation $f(x) = \frac{a}{x+b}$ yields $f(x) = \frac{6}{x+4}$. It's given that $g(x) = f(x + 4)$. Substituting $x + 4$ for x in the equation $f(x) = \frac{6}{x+4}$ yields $f(x + 4) = \frac{6}{x+4+4}$, which is equivalent to $f(x + 4) = \frac{6}{x+8}$. It follows that $g(x) = \frac{6}{x+8}$.

Choice A is incorrect. This could define function g if $g(x) = f(x - 4)$.

Choice B is incorrect. This could define function g if $g(x) = f(x)$.

Choice D is incorrect. This could define function g if $g(x) = f(x) \cdot (x + 4)$.

Question Difficulty: Hard

Question ID 39652e93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: 39652e93

The function f is defined by $f(x) = \frac{16}{x}$. What is the value of $f(x)$ when $x = 17$?

A. $\frac{16}{17}$

B. $\frac{17}{16}$

C. 16

D. 17

ID: 39652e93 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $f(x) = \frac{16}{x}$. Substituting 17 for x in this function yields $f(17) = \frac{16}{17}$. Therefore, when $x = 17$, the value of $f(x)$ is $\frac{16}{17}$.

Choice B is incorrect. This is the value of the reciprocal of $f(x)$ when $x = 17$.

Choice C is incorrect. This is the value of $f(x)$ when $x = 1$. Choice D is incorrect. This is the value of x when $x = 17$.

Question Difficulty: Easy

Question ID 4d7064a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 4d7064a6

$f(x) = (x - 10)(x + 13)$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -130

B. -13

C. $-\frac{23}{2}$

D. $-\frac{3}{2}$

ID: 4d7064a6 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that $f(x) = (x - 10)(x + 13)$, which can be rewritten as $f(x) = x^2 + 3x - 130$. Since the coefficient of the x^2-term is positive, the graph of $y = f(x)$ in the *xy*-plane opens upward and reaches its minimum value at its vertex. The *x*-coordinate of the vertex is the value of x such that $f(x)$ reaches its minimum. For an equation in the form $f(x) = ax^2 + bx + c$, where a, b, and c are constants, the *x*-coordinate of the vertex is $-\frac{b}{2a}$. For the equation $f(x) = x^2 + 3x - 130$, $a = 1$, $b = 3$, and $c = -130$. It follows that the *x*-coordinate of the vertex is $-\frac{3}{2(1)}$, or $-\frac{3}{2}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{3}{2}$.

Alternate approach: The value of x for the vertex of a parabola is the *x*-value of the midpoint between the two *x*-intercepts of the parabola. Since it's given that $f(x) = (x - 10)(x + 13)$, it follows that the two *x*-intercepts of the graph of $y = f(x)$ in the *xy*-plane occur when $x = 10$ and $x = -13$, or at the points $(10, 0)$ and $(-13, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2), is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$. Therefore, the midpoint between $(10, 0)$ and $(-13, 0)$ is $\left(\frac{10 + (-13)}{2}, \frac{0 + 0}{2}\right)$, or $\left(-\frac{3}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{3}{2}$.

Choice A is incorrect. This is the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane.

Choice B is incorrect. This is one of the *x*-coordinates of the *x*-intercepts of the graph of $y = f(x)$ in the *xy*-plane.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 4eaf0a3a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: 4eaf0a3a

Which expression is equivalent to $\sqrt[7]{x^9y^9}$, where x and y are positive?

A. msup

B. msup

C. msup

D. msup

ID: 4eaf0a3a Answer

Correct Answer: B

Rationale

Choice B is correct. For positive values of a and b, $a^m b^m = (ab)^m$, $\sqrt[n]{a} = (a)^{\frac{1}{n}}$, and $\left(a^j\right)^k = a^{jk}$. Therefore, the given expression, $\sqrt[7]{x^9y^9}$, can be rewritten as $\sqrt[7]{(xy)^9}$. This expression is equivalent to $\left((xy)^9\right)^{\frac{1}{7}}$, which can be rewritten as $(xy)^{9\cdot\frac{1}{7}}$, or $(xy)^{\frac{9}{7}}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 4993b828

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 4993b828

The area A, in square centimeters, of a rectangular cutting board can be represented by the expression $w(w+9)$, where w is the width, in centimeters, of the cutting board. Which expression represents the length, in centimeters, of the cutting board?

A. $w(w+9)$

B. w

C. 9

D. $(w+9)$

ID: 4993b828 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the expression $w(w+9)$ represents the area, in square centimeters, of a rectangular cutting board, where w is the width, in centimeters, of the cutting board. The area of a rectangle can be calculated by multiplying its length by its width. It follows that the length, in centimeters, of the cutting board is represented by the expression $(w+9)$.

Choice A is incorrect. This expression represents the area, in square centimeters, of the cutting board, not its length, in centimeters.

Choice B is incorrect. This expression represents the width, in centimeters, of the cutting board, not its length.

Choice C is incorrect. This is the difference between the length, in centimeters, and the width, in centimeters, of the cutting board, not its length, in centimeters.

Question Difficulty: Medium

Question ID 1853bb35

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1853bb35

For the function q, the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q?

A. $q(x) = 0.55(14)^x$

B. $q(x) = 1.45(14)^x$

C. $q(x) = 14(0.55)^x$

D. $q(x) = 14(1.45)^x$

ID: 1853bb35 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the value of $q(x)$ decreases by a fixed percentage, 45%, for every increase in the value of x by 1, the function q is a decreasing exponential function. A decreasing exponential function can be written in the form $q(x) = a\left(1 - \frac{p}{100}\right)^x$, where a is the value of $q(0)$ and the value of $q(x)$ decreases by $p\%$ for every increase in the value of x by 1. If $q(0) = 14$, then $a = 14$. Since the value of $q(x)$ decreases by 45% for every increase in the value of x by 1, $p = 45$. Substituting 14 for a and 45 for p in the equation $q(x) = a\left(1 - \frac{p}{100}\right)^x$ yields $q(x) = 14\left(1 - \frac{45}{100}\right)^x$, which is equivalent to $q(x) = 14(1 - 0.45)^x$, or $q(x) = 14(0.55)^x$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. For this function, the value of $q(x)$ increases, rather than decreases, by 45% for every increase in the value of x by 1.

Question Difficulty: Hard

Question ID a54753ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: a54753ca

In the *xy*-plane, the graph of the equation $y = -x^2 + 9x - 100$ intersects the line $y = c$ at exactly one point. What is the value of c?

A. $-\frac{481}{4}$

B. -100

C. $-\frac{319}{4}$

D. $-\frac{9}{2}$

ID: a54753ca Answer

Correct Answer: C

Rationale

Choice C is correct. In the *xy*-plane, the graph of the line $y = c$ is a horizontal line that crosses the *y*-axis at $y = c$ and the graph of the quadratic equation $y = -x^2 + 9x - 100$ is a parabola. A parabola can intersect a horizontal line at exactly one point only at its vertex. Therefore, the value of c should be equal to the *y*-coordinate of the vertex of the graph of the given equation. For a quadratic equation in vertex form, $y = a(x - h)^2 + k$, the vertex of its graph in the *xy*-plane is (h, k). The given quadratic equation, $y = -x^2 + 9x - 100$, can be rewritten as $y = -\left(x^2 - 2\left(\frac{9}{2}\right)x + \left(\frac{9}{2}\right)^2\right) + \left(\frac{9}{2}\right)^2 - 100$, or $y = -\left(x - \frac{9}{2}\right)^2 + \left(-\frac{319}{4}\right)$. Thus, the value of c is equal to $-\frac{319}{4}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c602140f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■□

ID: c602140f

$(x-11y)(2x-3y)-12y(-2x+3y)$

Which of the following is equivalent to the expression above?

A. $x-23y$

B. $2x^2-xy-3y^2$

C. $2x^2+24xy+36y^2$

D. $2x^2-49xy+69y^2$

ID: c602140f Answer

Correct Answer: B

Rationale

Choice B is correct. Expanding all terms yields $(x - 11y)(2x - 3y) - 12y(-2x + 3y)$, which is equivalent to $2x^2 - 22xy - 3xy + 33y^2 + 24xy - 36y^2$. Combining like terms gives $2x^2 - xy - 3y^2$.

Choice A is incorrect and may be the result of using the sums of the coefficients of the existing x and y terms as the coefficients of the x and y terms in the new expressions. Choice C is incorrect and may be the result of incorrectly combining like terms. Choice D is incorrect and may be the result of using the incorrect sign in front of the 12y term.

Question Difficulty: Medium

Question ID fcb78856

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: fcb78856

$b = 42cf$

The given equation relates the positive numbers b, c, and f. Which equation correctly expresses c in terms of b and f?

A. $c = \frac{b}{42f}$

B. $c = \frac{b-42}{f}$

C. $c = 42bf$

D. $c = 42 - b - f$

ID: fcb78856 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the equation $b = 42cf$ relates the positive numbers b, c, and f. Dividing each side of the given equation by $42f$ yields $\frac{b}{42f} = c$, or $c = \frac{b}{42f}$. Thus, the equation $c = \frac{b}{42f}$ correctly expresses c in terms of b and f.

Choice B is incorrect. This equation can be rewritten as $b = cf + 42$.

Choice C is incorrect. This equation can be rewritten as $b = \frac{c}{42f}$.

Choice D is incorrect. This equation can be rewritten as $b = 42 - c - f$.

Question Difficulty: Easy

Question ID a8ae0d22

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: a8ae0d22

Two variables, x and y, are related such that for each increase of 1 in the value of x, the value of y increases by a factor of 4. When $x = 0$, $y = 200$. Which equation represents this relationship?

A. $y = 4$msup

B. $y = 4$msup

C. $y = 200$msup

D. $y = 200$msup

ID: a8ae0d22 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the value of y increases by a constant factor, 4, for each increase of 1 in the value of x, the relationship between x and y is exponential. An exponential relationship between x and y can be represented by an equation of the form $y = a(b)^x$, where a is the value of x when $y = 0$ and y increases by a factor of b for each increase of 1 in the value of x. Since $y = 200$ when $x = 0$, $a = 200$. Since y increases by a factor of 4 for each increase of 1 in the value of x, $b = 4$. Substituting 200 for a and 4 for b in the equation $y = a(b)^x$ yields $y = 200(4)^x$. Thus, the equation $y = 200(4)^x$ represents the relationship between x and y.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect. This equation represents a relationship where for each increase of 1 in the value of x, the value of y increases by a factor of 200, not 4, and when $x = 0$, y is equal to 4, not 200.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Hard

Question ID fd4b2aa0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: fd4b2aa0

Which expression is equivalent to $12x^3 - 5x^3$?

A. $7x^6$

B. $17x^3$

C. $7x^3$

D. $17x^6$

ID: fd4b2aa0 Answer

Correct Answer: C

Rationale

Choice C is correct. The given expression shows subtraction of two like terms. The two terms can be subtracted as follows: $12x^3 - 5x^3 = (12 - 5)x^3$, or $7x^3$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the result of adding, not subtracting, the two like terms.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 981aca65

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 981aca65

$f(x) = \frac{a-19}{x} + 5$

In the given function f, a is a constant. The graph of function f in the *xy*-plane, where $y = f(x)$, is translated 3 units down and 4 units to the right to produce the graph of $y = g(x)$. Which equation defines function g?

A. $g(x) = \frac{a-19}{x+4} + 2$

B. $g(x) = \frac{a-19}{x-4} + 2$

C. $g(x) = \frac{a-22}{x+4} + 5$

D. $g(x) = \frac{a-22}{x-4} + 5$

ID: 981aca65 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the graph of $y = g(x)$ is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the right in the *xy*-plane. Therefore, function g can be defined by an equation in the form $g(x) = f(x - 4) - 3$. Function f is defined by the equation $f(x) = \frac{a-19}{x} + 5$, where a is a constant. Substituting $x - 4$ for x in the equation $f(x) = \frac{a-19}{x} + 5$ yields $f(x - 4) = \frac{a-19}{x-4} + 5$. Substituting $\frac{a-19}{x-4} + 5$ for $f(x - 4)$ in the equation $g(x) = f(x - 4) - 3$ yields $g(x) = \frac{a-19}{x-4} + 5 - 3$, or $g(x) = \frac{a-19}{x-4} + 2$. Therefore, the equation that defines function g is $g(x) = \frac{a-19}{x-4} + 2$.

Choice A is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the left, not 3 units down and 4 units to the right.

Choice C is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the left, not 3 units down and 4 units to the right.

Choice D is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the right, not 3 units down and 4 units to the right.

Question Difficulty: Medium

Question ID bf704c34

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: bf704c34

$c - 7 = 25p + k$

The given equation relates the positive numbers c, p, and k. Which equation correctly expresses c in terms of p and k?

A. $c = 25p + k + 7$

B. $c = 25p + k - 7$

C. $c = 7(25p + k)$

D. $c = \frac{25p+k}{7}$

ID: bf704c34 Answer

Correct Answer: A

Rationale

Choice A is correct. Adding 7 to each side of the given equation yields $c = 25p + k + 7$.

Choice B is incorrect. This equation is equivalent to $c + 7 = 25p + k$, not $c - 7 = 25p + k$.

Choice C is incorrect. This equation is equivalent to $\frac{c}{7} = 25p + k$, not $c - 7 = 25p + k$.

Choice D is incorrect. This equation is equivalent to $7c = 25p + k$, not $c - 7 = 25p + k$.

Question Difficulty: Easy

Question ID 4236c5a3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: 4236c5a3

If $(x+5)^2=4$, which of the following is a possible value of x?

A. 1

B. -1

C. -2

D. -3

ID: 4236c5a3 Answer

Correct Answer: D

Rationale

Choice D is correct. If $(x+5)^2=4$, then taking the square root of each side of the equation gives $x+5=2$ or $x+5=-2$. Solving these equations for x gives $x=-3$ or $x=-7$. Of these, -3 is the only solution given as a choice.

Choice A is incorrect and may result from solving the equation $x+5=4$ and making a sign error. Choice B is incorrect and may result from solving the equation $x+5=4$. Choice C is incorrect and may result from finding a possible value of $x+5$.

Question Difficulty: Easy

Question ID 161126cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 161126cf

$f(x) = (1.84)^{\frac{x}{4}}$

The function f is defined by the given equation. The equation can be rewritten as $f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant. Which of the following is closest to the value of p?

A. 16

B. 21

C. 46

D. 96

ID: 161126cf Answer

Correct Answer: A

Rationale

Choice A is correct. The equation $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as $f(x) = (1.84)^{\left(\frac{1}{4}\right)(x)}$, which is equivalent to $f(x) = \left(1.84^{\frac{1}{4}}\right)^x$, or approximately $f(x) = (1.16467)^x$. Since it's given that $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as $f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant, it follows that $1 + \frac{p}{100}$ is approximately equal to 1.16467. Therefore, $\frac{p}{100}$ is approximately equal to 0.16467. It follows that the value of p is approximately equal to 16.467. Of the given choices, 16 is closest to the value of p.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a7711fe8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: a7711fe8

What is the minimum value of the function f defined by $f(x)=(x-2)^2-4$?

A. -4

B. -2

C. 2

D. 4

ID: a7711fe8 Answer

Correct Answer: A

Rationale

Choice A is correct. The given quadratic function f is in vertex form, $f(x)=(x-h)^2+k$, where (h,k) is the vertex of the graph of $y=f(x)$ in the xy-plane. Therefore, the vertex of the graph of $y=f(x)$ is $(2,-4)$. In addition, the y-coordinate of the vertex represents either the minimum or maximum value of a quadratic function, depending on whether the graph of the function opens upward or downward. Since the leading coefficient of f (the coefficient of the term $(x-2)^2$) is 1, which is positive, the graph of $y=f(x)$ opens upward. It follows that at $x=2$, the minimum value of the function f is -4.

Choice B is incorrect and may result from making a sign error and from using the x-coordinate of the vertex. Choice C is incorrect and may result from using the x-coordinate of the vertex. Choice D is incorrect and may result from making a sign error.

Question Difficulty: Hard

Question ID 7a4475df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 7a4475df

A function p estimates that there were $2{,}000$ animals in a population in 1998. Each year from 1998 to 2010, the function estimates that the number of animals in this population increased by 3% of the number of animals in the population the previous year. Which equation defines this function, where $p(x)$ is the estimated number of animals in the population x years after 1998?

A. $p(x) = 2{,}000(3)^x$

B. $p(x) = 2{,}000(1.97)^x$

C. $p(x) = 2{,}000(1.03)^x$

D. $p(x) = 2{,}000(0.97)^x$

ID: 7a4475df Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that a function p estimates that there were $2{,}000$ animals in a population in 1998 and that each year from 1998 to 2010, the number of animals in this population increased by 3% of the number of animals in the population the previous year. It follows that this situation can be represented by the function $p(x) = a\left(1 + \frac{r}{100}\right)^x$, where $p(x)$ is the estimated number of animals in the population x years after 1998, a is the estimated number of animals in the population in 1998, and each year the estimated number of animals increased by $r\%$. Substituting $2{,}000$ for a and 3 for r in this function yields $p(x) = 2{,}000\left(1 + \frac{3}{100}\right)^x$, or $p(x) = 2{,}000(1.03)^x$.

Choice A is incorrect. This function represents a population in which each year the number of animals increased by 200%, not 3%, of the number of animals in the population the previous year.

Choice B is incorrect. This function represents a population in which each year the number of animals increased by 97%, not 3%, of the number of animals in the population the previous year.

Choice D is incorrect. This function represents a population in which each year the number of animals decreased, rather than increased, by 3% of the number of animals in the population the previous year.

Question Difficulty: Medium

Question ID 3b4b8831

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: 3b4b8831

$38x^2 = 38(9)$ What is the negative solution to the given equation?

ID: 3b4b8831 Answer

Correct Answer: -3

Rationale

The correct answer is -3. Dividing both sides of the given equation by 38 yields $x^2 = 9$. Taking the square root of both sides of this equation yields the solutions $x = 3$ and $x = -3$. Therefore, the negative solution to the given equation is -3.

Question Difficulty: Medium

Question ID f5247e52

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: f5247e52

$y = ax^2 - c$

In the equation above, *a* and *c* are positive constants. How many times does the graph of the equation above intersect the graph of the equation $y = a + c$ in the *xy*-plane?

A. Zero

B. One

C. Two

D. More than two

ID: f5247e52 Answer

Correct Answer: C

Rationale

Choice C is correct. It is given that the constants a and c are both positive; therefore, the graph of the given quadratic equation is a parabola that opens up with a vertex on the y-axis at a point below the x-axis. The graph of the second equation provided is a horizontal line that lies above the x-axis. A horizontal line above the x-axis will intersect a parabola that opens up and has a vertex below the x-axis in exactly two points.

Choices A, B, and D are incorrect and are the result of not understanding the relationships of the graphs of the two equations given. Choice A is incorrect because the two graphs intersect. Choice B is incorrect because in order for there to be only one intersection point, the horizontal line would have to intersect the parabola at the vertex, but the vertex is below the x-axis and the line is above the x-axis. Choice D is incorrect because a line cannot intersect a parabola in more than two points.

Question Difficulty: Medium

Question ID 1a722d7d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 1a722d7d

Let the function p be defined as $p(x)=\frac{(x-c)^2+160}{2c}$, where c is a constant.

If $p(c)=10$, what is the value of $p(12)$?

A. 10.00

B. 10.25

C. 10.75

D. 11.00

ID: 1a722d7d Answer

Correct Answer: D

Rationale

Choice D is correct. The value of p(12) depends on the value of the constant c, so the value of c must first be determined. It is given that p(c) = 10. Based on the definition of p, it follows that:

$$p(c)=\frac{(c-c)^2+160}{2c}=10\,\frac{160}{2c}=10\,{}_{2c=16}\,c=8$$

This means that $p(x)=\frac{(x-8)^2+160}{16}$ for all values of x. Therefore: $p(12)=\frac{(12-8)^2+160}{16}=\frac{16+160}{16}=11$

Choice A is incorrect. It is the value of p(8), not p(12). Choices B and C are incorrect. If one of these values were correct, then x = 12 and the selected value of p(12) could be substituted into the equation to solve for c. However, the values of c that result from choices B and C each result in p(c) < 10.

Question Difficulty: Hard

Question ID be1b8c74

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■□

ID: be1b8c74

$x = 8a(b + 9)$

The given equation relates the positive numbers a, b, and x. Which equation correctly expresses a in terms of b and x?

A. $a = \frac{x}{8} - (b + 9)$

B. $a = \frac{x}{8(b+9)}$

C. $a = \frac{8(b+9)}{x}$

D. $a = 8x(b + 9)$

ID: be1b8c74 Answer

Correct Answer: B

Rationale

Choice B is correct. To express a in terms of b and x, the given equation can be rewritten such that a is isolated on one side of the equation. Since it's given that b is a positive number, $b + 9$ is not equal to zero. Therefore, dividing both sides of the given equation by $8(b + 9)$ yields the equivalent equation $\frac{x}{8(b+9)} = a$, or $a = \frac{x}{8(b+9)}$.

Choice A is incorrect. This equation is equivalent to $x = 8(a + (b + 9))$.

Choice C is incorrect. This equation is equivalent to $x = \frac{8(b+9)}{a}$.

Choice D is incorrect. This equation is equivalent to $x = \frac{a}{8(b+9)}$.

Question Difficulty: Medium

Question ID f11ffa93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■□□

ID: f11ffa93

$\sqrt{x+4} = 11$

What value of x satisfies the equation above?

ID: f11ffa93 Answer

Rationale

The correct answer is 117. Squaring both sides of the given equation gives $x+4 = 11^2$, or $x+4 = 121$. Subtracting 4 from both sides of this equation gives $x = 117$.

Question Difficulty: Easy

Question ID 6e7ae9fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■■

ID: 6e7ae9fc

The function g is defined by $g(x) = x(x-2)(x+6)^2$. The value of $g(7-w)$ is 0, where w is a constant. What is the sum of all possible values of w?

ID: 6e7ae9fc Answer

Correct Answer: 25

Rationale

The correct answer is 25. The value of $g(7-w)$ is the value of $g(x)$ when $x = 7-w$, where w is a constant. Substituting $7-w$ for x in the given equation yields $g(7-w) = (7-w)(7-w-2)(7-w+6)^2$, which is equivalent to $g(7-w) = (7-w)(5-w)(13-w)^2$. It's given that the value of $g(7-w)$ is 0. Substituting 0 for $g(7-w)$ in the equation $g(7-w) = (7-w)(5-w)(13-w)^2$ yields $0 = (7-w)(5-w)(13-w)^2$. Since the product of the three factors on the right-hand side of this equation is equal to 0, at least one of these three factors must be equal to 0. Therefore, the possible values of w can be found by setting each factor equal to 0. Setting the first factor equal to 0 yields $7-w=0$. Adding w to both sides of this equation yields $7=w$. Therefore, 7 is one possible value of w. Setting the second factor equal to 0 yields $5-w=0$. Adding w to both sides of this equation yields $5=w$. Therefore, 5 is a second possible value of w. Setting the third factor equal to 0 yields $(13-w)^2=0$. Taking the square root of both sides of this equation yields $13-w=0$. Adding w to both sides of this equation yields $13=w$. Therefore, 13 is a third possible value of w. Adding the three possible values of w yields $7+5+13$, or 25. Therefore, the sum of all possible values of w is 25.

Question Difficulty: Hard

Question ID ee05c84e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■□□

ID: ee05c84e

$f(x) = (x + 0.25x)(50 - x)$

The function f is defined above. What is the value of $f(20)$?

A. 250

B. 500

C. 750

D. 2,000

ID: ee05c84e Answer

Correct Answer: C

Rationale

Choice C is correct. Adding the like terms x and $0.25x$ yields the equation $f(x) = (1.25x)(50 - x)$. Substituting 20 for x yields $f(20) = (1.25(20))(50 - 20)$. The product $1.25(20)$ is equal to 25, and the difference $50 - 20$ is equal to 30. Substituting these values in the given equation gives $f(20) = (25)(30)$, and multiplying 25 by 30 results in $f(20) = 750$.

Choices A, B, and D are incorrect and may result from conceptual or computational errors when finding the value of $f(20)$.

Question Difficulty: Easy

Question ID 5d93c782

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■□□

ID: 5d93c782

Which expression is equivalent to $x^2 + 3x - 40$?

A. $(x - 4)(x + 10)$

B. $(x - 5)(x + 8)$

C. $(x - 8)(x + 5)$

D. $(x - 10)(x + 4)$

ID: 5d93c782 Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression may be rewritten as $x^2 + 8x - 5x - 40$. Since the first two terms of this expression have a common factor of x and the last two terms of this expression have a common factor of -5, this expression may be rewritten as $x(x) + x(8) - 5(x) - 5(8)$, or $x(x + 8) - 5(x + 8)$. Since each term of this expression has a common factor of $(x + 8)$, it may be rewritten as $(x - 5)(x + 8)$.

Alternate approach: An expression of the form $x^2 + bx + c$, where b and c are constants, can be factored if there are two values that add to give b and multiply to give c. In the given expression, $b = 3$ and $c = -40$. The values of -5 and 8 add to give 3 and multiply to give -40, so the expression can be factored as $(x - 5)(x + 8)$.

Choice A is incorrect. This expression is equivalent to $x^2 + 6x - 40$, not $x^2 + 3x - 40$.

Choice C is incorrect. This expression is equivalent to $x^2 - 3x - 40$, not $x^2 + 3x - 40$.

Choice D is incorrect. This expression is equivalent to $x^2 - 6x - 40$, not $x^2 + 3x - 40$.

Question Difficulty: Easy

Question ID 5c00c2c1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	■■□

ID: 5c00c2c1

There were no jackrabbits in Australia before 1788 when 24 jackrabbits were introduced. By 1920 the population of jackrabbits had reached 10 billion. If the population had grown exponentially, this would correspond to a 16.2% increase, on average, in the population each year. Which of the following functions best models the population $p(t)$ of jackrabbits t years after 1788?

A. $p(t) = 1.162(24)^t$

B. $p(t) = 24(2)^{1.162t}$

C. $p(t) = 24(1.162)^t$

D. $p(t) = (24 \cdot 1.162)^t$

ID: 5c00c2c1 Answer

Correct Answer: C

Rationale

Choice C is correct. This exponential growth model can be written in the form $p(t) = A(1 + r)^t$, where $p(t)$ is the population t years after 1788, A is the initial population, and r is the yearly growth rate, expressed as a decimal. Since there were 24 jackrabbits in Australia in 1788, $A = 24$. Since the number of jackrabbits increased by an average of 16.2% each year, $r = 0.162$. Therefore, the equation that best models this situation is $p(t) = 24(1.162)^t$.

Choices A, B, and D are incorrect and may result from misinterpreting the form of an exponential growth model.

Question Difficulty: Medium

Question ID 3c8fdc40

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 3c8fdc40

A printer produces posters at a constant rate of 42 posters per minute. At what rate, in posters per hour, does the printer produce the posters?

ID: 3c8fdc40 Answer

Correct Answer: 2520

Rationale

The correct answer is $2{,}520$. There are 60 minutes in one hour. At a rate of 42 posters per minute, the number of posters produced in one hour can be determined by $\left(\frac{42 \text{ posters}}{1 \text{ minute}}\right)\left(\frac{60 \text{ minutes}}{1 \text{ hour}}\right)$, which is $2{,}520$ posters per hour.

Question Difficulty: Easy

Question ID 954943a4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 954943a4

Jennifer bought a box of Crunchy Grain cereal. The nutrition facts on the box state that a serving size of the cereal is $\frac{3}{4}$ cup and provides 210 calories, 50 of which are calories from fat. In addition, each serving of the cereal provides 180 milligrams of potassium, which is 5% of the daily allowance for adults. If p percent of an adult's daily allowance of potassium is provided by x servings of Crunchy Grain cereal per day, which of the following expresses p in terms of x ?

A. $p = 0.5x$

B. $p = 5x$

C. $p = (0.05)^x$

D. $p = (1.05)^x$

ID: 954943a4 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that each serving of Crunchy Grain cereal provides 5% of an adult's daily allowance of potassium, so x servings would provide x times 5%. The percentage of an adult's daily allowance of potassium, p, is 5 times the number of servings, x. Therefore, the percentage of an adult's daily allowance of potassium can be expressed as $p = 5x$.

Choices A, C, and D are incorrect and may result from incorrectly converting 5% to its decimal equivalent, which isn't necessary since p is expressed as a percentage. Additionally, choices C and D are incorrect because the context should be represented by a linear relationship, not by an exponential relationship.

Question Difficulty: Hard

Question ID 1baffbcf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 1baffbcf

The expression $0.35x$ represents the result of decreasing a positive quantity x by what percent?

A. 3.5%

B. 35%

C. 6.5%

D. 65%

ID: 1baffbcf Answer

Correct Answer: D

Rationale

Choice D is correct. Let $n\%$ represent the percent by which the positive quantity x is decreased to result in $0.35x$. The value of n can be found by solving the equation $x - \left(\frac{n}{100}\right)x = 0.35x$. Since x is a common factor of each of the terms on the left-hand side of this equation, the equation can be rewritten as $x\left(1 - \frac{n}{100}\right) = 0.35x$. Dividing each side of this equation by x yields $1 - \frac{n}{100} = 0.35$. Multiplying each side of this equation by 100 yields $100 - n = 35$. Subtracting 100 from each side of this equation yields $-n = -65$. Dividing each side of this equation by -1 yields $n = 65$. Therefore, the expression $0.35x$ represents the result of decreasing the positive quantity x by 65%.

Choice A is incorrect. Decreasing the quantity x by 3.5% yields $x - 0.035x$, or $0.965x$, not $0.35x$.

Choice B is incorrect. Decreasing the quantity x by 35% yields $x - 0.35x$, or $0.65x$, not $0.35x$.

Choice C is incorrect. Decreasing the quantity x by 6.5% yields $x - 0.065x$, or $0.935x$, not $0.35x$.

Question Difficulty: Hard

Question ID a5b069b4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: a5b069b4

$4, 10, 18, 4, 4, 5, 6, 5$ What is the median of the data set shown?

A. 4

B. 5

C. 7

D. 14

ID: a5b069b4 Answer

Correct Answer: B

Rationale

Choice B is correct. If a data set contains an even number of data values, when the data values are listed in ascending or descending order, the median is between the two middle values. The given data set contains 8 values. When listed in ascending order, the data set is $4, 4, 4, 5, 5, 6, 10, 18$ and the two middle values are 5 and 5. Since the two middle values are the same, the median must be 5.

Choice A is incorrect. This value is between the two middle values in the list shown, not the two middle values when the data values are listed in ascending or descending order.

Choice C is incorrect. This is the mean, not the median, of the data set.

Choice D is incorrect. This is the range, not the median, of the data set.

Question Difficulty: Medium

Question ID d28c29e1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: d28c29e1

The International Space Station orbits Earth at an average speed of 4.76 miles per second. What is the space station's average speed in miles per hour?

A. 285.6

B. 571.2

C. 856.8

D. 17,136.0

ID: d28c29e1 Answer

Correct Answer: D

Rationale

Choice D is correct. Since 1 minute = 60 seconds and 1 hour = 60 minutes, it follows that 1 hour = (60)(60), or 3,600 seconds. Using this conversion factor, the space station's average speed of 4.76 miles per second is equal to an average speed of $\frac{4.76 \text{ miles}}{\text{second}} \times \frac{3{,}600 \text{ seconds}}{\text{hour}} = \frac{17,136 \text{ miles}}{\text{hour}}$, or 17,136 miles per hour.

Choice A is incorrect. This is the space station's average speed in miles per minute. Choice B is incorrect. This is double the space station's average speed in miles per minute, or the number of miles the space station travels on average in 2 minutes. Choice C is incorrect. This is triple the space station's average speed in miles per minute, or the number of miles the space station travels on average in 3 minutes.

Question Difficulty: Medium

Question ID 3f5398a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 3f5398a6

For a person *m* miles from a flash of lightning, the length of the time interval from the moment the person sees the lightning to the moment the person hears the thunder is *k* seconds. The ratio of *m* to *k* can be estimated to be 1 to 5. According to this estimate, the person is how many miles from a flash of lightning if the time interval is 25 seconds?

A. 10

B. 9

C. 6

D. 5

ID: 3f5398a6 Answer

Rationale

Choice D is correct. It's given that the ratio of m to k is estimated to be 1 to 5. Therefore, when $k = 25$, the relationship between these ratios can be expressed by the proportion $\frac{m}{25} = \frac{1}{5}$. Multiplying both sides of this equation by 25 yields $m = 5$.

Choices A, B, and C are incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID b4912cc5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: b4912cc5

The population density of Iceland, in people per square kilometer of land area, increased from 2.5 in 1990 to 3.3 in 2014. During this time period, the land area of Iceland was 100,250 square kilometers. By how many people did Iceland's population increase from 1990 to 2014?

A. 330,825

B. 132,330

C. 125,312

D. 80,200

ID: b4912cc5 Answer

Correct Answer: D

Rationale

Choice D is correct. The increase in Iceland's population can be found by multiplying the increase in population density, in people per square kilometer, by the area, in square kilometers. It's given that the population density of Iceland was 2.5 people per square kilometer in 1990 and 3.3 people per square kilometer in 2014. The increase in population density can be found by subtracting 2.5 from 3.3, which yields 0.8. It's given that the land area of Iceland was 100,250 square kilometers. Thus, the increase in population is $0.8(100{,}250)$, or 80,200.

Alternate approach: It's given that the population density of Iceland, in people per square kilometer of land area, in 1990 was 2.5. Since the land area of Iceland was 100,250 square kilometers, it follows that the population of Iceland in 1990 was $2.5(100{,}250)$, or 250,625. Similarly, the population of Iceland in 2014 was $3.3(100{,}250)$, or 330,825. The population increase is the difference in the population from 1990 to 2014, or $330{,}825 - 250{,}625$, which yields 80,200. Therefore, Iceland's population increased by 80,200 from 1990 to 2014.

Choice A is incorrect. This is the population of Iceland in 2014. Choice B is incorrect and may result from dividing 3.3 by 2.5, instead of subtracting 2.5 from 3.3. Choice C is incorrect and may result from dividing the population of Iceland in 1990 by 2.

Question Difficulty: Medium

Question ID f890dc20

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: f890dc20

2, 2, 2, 3, 4, 4, 11

What is the median of the seven data values shown?

A. 2

B. 3

C. 4

D. 9

ID: f890dc20 Answer

Correct Answer: B

Rationale

Choice B is correct. When a data set has an odd number of values, the median can be found by ordering the values from least to greatest and determining the value in the middle. Since the values are already presented in order from least to greatest and there are 7 values, the median is the fourth value in the list. Therefore, the median is 3.

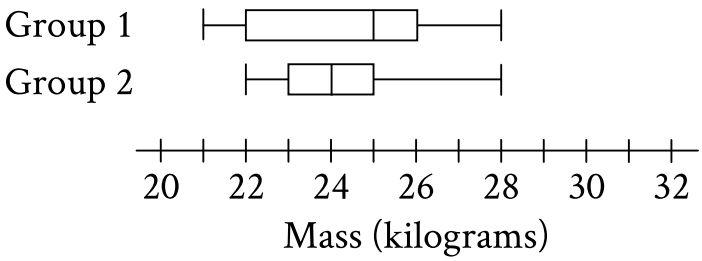
Choice A is incorrect. This is the mode. Choice C is incorrect. This is the mean. Choice D is incorrect. This is the range.

Question Difficulty: Easy

Question ID d3b9c8d8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: d3b9c8d8



The box plots summarize the masses, in kilograms, of two groups of gazelles. Based on the box plots, which of the following statements must be true?

A. The mean mass of group 1 is greater than the mean mass of group 2.

B. The mean mass of group 1 is less than the mean mass of group 2.

C. The median mass of group 1 is greater than the median mass of group 2.

D. The median mass of group 1 is less than the median mass of group 2.

ID: d3b9c8d8 Answer

Correct Answer: C

Rationale

Choice C is correct. The median of a data set represented in a box plot is represented by the vertical line within the box. It follows that the median mass of the gazelles in group 1 is 25 kilograms, and the median mass of the gazelles in group 2 is 24 kilograms. Since 25 kilograms is greater than 24 kilograms, the median mass of group 1 is greater than the median mass of group 2.

Choice A is incorrect. The mean mass of each of the two groups cannot be determined from the box plots.

Choice B is incorrect. The mean mass of each of the two groups cannot be determined from the box plots.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 65c49824

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 65c49824

A school district is forming a committee to discuss plans for the construction of a new high school. Of those invited to join the committee, 15% are parents of students, 45% are teachers from the current high school, 25% are school and district administrators, and the remaining 6 individuals are students. How many more teachers were invited to join the committee than school and district administrators?

ID: 65c49824 Answer

Rationale

The correct answer is 8. The 6 students represent $(100-15-45-25)\% = 15\%$ of those invited to join the committee. If x people were invited to join the committee, then $0.15x = 6$. Thus, there were $\frac{6}{0.15} = 40$ people invited to join the committee. It follows that there were $0.45(40) = 18$ teachers and $0.25(40) = 10$ school and district administrators invited to join the committee. Therefore, there were 8 more teachers than school and district administrators invited to join the committee.

Question Difficulty: Hard

Question ID 825b7490

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 825b7490

The ratio 140 to m is equivalent to the ratio 4 to 28. What is the value of m?

ID: 825b7490 Answer

Correct Answer: 980

Rationale

The correct answer is 980. It's given that the ratio 140 to m is equivalent to the ratio 4 to 28. Therefore, the value of m can be found by solving the equation $\frac{140}{m} = \frac{4}{28}$. Multiplying each side of this equation by m yields $140 = \frac{4m}{28}$. Multiplying each side of this equation by 28 yields $3{,}920 = 4m$. Dividing each side of this equation by 4 yields $980 = m$. Therefore, the value of m is 980.

Question Difficulty: Medium

Question ID 86636d8f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 86636d8f

A customer spent $\$27$ to purchase oranges at $\$3$ per pound. How many pounds of oranges did the customer purchase?

ID: 86636d8f Answer

Correct Answer: 9

Rationale

The correct answer is 9. It's given that the customer spent $\$27$ to purchase oranges at $\$3$ per pound. Therefore, the number of pounds of oranges the customer purchased is $\$27\left(\frac{1 \text{ pound}}{\$3}\right)$, or 9 pounds.

Question Difficulty: Easy

Question ID fe4c1c9e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: fe4c1c9e

A mechanical device in a workshop produces items at a constant rate of 60 items per hour. At this rate, how many items will the mechanical device produce in 3 hours?

ID: fe4c1c9e Answer

Correct Answer: 180

Rationale

The correct answer is 180. It's given that a mechanical device produces items at a constant rate of 60 items per hour. This rate can be written as $\frac{60 \text{ items}}{1 \text{ hour}}$. Let x represent the number of items the mechanical device will produce in 3 hours at the given rate. It follows that $\frac{60 \text{ items}}{1 \text{ hour}} = \frac{x \text{ items}}{3 \text{ hours}}$, which can be written as $\frac{60}{1} = \frac{x}{3}$, or $60 = \frac{x}{3}$. Multiplying each side of this equation by 3 yields $180 = x$. Therefore, at the given rate, the mechanical device will produce 180 items in 3 hours.

Alternate approach: It's given that a mechanical device produces items at a constant rate of 60 items per hour. At this rate, the mechanical device will produce $\left(\frac{60 \text{ items}}{1 \text{ hour}}\right)(3 \text{ hours})$, or 180 items in 3 hours.

Question Difficulty: Easy

Question ID 3310c2ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 3310c2ab

How many fluid ounces are equivalent to 76 quarts? $(8 \text{ fluid ounces} = 1 \text{ cup and } 4 \text{ cups} = 1 \text{ quart})$

ID: 3310c2ab Answer

Correct Answer: 2432

Rationale

The correct answer is $2{,}432$. It's given that $4 \text{ cups} = 1 \text{ quart}$. It follows that 76 quarts is equivalent to $(76 \text{ quarts})\left(\frac{4 \text{ cups}}{1 \text{ quart}}\right)$, or 304 cups. It's also given that $8 \text{ fluid ounces} = 1 \text{ cup}$. It follows that 304 cups is equivalent to $(304 \text{ cups})\left(\frac{8 \text{ fluid ounces}}{1 \text{ cup}}\right)$, or $2{,}432$ fluid ounces.

Question Difficulty: Medium

Question ID 4c774b00

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 4c774b00

Ages of 20 Students Enrolled in a College Class

Age	Frequency
18	6
19	5
20	4
21	2
22	1
23	1
30	1

The table above shows the distribution of ages of the 20 students enrolled in a college class. Which of the following gives the correct order of the mean, median, and mode of the ages?

A. mode < median < mean

B. mode < mean < median

C. median < mode < mean

D. mean < mode < median

ID: 4c774b00 Answer

Correct Answer: A

Rationale

Choice A is correct. The mode is the data value with the highest frequency. So for the data shown, the mode is 18. The median is the middle data value when the data values are sorted from least to greatest. Since there are 20 ages ordered, the median is the average of the two middle values, the 10th and 11th, which for these data are both 19. Therefore, the median is 19. The mean is the sum of the data values divided by the number of the data values. So for these data, the mean is $\frac{(18\times6)+(19\times5)+(20\times4)+(21\times2)+(22\times1)+(23\times1)+(30\times1)}{20}=20$.

Since the mode is 18, the median is 19, and the mean is 20, $\text{mode} < \text{median} < \text{mean}$.

Choices B and D are incorrect because the mean is greater than the median. Choice C is incorrect because the median is greater than the mode.

Alternate approach: After determining the mode, 18, and the median, 19, it remains to determine whether the mean is less than 19 or more than 19. Because the mean is a balancing point, there is as much deviation below the mean as above the mean. It is possible to compare the data to 19 to determine the balance of deviation above and below the mean. There is a total deviation of only 6 below 19 (the 6 values of 18); however, the data value 30 alone deviates by 11 above 19. Thus the mean must be greater than 19.

Question Difficulty: Medium

Question ID 52f9a246

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 52f9a246

4, 4, 4, 4, 8, 8, 8, 13, 13 Which frequency table correctly represents the data listed?

A.

Number	Frequency
4	4
8	3
13	2

B.

Number	Frequency
4	4
3	8
2	13

C.

Number	Frequency
4	16
8	24
13	26

D.

Number	Frequency
16	4
24	8
26	13

ID: 52f9a246 Answer

Correct Answer: A

Rationale

Choice A is correct. A frequency table is a table that lists the data value and shows the number of times the data value occurs. In the data listed, the number 4 occurs four times, the number 8 occurs three times, and the number 13 occurs two times. This corresponds to the table in choice A.

Choice B is incorrect. This table has the values for number and frequency reversed.

Choice C is incorrect because the frequency values don't represent the data listed.

Choice D is incorrect. This table represents the listed number values as the frequency values.

Question Difficulty: Easy

Question ID 000259aa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 000259aa

A group of monarch butterflies migrated from Chicago, Illinois, to Michoacán, Mexico, flying a total of 2,100 miles. It took a single butterfly in the group 120 days to travel this route one way. On average, how many miles did the butterfly travel per day?

A. 0.057

B. 0.729

C. 17.5

D. 24

ID: 000259aa Answer

Rationale

Choice C is correct. If the butterfly traveled 2,100 miles in 120 days, then it traveled, on average, $\frac{2{,}100 \text{ miles}}{120 \text{ days}} = 17.5$ miles per day.

Choice A is incorrect. This is approximately the average amount of time, in days, it took the butterfly to fly one mile: $\frac{120 \text{ days}}{2{,}100 \text{ miles}} = 0.057$ days per mile. Choice B is incorrect and may result from an arithmetic error. Choice D is incorrect. This is the number of hours in a day rather than the number of miles flown per day.

Question Difficulty: Easy

Question ID a456cfd2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: a456cfd2

Data value	Frequency
6	3
7	3
8	8
9	8
10	9
11	11
12	9
13	0
14	6

The frequency table summarizes the 57 data values in a data set. What is the maximum data value in the data set?

ID: a456cfd2 Answer

Correct Answer: 14

Rationale

The correct answer is 14. The maximum value is the largest value in the data set. The frequency refers to the number of times a data value occurs. The given frequency table shows that for this data set, the data value 6 occurs three times, the data value 7 occurs three times, the data value 8 occurs eight times, the data value 9 occurs eight times, the data value 10 occurs nine times, the data value 11 occurs eleven times, the data value 12 occurs nine times, the data value 13 occurs zero times, and the data value 14 occurs six times. Therefore, the maximum data value in the data set is 14.

Question Difficulty: Medium

Question ID 3726e079

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 3726e079

If $\frac{x}{y} = 4$ and $\frac{24x}{ny} = 4$, what is the value of n?

ID: 3726e079 Answer

Correct Answer: 24

Rationale

The correct answer is 24. The equation $\frac{24x}{ny} = 4$ can be rewritten as $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right) = 4$. It's given that $\frac{x}{y} = 4$. Substituting 4 for $\frac{x}{y}$ in the equation $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right) = 4$ yields $\left(\frac{24}{n}\right)(4) = 4$. Multiplying both sides of this equation by n yields $(24)(4) = 4n$. Dividing both sides of this equation by 4 yields $24 = n$. Therefore, the value of n is 24.

Question Difficulty: Medium

Question ID 4aaa9c42

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 4aaa9c42

The positive number a is $2{,}241\%$ of the sum of the positive numbers b and c, and b is 83% of c. What percent of b is a?

A. 23.24%

B. 49.41%

C. $2{,}324\%$

D. $4{,}941\%$

ID: 4aaa9c42 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that a is $2{,}241\%$ of the sum of b and c. This can be represented by the equation $a = \left(\frac{2{,}241}{100}\right)(b + c)$, or $a = 22.41(b + c)$. It's also given that that b is 83% of c. This can be represented by the equation $b = \left(\frac{83}{100}\right)c$, or $b = 0.83c$. Dividing both sides of this equation by 0.83 yields $\frac{b}{0.83} = c$. Substituting $\frac{b}{0.83}$ for c in the equation $a = 22.41(b + c)$ yields $a = 22.41\left(b + \frac{b}{0.83}\right)$, or $a = 22.41\left(\frac{1.83b}{0.83}\right)$, which is equivalent to $a = \frac{41.0103b}{0.83}$, or $a = 49.41b$. This equation is equivalent to $a = \left(\frac{4{,}941}{100}\right)b$; therefore, a is $4{,}941\%$ of b.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 312ba47c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 312ba47c

In a box of pens, the ratio of black pens to red pens is 8 to 1. There are 40 black pens in the box. How many red pens are in the box?

A. 5

B. 8

C. 40

D. 320

ID: 312ba47c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the ratio of black pens to red pens is 8 to 1. Therefore, there are $\frac{1}{8}$ as many red pens as black pens in the box. It's also given that there are 40 black pens in the box. Therefore, the number of red pens is $\frac{1}{8}$ of the 40 black pens. Thus, the number of red pens is $40\left(\frac{1}{8}\right)$, or 5.

Choice B is incorrect. This is the number of black pens in the box for every red pen.

Choice C is incorrect. This is the number of black pens in the box.

Choice D is incorrect. This is the number of red pens in the box if the ratio of black pens to red pens is 1 to 8.

Question Difficulty: Easy

Question ID bd90f87e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: bd90f87e

A table of the US minimum wage for 6 different years is shown below.

Year	US minimum wage (dollars per hour)
1960	1.00
1970	1.60
1980	3.10
1990	3.80
2000	5.15
2010	7.25

What was the percent increase of the minimum wage from 1960 to 1970?

A. 30%

B. 60%

C. 62.5%

D. 120%

ID: bd90f87e Answer

Correct Answer: B

Rationale

Choice B is correct. According to the table, the minimum wage in 1960 was $1.00 per hour, and in 1970 it was $1.60 per hour. The percentage change is therefore $100\left(\frac{1.60-1.00}{1.00}\right)=60\%$.

Choice A is incorrect and may result from averaging the two wages before calculating the percentage change. Choice C is incorrect. This is the 1960 wage expressed as a percentage of the 1970 wage, not the percentage change between the two. Choice D is incorrect and may result from a calculation error.

Question Difficulty: Easy

Question ID 0ea56bb2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 0ea56bb2

Year	Subscriptions sold
2012	5,600
2013	5,880

The manager of an online news service received the report above on the number of subscriptions sold by the service. The manager estimated that the percent increase from 2012 to 2013 would be double the percent increase from 2013 to 2014. How many subscriptions did the manager expect would be sold in 2014?

A. 6,020

B. 6,027

C. 6,440

D. 6,468

ID: 0ea56bb2 Answer

Correct Answer: B

Rationale

Choice B is correct. The percent increase from 2012 to 2013 was $\frac{5{,}880-5{,}600}{5{,}600}=0.05$, or 5%. Since the percent increase from 2012 to 2013 was estimated to be double the percent increase from 2013 to 2014, the percent increase from 2013 to 2014 was expected to be 2.5%.
Therefore, the number of subscriptions sold in 2014 is expected to be the number of subscriptions sold in 2013 multiplied by $(1+0.025)$, or $5{,}880(1.025)=6{,}027$.

Choice A is incorrect and is the result of adding half of the value of the increase from 2012 to 2013 to the 2013 result. Choice C is incorrect and is the result adding twice the value of the increase from 2012 to 2013 to the 2013 result. Choice D is incorrect and is the result of interpreting the percent increase from 2013 to 2014 as double the percent increase from 2012 to 2013.

Question Difficulty: Hard

Question ID 8e528129

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 8e528129

Pure beeswax has a density of 0.555 ounce per cubic inch. An online company sells pure beeswax at a price of $8.00 per ounce. What is the selling price, in dollars per cubic inch, for pure beeswax purchased from this company?

ID: 8e528129 Answer

Rationale

The correct answer is 4.44. The selling price, in dollars per cubic inch, is found by multiplying the density, in ounces per cubic inch, by the unit price, in dollars per ounce: $\left(\frac{0.555 \text{ ounce}}{1 \text{ cubic inch}}\right)\left(\frac{\$8.00}{1 \text{ ounce}}\right)$ yields $\frac{\$4.44}{1 \text{ cubic inch}}$. Thus, the selling price, in dollars per cubic inch, is 4.44.

Question Difficulty: Medium

Question ID 15617f62

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 15617f62

The population density of Worthington is 290 people per square mile. Worthington has a population of $92{,}800$ people. What is the area, in square miles, of Worthington?

A. $102{,}400$

B. $93{,}090$

C. 320

D. 32

ID: 15617f62 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the population density of Worthington is 290 people per square mile and Worthington has a population of $92{,}800$ people. Therefore, the area of Worthington is $92{,}800 \text{ people} \left(\frac{1 \text{ square mile}}{290 \text{ people}} \right)$, which is equivalent to $\frac{92{,}800 \text{ square miles}}{290}$, or 320 square miles.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

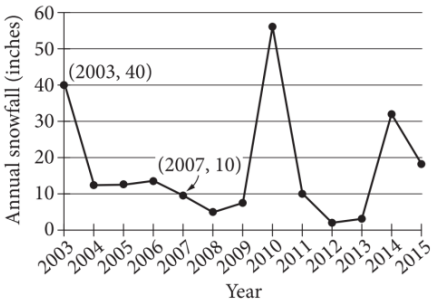
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 0231050d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 0231050d



The line graph shows the total amount of snow, in inches, recorded each year in Washington, DC, from 2003 to 2015. If $p\%$ is the percent decrease in the annual snowfall from 2003 to 2007, what is the value of p ?

ID: 0231050d Answer

Rationale

The correct answer is 75. The percent decrease between two values is found by dividing the difference between the two values by the original value and multiplying by 100. The line graph shows that the annual snowfall in 2003 was 40 inches, and the annual snowfall in 2007 was 10 inches. Therefore, the percent decrease in the annual snowfall from 2003 to 2007 is $\left(\frac{40-10}{40}\right)(100)$, or 75. It's given that this is equivalent to $p\%$, so the value of p is 75.

Question Difficulty: Hard

Question ID 8736334b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 8736334b

Data set A: 72,73,73,76,76

Data set B: 61,64,74,85,x

Data set A and data set B each contain 5 numbers. If the mean of data set A is equal to the mean of data set B, what is the value of x ?

A. 77

B. 85

C. 86

D. 95

ID: 8736334b Answer

Correct Answer: C

Rationale

Choice C is correct. The mean of a data set is found by dividing the sum of the values in the data set by the number of values in the data set. Therefore, the mean of data set A is $\frac{72+73+73+76+76}{5}$, which simplifies to 74. The mean of data set B is represented by the equation $\frac{61+64+74+85+x}{5}$, or $\frac{284+x}{5}$. It's given that the mean of data set A is equal to the mean of data set B. Therefore, the equation $74=\frac{284+x}{5}$ can be used to solve for x. Multiplying both sides of this equation by 5 yields $370=284+x$. Subtracting 284 from both sides of this equation yields $86=x$.

Choices A, B, and D are incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID be35c117

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: be35c117

A wind turbine completes 900 revolutions in 50 minutes. At this rate, how many revolutions per minute does this turbine complete?

A. 18

B. 850

C. 950

D. $1{,}400$

ID: be35c117 Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing the number of revolutions by the number of minutes gives the number of revolutions the turbine completes per minute. It's given that the wind turbine completes 900 revolutions in 50 minutes. Therefore, at this rate, this turbine completes $\frac{900}{50}$, or 18, revolutions per minute.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c88e0663

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: c88e0663

For a school fund-raiser, 10 students sold a total of 90 boxes of cookies. Which of the following can be calculated from this information?

A. The average number of boxes sold per student

B. The median number of boxes sold per student

C. The greatest number of boxes sold by one student

D. The least number of boxes sold by one student

ID: c88e0663 Answer

Correct Answer: A

Rationale

Choice A is correct. The average can be found by dividing the total number of boxes sold by the number of students, which is $\frac{90}{10}=9$.

Choices B, C, and D are incorrect. Each results from choosing measures that require the results of individual students, which are not given.

Question Difficulty: Easy

Question ID 3f2ee20a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 3f2ee20a

The results of two independent surveys are shown in the table below.

Men's Height

Group	Sample size	Mean (centimeters)	Standard deviation (centimeters)
A	2,500	186	12.5
B	2,500	186	19.1

Which statement is true based on the table?

A. The Group A data set was identical to the Group B data set.

B. Group B contained the tallest participant.

C. The heights of the men in Group B had a larger spread than the heights of the men in Group A.

D. The median height of Group B is larger than the median height of Group A.

ID: 3f2ee20a Answer

Correct Answer: C

Rationale

Choice C is correct. Standard deviation is a measure of spread, so data sets with larger standard deviations tend to have larger spread. The standard deviation of the heights of the men in Group B is larger than the standard deviation of the heights of the men in Group A. Therefore, the heights of the men in Group B had a larger spread than the heights of the men in Group A.

Choice A is incorrect. If two data sets are identical, they will have equivalent means and equivalent standard deviations. Since the two data sets have different standard deviations, they cannot be identical. Choice B is incorrect. Without knowing the maximum value for each data set, it's impossible to know which group contained the tallest participant. Choice D is incorrect. Since the means of the two groups are equivalent, the medians could also be the same or could be different, but it's impossible to tell from the given information.

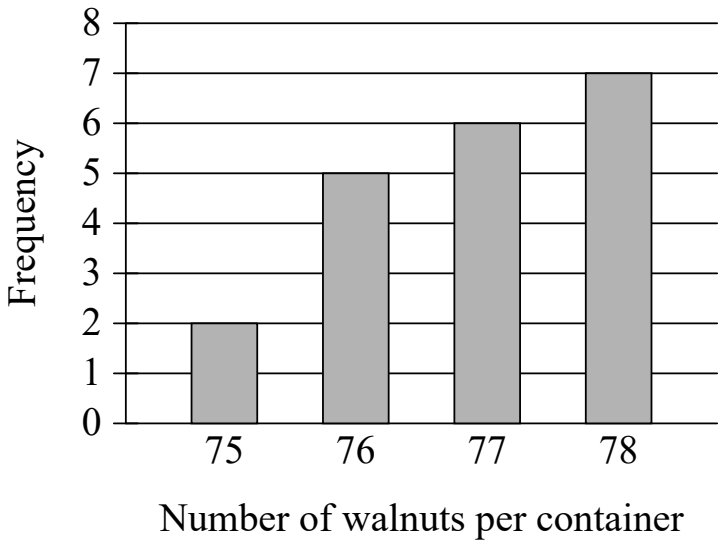
Question Difficulty: Medium

Question ID fe6a49d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: fe6a49d6

The bar graph shows the distribution of the number of walnuts per container for 20 containers at a grocery store.



How many of these containers of walnuts contain exactly 78 walnuts?

A. 2

B. 7

C. 20

D. 78

ID: fe6a49d6 Answer

Correct Answer: B

Rationale

Choice B is correct. The height of each bar in the graph shown represents the number of containers that contain the number of walnuts specified at the bottom of the bar. The bar for 78 walnuts has a height of 7. Therefore, 7 of these containers of walnuts contain exactly 78 walnuts.

Choice A is incorrect. This is the number of containers that contain exactly 75 walnuts, not 78 walnuts.

Choice C is incorrect. This is the total number of containers of walnuts represented in the bar graph, not the number that contain exactly 78 walnuts.

Choice D is incorrect. This is the number of walnuts in a container that contains exactly 78 walnuts, not the number of containers that contain exactly 78 walnuts.

Question Difficulty: Easy

Question ID d0efc1dd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: d0efc1dd

15, 14, 18, 17, *x*

The mean and the median of the five numbers above are equal. Which of the following is NOT a possible value of *x* ?

A. 6

B. 11

C. 16

D. 21

ID: d0efc1dd Answer

Correct Answer: A

Rationale

Choice A is correct. If x is 6, then the five numbers in the given list are 15, 14, 18, 17, 6. The mean of these five numbers is the sum of all the values divided by the number of values, or $\frac{15+14+18+17+6}{5}=\frac{70}{5}=14$. The median of these five numbers can be found by ordering the numbers from least to greatest and determining the middle value. When ordered from least to greatest, the numbers in the given list are 6, 14, 15, 17, 18, and the middle value is 15. Since the mean is 14 and the median is 15, the mean and median aren't equal when x is 6.

Choices B, C, and D are incorrect. If any of these values is substituted for x, the mean and median of the data set would be equal.

Question Difficulty: Medium

Question ID e9fb7774

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: e9fb7774

What percentage of 300 is 75?

A. 25%

B. 50%

C. 75%

D. 225%

ID: e9fb7774 Answer

Correct Answer: A

Rationale

Choice A is correct. Let x represent the percentage of 300 that is 75. This can be written as $\frac{x}{100}(300) = 75$, or $3x = 75$. Dividing both sides of this equation by 3 yields $x = 25$. Therefore, 25% of 300 is 75.

Choice B is incorrect. 50% of 300 is 150, not 75. Choice C is incorrect. 75% of 300 is 225, not 75.

Choice D is incorrect. 225% of 300 is 675, not 75.

Question Difficulty: Easy

Question ID 190be2fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 190be2fc

Data set A consists of 10 positive integers less than 60. The list shown gives 9 of the integers from data set A.

$43, 45, 44, 43, 38, 39, 40, 46, 40$

The mean of these 9 integers is 42. If the mean of data set A is an integer that is greater than 42, what is the value of the largest integer from data set A?

ID: 190be2fc Answer

Correct Answer: 52

Rationale

The correct answer is 52. The mean of a data set is calculated by dividing the sum of the data values by the number of values. It's given that data set A consists of 10 values, 9 of which are shown. Let x represent the 10th data value in data set A, which isn't shown. The mean of data set A can be found using the expression $\frac{43+45+44+43+38+39+40+46+40+x}{10}$, or $\frac{378+x}{10}$. It's given that the mean of the 9 values shown is 42 and that the mean of all 10 numbers is greater than 42. Consequently, the 10th data value, x, is larger than 42. It's also given that the data values in data set A are positive integers less than 60. Thus, $42 < x < 60$. Finally, it's given that the mean of data set A is an integer. This means that the sum of the 10 data values, $378 + x$, is divisible by 10. Thus, $378 + x$ must have a ones digit of 0. It follows that x must have a ones digit of 2. Since $42 < x < 60$ and x has a ones digit of 2, the only possible value of x is 52. Since 52 is larger than any of the integers shown, the largest integer from data set A is 52.

Question Difficulty: Hard

Question ID 3f236a64

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 3f236a64

x	y
1	4
3	12
5	20
40	k

In the table above, the ratio of y to x for each ordered pair is constant. What is the value of k ?

A. 28

B. 36

C. 80

D. 160

ID: 3f236a64 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the ratio of y to x is constant for each ordered pair in the table, the first row can be used to determine that the ratio of y to x is 4 to 1. The proportion $\frac{4}{1} = \frac{k}{40}$ can be used to solve for k. Multiplying each side of the equation by 40 yields $160 = k$.

Choice A is incorrect. This is the value of y when the value of x is 7, not 40. Choice B is incorrect and may result from subtracting 4 from 40 instead of multiplying 40 by 4. Choice C is incorrect and may result from incorrectly setting up the proportion.

Question Difficulty: Easy

Question ID 8705ecba

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 8705ecba

The cost of a certain shirt is $20 before a 5% sales tax is added. What is the total cost, including sales tax, to purchase the shirt?

A. $20.05

B. $20.50

C. $21.00

D. $25.00

ID: 8705ecba Answer

Correct Answer: C

Rationale

Choice C is correct. The total cost to purchase the shirt is the $20 cost of the shirt plus the 5% sales tax. The value of the 5% sales tax on the $20 shirt is equivalent to $(0.05)(\$20)$, or $1. Therefore, the total cost to purchase the shirt is $\$20 + \$1$, or $21.

Choice A is incorrect and may result from neglecting to multiply by $20 when finding the value of the sales tax. Choice B is incorrect and may result from dividing by 10, instead of by 100, and then neglecting to multiply by $20 when finding the sales tax. Choice D is incorrect and may result from interpreting the sales tax of 5% as $5.

Question Difficulty: Easy

Question ID da9ffcf6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: da9ffcf6

The ratio of the length of line segment XY to the length of line segment ZV is 6 to 1. If the length of line segment XY is 102 inches, what is the length, in inches, of line segment ZV?

A. 17

B. 96

C. 102

D. 612

ID: da9ffcf6 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the ratio of the length of line segment XY to the length of line segment ZV is 6 to 1, which means $\frac{XY}{ZV} = \frac{6}{1}$. It's given that the length of line segment XY is 102 inches. If the length, in inches, of line segment ZV is represented by ℓ, the value of ℓ can be calculated by solving the equation $\frac{102}{\ell} = \frac{6}{1}$, or $\frac{102}{\ell} = 6$. Multiplying each side of this equation by ℓ yields $102 = 6\ell$. Dividing each side of this equation by 6 yields $17 = \ell$. Therefore, the length of line segment ZV is 17 inches.

Choice B is incorrect. This is the length, in inches, of line segment ZV if the length of line segment XY is 576, not 102, inches.

Choice C is incorrect. This is the length, in inches, of line segment XY, not line segment ZV.

Choice D is incorrect. This is the length, in inches, of line segment ZV if the ratio of the length of line segment XY to the length of line segment ZV is 1 to 6, not 6 to 1.

Question Difficulty: Easy

Question ID 707db2d3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 707db2d3

For the finale of a TV show, viewers could use either social media or a text message to vote for their favorite of two contestants. The contestant receiving more than 50% of the vote won. An estimated 10% of the viewers voted, and 30% of the votes were cast on social media. Contestant 2 earned 70% of the votes cast using social media and 40% of the votes cast using a text message. Based on this information, which of the following is an accurate conclusion?

A. If all viewers had voted, Contestant 2 would have won.

B. Viewers voting by social media were likely to be younger than viewers voting by text message.

C. If all viewers who voted had voted by social media instead of by text message, Contestant 2 would have won.

D. Viewers voting by social media were more likely to prefer Contestant 2 than were viewers voting by text message.

ID: 707db2d3 Answer

Correct Answer: D

Rationale

Choice D is correct. It is given that Contestant 2 earned 70% of the votes cast using social media and 40% of the votes cast using a text message. Based on this information, viewers voting by social media were more likely to prefer Contestant 2 than were viewers voting by text message.

Choices A, B, and C are incorrect. There is not enough information about the viewers to reach these conclusions.

Question Difficulty: Medium

Question ID c178d4da

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: c178d4da

Value	Data set A frequency	Data set B frequency
30	2	9
34	4	7
38	5	5
42	7	4
46	9	2

Data set A and data set B each consist of 27 values. The table shows the frequencies of the values for each data set. Which of the following statements best compares the means of the two data sets?

A. The mean of data set A is greater than the mean of data set B.

B. The mean of data set A is less than the mean of data set B.

C. The mean of data set A is equal to the mean of data set B.

D. There is not enough information to compare the means of the data sets.

ID: c178d4da Answer

Correct Answer: A

Rationale

Choice A is correct. The mean value of a data set is the sum of the values of the data set divided by the number of values in the data set. When a data set is represented in a frequency table, the sum of the values in the data set is the sum of the products of each value and its frequency. For data set A, the sum of products of each value and its frequency is $30(2) + 34(4) + 38(5) + 42(7) + 46(9)$, or $1{,}094$. It's given that there are 27 values in data set A. Therefore, the mean of data set A is $\frac{1{,}094}{27}$, or approximately 40.52. Similarly, the mean of data B is $\frac{958}{27}$, or approximately 35.48. Therefore, the mean of data set A is greater than the mean of data set B.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 457d2f2c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 457d2f2c

A data set of 27 different numbers has a mean of 33 and a median of 33. A new data set is created by adding 7 to each number in the original data set that is greater than the median and subtracting 7 from each number in the original data set that is less than the median. Which of the following measures does NOT have the same value in both the original and new data sets?

A. Median

B. Mean

C. Sum of the numbers

D. Standard deviation

ID: 457d2f2c Answer

Correct Answer: D

Rationale

Choice D is correct. When a data set has an odd number of elements, the median can be found by ordering the values from least to greatest and determining the middle value. Out of the 27 different numbers in this data set, 13 numbers are below the median, one number is exactly 33, and 13 numbers are above the median. When 7 is subtracted from each number below the median and added to each number above the median, the data spread out from the median. Since the median of this data set, 33, is equivalent to the mean of the data set, the data also spread out from the mean. Since standard deviation is a measure of how spread out the data are from the mean, a greater spread from the mean indicates an increased standard deviation.

Choice A is incorrect. All the numbers less than the median decrease and all the numbers greater than the median increase, but the median itself doesn't change. Choices B and C are incorrect. The mean of a data set is found by dividing the sum of the values by the number of values. The net change from subtracting 7 from 13 numbers and adding 7 to 13 numbers is zero. Therefore, neither the mean nor the sum of the numbers changes.

Question Difficulty: Hard

Question ID c9fb15ad

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: c9fb15ad

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees. If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

A. 1.0

B. 1.2

C. 1.3

D. 1.4

ID: c9fb15ad Answer

Correct Answer: C

Rationale

Choice C is correct. According to the given information, multiplying a tree species' growth factor by the tree's diameter is a method to approximate the age of the tree. A white birch with a diameter of 12 inches (or 1 foot) has a given growth factor of 5 and is approximately 60 years old. A pin oak with a diameter of 12 inches (or 1 foot) has a given growth factor of 3 and is approximately 36 years old. The diameters of the two trees 10 years from now can be found by dividing each tree's age in 10 years, 70 years, and 46 years, by its respective growth factor. This yields 14 inches and $15\frac{1}{3}$ inches. The difference between $15\frac{1}{3}$ and 14 is $1\frac{1}{3}$, or approximately 1.3 inches.

Alternate approach: Since a white birch has a growth factor of 5, the age increases at a rate of 5 years per inch or, equivalently, the diameter increases at a rate of $\frac{1}{5}$ of an inch per year. Likewise, the pin oak has a growth factor of 3, so its diameter increases at a rate of $\frac{1}{3}$ of an inch per year. Thus, the pin oak grows $\frac{2}{15}$ of an inch per year more than the white birch. In 10 years it will grow $\left(\frac{2}{15}\right)10 = \frac{4}{3}$ of an inch more, which is approximately 1.3 inches.

Choices A, B, and D are incorrect and a result of incorrectly calculating the diameters of the two trees in 10 years.

Question Difficulty: Hard

Question ID 6310adbc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 6310adbc

The ratio of t to u is 1 to 2, and $t = 10$.

What is the value of u?

A. 2

B. 5

C. 10

D. 20

ID: 6310adbc Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the ratio of t to u is 1 to 2. Since $t = 10$, it follows that the ratio of 10 to u is also 1 to 2. The relationship between these ratios can be represented by the proportion $\frac{10}{u} = \frac{1}{2}$. Multiplying both sides of this equation by 2 and then by u yields $20 = u$.

Choice A is incorrect. This is the value of u when $t = 1$. Choice B is incorrect. This would be the value of u if the ratio of t to u were 2 to 1. Choice C is incorrect. This is the value of t, not u.

Question Difficulty: Easy

Question ID 63573fea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 63573fea

During the first month of sales, a company sold 1,300,000 units of a certain type of smartphone. During the same month, 15% of the units sold were returned. If sales and the return rate remain the same for each of the next 5 months, about how many units of this smartphone will be returned to the company during this 6-month period?

A. 195,000

B. 975,000

C. 1,170,000

D. 6,630,000

ID: 63573fea Answer

Correct Answer: C

Rationale

Choice C is correct. Of the 1,300,000 units sold during the first month, 15% were returned, so $(1{,}300{,}000)(0.15) = 195{,}000$ units were returned during the first month. If the units were sold and returned at the same rate for the next 5 months, then a total of $(195{,}000)(6) = 1{,}170{,}000$ smartphone units were returned during the 6-month period.

Choice A is incorrect. This is the number of units that were returned in 1 month. Choice B is incorrect. This is the number of units that were returned in 5 months. Choice D is incorrect. This is the number of units sold and not returned during the first 6 months.

Question Difficulty: Medium

Question ID 191d167b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 191d167b

Last year, 200 students enrolled in an interior design program. This year, the number of students enrolled is 147% of last year's number. How many students are enrolled in the interior design program this year?

A. 247

B. 294

C. 347

D. 394

ID: 191d167b Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the number of students enrolled in an interior design program this year is 147% of last year's number, which is 200. 147% of 200 can be expressed as $\left(\frac{147}{100}\right)(200)$, or $(1.47)(200)$, which is equivalent to 294. Therefore, 294 students are enrolled in the interior design program this year.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID c3d65f93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: c3d65f93

Five *Eretmochelys imbricata*, a type of sea turtle, each have a nest. The table shows an original data set of the number of eggs that each turtle laid in its nest.

Nest	Number of eggs
A	149
B	144
C	148
D	136
E	139

A sixth nest with 121 eggs is added to create a new data set. Which of the following correctly compares the means of the two data sets?

A. The mean of the original data set is greater than the mean of the new data set.

B. The mean of the original data set is less than the mean of the new data set.

C. The means of both data sets are equal.

D. There is not enough information to compare the means.

ID: c3d65f93 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the table shows an original data set of 5 values. It's also given that a sixth value is added to create a new data set. The new data set consists of the 5 values in the original data set and one additional value, 121. Since the additional value, 121, is less than any value in the original data set, the mean of the original data set is greater than the mean of the new data set.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 93724cc6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 93724cc6

21 is 21% of what number?

A. 0

B. 1

C. 42

D. 100

ID: 93724cc6 Answer

Correct Answer: D

Rationale

Choice D is correct. Let x represent the number that 21 is 21% of. It follows that $\frac{21}{x} = \frac{21}{100}$. Multiplying each side of this equation by x yields $21 = \frac{21x}{100}$. Multiplying each side of this equation by 100 yields $2{,}100 = 21x$. Dividing each side of this equation by 21 yields $100 = x$. Therefore, 21 is 21% of 100.

Choice A is incorrect. 21% of 0 is 0, not 21. Choice B is incorrect. 21% of 1 is 0.21, not 21.

Choice C is incorrect. 21% of 42 is 8.82, not 21.

Question Difficulty: Easy

Question ID 2d16d62c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 2d16d62c

A special camera is used for underwater ocean research. When the camera is at a depth of 58 fathoms, what is the camera's depth in feet? $(1 \text{ fathom} = 6 \text{ feet})$

ID: 2d16d62c Answer

Correct Answer: 348

Rationale

The correct answer is 348. It's given that 1 fathom is equivalent to 6 feet. Therefore, 58 fathoms is equivalent to $(58 \text{ fathoms})\left(\frac{6 \text{ feet}}{1 \text{ fathom}}\right)$, or 348 feet. Thus, when the camera is at a depth of 58 fathoms, the camera's depth, in feet, is 348.

Question Difficulty: Easy

Question ID 69f6717f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 69f6717f

A sample of oak has a density of 807 kilograms per cubic meter. The sample is in the shape of a cube, where each edge has a length of 0.90 meters. To the nearest whole number, what is the mass, in kilograms, of this sample?

A. 588

B. 726

C. 897

D. $1{,}107$

ID: 69f6717f Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the sample is in the shape of a cube with edge lengths of 0.9 meters. Therefore, the volume of the sample is 0.90^3, or 0.729, cubic meters. It's also given that the sample has a density of 807 kilograms per 1 cubic meter. Therefore, the mass of this sample is $0.729 \text{ cubic meters} \left(\frac{807 \text{ kilograms}}{1 \text{ cubic meter}} \right)$, or 588.303 kilograms. Rounding this mass to the nearest whole number gives 588 kilograms. Therefore, to the nearest whole number, the mass, in kilograms, of this sample is 588.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 35bec412

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 35bec412

73, 74, 75, 77, 79, 82, 84, 85, 91 What is the median of the data shown?

ID: 35bec412 Answer

Correct Answer: 79

Rationale

The correct answer is 79. The median of a data set with an odd number of values is the middle value of the set when the values are ordered from least to greatest. Because the given data set consists of nine values that are ordered from least to greatest, the median is the fifth value in the data set. Therefore, the median of the data shown is 79.

Question Difficulty: Easy

Question ID c3d78831

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: c3d78831

At a particular track meet, the ratio of coaches to athletes is 1 to 26. If there are x coaches at the track meet, which of the following expressions represents the number of athletes at the track meet?

A. $\frac{x}{26}$

B. $26x$

C. $x + 26$

D. $\frac{26}{x}$

ID: c3d78831 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that at a particular track meet, the ratio of coaches to athletes is 1 to 26. If one number in a ratio is multiplied by a value, the other number must be multiplied by the same value in order to maintain the same ratio. If there are x coaches at the track meet, multiplying both numbers in the ratio by x yields $1(x)$ to $26(x)$, or x to $26x$. Therefore, the expression $26x$ represents the number of athletes at the track meet.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID fea831fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: fea831fc

On April 18, 1775, Paul Revere set off on his midnight ride from Charlestown to Lexington. If he had ridden straight to Lexington without stopping, he would have traveled 11 miles in 26 minutes. In such a ride, what would the average speed of his horse have been, to the nearest tenth of a mile per hour?

ID: fea831fc Answer

Rationale

The correct answer is 25.4. The average speed is the total distance divided by the total time. The total distance is 11 miles and the total time is 26 minutes. Thus, the average speed is $\frac{11}{26}$ miles per minute. The question asks for the average speed in miles per hour, and there are 60 minutes in an hour; converting miles per minute to miles per hour gives the following:

$$\text{Average speed} = \frac{11 \text{ miles}}{26 \text{ minutes}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = \frac{660}{26} \text{ miles per hour} \approx 25.38 \text{ miles per hour}$$

Therefore, to the nearest tenth of a mile per hour, the average speed of Paul Revere's ride would have been 25.4 miles per hour. Note that 25.4 and 127/5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID aeeaec96

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: aeeaec96

How many yards are equivalent to 612 inches? $(1\text{ yard} = 36\text{ inches})$

A. 0.059

B. 17

C. 576

D. $22{,}032$

ID: aeeaec96 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that $1\text{ yard} = 36\text{ inches}$. Therefore, 612 inches is equivalent to $612\text{ inches}\left(\frac{1\text{ yard}}{36\text{ inches}}\right)$, which can be rewritten as $\frac{612\text{ yards}}{36}$, or 17 yards.

Choice A is incorrect. This is the number of yards that are equivalent to 2.124 inches.

Choice C is incorrect. This is the number of yards that are equivalent to $20{,}736$ inches.

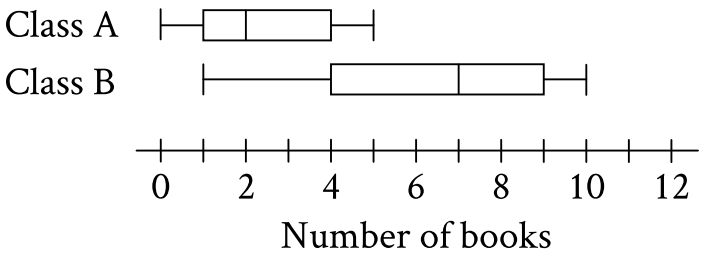
Choice D is incorrect. This is the number of yards that are equivalent to $793{,}152$ inches.

Question Difficulty: Easy

Question ID 6c9444cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 6c9444cd



The two box plots show the distribution of number of books read over the summer by the students in two different English classes. What is the positive difference between the ranges of number of books read over the summer for the two classes?

ID: 6c9444cd Answer

Correct Answer: 4

Rationale

The correct answer is 4. It's given that the two boxplots show the distribution of number of books read over the summer by the students in two different English classes. In a boxplot, the first vertical line represents the minimum value of the data set and the last vertical line represents the maximum value of the data set. The range of a data set is the difference between its maximum value and its minimum value. In class A, the maximum number of books read is 5 and the minimum number of books read is 0. The difference between those values is $5 - 0$, or 5. Therefore, the range of the number of books read in class A is 5. In class B, the maximum number of books read is 10 and the minimum number of books read is 1. The difference between those values is $10 - 1$, or 9. Therefore, the range of the number of books read in class B is 9. To find the positive difference between the ranges of the number of books read for the two classes, the smaller range must be subtracted from the larger range. Therefore, the positive difference between the ranges of number of books read over the summer for the two classes is $9 - 5$, or 4.

Question Difficulty: Hard

Question ID d693f563

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: d693f563

Last year, Cedric had 35 plants in his garden. This year, the number of plants in Cedric's garden is 60% greater than the number of plants in his garden last year. How many plants does Cedric have in his garden this year?

ID: d693f563 Answer

Correct Answer: 56

Rationale

The correct answer is 56. It's given that Cedric had 35 plants in his garden last year and that the number of plants in Cedric's garden this year is 60% greater than the number of plants in his garden last year. It follows that the number of plants in Cedric's garden this year is 35 plus 60% of 35, which is equal to $35 + 35\left(\frac{60}{100}\right)$, or $35 + 35(0.6)$. This expression is equivalent to $35 + 21$, or 56. Therefore, Cedric has 56 plants in his garden this year.

Question Difficulty: Medium

Question ID 07f2829b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 07f2829b

International Tourist Arrivals, in millions

Country	2012	2013
France	83.0	84.7
United States	66.7	69.8
Spain	57.5	60.7
China	57.7	55.7
Italy	46.4	47.7
Turkey	35.7	37.8
Germany	30.4	31.5
United Kingdom	26.3	32.2
Russia	24.7	28.4

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2012 and 2013. Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2013 than the median number in 2012, to the nearest tenth of a million?

ID: 07f2829b Answer

Rationale

The correct answer is 1.3. The median number of tourists is found by ordering the number of tourists from least to greatest and determining the middle value from this list. When the number of tourists in 2012 is ordered from least to greatest, the middle value, or the fifth number, is 46.4 million. When the number of tourists in 2013 is ordered from least to greatest, the middle value, or the fifth number, is 47.7 million. The difference between these two medians is $47.7 \text{ million} - 46.4 \text{ million} = 1.3 \text{ million}$. Note that 1.3 and 13/10 are examples of ways to enter a correct answer.

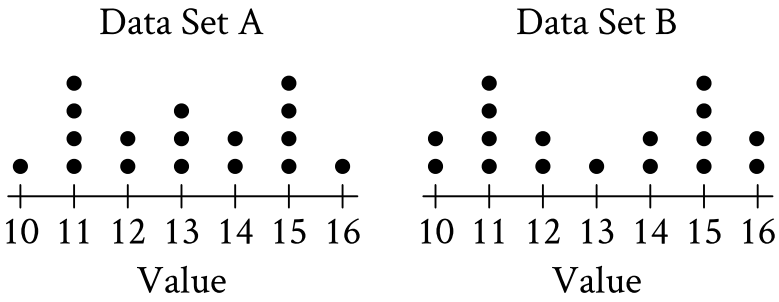
Question Difficulty: Medium

Question ID d65b9a87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: d65b9a87

The dot plots represent the distributions of values in data sets A and B.



Which of the following statements must be true?

The median of data set A is equal to the median of data set B.

The standard deviation of data set A is equal to the standard deviation of data set B.

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: d65b9a87 Answer

Correct Answer: A

Rationale

Choice A is correct. The median of a data set with an odd number of values that are in ascending or descending order is the middle value of the data set. Since the distribution of the values of both data set A and data set B form symmetric dot plots, and each data set has an odd number of values, it follows that the median is given by the middle value in each of the dot plots. Thus, the median of data set A is 13, and the median of data set B is 13. Therefore, statement I is true. Data set A and data set B have the same frequency for each of the values 11, 12, 14, and 15. Data set A has a frequency of 1 for values 10 and 16, whereas data set B has a frequency of 2 for values 10 and 16. Standard deviation is a measure of the spread of a data set; it is larger when there are more values further from the mean, and smaller when there are more values closer to the mean. Since both distributions are symmetric with an odd number of values, the mean of each data set is equal to its median. Thus, each data set has a mean of 13. Since more of the values in data set A are closer to 13 than data set B, it follows that data set A has a smaller standard deviation than data set B. Thus, statement II is false. Therefore, only statement I must be true.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID bb7c8186

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: bb7c8186

What is 23% of 100?

A. 23

B. 46

C. 77

D. 123

ID: bb7c8186 Answer

Correct Answer: A

Rationale

Choice A is correct. 23% of 100 can be calculated by multiplying $\frac{23}{100}$ by 100, which yields $\left(\frac{23}{100}\right)100$, or 23.

Choice B is incorrect. This is 46%, not 23%, of 100. Choice C is incorrect. This is 23% less than 100, not 23% of 100.

Choice D is incorrect. This is 23% greater than 100, not 23% of 100.

Question Difficulty: Easy

Question ID 181cc4d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 181cc4d6

Rectangle *A* has length 15 and width *w*. Rectangle *B* has length 20 and the same length-to-width ratio as rectangle *A*. What is the width of rectangle *B* in terms of *w* ?

A. $\frac{4}{3}w$

B. $w+5$

C. $\frac{3}{4}w$

D. $w-5$

ID: 181cc4d6 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that rectangle A has length 15 and width w. Therefore, the length-to-width ratio of rectangle A is 15 to w. It's also given that rectangle B has length 20 and the same length-to-width ratio as rectangle A. Let x represent the width of rectangle B. The proportion $\frac{15}{w}=\frac{20}{x}$ can be used to solve for x in terms of w. Multiplying both sides of this equation by x yields $\frac{15x}{w}=20$, and then multiplying both sides of this equation by w yields $15x=20w$. Dividing both sides of this equation by 15 yields $x=\frac{20w}{15}$. Simplifying this fraction yields $x=\frac{4}{3}w$.

Choices B and D are incorrect and may result from interpreting the difference in the lengths of rectangle A and rectangle B as equivalent to the difference in the widths of rectangle A and rectangle B. Choice C is incorrect and may result from using a length-to-width ratio of w to 15, instead of 15 to w.

Question Difficulty: Medium

Question ID e9841407

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: e9841407

Shaquan has 7 red cards and 28 blue cards. What is the ratio of red cards to blue cards that Shaquan has?

A. 1 to 4

B. 4 to 1

C. 1 to 7

D. 7 to 1

ID: e9841407 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that Shaquan has 7 red cards and 28 blue cards. Therefore, the ratio of red cards to blue cards that Shaquan has is 7 to 28. This ratio can be reduced by dividing both parts of the ratio by 7, which yields the ratio 1 to 4.

Choice B is incorrect. This is the ratio of blue cards to red cards that Shaquan has. Choice C is incorrect and may result from a calculation error when reducing the ratio. Choice D is incorrect. This may result from finding the ratio of blue cards to red cards, or 28 to 7, and then making a calculation error when reducing the ratio.

Question Difficulty: Easy

Question ID 1fbd3b67

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 1fbd3b67

The number a is 190% greater than the number b. The number b is 80% less than 24. What is the value of a?

A. 9.12

B. 13.92

C. 26.40

D. 36.48

ID: 1fbd3b67 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the number b is 80% less than 24. It follows that b is equal to 24 minus 80% of 24, which can be written as $b = 24 - \left(\frac{80}{100}\right)24$. This is equivalent to $b = 24 - 0.8(24)$, or $b = 4.8$. It's also given that the number a is 190% greater than the number b. It follows that a is equal to b plus 190% of b. Since $b = 4.8$, this can be written as $a = 4.8 + \left(\frac{190}{100}\right)4.8$. This is equivalent to $a = 4.8 + 1.9(4.8)$, or $a = 13.92$.

Choice A is incorrect. This would be the value of a if a were 190% of b, not 190% greater than b.

Choice C is incorrect. This is $(190 - 80)\%$ of 24.

Choice D is incorrect. This would be the value of a if b were 80% of 24, not 80% less than 24, and a were 190% of b, not 190% greater than b.

Question Difficulty: Hard

Question ID 1b403590

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 1b403590

An object has a mass of 168 grams and a volume of 24 cubic centimeters. What is the density, in grams per cubic centimeter, of the object?

A. 7

B. 144

C. 192

D. $4{,}032$

ID: 1b403590 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the object has a mass of 168 grams and a volume of 24 cubic centimeters. Dividing the mass, in grams, of the object by the volume, in cubic centimeters, of the object gives the density, in grams per cubic centimeter, of the object. It follows that the density of the object is $\frac{168 \text{ grams}}{24 \text{ cubic centimeters}}$, which is equivalent to $\frac{168}{24}$ grams per cubic centimeter, or 7 grams per cubic centimeter.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID ecbdbe84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: ecbdbe84

The table shown summarizes the number of employees at each of the 17 restaurants in a town.

Number of employees	Number of restaurants
2 to 7	2
8 to 13	4
14 to 19	2
20 to 25	7
26 to 31	2

Which of the following could be the median number of employees for the restaurants in this town?

A. 2

B. 9

C. 15

D. 21

ID: ecbdbe84 Answer

Correct Answer: D

Rationale

Choice D is correct. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since the numbers of employees are given as ranges of values rather than specific values, it's only possible to determine the range in which the median falls, rather than the exact median. Since there are 17 restaurants included in the data set and the numbers of employees are listed in ascending order, it follows that the median number of employees will be represented by the ninth restaurant in the list. Since the first 2 restaurants each have 2 to 7 employees, numbers of employees in the 2 to 7 range would be represented by the first and second restaurants in the list. The next 4 restaurants each have 8 to 13 employees. Therefore, numbers of employees in the 8 to 13 range will be represented by the third through sixth restaurants in the list. The next 2 restaurants each have 14 to 19 employees. Therefore, numbers of employees in the 14 to 19 range will be represented by the seventh and eighth restaurants in the list. Since the next 7 restaurants each have 20 to 25 employees, numbers of employees in the 20 to 25 range will be represented by the ninth through fifteenth restaurants in the list. This means that the ninth restaurant in the list, which has the median number of employees for the restaurants in this town, has a number of employees in the 20 to 25 range. Of the given choices, the only number of employees in the 20 to 25 range is 21.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the position of the median in the list, not the value of the median.

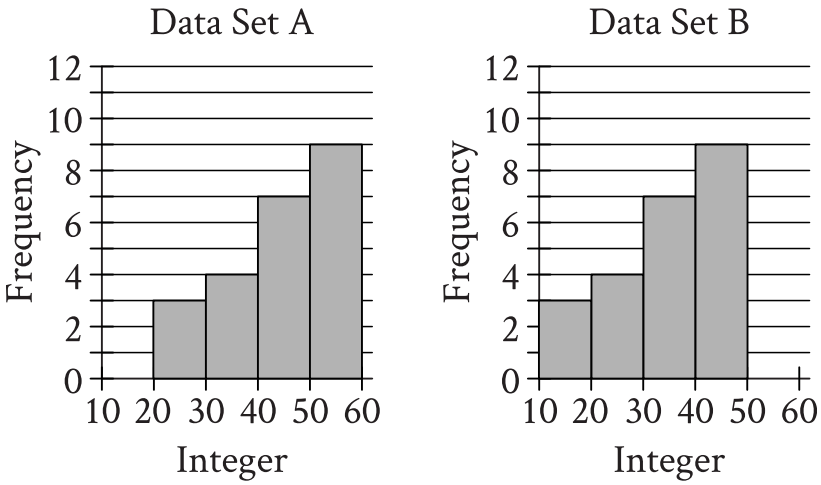
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID f8a322d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: f8a322d9



Two data sets of 23 integers each are summarized in the histograms shown. For each of the histograms, the first interval represents the frequency of integers greater than or equal to 10, but less than 20. The second interval represents the frequency of integers greater than or equal to 20, but less than 30, and so on. What is the smallest possible difference between the mean of data set A and the mean of data set B?

A. 0

B. 1

C. 10

D. 23

ID: f8a322d9 Answer

Correct Answer: B

Rationale

Choice B is correct. The histograms shown have the same shape, but data set A contains values between 20 and 60 and data set B contains values between 10 and 50. Thus, the mean of data set A is greater than the mean of data set B. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is the difference between the smallest possible mean of data set A and the greatest possible mean of data set B. In data set A, since there are 3 integers in the interval greater than or equal to 20 but less than 30, 4 integers greater than or equal to 30 but less than 40, 7 integers greater than or equal to 40 but less than 50, and 9 integers greater than or equal to 50 but less than 60, the smallest possible mean for data set A is $\frac{(3\cdot20)+(4\cdot30)+(7\cdot40)+(9\cdot50)}{23}$. In data set B, since there are 3 integers greater than or equal to 10 but less than 20, 4 integers greater than or equal to 20 but less than 30, 7 integers greater than or equal to 30 but less than 40, and 9 integers greater than or equal to 40 but less than 50, the largest possible mean for data set B is $\frac{(3\cdot19)+(4\cdot29)+(7\cdot39)+(9\cdot49)}{23}$. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is $\frac{(3\cdot20)+(4\cdot30)+(7\cdot40)+(9\cdot50)}{23} - \frac{(3\cdot19)+(4\cdot29)+(7\cdot39)+(9\cdot49)}{23}$, which is equivalent to $\frac{(3\cdot20)-(3\cdot19)+(4\cdot30)-(4\cdot29)+(7\cdot40)-(7\cdot39)+(9\cdot50)-(9\cdot49)}{23}$. This expression can be rewritten as $\frac{3(20-19)+4(30-29)+7(40-39)+9(50-49)}{23}$, or $\frac{23}{23}$, which is equal to 1. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is 1.

Choice A is incorrect. This is the smallest possible difference between the ranges, not the means, of the data sets.

Choice C is incorrect. This is the difference between the greatest possible mean, not the smallest possible mean, of data set A and the greatest possible mean of data set B.

Choice D is incorrect. This is the smallest possible difference between the sum of the values in data set A and the sum of the values in data set B, not the smallest possible difference between the means.

Question Difficulty: Hard

Question ID 7cab9fe1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 7cab9fe1

Which expression represents the result of increasing a positive quantity w by 43%?

A. $1.43w$

B. $0.57w$

C. $43w$

D. $0.43w$

ID: 7cab9fe1 Answer

Correct Answer: A

Rationale

Choice A is correct. The result of increasing a positive quantity w by $x\%$ can be represented by the expression $\left(1+\frac{x}{100}\right)w$. Therefore, the result of increasing a positive quantity w by 43% can be found by substituting 43 for x in the expression $\left(1+\frac{x}{100}\right)w$, which gives $\left(1+\frac{43}{100}\right)w$, or $1.43w$. Thus, the expression $1.43w$ represents the result of increasing a positive quantity w by 43%.

Choice B is incorrect. This is the result of decreasing a positive quantity w by 43%.

Choice C is incorrect. This is the result of increasing a positive quantity w by $4{,}200\%$.

Choice D is incorrect. This is the result of decreasing a positive quantity w by 57%.

Question Difficulty: Medium

Question ID 0700a2d5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 0700a2d5

How many yards are equivalent to 77 rods? $(5.5 \text{ yards} = 1 \text{ rod})$

ID: 0700a2d5 Answer

Correct Answer: 423.5, 847/2

Rationale

The correct answer is 423.5. It's given that $5.5 \text{ yards} = 1 \text{ rod}$. Therefore, 77 rods is equivalent to $(77 \text{ rods})\left(\frac{5.5 \text{ yards}}{1 \text{ rod}}\right)$, or 423.5 yards. Note that 423.5 and 847/2 are examples of ways to enter a correct answer.

Question Difficulty: Easy

Question ID 3638f413

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 3638f413

Jeremy deposited x dollars in his investment account on January 1, 2001. The amount of money in the account doubled each year until Jeremy had 480 dollars in his investment account on January 1, 2005. What is the value of x ?

ID: 3638f413 Answer

Rationale

The correct answer is 30. The situation can be represented by the equation $x(2^4) = 480$, where the 2 represents the fact that the amount of money in the account doubled each year and the 4 represents the fact that there are 4 years between January 1, 2001, and January 1, 2005. Simplifying $x(2^4) = 480$ gives $16x = 480$. Therefore, $x = 30$.

Question Difficulty: Hard

Question ID 12dae628

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 12dae628

$2, 9, 14, 23, 32$ What is the mean of the data shown?

A. 14

B. 16

C. 17

D. 32

ID: 12dae628 Answer

Correct Answer: B

Rationale

Choice B is correct. The mean of a set of data values is the sum of all the data values divided by the number of data values in the set. The sum of the data values shown is $2 + 9 + 14 + 23 + 32$, or 80. Since there are 5 data values in the set, the mean of the data shown is $\frac{80}{5}$, or 16.

Choice A is incorrect. This is the median, not the mean, of the data shown.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the maximum, not the mean, of the data shown.

Question Difficulty: Easy

Question ID 1142af44

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 1142af44

Value	Frequency
1	a
2	$2a$
3	$3a$
4	$2a$
5	a

The frequency distribution above summarizes a set of data, where a is a positive integer. How much greater is the mean of the set of data than the median?

A. 0

B. 1

C. 2

D. 3

ID: 1142af44 Answer

Correct Answer: A

Rationale

Choice A is correct. Since the frequencies of values less than the middle value, 3, are the same as the frequencies of the values greater than 3, the set of data has a symmetric distribution. When a set of data has a symmetric distribution, the mean and median values are equal. Therefore, the mean is 0 greater than the median.

Choices B, C, and D are incorrect and may result from misinterpreting the set of data.

Question Difficulty: Hard

Question ID 445dd032

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 445dd032

Tanya earns $13.50 per hour at her part-time job. When she works z hours, she earns $13.50z$ dollars. Which of the following expressions gives the amount, in dollars, Tanya will earn if she works $3z$ hours?

A. $3(13.50z)$

B. $3+13.50z$

C. $3z+13.50z$

D. $13.50(z+3)$

ID: 445dd032 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that when Tanya works z hours, she earns $13.50z$ dollars. Since her hourly rate is constant, if she works 3 times as many hours, or $3z$ hours, she will earn 3 times as many dollars, or $3(13.50z)$.

Choice B is incorrect. This expression represents adding 3 dollars to the $13.50z$ dollars Tanya will earn. Choice C is incorrect. This expression can be rewritten as $16.50z$, which implies that Tanya earns $16.50 per hour, not $13.50. Choice D is incorrect. This expression adds 3 to the number of hours Tanya works, rather than multiplying the hours she works by 3.

Question Difficulty: Medium

Question ID 651d83bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 651d83bb

Two different teams consisting of 10 members each ran in a race. Each member's completion time of the race was recorded. The mean of the completion times for each team was calculated and is shown below.

Team A: 3.41 minutes

Team B: 3.79 minutes

Which of the following MUST be true?

I. Every member of team A completed the race in less time than any member of team B.

II. The median time it took the members of team B to complete the race is greater than the median time it took the members of team A to complete the race.

III. There is at least one member of team B who took more time to complete the race than some member of team A.

A. III only

B. I and III only

C. II and III only

D. I, II, and III

ID: 651d83bb Answer

Correct Answer: A

Rationale

Choice A is correct. Since the average time for the 10 members of team A is 3.41 minutes, the sum of the 10 times for team A is equal to $(10)(3.41) = 34.1$ minutes. Since the average time for the 10 members of team B is 3.79 minutes, the sum of the 10 times for team B is equal to $(10)(3.79) = 37.9$ minutes. Since the sum of the 10 times for team B is greater than the sum of the 10 times for team A, it must be true that at least one of the times for team B must be greater than one of the times for team A. Thus, statement III is true. However, it's possible that at least some of the times for team A were greater than some of the times for team B. For example, all of team A's times could be 3.41 minutes, and team B could have 1 time of 3.34 minutes and 9 times of 3.84 minutes. Thus, statement I need not be true. It's also possible that the median of the times for team B is less than the median of the times for team A. For example, all of team A's times could be 3.41 minutes, and team B could have 6 times of 3.37 minutes and 4 times of 4.42 minutes; then the median of team B's times would be 3.37 minutes and the median of team A's times would be 3.41 minutes. Thus, statement II need not be true.

Choices B, C, and D are incorrect because neither statement I nor statement II must be true.

Question Difficulty: Hard

Question ID 121dc44f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 121dc44f

The population of City A increased by 7% from 2015 to 2016. If the 2016 population is k times the 2015 population, what is the value of k?

A. 0.07

B. 0.7

C. 1.07

D. 1.7

ID: 121dc44f Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the population of City A increased by 7% from 2015 to 2016. Therefore, the population of City A in 2016 includes 100% of the population of City A in 2015 plus an additional 7% of the population of City A in 2015. This means that the population of City A in 2016 is 107% of the population in 2015. Thus, the population of City A in 2016 is $\frac{107}{100}$, or 1.07, times the 2015 population. Therefore, the value of k is 1.07.

Choice A is incorrect. This would be the value of k if the population in 2016 was 7% of the population in 2015.

Choice B is incorrect. This would be the value of k if the population in 2016 was 70% of the population in 2015.

Choice D is incorrect. This would be the value of k if the population increased by 70%, not 7%, from 2015 to 2016.

Question Difficulty: Medium

Question ID 1e8ccffd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 1e8ccffd

The mean score of 8 players in a basketball game was 14.5 points. If the highest individual score is removed, the mean score of the remaining 7 players becomes 12 points. What was the highest score?

A. 20

B. 24

C. 32

D. 36

ID: 1e8ccffd Answer

Correct Answer: C

Rationale

Choice C is correct. If the mean score of 8 players is 14.5, then the total of all 8 scores is $14.5\times8=116$. If the mean of 7 scores is 12, then the total of all 7 scores is $12\times7=84$. Since the set of 7 scores was made by removing the highest score of the set of 8 scores, then the difference between the total of all 8 scores and the total of all 7 scores is equal to the removed score: $116-84=32$.

Choice A is incorrect because if 20 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5\times8)-20}{7}$ is approximately 13.71, not 12. Choice B is incorrect because if 24 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5\times8)-24}{7}$ is approximately 13.14, not 12. Choice D is incorrect because if 36 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5\times8)-36}{7}$ or approximately 11.43, not 12.

Question Difficulty: Hard

Question ID a29e89fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: a29e89fc

The list gives the mass, in grams, of 5 alpine marmots. $4{,}010$; $4{,}010$; $3{,}030$; $4{,}050$; $3{,}050$

What is the mean mass, in grams, of these 5 alpine marmots?

ID: a29e89fc Answer

Correct Answer: 3630

Rationale

The correct answer is $3{,}630$. The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. The sum of the masses, in grams, of these alpine marmots is $4{,}010 + 4{,}010 + 3{,}030 + 4{,}050 + 3{,}050$, or $18{,}150$ grams. The number of alpine marmots in the data set is 5. Therefore, the mean mass, in grams, of these 5 alpine marmots is $\frac{18{,}150}{5}$, or $3{,}630$.

Question Difficulty: Medium

Question ID fe1ec415

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: fe1ec415

A cherry pitting machine pits 12 pounds of cherries in 3 minutes. At this rate, how many minutes does it take the machine to pit 96 pounds of cherries?

A. 8

B. 15

C. 24

D. 36

ID: fe1ec415 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the cherry pitting machine pits 12 pounds of cherries in 3 minutes. This rate can be written as $\frac{12 \text{ pounds of cherries}}{3 \text{ minutes}}$. If the number of minutes it takes the machine to pit 96 pounds of cherries is represented by x, the value of x can be calculated by solving the equation $\frac{12 \text{ pounds of cherries}}{3 \text{ minutes}} = \frac{96 \text{ pounds of cherries}}{x \text{ minutes}}$, which can be rewritten as $\frac{12}{3} = \frac{96}{x}$, or $4 = \frac{96}{x}$. Multiplying each side of this equation by x yields $4x = 96$. Dividing each side of this equation by 4 yields $x = 24$. Therefore, it takes the machine 24 minutes to pit 96 pounds of cherries.

Choice A is incorrect. This is the number of minutes it takes the machine to pit 32, not 96, pounds of cherries.

Choice B is incorrect. This is the number of minutes it takes the machine to pit 60, not 96, pounds of cherries.

Choice D is incorrect. This is the number of minutes it takes the machine to pit 144, not 96, pounds of cherries.

Question Difficulty: Easy

Question ID ba62b0b0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: ba62b0b0

A kangaroo has a mass of 28 kilograms. What is the kangaroo's mass, in grams? $(1\ \text{kilogram} = 1{,}000\ \text{grams})$

A. $28{,}000$

B. $1{,}028$

C. 972

D. 784

ID: ba62b0b0 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a kangaroo has a mass of 28 kilograms and that 1 kilogram is equal to $1{,}000$ grams. Therefore, the kangaroo's mass, in grams, is $28\ \text{kilograms}\left(\frac{1{,}000\ \text{grams}}{1\ \text{kilogram}}\right)$, which is equivalent to $28{,}000$ grams.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

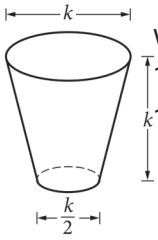
Question Difficulty: Easy

Question ID 939c46d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 939c46d1

Volume = $\frac{7\pi k^3}{48}$



The glass pictured above can hold a maximum volume of 473 cubic centimeters, which is approximately 16 fluid ounces. Jenny has a pitcher that contains 1 gallon of water. How many times could Jenny completely fill the glass with 1 gallon of water? (1 gallon = 128 fluid ounces)

A. 16

B. 8

C. 4

D. 3

ID: 939c46d1 Answer

Correct Answer: B

Rationale

Choice B is correct. It is given that the volume of the glass is approximately 16 fluid ounces. If Jenny has 1 gallon of water, which is 128 fluid ounces, she could fill the glass $\frac{128}{16} = 8$ times.

Choice A is incorrect because Jenny would need 16×16 fluid ounces = 256 fluid ounces, or 2 gallons, of water to fill the glass 16 times. Choice C is incorrect because Jenny would need only 4×16 fluid ounces = 64 fluid ounces of water to fill the glass 4 times. Choice D is incorrect because Jenny would need only 3×16 fluid ounces = 48 fluid ounces to fill the glass 3 times.

Question Difficulty: Medium

Question ID 29c177e6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 29c177e6

What is 10% of 470?

A. 37

B. 47

C. 423

D. 460

ID: 29c177e6 Answer

Correct Answer: B

Rationale

Choice B is correct. 10% of a quantity means $\frac{10}{100}$ times the quantity. Therefore, 10% of 470 can be represented as $\frac{10}{100}(470)$, which is equivalent to $0.10(470)$, or 47. Therefore, 10% of 470 is 47.

Choice A is incorrect. This is 10% of 370, not 10% of 470. Choice C is incorrect. This is 90% of 470, not 10% of 470.

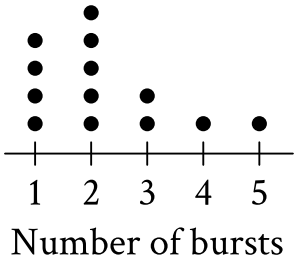
Choice D is incorrect. This is $470 - 10$, not 10% of 470.

Question Difficulty: Easy

Question ID e7d48c8a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: e7d48c8a



The dot plot represents a data set of the number of bursts for 13 eruptions of a steam vent. If an additional eruption with 11 bursts is added to this data set to create a new data set of 14 eruptions, which of the following measures will be greater for the new data set than for the original data set?

I. The median number of bursts
II. The mean number of bursts

A. I and II

B. I only

C. II only

D. Neither I nor II

ID: e7d48c8a Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the dot plot represents a data set of the number of bursts for 13 eruptions of a steam vent. The median of a data set with an odd number of elements is the middle element when the elements are in numerical order. For 13 elements in numerical order, this is the 7th element. For this data set, the first 4 elements have a value of 1, and the next 5 elements have a value of 2. Thus, the 7th element in the ordered data set is 2 and the median number of bursts for the original data set is 2. If an additional eruption with 11 bursts is added to this data set to create a new data set of 14 eruptions, the median of the new data set will be between the 7th and 8th elements in the ordered set, which will also be 2. Therefore, the median number of bursts for the new data set will be the same as the median number of bursts for the original data set. The mean number of bursts for the original data set is found by adding the values of all 13 elements and dividing that sum by the number of elements, 13. Since the data is shown in a dot plot, the sum of the values of the elements can be found by multiplying each element's value by its frequency: $1(4) + 2(5) + 3(2) + 4(1) + 5(1)$, or 29. Therefore, the mean number of bursts for the original data set is $\frac{29}{13}$. If an additional eruption with 11 bursts is added to this data set to create a new data set of 14 bursts, the mean number of bursts for the new data set is $\frac{29+11}{14}$, or $\frac{40}{14}$. Since $\frac{40}{14} > \frac{29}{13}$, the mean number of bursts for the new data set is greater than the mean number of bursts for the original data set. Therefore, of the median number of bursts and the mean number of bursts, only the mean number of bursts is greater for the new data set than for the original data set.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 7b65bb28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 7b65bb28

Station 1	Station 2	Station 3	Station 4	Station 5
$3.699	$3.609	$3.729	$3.679	$3.729

In the table above, Melissa recorded the price of one gallon of regular gas from five different local gas stations on the same day. What is the median of the gas prices Melissa recorded?

A. $3.679

B. $3.689

C. $3.699

D. $3.729

ID: 7b65bb28 Answer

Correct Answer: C

Rationale

Choice C is correct. The median of a data set is the middle value when the data is in ascending or descending order. In ascending order, the gas prices are $3.609, $3.679, $3.699, $3.729, and $3.729. The middle number of this list is 3.699, so it follows that $3.699 is the median gas price.

Choice A is incorrect. When the gas prices are listed in ascending order, this value isn't the middle number. Choice B is incorrect. This value represents the mean gas price. Choice D is incorrect. This value represents both the mode and the maximum gas price.

Question Difficulty: Medium

Question ID 8a714fa1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 8a714fa1

Which of the following represents the result of increasing the quantity x by 9%, where $x > 0$?

A. $1.09x$

B. $0.09x$

C. $x + 9$

D. $x + 0.09$

ID: 8a714fa1 Answer

Correct Answer: A

Rationale

Choice A is correct. Increasing the positive quantity x by 9% is the result of adding 9% of x to x. 9% of x can be represented algebraically as $\frac{9}{100}x$, or $0.09x$. Adding this expression to x yields $x + 0.09x$, or $1.09x$.

Choice B is incorrect. This represents 9% of x. Choice C is incorrect. This represents increasing x by 9, not by 9%. Choice D is incorrect. This represents increasing x by 0.09, not by 9%.

Question Difficulty: Medium

Question ID 7cd1c6db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 7cd1c6db

An object travels at a constant speed of 12 centimeters per second. At this speed, what is the time, in seconds, that it would take for the object to travel 108 centimeters?

A. 9

B. 96

C. 120

D. 972

ID: 7cd1c6db Answer

Correct Answer: A

Rationale

Choice A is correct. If the object travels 108 centimeters at a speed of 12 centimeters per second, the time of travel can be determined by dividing the total distance by the speed. This results in $\frac{108 \text{ centimeters}}{12 \text{ centimeters/second}}$, which is 9 seconds.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 8784bc84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 8784bc84

What is 20% of 440?

A. 44

B. 88

C. 880

D. $1{,}760$

ID: 8784bc84 Answer

Correct Answer: B

Rationale

Choice B is correct. 20% of 440 can be calculated as $\left(\frac{20}{100}\right)(440)$, which is equivalent to $\frac{8{,}800}{100}$, or 88.

Choice A is incorrect. This is 10%, not 20%, of 440. Choice C is incorrect. This is 200%, not 20%, of 440.

Choice D is incorrect. This is 400%, not 20%, of 440.

Question Difficulty: Easy

Question ID 3f775bbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 3f775bbf

State	Power capacity			
	Low	Medium	High	Total
Texas	4	2	3	9
California	1	0	1	2
Oregon	1	0	1	2
Indiana	0	2	0	2
Colorado	1	1	0	2
Iowa	2	0	0	2
Oklahoma	1	0	0	1
Total	10	5	5	20

The table shows the distribution, by location and power capacity (maximum rate of power generation) of the twenty largest wind projects in the United States in 2013. The total power capacity of the nine wind projects located in Texas was 4,952 megawatts (MW), and the total power capacity of the twenty wind projects was 11,037 MW in 2013. The amount of energy produced in one hour at a rate of one megawatt is one megawatt-hour. If each of the nine Texas wind projects in 2013 had operated continuously for 24 hours at the maximum rate of power generation, approximately how many megawatt-hours of energy would the nine projects have produced?

A. 200

B. 5,000

C. 11,000

D. 120,000

ID: 3f775bbf Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the total power capacity of the nine wind projects in Texas was 4,952 megawatts. Therefore, if all nine Texas projects operated continuously for 1 hour, the amount of energy produced would be 4,952 megawatt-hours. It follows that, if all nine Texas projects operated continuously for 24 hours, the amount of energy produced, in megawatt-hours, would be $(4{,}952)(24) = 118{,}848$, which is closest to 120,000.

Choice A is incorrect. This is approximately the amount of energy produced for the nine projects divided by 24 hours. Choice B is incorrect. This is approximately the amount of energy produced for the nine projects. Choice C is incorrect. This is approximately the given amount of energy produced for all twenty projects in the table.

Question Difficulty: Hard

Question ID 8637294f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 8637294f

If $\frac{4a}{b} = 6.7$ and $\frac{a}{bn} = 26.8$, what is the value of n?

ID: 8637294f Answer

Correct Answer: .0625, 1/16

Rationale

The correct answer is $.0625$. It's given that $\frac{4a}{b} = 6.7$ and $\frac{a}{bn} = 26.8$. The equation $\frac{4a}{b} = 6.7$ can be rewritten as $(4)\left(\frac{a}{b}\right) = 6.7$. Dividing both sides of this equation by 4 yields $\frac{a}{b} = 1.675$. The equation $\frac{a}{bn} = 26.8$ can be rewritten as $\left(\frac{a}{b}\right)\left(\frac{1}{n}\right) = 26.8$. Substituting 1.675 for $\frac{a}{b}$ in this equation yields $(1.675)\left(\frac{1}{n}\right) = 26.8$, or $\frac{1.675}{n} = 26.8$. Multiplying both sides of this equation by n yields $1.675 = 26.8n$. Dividing both sides of this equation by 26.8 yields $n = 0.0625$. Therefore, the value of n is 0.0625. Note that .0625, 0.062, 0.063, and 1/16 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 8e2e424e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 8e2e424e

The number *k* is 36% greater than 50. If *k* is the product of 50 and *r*, what is the value of *r* ?

A. 36

B. 3.6

C. 1.36

D. 0.36

ID: 8e2e424e Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the number k is 36% greater than 50. Therefore, the value of k is the number 50 plus 36% of 50. This can be rewritten as $k = 50 + \left(\frac{36}{100}\right)(50)$. Multiplying the terms $\left(\frac{36}{100}\right)(50)$ yields 18, so $k = 50 + 18$, or $k = 68$. It's also given that k is the product of 50 and r, which can be rewritten as $k = 50r$. Substituting 68 for k yields $68 = 50r$. Dividing both sides of this equation by 50 yields $r = 1.36$.

Choice A is incorrect. This is the percentage that k is greater than 50. Choice B is incorrect and may result from a calculation error. Choice D is incorrect. This would be the value of r if k were 36% of 50, instead of 36% greater than 50.

Question Difficulty: Medium

Question ID 24ad9dcb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 24ad9dcb

The weight of an object on Venus is approximately $\frac{9}{10}$ of its weight on Earth. The weight of an object on Jupiter is approximately $\frac{23}{10}$ of its weight on Earth. If an object weighs 100 pounds on Earth, approximately how many more pounds does it weigh on Jupiter than it weighs on Venus?

A. 90

B. 111

C. 140

D. 230

ID: 24ad9dcb Answer

Correct Answer: C

Rationale

Choice C is correct. The weight of an object on Venus is approximately $\frac{9}{10}$ of its weight on Earth. If an object weighs 100 pounds on Earth, then the object's weight on Venus is approximately $\frac{9}{10}(100)=90$ pounds. The same object's weight on Jupiter is approximately $\frac{23}{10}$ of its weight on Earth; therefore, the object weighs approximately $\frac{23}{10}(100)=230$ pounds on Jupiter. The difference between the object's weight on Jupiter and the object's weight on Venus is approximately $230-90=140$ pounds. Therefore, an object that weighs 100 pounds on Earth weighs 140 more pounds on Jupiter than it weighs on Venus.

Choice A is incorrect because it is the weight, in pounds, of the object on Venus. Choice B is incorrect because it is the weight, in pounds, of an object on Earth if it weighs 100 pounds on Venus. Choice D is incorrect because it is the weight, in pounds, of the object on Jupiter.

Question Difficulty: Easy

Question ID be00d896

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: be00d896

For which of the following data sets is the mean greater than the median?

A. 5, 5, 5, 5, 5, 5, 5, 5, 5

B. 0, 10, 20, 30, 40, 50, 60, 70, 80

C. 2, 4, 8, 16, 32, 64, 128, 256, 512

D. 7, 107, 107, 207, 207, 207, 307, 307, 307

ID: be00d896 Answer

Correct Answer: C

Rationale

Choice C is correct. If the values in a data set are ordered from least to greatest, the median of the data set will be the middle value. Since each data set in the choices is ordered and contains exactly 9 data values, the 5th value in each is the median. It follows that the median of the data set in choice C is 32. The sum of the positive differences between 32 and each of the values that are less than 32 is significantly smaller than the sum of the positive differences between 32 and each of the values that are greater than 32. If 32 were the mean, these sums would have been equal to each other. Therefore, the mean of this data set must be greater than 32. This can also be confirmed by calculating the mean as the sum of the values divided by the number of values in the data set:

$$\frac{2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512}{9} = 113\frac{5}{9}.$$

Choices A and B are incorrect. Each of the data sets in these choices is symmetric with respect to its median, so the mean and the median for each of these choices are equivalent. Choice D is incorrect. The median of this data set is 207. Since the sum of the positive differences between 207 and each of the values less than 207 is greater than the sum of the positive differences between 207 and each value greater than 207 in this data set, the mean must be less than the median.

Question Difficulty: Medium

Question ID 560fab82

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 560fab82

The table shows the frequency of values in a data set.

Value	Frequency
19	7
21	1
23	7
25	4

What is the minimum value of the data set?

ID: 560fab82 Answer

Correct Answer: 19

Rationale

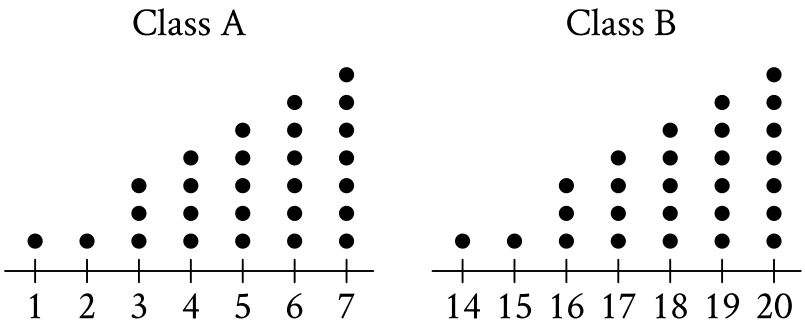
The correct answer is 19. The minimum value of a data set is the least value in the data set. The frequency refers to the number of times a value occurs. The given table shows that for this data set, the value 19 occurs 7 times, the value 21 occurs 1 time, the value 23 occurs 7 times, and the value 25 occurs 4 times. Therefore, of the values 19, 21, 23, and 25 given in the data set, the minimum value of the data set is 19.

Question Difficulty: Medium

Question ID d94018fd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: d94018fd



Each of the dot plots shown represents the number of glue sticks brought in by each student for two classes, class A and class B. Which statement best compares the standard deviations of the numbers of glue sticks brought in by each student for these two classes?

A. The standard deviation of the number of glue sticks brought in by each student for class A is less than the standard deviation of the number of glue sticks brought in by each student for class B.

B. The standard deviation of the number of glue sticks brought in by each student for class A is equal to the standard deviation of the number of glue sticks brought in by each student for class B.

C. The standard deviation of the number of glue sticks brought in by each student for class A is greater than the standard deviation of the number of glue sticks brought in by each student for class B.

D. There is not enough information to compare these standard deviations.

ID: d94018fd Answer

Correct Answer: B

Rationale

Choice B is correct. Standard deviation is a measure of the spread of a data set from its mean. The dot plot for class A and the dot plot for class B have the same shape. Thus, the frequency distributions for both class A and class B are the same. Since both class A and class B have the same frequency distribution of glue sticks brought in by each student, it follows that both class A and class B have the same spread of the number of glue sticks brought in by each student from their respective means. Therefore, the standard deviation of the number of glue sticks brought in by each student for class A is equal to the standard deviation of the number of glue sticks brought in by each student for class B.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID e635aede

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: e635aede

In 2008, Zinah earned 14% more than in 2007, and in 2009 Zinah earned 4% more than in 2008. If Zinah earned y times as much in 2009 as in 2007, what is the value of y?

A. 0.5600

B. 1.0056

C. 1.1800

D. 1.1856

ID: e635aede Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that in 2008 Zinah earned 14% more than in 2007. Let h represent the amount Zinah earned in 2007 and let j represent the amount that Zinah earned in 2008. This situation can be represented by the equation $j = \left(1 + \frac{14}{100}\right)h$, or $j = 1.14h$. It's also given that in 2009 Zinah earned 4% more than in 2008. Let k represent the amount Zinah earned in 2009. This situation can be represented by the equation $k = \left(1 + \frac{4}{100}\right)j$, or $k = 1.04j$. Substituting $1.14h$ for j in the equation $k = 1.04j$ yields $k = (1.04)(1.14h)$, or $k = 1.1856h$. If Zinah earned y times as much in 2009 as in 2007, then the value of y is 1.1856.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID e21d10a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: e21d10a7

One of a planet's moons orbits the planet every 252 days. A second moon orbits the planet every 287 days. How many more days does it take the second moon to orbit the planet 29 times than it takes the first moon to orbit the planet 29 times?

ID: e21d10a7 Answer

Correct Answer: 1015

Rationale

The correct answer is $1{,}015$. It's given that the first moon orbits the planet every 252 days. Therefore, it takes the first moon $252(29)$, or $7{,}308$, days to orbit the planet 29 times. It's also given that the second moon orbits the planet every 287 days. Therefore, it takes the second moon $287(29)$, or $8{,}323$, days to orbit the planet 29 times. Since it takes the first moon $7{,}308$ days and the second moon $8{,}323$ days, it takes the second moon $8{,}323 - 7{,}308$, or $1{,}015$, more days than it takes the first moon to orbit the planet 29 times.

Question Difficulty: Medium

Question ID 7d721177

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 7d721177

The density of a certain type of wood is 353 kilograms per cubic meter. A sample of this type of wood is in the shape of a cube and has a mass of 345 kilograms. To the nearest hundredth of a meter, what is the length of one edge of this sample?

A. 0.98

B. 0.99

C. 1.01

D. 1.02

ID: 7d721177 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the density of a certain type of wood is 353 kilograms per cubic meter $\left(\text{kg/m}^3\right)$, and a sample of this type of wood has a mass of $345\ \text{kg}$. Let x represent the volume, in m^3, of the sample. It follows that the relationship between the density, mass, and volume of this sample can be written as $\frac{353\ \text{kg}}{1\ \text{m}^3} = \frac{345\ \text{kg}}{x\ \text{m}^3}$, or $353 = \frac{345}{x}$. Multiplying both sides of this equation by x yields $353x = 345$. Dividing both sides of this equation by 353 yields $x = \frac{345}{353}$. Therefore, the volume of this sample is $\frac{345}{353}\ \text{m}^3$. Since it's given that the sample of this type of wood is a cube, it follows that the length of one edge of this sample can be found using the volume formula for a cube, $V = s^3$, where V represents the volume, in m^3, and s represents the length, in m, of one edge of the cube. Substituting $\frac{345}{353}$ for V in this formula yields $\frac{345}{353} = s^3$. Taking the cube root of both sides of this equation yields $\sqrt[3]{\frac{345}{353}} = s$, or $s \approx 0.99$. Therefore, the length of one edge of this sample to the nearest hundredth of a meter is 0.99.

Choices A, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID d0d9ede4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: d0d9ede4

How many feet are equivalent to 34 yards? $(1 \text{ yard} = 3 \text{ feet})$

ID: d0d9ede4 Answer

Correct Answer: 102

Rationale

The correct answer is 102. It's given that 1 yard is equivalent to 3 feet. Therefore, 34 yards is equivalent to $(34 \text{ yards})\left(\frac{3 \text{ feet}}{1 \text{ yard}}\right)$, or 102 feet.

Question Difficulty: Easy

Question ID 4b09f783

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 4b09f783

A list of 10 data values is shown. $6, 8, 16, 4, 17, 26, 8, 5, 5, 5$ What is the mean of these data?

ID: 4b09f783 Answer

Correct Answer: 10

Rationale

The correct answer is 10. The mean of a data set is calculated by dividing the sum of the data values by the number of data values in the data set. For this data set, the mean can be calculated as $\frac{6+8+16+4+17+26+8+5+5+5}{10}$, which is equivalent to $\frac{100}{10}$, or 10.

Question Difficulty: Easy

Question ID 67c0200a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 67c0200a

The number a is 70% less than the positive number b. The number c is 80% greater than a. The number c is how many times b?

ID: 67c0200a Answer

Correct Answer: .54, 27/50

Rationale

The correct answer is $.54$. It's given that the number a is 70% less than the positive number b. Therefore, $a = \left(1 - \frac{70}{100}\right)b$, which is equivalent to $a = (1 - 0.70)b$, or $a = 0.30b$. It's also given that the number c is 80% greater than a. Therefore, $c = \left(1 + \frac{80}{100}\right)a$, which is equivalent to $c = (1 + 0.80)a$, or $c = 1.80a$. Since $a = 0.30b$, substituting $0.30b$ for a in the equation $c = 1.80a$ yields $c = 1.80(0.30b)$, or $c = 0.54b$. Thus, c is 0.54 times b. Note that .54 and 27/50 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID bfa8a85c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: bfa8a85c

$6, 6, 8, 8, 8, 10, 21$ Which of the following lists represents a data set that has the same median as the data set shown?

A. $4, 6, 6, 6, 8, 8$

B. $6, 6, 8, 8, 10, 10$

C. $6, 8, 10, 10, 10, 12$

D. $8, 8, 10, 10, 21, 21$

ID: bfa8a85c Answer

Correct Answer: B

Rationale

Choice B is correct. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since the data set shown has 7 data values and is in ascending order, it follows that the median is the fourth data value in the list, or 8. If a data set contains an even number of data values, the median is between the two middle data values when the values are listed in ascending or descending order. Since each of the choices consists of a data set with 6 data values in ascending order, it follows that the median is between the third and fourth data value. The third and fourth data values in choice B are 8 and 8. Thus, choice B represents a data set with a median of 8. Since the median of the data set shown is 8 and choice B represents a data set with a median of 8, it follows that choice B represents a data set that has the same median as the data set shown.

Choice A is incorrect. This list represents a data set with a median of 6, not 8.

Choice C is incorrect. This list represents a data set with a median of 10, not 8.

Choice D is incorrect. This list represents a data set with a median of 10, not 8.

Question Difficulty: Easy

Question ID fa7a0164

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: fa7a0164

The table below shows the high and low temperatures in Houston, Texas, during a five-day period.

Temperatures in Houston, Texas
(degrees Fahrenheit)

	Monday	Tuesday	Wednesday	Thursday	Friday
High temperature	73	56	62	75	81
Low temperature	49	37	41	54	63

What was the mean low temperature, in degrees Fahrenheit, during the five-day period?

A. 48.8

B. 49

C. 59

D. 59.1

ID: fa7a0164 Answer

Correct Answer: A

Rationale

Choice A is correct. The mean low temperature can be calculated by finding the sum of the low temperatures for all the days shown in the table, 49 + 37 + 41 + 54 + 63 = 244, and then dividing the sum by the number of days the temperature was recorded, $244 \div 5 = 48.8$.

Choice B is incorrect. This may be the result of choosing the median rather than calculating the mean. Choices C and D are incorrect and may be the result of calculation errors.

Question Difficulty: Easy

Question ID 40e7a1a9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 40e7a1a9

210 is $p\%$ greater than 30. What is the value of p?

ID: 40e7a1a9 Answer

Correct Answer: 600

Rationale

The correct answer is 600. It's given that 210 is $p\%$ greater than 30. It follows that $210 = \left(1 + \frac{p}{100}\right)(30)$. Dividing both sides of this equation by 30 yields $7 = 1 + \frac{p}{100}$. Subtracting 1 from both sides of this equation yields $6 = \frac{p}{100}$. Multiplying both sides of this equation by 100 yields $p = 600$. Therefore, the value of p is 600.

Question Difficulty: Hard

Question ID 708590d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 708590d7

Data set A: 1, 2, 3, 4, 5, 6, 7

Data set B: 1, 1, 2, 2, 3, 3, 4

Which of the following statements correctly compares the means of data set A and data set B?

A. The mean of each data set is 2.

B. The mean of each data set is 4.

C. The mean of data set A is less than the mean of data set B.

D. The mean of data set A is greater than the mean of data set B.

ID: 708590d7 Answer

Correct Answer: D

Rationale

Choice D is correct. The mean of a data set is found by dividing the sum of the values in the data set by the number of values in the data set. Therefore, the mean of data set A is $\frac{1+2+3+4+5+6+7}{7}=\frac{28}{7}$, or 4. The mean of data set B is $\frac{1+1+2+2+3+3+4}{7}=\frac{16}{7}$, or approximately 2.2857. Therefore, the mean of data set A is greater than the mean of data set B.

Alternate approach: Data set A and data set B are both ordered from least to greatest value. Besides the first value in each data set, which is 1, each value in ordered data set B is less than the respective value in ordered data set A. Therefore, conceptually, the mean of data set A must be greater than the mean of data set B.

Choices A, B, and C are incorrect and may result from various misconceptions or miscalculations.

Question Difficulty: Easy

Question ID bf47ad54

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: bf47ad54

Each of the following frequency tables represents a data set. Which data set has the greatest mean?

A.

Value	Frequency
70	4
80	5
90	6
100	7

B.

Value	Frequency
70	6
80	6
90	6
100	6

C.

Value	Frequency
70	7
80	6
90	6
100	7

D.

Value	Frequency
70	8
80	5
90	5
100	8

ID: bf47ad54 Answer

Correct Answer: A

Rationale

Choice A is correct. The tables in choices B, C, and D each represent a data set where the values 80 and 90 have the same frequency and the values 70 and 100 have the same frequency. It follows that each of these data sets is symmetric around the value halfway between 80 and 90, or 85. When a data set is symmetric around a value, that value is the mean of the data set. Therefore, the data sets represented by the tables in choices B, C, and D each have a mean of 85. The table in choice A represents a data set where the value 90 has a greater frequency than the value 80 and the value 100 has a greater frequency than the value 70. It follows that this data set has a mean greater than 85. Therefore, of the given choices, choice A represents the data set with the greatest mean.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID f52123e0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: f52123e0

$23, 27, 27, 32, 35, 36, 52$ What is the range of the 7 scores shown?

ID: f52123e0 Answer

Correct Answer: 29

Rationale

The correct answer is 29. The range of a data set is the difference between its maximum value and its minimum value. For the data set shown, the maximum score is 52 and the minimum score is 23. The difference between those scores is $52 - 23$, or 29. Therefore, the range of the 7 scores shown is 29.

Question Difficulty: Medium

Question ID 06a152cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 06a152cd

To make a bakery's signature chocolate muffins, a baker needs 2.5 ounces of chocolate for each muffin. How many pounds of chocolate are needed to make 48 signature chocolate muffins? (1 pound = 16 ounces)

A. 7.5

B. 10

C. 50.5

D. 120

ID: 06a152cd Answer

Correct Answer: A

Rationale

Choice A is correct. If 2.5 ounces of chocolate are needed for each muffin, then the number of ounces of chocolate needed to make 48 muffins is $48 \times 2.5 = 120$ ounces. Since 1 pound = 16 ounces, the number of pounds that is equivalent to 120 ounces is $\frac{120}{16} = 7.5$ pounds. Therefore, 7.5 pounds of chocolate are needed to make the 48 muffins.

Choice B is incorrect. If 10 pounds of chocolate were needed to make 48 muffins, then the total number of ounces of chocolate needed would be $10 \times 16 = 160$ ounces. The number of ounces of chocolate per muffin would then be $\frac{160}{48} = 3.33$ ounces per muffin, not 2.5 ounces per muffin. Choices C and D are also incorrect. Following the same procedures as used to test choice B gives 16.8 ounces per muffin for choice C and 40 ounces per muffin for choice D, not 2.5 ounces per muffin. Therefore, 50.5 and 120 pounds cannot be the number of pounds needed to make 48 signature chocolate muffins.

Question Difficulty: Easy

Question ID 7760c516

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 7760c516

Each value in the data set shown represents the height, in centimeters, of a plant. $6, 10, 13, 2, 15, 22, 10, 4, 4, 4$

What is the mean height, in centimeters, of these plants?

ID: 7760c516 Answer

Correct Answer: 9

Rationale

The correct answer is 9. The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. It follows that the mean height, in centimeters, of these plants is the sum of the heights, in centimeters, of each plant, $6 + 10 + 13 + 2 + 15 + 22 + 10 + 4 + 4 + 4$, or 90, divided by the number of plants in the data set, 10. Therefore, the mean height, in centimeters, of these plants is $\frac{90}{10}$, or 9.

Question Difficulty: Easy

Question ID 8917ce38

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 8917ce38

Which of the following speeds is equivalent to 90 kilometers per hour? (1 kilometer = 1,000 meters)

A. 25 meters per second

B. 32 meters per second

C. 250 meters per second

D. 324 meters per second

ID: 8917ce38 Answer

Correct Answer: A

Rationale

Choice A is correct. Since 1 kilometer is equal to 1,000 meters, it follows that 90 kilometers is equal to $90(1{,}000) = 90{,}000$ meters. Since 1 hour is equal to 60 minutes and 1 minute is equal to 60 seconds, it follows that 1 hour is equal to $60(60) = 3{,}600$ seconds. Now $\frac{90 \text{ kilometers}}{1 \text{ hour}}$ is equal to $\frac{90{,}000 \text{ meters}}{3{,}600 \text{ seconds}}$, which reduces to $\frac{25 \text{ meters}}{1 \text{ second}}$ or 25 meters per second.

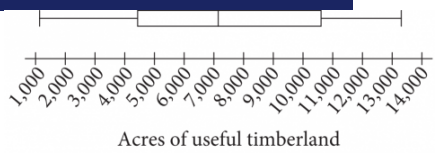
Choices B, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 374b18f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 374b18f9



The number of acres of useful timberland in 13 counties in California is summarized in the box plot above. Which of the following is closest to the median number of acres?

A. 4,399

B. 7,067

C. 8,831

D. 10,595

ID: 374b18f9 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of the data summarized by a box plot is the value associated with the vertical line segment within the box. According to the box plot shown, this value is slightly greater than 7,000. Therefore, the closest value for the median number of acres is 7,067.

Choice A is incorrect. This is the value associated with the vertical line segment forming the left-hand side of the box. Choice C is incorrect. This value is greater than the value associated with the vertical line segment within the box. Choice D is incorrect. This is the value associated with the vertical line segment forming the right-hand side of the box.

Question Difficulty: Easy

Question ID 4ff597db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 4ff597db

The mean amount of time that the 20 employees of a construction company have worked for the company is 6.7 years. After one of the employees leaves the company, the mean amount of time that the remaining employees have worked for the company is reduced to 6.25 years. How many years did the employee who left the company work for the company?

A. 0.45

B. 2.30

C. 9.00

D. 15.25

ID: 4ff597db Answer

Correct Answer: D

Rationale

Choice D is correct. The mean amount of time that the 20 employees worked for the company is 6.7 years. This means that the total number of years all 20 employees worked for the company is (6.7)(20) = 134 years. After the employee left, the mean amount of time that the remaining 19 employees worked for the company is 6.25 years. Therefore, the total number of years all 19 employees worked for the company is (6.25)(19) = 118.75 years. It follows that the number of years that the employee who left had worked for the company is 134 – 118.75 = 15.25 years.

Choice A is incorrect; this is the change in the mean, which isn't the same as the amount of time worked by the employee who left. Choice B is incorrect and likely results from making the assumption that there were still 20 employees, rather than 19, at the company after the employee left and then subtracting the original mean of 6.7 from that result. Choice C is incorrect and likely results from making the assumption that there were still 20 employees, rather than 19, at the company after the employee left.

Question Difficulty: Hard

Question ID ec787383

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: ec787383

A distance of 61 furlongs is equivalent to how many feet? $(1\text{ furlong} = 220\text{ yards and }1\text{ yard} = 3\text{ feet})$

ID: ec787383 Answer

Correct Answer: 40260

Rationale

The correct answer is $40{,}260$. It's given that $1\text{ furlong} = 220\text{ yards}$ and $1\text{ yard} = 3\text{ feet}$. It follows that a distance of 61 furlongs is equivalent to $(61\text{ furlongs})\left(\frac{220\text{ yards}}{1\text{ furlong}}\right)\left(\frac{3\text{ feet}}{1\text{ yard}}\right)$, or $40{,}260$ feet.

Question Difficulty: Medium

Question ID 7e6c745f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 7e6c745f

Food	Protein	Cost
1 large egg	6 grams	$0.36
1 cup of milk	8 grams	$0.24

The table above shows the amount of protein in two foods and the cost of each food. Based on the table, what is the ratio of the cost per gram of protein in a large egg to the cost per gram of protein in a cup of milk?

A. 1 : 2

B. 2 : 3

C. 3 : 4

D. 2 : 1

ID: 7e6c745f Answer

Correct Answer: D

Rationale

Choice D is correct. The cost per gram of protein in 1 large egg is $0.36 ÷ 6 = $0.06. The cost per gram of protein in 1 cup of milk is $0.24 ÷ 8 = $0.03. It follows that the ratio of the cost per gram of protein in a large egg to the cost per gram of protein in a cup of milk is 0.06:0.03, which can be rewritten as 2:1.

Choice A is incorrect and may result from finding the ratio of the cost per gram of protein in a cup of milk to the cost per gram of protein in a large egg (the reciprocal of the ratio specified in the question). Choices B and C are incorrect and may result from incorrectly calculating the unit rates or from errors made when simplifying the ratio.

Question Difficulty: Medium

Question ID 709e04de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 709e04de

The value of z is 1.13 times 100. The value of z is what percent greater than 100?

A. 11.3

B. 13

C. 130

D. 213

ID: 709e04de Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the value of z is 1.13 times 100. This can be written as $z = (1.13)(100)$, which is equivalent to $z = (1 + 0.13)(100)$, or $z = \left(1 + \frac{13}{100}\right)(100)$. It follows that the value of z is 100% of 100 plus 13% of 100. Therefore, the value of z is 13% greater than 100.

Choice A is incorrect. This gives a value of z that is 1.113, not 1.13, times 100.

Choice C is incorrect. This gives a value of z that is 2.30, not 1.13, times 100.

Choice D is incorrect. This gives a value of z that is 3.13, not 1.13, times 100.

Question Difficulty: Medium

Question ID 949cd96b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 949cd96b

The length of the base of a certain parallelogram is 89% of the height of the parallelogram. Which expression represents the length of the base of the parallelogram, where h is the height of the parallelogram?

A. $89h$

B. $0.089h$

C. $8.9h$

D. $0.89h$

ID: 949cd96b Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the length of the base of the parallelogram is 89% of the height of the parallelogram. Since h is the height of the parallelogram, it follows that the length of the base of the parallelogram can be represented by the expression $\frac{89}{100}h$, or $0.89h$.

Choice A is incorrect. This expression represents $8{,}900\%$, not 89%, of the height of the parallelogram.

Choice B is incorrect. This expression represents 8.9%, not 89%, of the height of the parallelogram.

Choice C is incorrect. This expression represents 890%, not 89%, of the height of the parallelogram.

Question Difficulty: Easy

Question ID 28c6bd8c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 28c6bd8c

Where Do People Get Most of Their Medical Information?

Source	Percent of those surveyed
Doctor	63%
Internet	13%
Magazines/brochures	9%
Pharmacy	6%
Television	2%
Other/none of the above	7%

The table above shows a summary of 1,200 responses to a survey question. Based on the table, how many of those surveyed get most of their medical information from either a doctor or the Internet?

A. 865

B. 887

C. 912

D. 926

ID: 28c6bd8c Answer

Correct Answer: C

Rationale

Choice C is correct. According to the table, 63% of survey respondents get most of their medical information from a doctor and 13% get most of their medical information from the Internet. Therefore, 76% of the 1,200 survey respondents get their information from either a doctor or the Internet, and 76% of 1,200 is 912.

Choices A, B, and D are incorrect. According to the table, 76% of survey respondents get their information from either a doctor or the Internet. Choice A is incorrect because 865 is about 72% (the percent of survey respondents who get most of their medical information from a doctor or from magazines/brochures), not 76%, of 1,200. Choice B is incorrect because 887 is about 74%, not 76%, of 1,200. Choice D is incorrect because 926 is about 77%, not 76%, of 1,200.

Question Difficulty: Easy

Question ID 3a6ed720

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 3a6ed720

Of $900{,}000$ beads, $828{,}000$ are silver. What percentage of the beads are silver?

A. 8%

B. 36%

C. 72%

D. 92%

ID: 3a6ed720 Answer

Correct Answer: D

Rationale

Choice D is correct. The proportion of the beads that are silver can be written as $\frac{828{,}000}{900{,}000}$, or 0.92. Therefore, the percentage of the beads that are silver is $0.92(100)$, or 92%.

Choice A is incorrect. This is the percentage of the beads that are not silver.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 85b33aa8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 85b33aa8

A fish swam a distance of $5{,}104$ yards. How far did the fish swim, in miles? $(1 \text{ mile} = 1{,}760 \text{ yards})$

A. 0.3

B. 2.9

C. $3{,}344$

D. $6{,}864$

ID: 85b33aa8 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the fish swam $5{,}104$ yards and that 1 mile is equal to $1{,}760$ yards. Therefore, the fish swam $5{,}104 \text{ yards}\left(\frac{1 \text{ mile}}{1{,}760 \text{ yards}}\right)$, which is equivalent to $\frac{5{,}104}{1{,}760} \text{ miles}$, or 2.9 miles.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID ba61d95f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: ba61d95f

The population of Greenville increased by 7% from 2015 to 2016. If the 2016 population is k times the 2015 population, what is the value of k?

A. 0.07

B. 0.7

C. 1.07

D. 1.7

ID: ba61d95f Answer

Correct Answer: C

Rationale

Choice C is correct. Let x be the 2015 population of Greenville. It's given that the population increased by 7% from 2015 to 2016. The increase in population can be written as $(0.07)x$. The 2016 population of Greenville is given as the sum of the 2015 population of Greenville and the increase in population from 2015 to 2016. This can be rewritten as $x + (0.07)x$, or $1.07x$. Therefore, the value of k is 1.07.

Choice A is incorrect. This is the percent, represented as a decimal, that the population increased from 2015 to 2016, not the value of k.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of k if the population increased by 70%, not 7%, from 2015 to 2016.

Question Difficulty: Medium

Question ID 873d2838

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 873d2838

The population density of Cedar County is 230 people per square mile. The county has a population of $85{,}100$ people. What is the area, in square miles, of Cedar County?

ID: 873d2838 Answer

Correct Answer: 370

Rationale

The correct answer is 370. It's given that the population density of Cedar County is 230 people per square mile and the county has a population of $85{,}100$ people. Based on the population density, it follows that the area of Cedar County is $(85{,}100 \text{ people})\left(\frac{1 \text{ square mile}}{230 \text{ people}}\right)$, or 370 square miles.

Question Difficulty: Medium

Question ID 2cdefcb1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 2cdefcb1

What length, in centimeters, is equivalent to a length of 51 meters? $(1 \text{ meter} = 100 \text{ centimeters})$

A. 0.051

B. 0.51

C. $5{,}100$

D. $51{,}000$

ID: 2cdefcb1 Answer

Correct Answer: C

Rationale

Choice C is correct. Since 1 meter is equal to 100 centimeters, 51 meters is equal to $51 \text{ meters}\left(\frac{100 \text{ centimeters}}{1 \text{ meter}}\right)$, or $5{,}100$ centimeters.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from dividing, rather than multiplying, 51 by 100.

Choice D is incorrect. This is the length, in millimeters rather than centimeters, that is equivalent to a length of 51 meters.

Question Difficulty: Easy

Question ID 8cbf1415

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 8cbf1415

In a group, 40% of the items are red. Of all the red items in the group, 30% also have stripes. What percentage of the items in the group are red with stripes?

A. 10%

B. 12%

C. 70%

D. 75%

ID: 8cbf1415 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that in a group, 40% of the items are red. It follows that the number of red items in the group can be represented by $0.4x$, where x represents the total number of items in the group. It's also given that of all the red items in the group, 30% also have stripes. It follows that the number of items in the group that are red and have stripes can be represented by $0.3(0.4x)$, or $0.12x$. The expression $0.12x$ represents 12% of x. Since x represents the total number of items in the group, it follows that 12% of the items in the group are red and have stripes.

Choice A is incorrect and may result from subtracting 30% from 40% rather than calculating 30% of 40%.

Choice C is incorrect and may result from adding 30% and 40% rather than calculating 30% of 40%.

Choice D is incorrect and may result from calculating the percentage that 30% is of 40% rather than calculating 30% of 40%.

Question Difficulty: Medium

Question ID c7c6445f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: c7c6445f

A certain town has an area of 4.36 square miles. What is the area, in square yards, of this town?
$(1 \text{ mile} = 1{,}760 \text{ yards})$

A. 404

B. $7{,}674$

C. $710{,}459$

D. $13{,}505{,}536$

ID: c7c6445f Answer

Correct Answer: D

Rationale

Choice D is correct. Since the number of yards in 1 mile is $1{,}760$, the number of square yards in 1 square mile is $(1{,}760)(1{,}760) = 3{,}097{,}600$. Therefore, if the area of the town is 4.36 square miles, it is $4.36(3{,}097{,}600) = 13{,}505{,}536$, in square yards.

Choice A is incorrect and may result from dividing the number of yards in a mile by the square mileage of the town.

Choice B is incorrect and may result from multiplying the number of yards in a mile by the square mileage of the town.

Choice C is incorrect and may result from dividing the number of square yards in a square mile by the square mileage of the town.

Question Difficulty: Hard

Question ID c54b92a2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: c54b92a2

A study was conducted on the production rates for a company that produces tractor wheels. The table below shows the number of wheels made during 11 consecutive one-hour production periods.

One-hour period	Number of wheels made
A	24
B	24
C	21
D	21
E	21
F	19
G	24
H	24
I	19
J	22
K	23

What is the range of the number of wheels made for the 11 one-hour periods?

A. 5.5

B. 5.0

C. 4.5

D. 4.0

ID: c54b92a2 Answer

Correct Answer: B

Rationale

Choice B is correct. Range is defined as the difference between the greatest and least values from a set of data. The greatest number of wheels made during a one-hour period was 24 wheels. The least number of wheels was 19. Hence, the range is $24 - 19 = 5$, or 5.0.

Choices A, C, and D are incorrect and may be the result of arithmetic errors or incorrectly identifying the greatest or least number of wheels made during a one-hour period.

Question Difficulty: Easy

Question ID 73ddfdac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 73ddfdac

A distance of 112 furlongs is equivalent to how many feet? $(1\text{ furlong} = 220\text{ yards and }1\text{ yard} = 3\text{ feet})$

ID: 73ddfdac Answer

Correct Answer: 73920

Rationale

The correct answer is $73{,}920$. It's given that $1\text{ furlong} = 220\text{ yards}$ and $1\text{ yard} = 3\text{ feet}$. It follows that a distance of 112 furlongs is equivalent to $(112\text{ furlongs})\left(\frac{220\text{ yards}}{1\text{ furlong}}\right)\left(\frac{3\text{ feet}}{1\text{ yard}}\right)$, or $73{,}920$ feet.

Question Difficulty: Medium

Question ID 96a45430

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 96a45430

A number n is increased 6%. If the result is 318, what is the value of n ?

A. 199

B. 299

C. 300

D. 337

ID: 96a45430 Answer

Correct Answer: C

Rationale

Choice C is correct. The decimal equivalent of 6% is 0.06. Since increasing the number n by 6% yields the number 318, this situation can be represented by the equation $n(1+0.06)=318$, or $n(1.06)=318$. Dividing both sides of this equation by 1.06 yields $n=300$.

Choice A is incorrect. This is the result when n is increased by 60%, not by 6%. Choice B is incorrect. This is the approximate result of decreasing 318 by 6%. Choice D is incorrect. This is the approximate result of increasing 318 by 6%.

Question Difficulty: Medium

Question ID 5267c3c7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 5267c3c7

The result of increasing the quantity x by 400% is 60. What is the value of x?

A. 12

B. 15

C. 240

D. 340

ID: 5267c3c7 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the result of increasing the quantity x by 400% is 60. This can be written as $x + \left(\frac{400}{100}\right)x = 60$, which is equivalent to $x + 4x = 60$, or $5x = 60$. Dividing each side of this equation by 5 yields $x = 12$. Therefore, the value of x is 12.

Choice B is incorrect. The result of increasing the quantity 15 by 400% is 75, not 60.

Choice C is incorrect. The result of increasing the quantity 240 by 400% is $1{,}200$, not 60.

Choice D is incorrect. The result of increasing the quantity 340 by 400% is $1{,}700$, not 60.

Question Difficulty: Hard

Question ID 5c3c2e3c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 5c3c2e3c

The weights, in pounds, for 15 horses in a stable were reported, and the mean, median, range, and standard deviation for the data were found. The horse with the lowest reported weight was found to actually weigh 10 pounds less than its reported weight. What value remains unchanged if the four values are reported using the corrected weight?

A. Mean

B. Median

C. Range

D. Standard deviation

ID: 5c3c2e3c Answer

Correct Answer: B

Rationale

Choice B is correct. The median weight is found by ordering the horses' weights from least to greatest and then determining the middle value from this list of weights. Decreasing the value for the horse with the lowest weight doesn't affect the median since it's still the lowest value.

Choice A is incorrect. The mean is calculated by finding the sum of all the weights of the horses and then dividing by the number of horses. Decreasing one of the weights would decrease the sum and therefore decrease the mean. Choice C is incorrect. Range is the difference between the highest and lowest weights, so decreasing the lowest weight would increase the range. Choice D is incorrect. Standard deviation is calculated based on the mean weight of the horses. Decreasing one of the weights decreases the mean and therefore would affect the standard deviation.

Question Difficulty: Medium

Question ID 61b87506

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 61b87506

For the values j and k, the ratio of j to k is 11 to 12. If j is multiplied by 17, what is k multiplied by in order to maintain the same ratio?

ID: 61b87506 Answer

Correct Answer: 17

Rationale

The correct answer is 17. If one value is multiplied by a number, then the other value must be multiplied by the same number in order to maintain the same ratio. It's given that j is multiplied by 17. Therefore, in order to maintain the same ratio, k must also be multiplied by 17.

Question Difficulty: Medium

Question ID 3ac09984

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 3ac09984

Marta has 7,500 pesos she will convert to US dollars using a currency exchange service. At this time, the currency exchange rate is 1 peso = 0.075 US dollars. The exchange service will charge Marta a 2% fee on the converted US dollar amount. How many US dollars will Marta receive from the currency exchange after the 2% fee is applied?

A. $551.25

B. $562.50

C. $5,625.00

D. $98,000.00

ID: 3ac09984 Answer

Correct Answer: A

Rationale

Choice A is correct. At the exchange rate of 1 peso = 0.075 US dollars, 7,500 pesos would be converted to 7,500 × 0.075 = $562.50. However, since Maria pays a 2% fee on the converted US dollar amount, she receives only (100 – 2)%, or 98%, of the converted US dollars, and 562.50 × 0.98 = $551.25.

Choice B is incorrect. This is the number of US dollars Maria would receive if the exchange service did not charge a 2% fee. Choice C is incorrect and may result from a decimal point error made when calculating the conversion to US dollars and from not assessing the 2% fee. Choice D is incorrect and may result from reversing the units of the exchange rate.

Question Difficulty: Easy

Question ID 66f03086

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 66f03086

71, 72, 73, 76, 77, 79, 83, 87, 93 What is the median of the data shown?

A. 71

B. 77

C. 78

D. 79

ID: 66f03086 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of a data set with an odd number of data values is defined as the middle value of the ordered list of values. The data set shown has nine values, so the median is the fifth value in the ordered list, which is 77.

Choice A is incorrect. This is the minimum value of the data set, not the median.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the mean of the data set, not the median.

Question Difficulty: Easy

Question ID 9110c120

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 9110c120

Data set A: 5, 5, 5, 5, 5, 5, 5, 5, 5, 5

Data set B: 5, 5, 5, 5, 5, 5, 5, 5, 5, 100

Which of the following statements about the means and medians of data set A and data set B is true?

A. Only the means are different.

B. Only the medians are different.

C. Both the means and the medians are different.

D. Neither the means nor the medians are different.

ID: 9110c120 Answer

Correct Answer: A

Rationale

Choice A is correct. The mean of a data set is the sum of the values divided by the number of values. The mean of data set A is $\frac{45}{9}$, or 5. The mean of data set B is $\frac{145}{10}$, or 14.5. Thus, the means are different. The median of a data set is the middle value when the values are ordered from least to greatest. The medians of data sets A and B are both 5. Therefore, the medians are the same, so only the means are different.

Choices B, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID d1db8def

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: d1db8def

Response	Frequency
Once a week or more	3
Two or three times a month	16
About once a month	26
A few times a year	73
Almost never	53
Never	29
Total	200

The table gives the results of a survey of 200 people who were asked how often they see a movie in a theater. How many people responded either “never” or “almost never”?

A. 24

B. 53

C. 82

D. 118

ID: d1db8def Answer

Correct Answer: C

Rationale

Choice C is correct. The table gives the results of 200 people who were asked how often they see a movie in a theater. The table shows that 29 people responded “never” and 53 people responded “almost never.” Therefore, $29 + 53$, or 82, people responded either “never” or “almost never.”

Choice A is incorrect. This is the difference between the number of people who responded “almost never” and the number of people who responded “never.”

Choice B is incorrect. This is the number of people who responded “almost never” but doesn't include those who responded “never.”

Choice D is incorrect. This is the number of people who responded something other than “never” or “almost never,” rather than the number of people who responded either “never” or “almost never.”

Question Difficulty: Easy

Question ID b2f6f17d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: b2f6f17d

A customer's monthly water bill was $75.74. Due to a rate increase, her monthly bill is now $79.86. To the nearest tenth of a percent, by what percent did the amount of the customer's water bill increase?

A. 4.1%

B. 5.1%

C. 5.2%

D. 5.4%

ID: b2f6f17d Answer

Correct Answer: D

Rationale

Choice D is correct. To find the percent increase of the customer's water bill, the absolute increase of the bill, in dollars, is divided by the original amount of the bill, and the result is multiplied by 100%, as follows: $\frac{79.86-75.74}{75.74}\approx 0.054$; $0.054\times 100\%=5.4\%$.

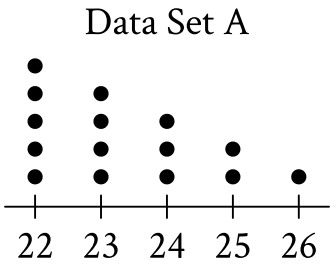
Choice A is incorrect. This choice is the difference $79.86-75.74$ rounded to the nearest tenth, which is the (absolute) increase of the bill's amount, not its percent increase. Choice B is incorrect and may be the result of some calculation errors. Choice C is incorrect and is the result of dividing the difference between the two bill amounts by the new bill amount instead of the original bill amount.

Question Difficulty: Medium

Question ID 4626102e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 4626102e



The dot plot represents the 15 values in data set A. Data set B is created by adding 56 to each of the values in data set A. Which of the following correctly compares the medians and the ranges of data sets A and B?

A. The median of data set B is equal to the median of data set A, and the range of data set B is equal to the range of data set A.

B. The median of data set B is equal to the median of data set A, and the range of data set B is greater than the range of data set A.

C. The median of data set B is greater than the median of data set A, and the range of data set B is equal to the range of data set A.

D. The median of data set B is greater than the median of data set A, and the range of data set B is greater than the range of data set A.

ID: 4626102e Answer

Correct Answer: C

Rationale

Choice C is correct. The median of a data set with an odd number of values, in ascending or descending order, is the middle value of the data set, and the range of a data set is the positive difference between the maximum and minimum values in the data set. Since the dot plot shown gives the values in data set A in ascending order and there are 15 values in the data set, the eighth value in data set A, 23, is the median. The maximum value in data set A is 26 and the minimum value is 22, so the range of data set A is $26 - 22$, or 4. It's given that data set B is created by adding 56 to each of the values in data set A. Increasing each of the 15 values in data set A by 56 will also increase its median value by 56 making the median of data set B 79. Increasing each value of data set A by 56 does not change the range, since the maximum value of data set B is $26 + 56$, or 82, and the minimum value is $22 + 56$, or 78, making the range of data set B $82 - 78$, or 4. Therefore, the median of data set B is greater than the median of data set A, and the range of data set B is equal to the range of data set A.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 55cfaf22

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 55cfaf22

Data set X: $5, 9, 9, 13$ Data set Y: $5, 9, 9, 13, 27$

The lists give the values in data sets X and Y. Which statement correctly compares the mean of data set X and the mean of data set Y?

A. The mean of data set X is greater than the mean of data set Y.

B. The mean of data set X is less than the mean of data set Y.

C. The means of data set X and data set Y are equal.

D. There is not enough information to compare the means.

ID: 55cfaf22 Answer

Correct Answer: B

Rationale

Choice B is correct. The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. It follows that the mean of data set X is $\frac{5+9+9+13}{4}$, or 9, and the mean of data set Y is $\frac{5+9+9+13+27}{5}$, or 12.6. Since 9 is less than 12.6, the mean of data set X is less than the mean of data set Y.

Alternate approach: Data set Y consists of the 4 values in data set X and one additional value, 27. Since the additional value, 27, is larger than any value in data set X, the mean of data set X is less than the mean of data set Y.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 5154615f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 5154615f

To study fluctuations in composition, samples of pumice were taken from 29 locations and cut in the shape of a cube. The length of the edge of one of these cubes is 3.000 centimeters. This cube has a density of 0.230 grams per cubic centimeter. What is the mass of this cube, in grams?

ID: 5154615f Answer

Correct Answer: 6.21

Rationale

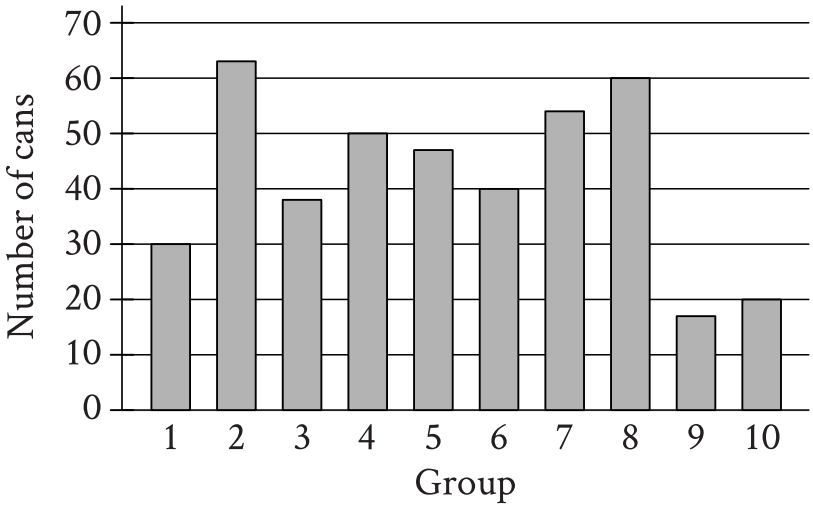
The correct answer is 6.21. It's given that the samples of pumice were cut in the shape of a cube. It's also given that the length of the edge of one of these cubes is 3.000 centimeters. Therefore, the volume of this cube is $(3.000 \text{ centimeters})^3$, or 27 cubic centimeters. Since the density of this cube is 0.230 grams per cubic centimeter, it follows that the mass of this cube is $\left(\frac{0.230 \text{ grams}}{1 \text{ cubic centimeter}}\right)(27 \text{ cubic centimeters})$, or 6.21 grams.

Question Difficulty: Hard

Question ID 820d7a73

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 820d7a73



The bar graph shows the distribution of 419 cans collected by 10 different groups for a food drive. How many cans were collected by group 6?

ID: 820d7a73 Answer

Correct Answer: 40

Rationale

The correct answer is 40. The height of each bar in the bar graph shown represents the number of cans collected by the group specified at the bottom of the bar. The bar for group 6 reaches a height of 40. Therefore, group 6 collected 40 cans.

Question Difficulty: Easy

Question ID 9c44f828

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 9c44f828

There are a total of 840 seats in a school auditorium. During an assembly, students occupied 50% of the seats in the auditorium. How many seats did the students occupy during this assembly?

A. 25

B. 50

C. 420

D. 790

ID: 9c44f828 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that during an assembly, students occupied 50% of the 840 seats in the school auditorium. Therefore, the number of seats that the students occupied during this assembly can be calculated by multiplying the number of seats in the school auditorium by $\frac{50}{100}$. Thus, the students occupied $840\left(\frac{50}{100}\right)$, or 420, seats during this assembly.

Choice A is incorrect. This is approximately 3%, not 50%, of 840.

Choice B is incorrect. This is approximately 6%, not 50%, of 840.

Choice D is incorrect. This is approximately 94%, not 50%, of 840.

Question Difficulty: Easy

Question ID eb672707

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: eb672707

How many tablespoons are equivalent to 14 teaspoons? $(3 \text{ teaspoons} = 1 \text{ tablespoon})$

ID: eb672707 Answer

Correct Answer: 14/3, 4.666, 4.667

Rationale

The correct answer is $\frac{14}{3}$. It's given that 3 teaspoons is equivalent to 1 tablespoon. Therefore, 14 teaspoons is equivalent to $(14 \text{ teaspoons})\left(\frac{1 \text{ tablespoon}}{3 \text{ teaspoons}}\right)$, or $\frac{14}{3}$ tablespoons. Note that 14/3, 4.666, and 4.667 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 7270d642

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 7270d642

A certain bird species can fly at an average speed of 16 meters per second when in continuous flight. At this rate, how many meters would this bird species fly in 4 seconds?

A. 64

B. 20

C. 16

D. 12

ID: 7270d642 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a certain bird species can fly at an average speed of 16 meters per second when in continuous flight. At this rate, in 4 seconds this bird species would fly $\left(\frac{16 \text{ meters}}{\text{second}}\right)(4 \text{ seconds})$, or 64 meters.

Choice B is incorrect. This is the value of $16 + 4$, not $16(4)$.

Choice C is incorrect. This is the distance the bird would fly in 1 second, not 4 seconds.

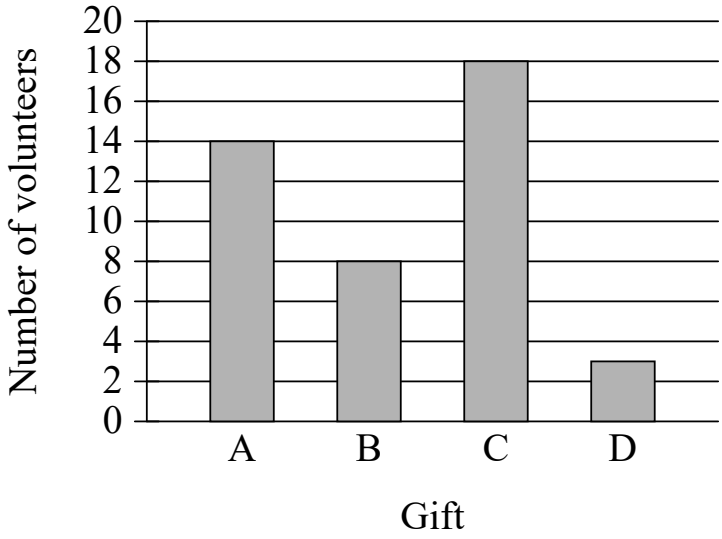
Choice D is incorrect. This is the value of $16 - 4$, not $16(4)$.

Question Difficulty: Easy

Question ID 6e3ab4bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 6e3ab4bf



In April, there were 43 volunteers in a cleanup project. Each volunteer was asked to choose a small gift labeled A, B, C, or D. The bar graph shows the number of volunteers who chose each gift. How many volunteers chose gift C?

A. 3

B. 8

C. 14

D. 18

ID: 6e3ab4bf Answer

Correct Answer: D

Rationale

Choice D is correct. The height of each bar in the graph shown represents the number of volunteers who chose the gift labeled with the letter specified at the bottom of the bar. The bar for gift C has a height of 18. Therefore, 18 volunteers chose gift C.

Choice A is incorrect. This is the number of volunteers who chose gift D, not gift C.

Choice B is incorrect. This is the number of volunteers who chose gift B, not gift C.

Choice C is incorrect. This is the number of volunteers who chose gift A, not gift C.

Question Difficulty: Easy

Question ID c256b723

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: c256b723

The amount of Hanna's bill for a food order was $\$50$. Hanna gave a tip of 20% of the amount of the bill. What is the amount, in dollars, of the tip Hanna gave?

ID: c256b723 Answer

Correct Answer: 10

Rationale

The correct answer is 10. It's given that the amount of Hanna's food order was $\$50$ and that Hanna gave a tip of 20% of the amount of the bill. 20% of 50 can be calculated as $\left(\frac{20}{100}\right)(50)$, which yields $\frac{1000}{100}$, or 10. Therefore, the amount, in dollars, of the tip Hanna gave is 10.

Question Difficulty: Medium

Question ID 881ef5f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 881ef5f5

If *a* is the mean and *b* is the median of nine consecutive integers, what is the value of $|a-b|$?

ID: 881ef5f5 Answer

Rationale

The correct answer is 0. Any nine consecutive integers can be written as $k, k+1, k+2, k+3, k+4, k+5, k+6, k+7, k+8$. The mean of the integers is their sum divided by 9: $\frac{(k+k+1+k+2+...+k+8)}{9} = \frac{(9k+36)}{9}$, which simplifies to $k+4$. So $a = k+4$. Since there is an odd number of integers (nine), the median is the integer in the middle when all the integers are ordered from least to greatest: $k+4$. So $b = k+4$. Therefore, $|a-b| = |(k+4)-(k+4)|$, which is 0.

Question Difficulty: Medium

Question ID 273b7f37

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 273b7f37

Isabel grows potatoes in her garden. This year, she harvested 760 potatoes and saved 10% of them to plant next year. How many of the harvested potatoes did Isabel save to plant next year?

A. 66

B. 76

C. 84

D. 86

ID: 273b7f37 Answer

Correct Answer: B

Rationale

Choice B is correct. The number of harvested potatoes Isabel saved to plant next year can be calculated by multiplying the total number of potatoes Isabel harvested, 760, by the proportion of potatoes she saved. Since she saved 10% of the potatoes she harvested, the proportion of potatoes she saved is $\frac{10}{100}$, or 0.1. Multiplying 760 by this proportion gives $760(0.1)$, or 76, potatoes that she saved to plant next year.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 55818046

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 55818046

According to the 2010 Census, the adult population aged 18 years or greater of the United States in 2010 was 234,564,071. In 2010, a survey was conducted among a randomly chosen sample of adults aged 18 years or greater in the United States about their preference to live in a warm climate or a cool climate. The table below displays a summary of the survey results.

Climate Preferences

	Warm	Cool	No preference	Total
18–35 years old	295	168	45	508
36–50 years old	246	123	41	410
51–65 years old	238	117	48	403
Greater than 65 years old	137	78	64	279
Total	916	486	198	1,600

Which of the following is closest to the difference between the percentage of adults aged 18–50 years who responded “warm” and the percentage of adults aged 51 years or greater who responded “warm”?

A. 4%

B. 5%

C. 10%

D. 18%

ID: 55818046 Answer

Correct Answer: A

Rationale

Choice A is correct. The percentage of adults aged 18–50 who responded “warm” is $\frac{295+246}{508+410}=\frac{541}{918}$, or about 58.9%. The percentage of adults aged 51 years or greater who responded “warm” is $\frac{238+137}{403+279}=\frac{375}{682}$, or about 55.0%. The difference between 58.9% and 55.0% is 3.9%. Of the answer choices, 4% is closest to this number.

Choices B, C, and D are incorrect and may result from calculation errors.

Question Difficulty: Hard

Question ID 7ed0d098

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 7ed0d098

Lani spent 15% of her 8-hour workday in meetings. How many minutes of her workday did she spend in meetings?

A. 1.2

B. 15

C. 48

D. 72

ID: 7ed0d098 Answer

Correct Answer: D

Rationale

Choice D is correct. There are 60 minutes in one hour, so an 8-hour workday has $(60)(8) = 480$ minutes. To calculate 15% of 480, multiply 0.15 by 480: $(0.15)(480) = 72$. Therefore, Lani spent 72 minutes of her workday in meetings.

Choice A is incorrect because 1.2 is 15% of 8, which gives the time Lani spent of her workday in meetings in hours, not minutes. Choices B and C are incorrect and may be the result of computation errors.

Question Difficulty: Easy

Question ID 20845d36

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 20845d36

The number a is 70% less than the positive number b. The number c is 60% greater than a. The number c is how many times b?

ID: 20845d36 Answer

Correct Answer: .48, 12/25

Rationale

The correct answer is $.48$. It's given that the number a is 70% less than the positive number b. Therefore, $a = \left(1 - \frac{70}{100}\right)b$, which is equivalent to $a = (1 - 0.70)b$, or $a = 0.30b$. It's also given that the number c is 60% greater than a. Therefore, $c = \left(1 + \frac{60}{100}\right)a$, which is equivalent to $c = (1 + 0.60)a$, or $c = 1.60a$. Since $a = 0.30b$, substituting $0.30b$ for a in the equation $c = 1.60a$ yields $c = 1.60(0.30b)$, or $c = 0.48b$. Thus, c is 0.48 times b. Note that .48 and 12/25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 8bf3f67a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 8bf3f67a

A special camera is used for underwater ocean research. The camera is at a depth of 39 fathoms. What is the camera's depth in feet? $(1 \text{ fathom} = 6 \text{ feet})$

A. 234

B. 117

C. 45

D. 7

ID: 8bf3f67a Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a special camera is used for underwater ocean research, and this camera is at a depth of 39 fathoms. It's also given that 1 fathom is equal to 6 feet. Thus, 39 fathoms is equivalent to $(39 \text{ fathoms})\left(\frac{6 \text{ feet}}{1 \text{ fathom}}\right)$, or 234 feet. Therefore, the camera's depth, in feet, is 234.

Choice B is incorrect. This is the camera's depth, in feet, if the camera is at a depth of 19.5 fathoms.

Choice C is incorrect. This is the camera's depth, in feet, if the camera is at a depth of 7.5 fathoms.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 4bb25495

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 4bb25495

Five Smallest Countries in 2016

Country	Land area (square kilometers)
Monaco	2.0
Nauru	21
San Marino	61
Tuvalu	26
Vatican City	0.44

The table above shows the land area, in square kilometers, of the five smallest countries of the world in 2016. Based on the table, what is the mean land area of the 5 smallest countries in 2016, to the nearest square kilometer?

A. 20

B. 22

C. 61

D. 110

ID: 4bb25495 Answer

Correct Answer: B

Rationale

Choice B is correct. The mean land area of these 5 countries is equal to the sum of the land areas of these countries, or $2.0+21+61+26+0.44$, divided by the number of countries in the table, 5, or $\frac{2.0+21+61+26+0.44}{5}$. Combining like terms in the numerator yields $\frac{110.44}{5}$, which simplifies to 22.088 square kilometers. This value, when rounded to the nearest square kilometer, is 22.

Choice A is incorrect and may result from a calculation error. Choice C is incorrect. This is the greatest land area of the 5 countries in the table. Choice D is incorrect. This is the sum of the land areas of the 5 countries in the table, rounded to the nearest square kilometer.

Question Difficulty: Easy

Question ID cb4894f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: cb4894f9

A triathlon is a multisport race consisting of three different legs. A triathlon participant completed the cycling leg with an average speed of 19.700 miles per hour. What was the average speed, in yards per hour, of the participant during the cycling leg? $(1 \text{ mile} = 1{,}760 \text{ yards})$

ID: cb4894f9 Answer

Correct Answer: 34672

Rationale

The correct answer is $34{,}672$. It's given that $1 \text{ mile} = 1{,}760 \text{ yards}$. It follows that an average speed of 19.700 miles per hour is equivalent to $\left(\frac{19.700 \text{ miles}}{1 \text{ hour}}\right)\left(\frac{1{,}760 \text{ yards}}{1 \text{ mile}}\right)$, or $34{,}672$ yards per hour.

Question Difficulty: Medium

Question ID 50b99b2d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 50b99b2d

Objects R and S each travel at a constant speed. The speed of object R is half the speed of object S. Object R travels a distance of $4x$ inches in y seconds. Which expression represents the time, in seconds, it takes object S to travel a distance of $24x$ inches?

A. $12y$

B. $3y$

C. $16y$

D. $6y$

ID: 50b99b2d Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that object R travels a distance of $4x$ inches in y seconds. This speed can be written as $\frac{4x \text{ inches}}{y \text{ seconds}}$. It's given that the speed of object R is half the speed of object S. It follows that the speed of object S is twice the speed of object R, which is $2\left(\frac{4x \text{ inches}}{y \text{ seconds}}\right)$, or $\frac{8x \text{ inches}}{y \text{ seconds}}$. Let n represent the time, in seconds, it takes object S to travel a distance of $24x$ inches. The value of n can be found by solving the equation $\frac{8x \text{ inches}}{y \text{ seconds}} = \frac{24x \text{ inches}}{n \text{ seconds}}$, which can be written as $\frac{8x}{y} = \frac{24x}{n}$. Multiplying each side of this equation by ny yields $8xn = 24xy$. Dividing each side of this equation by $8x$ yields $n = 3y$. Therefore, the expression $3y$ represents the time, in seconds, it takes object S to travel a distance of $24x$ inches.

Choice A is incorrect. This expression represents the time, in seconds, it would take object S to travel a distance of $24x$ inches if the speed of object R were twice, not half, the speed of object S.

Choice C is incorrect. This expression represents the time, in seconds, it takes object S to travel a distance of $128x$ inches, not $24x$ inches.

Choice D is incorrect. This expression represents the time, in seconds, it takes object R, not object S, to travel a distance of $24x$ inches.

Question Difficulty: Hard

Question ID 551c52b9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 551c52b9

Tilly earns p dollars for every w hours of work. Which expression represents the amount of money, in dollars, Tilly earns for $39w$ hours of work?

A. $39p$

B. $\frac{p}{39}$

C. $p + 39$

D. $p - 39$

ID: 551c52b9 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that Tilly earns p dollars for every w hours of work. This can be represented by the proportion $\frac{p}{w}$. The amount of money, x, Tilly earns for $39w$ hours of work can be found by setting up the proportion $\frac{p}{w} = \frac{x}{39w}$. This can be rewritten as $39pw = xw$. Dividing both sides by w results in $x = 39p$.

Choice B is incorrect. This is the amount of money Tilly earns in dollars per hour, not the amount of money Tilly earns for $39w$ hours of work.

Choice C is incorrect. This is the amount of money Tilly earns for w hours of work plus 39, not the amount of money Tilly earns for $39w$ hours of work.

Choice D is incorrect. This is the amount of money Tilly earns for w hours of work minus 39, not the amount of money Tilly earns for $39w$ hours of work.

Question Difficulty: Easy

Question ID 1180401d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 1180401d

The total area of a coastal city is 92.1 square miles, of which 11.3 square miles is water. If the city had a population of 621,000 people in the year 2010, which of the following is closest to the population density, in people per square mile of land area, of the city at that time?

A. 6,740

B. 7,690

C. 55,000

D. 76,000

ID: 1180401d Answer

Correct Answer: B

Rationale

Choice B is correct. The land area of the coastal city can be found by subtracting the area of the water from the total area of the coastal city; that is, $92.1 - 11.3 = 80.8$ square miles. The population density is the population divided by the land area, or $\frac{621{,}000}{80.8} = 7{,}686$, which is closest to 7,690 people per square mile.

Choice A is incorrect and may be the result of dividing the population by the total area, instead of the land area. Choice C is incorrect and may be the result of dividing the population by the area of water. Choice D is incorrect and may be the result of making a computational error with the decimal place.

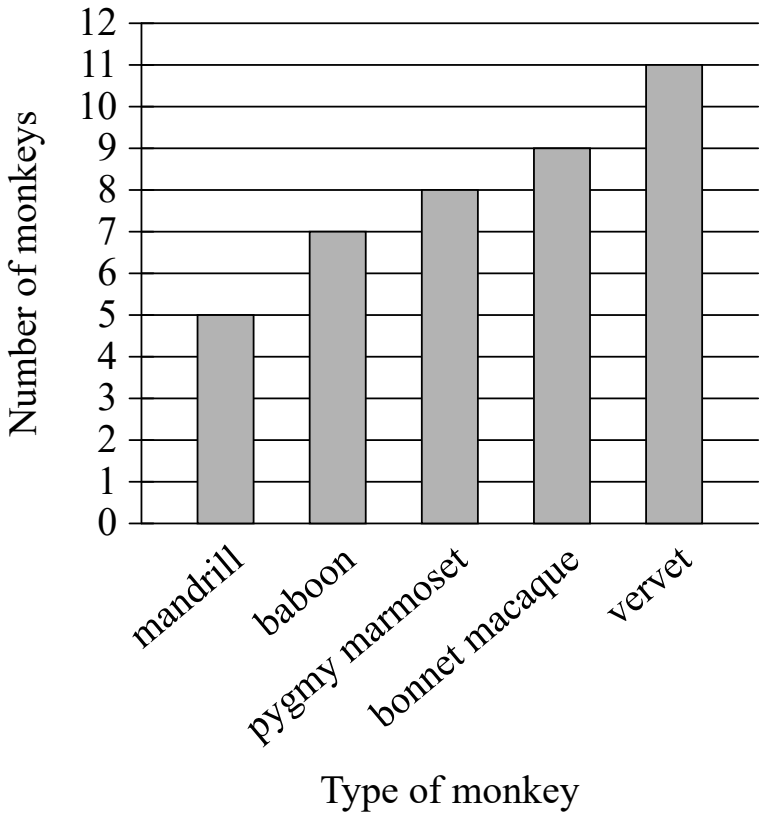
Question Difficulty: Medium

Question ID 57481175

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 57481175

The bar graph shows the number of each type of monkey in a sanctuary.



How many more vervets are in this sanctuary than mandrills?

A. 11

B. 6

C. 5

D. 3

ID: 57481175 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the bar graph shows the number of each type of monkey in a sanctuary. The bar representing the number of mandrills has a height of 5; therefore, there are 5 mandrills in the sanctuary. The bar representing vervets has a height of 11; therefore, there are 11 vervets in the sanctuary. Therefore, there are $11 - 5$, or 6, more vervets in this sanctuary than mandrills.

Choice A is incorrect. This is the number of vervets in the sanctuary.

Choice C is incorrect. This is the number of mandrills in the sanctuary.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID f6cbb04a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: f6cbb04a

$d = 55t$

The equation above can be used to calculate the distance d, in miles, traveled by a car moving at a speed of 55 miles per hour over a period of t hours. For any positive constant k, the distance the car would have traveled after $9k$ hours is how many times the distance the car would have traveled after $3k$ hours?

A. 3

B. 6

C. $3k$

D. $6k$

ID: f6cbb04a Answer

Correct Answer: A

Rationale

Choice A is correct. Since the distance is equal to the amount of time multiplied by a constant, the given equation $d = 55t$ represents a proportional relationship between distance and time in this situation. Since $9k = 3 \cdot 3k$, the time when $t = 9k$ hours is 3 times the time when $t = 3k$ hours. Therefore, the distance traveled after $9k$ hours is 3 times the distance after $3k$ hours.

Choices B and D are incorrect and may result from interpreting the proportional relationship between time and distance as additive rather than multiplicative. Choice C is incorrect and may result from an arithmetic error.

Question Difficulty: Medium

Question ID 96c3e32d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 96c3e32d

One side of a flat board has an area of 874 square inches. If a pressure of 19 pounds per square inch of area is exerted on this side of the board, what is the total force, in pounds, exerted on this side of the board?

ID: 96c3e32d Answer

Correct Answer: 16606

Rationale

The correct answer is $16{,}606$. It's given that one side of a flat board has an area of 874 square inches. If a pressure of 19 pounds per square inch of area is exerted on this side of the board, the total force exerted on this side of the board is $(874 \text{ square inches})\left(\frac{19 \text{ pounds}}{1 \text{ square inch}}\right)$, or $16{,}606$ pounds.

Question Difficulty: Medium

Question ID 98958ae8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 98958ae8

Data set A consists of the heights of 75 objects and has a mean of 25 meters. Data set B consists of the heights of 50 objects and has a mean of 65 meters. Data set C consists of the heights of the 125 objects from data sets A and B. What is the mean, in meters, of data set C?

ID: 98958ae8 Answer

Correct Answer: 41

Rationale

The correct answer is 41. The mean of a data set is computed by dividing the sum of the values in the data set by the number of values in the data set. It's given that data set A consists of the heights of 75 objects and has a mean of 25 meters. This can be represented by the equation $\frac{x}{75} = 25$, where x represents the sum of the heights of the objects, in meters, in data set A. Multiplying both sides of this equation by 75 yields $x = 75(25)$, or $x = 1{,}875$ meters. Therefore, the sum of the heights of the objects in data set A is $1{,}875$ meters. It's also given that data set B consists of the heights of 50 objects and has a mean of 65 meters. This can be represented by the equation $\frac{y}{50} = 65$, where y represents the sum of the heights of the objects, in meters, in data set B. Multiplying both sides of this equation by 50 yields $y = 50(65)$, or $y = 3{,}250$ meters. Therefore, the sum of the heights of the objects in data set B is $3{,}250$ meters. Since it's given that data set C consists of the heights of the 125 objects from data sets A and B, it follows that the mean of data set C is the sum of the heights of the objects, in meters, in data sets A and B divided by the number of objects represented in data sets A and B, or $\frac{1{,}875+3{,}250}{125}$, which is equivalent to 41 meters. Therefore, the mean, in meters, of data set C is 41.

Question Difficulty: Hard

Question ID 391ae4b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 391ae4b2

Data set F consists of 55 integers between 170 and 290. Data set G consists of all the integers in data set F as well as the integer 10. Which of the following must be less for data set F than for data set G?

The mean The median

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 391ae4b2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that data set F consists of 55 integers between 170 and 290 and data set G consists of all the integers in data set F as well as the integer 10. Since the integer 10 is less than all the integers in data set F, the mean of data set G must be less than the mean of data set F. Thus, the mean of data set F isn't less than the mean of data set G. When a data set is in ascending order, the median is between the two middle values when there is an even number of values and the median is the middle value when there is an odd number of values. It follows that the median of data set F is either greater than or equal to the median of data set G. Therefore, the median of data set F isn't less than the median of data set G. Thus, neither the mean nor the median must be less for data set F than for data set G.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

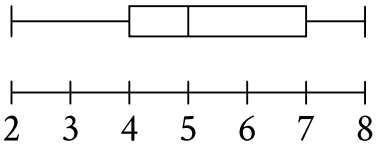
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 57f45509

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 57f45509



The box plot summarizes 15 data values. What is the median of this data set?

A. 2

B. 3

C. 5

D. 8

ID: 57f45509 Answer

Correct Answer: C

Rationale

Choice C is correct. The median of a data set represented in a box plot is given by the vertical line within the box. In the given box plot, the vertical line within the box occurs at 5. Therefore, the median of this data set is 5.

Choice A is incorrect. This is the minimum value of the data set.

Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect. This is the maximum value of the data set.

Question Difficulty: Easy

Question ID 2a59eb45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 2a59eb45

Data set A consists of the heights of 75 buildings and has a mean of 32 meters. Data set B consists of the heights of 50 buildings and has a mean of 62 meters. Data set C consists of the heights of the 125 buildings from data sets A and B. What is the mean, in meters, of data set C?

ID: 2a59eb45 Answer

Correct Answer: 44

Rationale

The correct answer is 44. The mean of a data set is computed by dividing the sum of the values in the data set by the number of values in the data set. It's given that data set A consists of the heights of 75 buildings and has a mean of 32 meters. This can be represented by the equation $\frac{x}{75} = 32$, where x represents the sum of the heights of the buildings, in meters, in data set A. Multiplying both sides of this equation by 75 yields $x = 75(32)$, or $x = 2{,}400$ meters. Therefore, the sum of the heights of the buildings in data set A is $2{,}400$ meters. It's also given that data set B consists of the heights of 50 buildings and has a mean of 62 meters. This can be represented by the equation $\frac{y}{50} = 62$, where y represents the sum of the heights of the buildings, in meters, in data set B. Multiplying both sides of this equation by 50 yields $y = 50(62)$, or $y = 3{,}100$ meters. Therefore, the sum of the heights of the buildings in data set B is $3{,}100$ meters. Since it's given that data set C consists of the heights of the 125 buildings from data sets A and B, it follows that the mean of data set C is the sum of the heights of the buildings, in meters, in data sets A and B divided by the number of buildings represented in data sets A and B, or $\frac{2{,}400+3{,}100}{125}$, which is equivalent to 44 meters. Therefore, the mean, in meters, of data set C is 44.

Question Difficulty: Hard

Question ID 2afd3cec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 2afd3cec

After 20% of the original number of marbles in a group were removed from the group, 360 marbles remained in the group. How many marbles were removed from the group?

A. 72

B. 90

C. 450

D. $1{,}800$

ID: 2afd3cec Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that 20% of the original number of marbles were removed from the group. Let x represent the original number of marbles in the group. It follows that $\frac{20}{100}x$, or $0.20x$, marbles were removed from the group. Therefore, $x - 0.20x$ marbles remained in the group. It's also given that 360 marbles remained in the group. Thus, $x - 0.20x = 360$, or $0.80x = 360$. Dividing both sides of this equation by 0.80 yields $x = 450$. Substituting 450 for x in the expression $0.20x$ yields $0.20(450)$, or 90. Therefore, 90 marbles were removed from the group.

Choice A is incorrect. This is 20% of the remaining number of marbles.

Choice C is incorrect. This is the original number of marbles, not the number of marbles that were removed.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2e92cc21

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 2e92cc21

The number a is 110% greater than the number b. The number b is 90% less than 47. What is the value of a?

ID: 2e92cc21 Answer

Correct Answer: 9.87, 987/100

Rationale

The correct answer is 9.87. It's given that the number a is 110% greater than the number b. It follows that $a = \left(1 + \frac{110}{100}\right)b$, or $a = 2.1b$. It's also given that the number b is 90% less than 47. It follows that $b = \left(1 - \frac{90}{100}\right)(47)$, or $b = 0.1(47)$, which yields $b = 4.7$. Substituting 4.7 for b in the equation $a = 2.1b$ yields $a = 2.1(4.7)$, which is equivalent to $a = 9.87$. Therefore, the value of a is 9.87.

Question Difficulty: Hard

Question ID 77cf4fa6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 77cf4fa6

There are 170 blocks in a container. Of these blocks, 10% are green. How many blocks in the container are green?

ID: 77cf4fa6 Answer

Correct Answer: 17

Rationale

The correct answer is 17. It's given that there are 170 blocks in a container, and of these blocks, 10% are green. Since 10% can be rewritten as $\frac{10}{100}$, or 0.1, the number of green blocks in the container is $0.1(170)$, or 17.

Question Difficulty: Easy

Question ID 2d31caae

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 2d31caae

Call Ratings

	1 Star	2 Stars	3 Stars	4 Stars	Total
Employee A	16	49	72	8	145
Employee B	4	10	22	34	70
Employee C	8	56	45	16	125
Employee D	22	42	84	12	160
Total	50	157	223	70	500

A supervisor at a call center reviewed 500 calls taken by four employees and rated the employees' performance on each call on a scale from 1 star to 4 stars. The ratings for each employee are shown in the table above. According to the table, to the nearest whole percent, what percent of Employee A's calls received a rating of 1 star?

A. 3%

B. 11%

C. 16%

D. 32%

ID: 2d31caae Answer

Correct Answer: B

Rationale

Choice B is correct. The percent of Employee A's calls that received a rating of 1 star is the number of Employee A's 1-star calls divided by the total number of Employee A's calls. This quotient, $\frac{16}{145}$, is approximately equal to 0.1103, or 11.03%. To the nearest whole percent, this is 11%.

Choice A is incorrect. This is the percent of all calls taken by Employee A that received a rating of 1 star. Choice C is incorrect and may result from a conceptual error. For example, 16 is the number, not the percent, of calls taken by Employee A that received a rating of 1 star. Choice D is incorrect. This is the percent of all calls that received a rating of 1 star that were taken by Employee A.

Question Difficulty: Easy

Question ID 94660ba8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 94660ba8

A participant in a bicycle race completes the race with an average speed of $24{,}816$ yards per hour. What is this average speed, in miles per hour? $(1 \text{ mile} = 1{,}760 \text{ yards})$

ID: 94660ba8 Answer

Correct Answer: 14.1

Rationale

The correct answer is 14.1. It's given that a participant completes the bicycle race with an average speed of $24{,}816$ yards per hour and $1 \text{ mile} = 1{,}760 \text{ yards}$. It follows that this average speed is equivalent to $\left(\frac{24{,}816 \text{ yards}}{1 \text{ hour}}\right)\left(\frac{1 \text{ mile}}{1{,}760 \text{ yards}}\right)$, which yields $\frac{14.1 \text{ miles}}{1 \text{ hour}}$, or 14.1 miles per hour.

Question Difficulty: Easy

Question ID ba0e23b0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: ba0e23b0

140 is $p\%$ greater than 10. What is the value of p?

A. $1{,}400$

B. $1{,}300$

C. 140

D. 130

ID: ba0e23b0 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that 140 is $p\%$ greater than 10. It follows that $140 = 10 + \left(\frac{p}{100}\right)10$, which is equivalent to $140 = 10 + \frac{10}{100}p$, or $140 = 10 + 0.1p$. Subtracting 10 from each side of this equation yields $130 = 0.1p$. Dividing each side of this equation by 0.1 yields $1{,}300 = p$, or $p = 1{,}300$.

Choice A is incorrect. This would be the value of p if 140 were $p\%$ of 10, not $p\%$ greater than 10.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c2e7fa6d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: c2e7fa6d

For an electric field passing through a flat surface perpendicular to it, the electric flux of the electric field through the surface is the product of the electric field's strength and the area of the surface. A certain flat surface consists of two adjacent squares, where the side length, in meters, of the larger square is 3 times the side length, in meters, of the smaller square. An electric field with strength 29.00 volts per meter passes uniformly through this surface, which is perpendicular to the electric field. If the total electric flux of the electric field through this surface is $4{,}640$ $\text{volts} \cdot \text{meters}$, what is the electric flux, in $\text{volts} \cdot \text{meters}$, of the electric field through the larger square?

ID: c2e7fa6d Answer

Correct Answer: 4176

Rationale

The correct answer is $4{,}176$. It's given that the side length of the larger square is 3 times the side length of the smaller square. This means that the area of the larger square is 3^2, or 9, times the area of the smaller square. If the area of the smaller square is represented by x, then the area of the larger square can be represented by $9x$. Therefore, the flat surface of the two adjacent squares has a total area of $x + 9x$, or $10x$. It's given that an electric field with strength 29.00 volts per meter passes uniformly through this surface and the total electric flux of the electric field through this surface is $4{,}640$ $\text{volts} \cdot \text{meters}$. Since it's given that the electric flux is the product of the electric field's strength and the area of the surface, the equation $29.00(10x) = 4{,}640$, or $290x = 4{,}640$, can be used to represent this situation. Dividing each side of this equation by 290 yields $x = 16$. Substituting 16 for x in the expression for the area of the larger square, $9x$, yields $9(16)$, or 144, square meters. Since the area of the larger square is 144 square meters, the electric flux, in $\text{volts} \cdot \text{meters}$, of the electric field through the larger square can be determined by multiplying the area of the larger square by the strength of the electric field. Thus, the electric flux is $(144 \text{ square meters})\left(\frac{29.00 \text{ volts}}{\text{meter}}\right)$, or $4{,}176$ $\text{volts} \cdot \text{meters}$.

Question Difficulty: Hard

Question ID 194ae3b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 194ae3b1

There were approximately 113,000 occupational therapy jobs in the United States in 2012. The Bureau of Labor Statistics has projected that this number will increase by 29% from 2012 to 2022. Of the following, which is closest to the number of occupational therapy jobs the bureau has projected for the United States in 2022?

A. 115,900

B. 116,300

C. 142,000

D. 145,800

ID: 194ae3b1 Answer

Correct Answer: D

Rationale

Choice D is correct. The decimal equivalent of 29% is 0.29. It's given that the 113,000 occupational therapy jobs in the United States in 2012 are projected to increase by 29% by 2022. Increasing 113,000 by 29% can be expressed as $(113{,}000)(1+0.29)$, or $(113{,}000)(1.29)$. Evaluating this expression yields 145,770. The closest number is 145,800 in choice D.

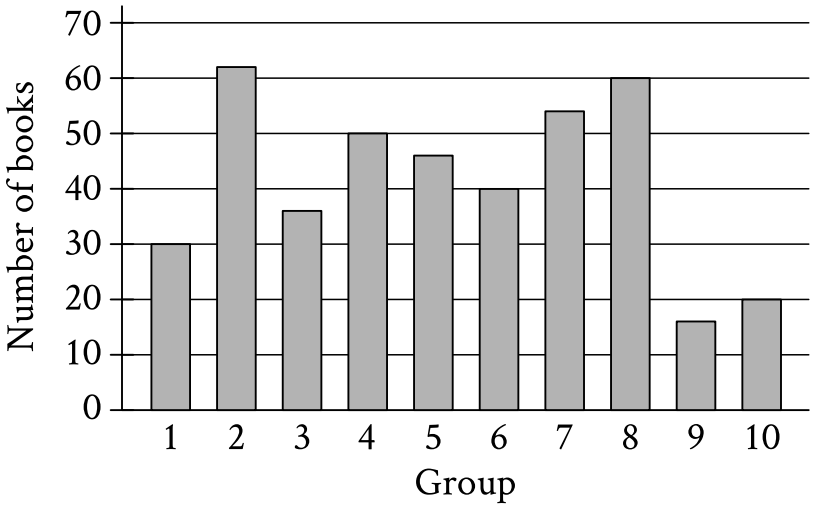
Choice A is incorrect and may result from increasing 113,000 by 2,900 instead of by 29%. Choice B is incorrect and may result from increasing 113,000 by 2.9% instead of by 29%. Choice C is incorrect and may result from increasing 113,000 by 29,000 instead of by 29%.

Question Difficulty: Easy

Question ID 79340403

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 79340403



The bar graph shows the distribution of 414 books collected by 10 different groups for a book drive. How many books were collected by group 1?

ID: 79340403 Answer

Correct Answer: 30

Rationale

The correct answer is 30. The height of each bar in the bar graph shown represents the number of books collected by the group specified at the bottom of the bar. The bar for group 1 reaches a height of 30. Therefore, group 1 collected 30 books.

Question Difficulty: Easy

Question ID a8fabad0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: a8fabad0

A waiter receives tips from each customer. On average, the tip is 15% of the customer's bill. At this rate, which of the following is closest to the tip the waiter can expect when a customer has a bill that is $78.20?

A. $8.00

B. $10.00

C. $12.00

D. $14.00

ID: a8fabad0 Answer

Correct Answer: C

Rationale

Choice C is correct. If the bill is $78.20, 15% of the bill can be found by multiplying 78.20 by the decimal conversion of 15%, 78.20 × 0.15 = $11.73. The exact amount $11.73 is closest in value to $12.00.

Choices A, B, and D are incorrect and may be the result of errors when calculating 15% of the total $78.20.

Question Difficulty: Easy

Question ID 4837406c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 4837406c

An object travels at a constant speed of 6 centimeters per second. At this speed, what is the time, in seconds, that it would take for the object to travel 24 centimeters?

ID: 4837406c Answer

Correct Answer: 4

Rationale

The correct answer is 4. It's given that the object travels at a constant speed of 6 centimeters per second. The speed of the object can be written as $\frac{6 \text{ centimeters}}{1 \text{ second}}$. Let x represent the time, in seconds, it would take for the object to travel 24 centimeters. The value of x can be calculated by solving the equation $\frac{6 \text{ centimeters}}{1 \text{ second}} = \frac{24 \text{ centimeters}}{x \text{ seconds}}$, which can be written as $\frac{6}{1} = \frac{24}{x}$, or $6 = \frac{24}{x}$. Multiplying each side of this equation by x yields $6x = 24$. Dividing each side of this equation by 6 yields $x = 4$. Therefore, it would take the object 4 seconds to travel 24 centimeters.

Question Difficulty: Easy

Question ID 99550621

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 99550621

Makayla is planning an event in a 5,400-square-foot room. If there should be at least 8 square feet per person, what is the maximum number of people that could attend this event?

A. 588

B. 675

C. 15,274

D. 43,200

ID: 99550621 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the event will be in a 5,400-square-foot room and that there should be at least 8 square feet per person. The maximum number of people that could attend the event can be found by dividing the total square feet in the room by the minimum number of square feet needed per person, which gives $\frac{5,400}{8}=675$.

Choices A and C are incorrect and may result from conceptual or computational errors. Choice D is incorrect and may result from multiplying, rather than dividing, 5,400 by 8.

Question Difficulty: Easy

Question ID 3318d37b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 3318d37b

A product costs 11.00 dollars per pound. What is the cost, in dollars, for 6 pounds of the product?

ID: 3318d37b Answer

Correct Answer: 66

Rationale

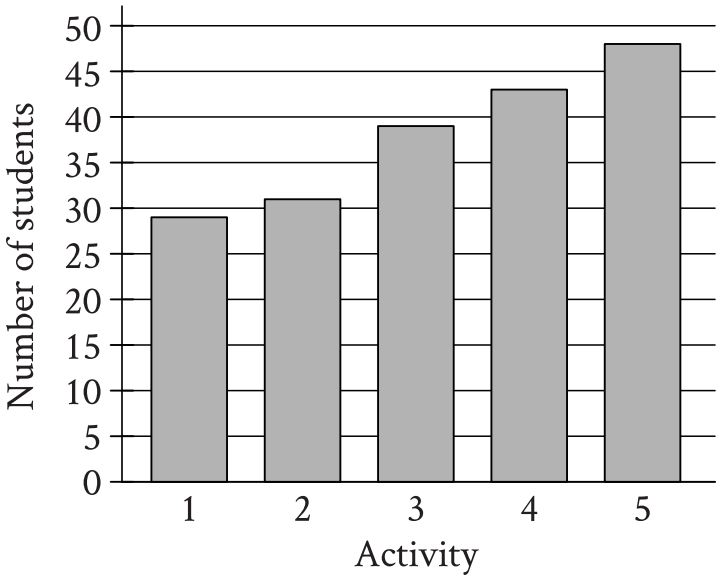
The correct answer is 66. It's given that a product costs 11.00 dollars per pound. Therefore, the cost for 6 pounds of the product is $\left(\frac{11.00 \text{ dollars}}{1 \text{ pound}}\right)(6 \text{ pounds})$, which is equivalent to 66.00, or 66, dollars.

Question Difficulty: Easy

Question ID 93779b53

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 93779b53



A group of students voted on five after-school activities. The bar graph shows the number of students who voted for each of the five activities. How many students chose activity 3?

A. 25

B. 39

C. 48

D. 50

ID: 93779b53 Answer

Correct Answer: B

Rationale

Choice B is correct. The height of each bar in the bar graph given represents the number of students that voted for the activity specified at the bottom of the bar. The bar for activity 3 has a height that is between 35 and 40. In other words, the number of students that chose activity 3 is between 35 students and 40 students. Of the given choices, 39 is the only value between 35 and 40. Therefore, 39 students chose activity 3.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect. This is the number of students that chose activity 5, not activity 3.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID 9d935bd8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 9d935bd8

Percent of Residents Who Earned a Bachelor's Degree or Higher

State	Percent of residents
State A	21.9%
State B	27.9%
State C	25.9%
State D	19.5%
State E	30.1%
State F	36.4%
State G	35.5%

A survey was given to residents of all 50 states asking if they had earned a bachelor's degree or higher. The results from 7 of the states are given in the table above. The median percent of residents who earned a bachelor's degree or higher for all 50 states was 26.95%. What is the difference between the median percent of residents who earned a bachelor's degree or higher for these 7 states and the median for all 50 states?

A. 0.05%

B. 0.95%

C. 1.22%

D. 7.45%

ID: 9d935bd8 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of a set of numbers is the middle value of the set values when ordered from least to greatest. If the percents in the table are ordered from least to greatest, the middle value is 27.9%. The difference between 27.9% and 26.95% is 0.95%.

Choice A is incorrect and may be the result of calculation errors or not finding the median of the data in the table correctly. Choice C is incorrect and may be the result of finding the mean instead of the median. Choice D is incorrect and may be the result of using the middle value of the unordered list.

Question Difficulty: Hard

Question ID 8c5dbd3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 8c5dbd3e

The number w is 110% greater than the number z. The number z is 55% less than 50. What is the value of w?

ID: 8c5dbd3e Answer

Correct Answer: 189/4, 47.25

Rationale

The correct answer is 47.25. It's given that the number w is 110% greater than the number z. It follows that $w = \left(1 + \frac{110}{100}\right)z$, or $w = 2.1z$. It's also given that the number z is 55% less than 50. It follows that $z = \left(1 - \frac{55}{100}\right)(50)$, or $z = 0.45(50)$, which yields $z = 22.5$. Substituting 22.5 for z in the equation $w = 2.1z$ yields $w = 2.1(22.5)$, which is equivalent to $w = 47.25$. Therefore, the value of w is 47.25. Note that 47.25 and 189/4 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 94c65646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 94c65646

432 is 96% of what number?

ID: 94c65646 Answer

Correct Answer: 450

Rationale

The correct answer is 450. Let x represent the number that 432 is 96% of. This can be written as $\left(\frac{96}{100}\right)x = 432$, or $0.96x = 432$. Dividing both sides of this equation by 0.96 yields $x = 450$. Therefore, 432 is 96% of 450.

Question Difficulty: Medium

Question ID 9e2bf782

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 9e2bf782

A fish hatchery has three tanks for holding fish before they are introduced into the wild. Ten fish weighing less than 5 ounces are placed in tank A. Eleven fish weighing at least 5 ounces but no more than 13 ounces are placed in tank B. Twelve fish weighing more than 13 ounces are placed in tank C. Which of the following could be the median of the weights, in ounces, of these 33 fish?

A. 4.5

B. 8

C. 13.5

D. 15

ID: 9e2bf782 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of a set of numbers is the middle number when the values in the set are ordered from least to greatest. There are 33 fish, so in an ordered list of the weights, the 17th value would be the median weight. The 10 fish in tank A weigh the least, and these 10 weights would be the first 10 values on the ordered list. The 11 fish in tank B have the next set of higher weights, and so would be the 11th through 21st weights in the ordered list, which includes the median weight as the 17th value. The fish in tank B weigh at least 5 ounces but no more than 13 ounces; of the given choices, only 8 ounces falls within this range of values.

Choice A is incorrect. It's given that tank A has ten fish weighing less than 5 ounces. Since there are more than ten fish in tanks B and C combined, the median weight cannot be less than 5 ounces. Choice C and D are incorrect. It's given that tank C has twelve fish weighing more than 13 ounces. There are more than twelve fish in tanks A and B combined, so the median weight can't be more than 13 ounces.

Question Difficulty: Medium

Question ID 54cb53cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 54cb53cf

The number of zebras in a population in 2018 was 1.27 times the number of zebras in this population in 2014. If the number of zebras in this population in 2014 is $p\%$ of the number of zebras in this population in 2018, what is the value of p, to the nearest whole number?

ID: 54cb53cf Answer

Correct Answer: 79

Rationale

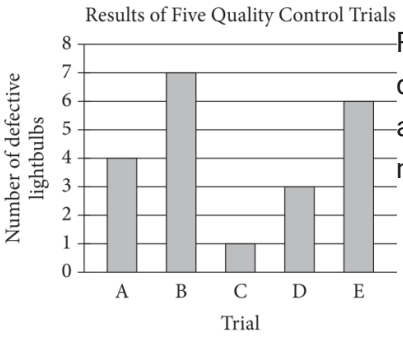
The correct answer is 79. Let x represent the number of zebras in the population in 2014 and let y represent the number of zebras in the population in 2018. It's given that the number of zebras in this population in 2018 was 1.27 times the number of zebras in this population in 2014. It follows that the equation $y = 1.27x$ represents this situation. Dividing both sides of this equation by 1.27 yields $\frac{y}{1.27} = x$, or $\left(\frac{1}{1.27}\right)y = x$. Therefore, the number of zebras in this population in 2014 is $\frac{1}{1.27}$ times the number of zebras in this population in 2018. If the number of zebras in this population in 2014 is $p\%$ of the number of zebras in this population in 2018, then $x = \frac{p}{100}y$. It follows that $\frac{1}{1.27} = \frac{p}{100}$, or $\frac{100}{1.27} = p$, which means p is approximately equal to 78.74. Therefore, the value of p, to the nearest whole number, is 79.

Question Difficulty: Hard

Question ID a9647302

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: a9647302



For quality control, a company that manufactures lightbulbs conducted five different trials. In each trial, 500 different lightbulbs were tested. The bar graph above shows the number of defective lightbulbs found in each trial. What is the mean number of defective lightbulbs for the five trials?

A. 4.0

B. 4.2

C. 4.6

D. 5.0

ID: a9647302 Answer

Correct Answer: B

Rationale

Choice B is correct. The numbers of defective lightbulbs found for the five trials are 4, 7, 1, 3, and 6, respectively. The mean is therefore $\frac{4+7+1+3+6}{5}=4.2$.

Choice A is incorrect. This is the median number of defective lightbulbs for the five trials. Choice C is incorrect and may result from an arithmetic error. Choice D is incorrect and may result from mistaking the number of trials for the number of defective lightbulbs.

Question Difficulty: Easy

Question ID 7b731fc3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 7b731fc3

What number is 40% greater than 115?

ID: 7b731fc3 Answer

Correct Answer: 161

Rationale

The correct answer is 161. For a number to be 40% greater than 115, it follows that the number is $(100\% \text{ of } 115) + (40\% \text{ of } 115)$, which can be written as $\frac{100}{100}(115) + \frac{40}{100}(115)$. This expression is equivalent to $1(115) + 0.4(115)$, or $1.4(115)$, which is equal to 161. Therefore, 161 is 40% greater than 115.

Question Difficulty: Medium

Question ID e9f4521a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: e9f4521a

13 is $p\%$ of 25. What is the value of p?

ID: e9f4521a Answer

Correct Answer: 52

Rationale

The correct answer is 52. It's given that 13 is $p\%$ of 25. It follows that $\frac{13}{25} = \frac{p}{100}$. Multiplying both sides of this equation by 100 gives $52 = p$. Therefore, the value of p is 52.

Question Difficulty: Medium

Question ID 89c39d77

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 89c39d77

A competition consisted of four different events. One participant completed the first event with an average speed of 20.300 miles per hour. What was this average speed, in yards per hour? $(1\ \text{mile} = 1{,}760\ \text{yards})$

ID: 89c39d77 Answer

Correct Answer: 35728

Rationale

The correct answer is $35{,}728$. It's given that $1\ \text{mile} = 1{,}760\ \text{yards}$. It follows that an average speed of 20.300 miles per hour is equivalent to $\left(\frac{20.300\ \text{miles}}{1\ \text{hour}}\right)\left(\frac{1{,}760\ \text{yards}}{1\ \text{mile}}\right)$, or $35{,}728$ yards per hour.

Question Difficulty: Medium

Question ID 1c2f50a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 1c2f50a6

During a sale, the original prices of all the items in a clothing store have been reduced by 20%. What is the sale price of a jacket with an original price of $50 ?

A. $12

B. $30

C. $36

D. $40

ID: 1c2f50a6 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the original price of the jacket has been reduced by 20%. Multiplying the original price, $50, by 20% gives the amount, in dollars, that the price of the jacket is reduced by: $50 \times .20 = 10$. Subtracting this value from the original price results in the sale price of the jacket: $\$50 - \$10$, or $40.

Choices A, B, and C are incorrect and may result from a conceptual or calculation error.

Question Difficulty: Easy

Question ID 8193e8cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■□

ID: 8193e8cd

2, 10, 3, 7, 6

The mean of the list of numbers above is what fraction of the sum of the five numbers?

ID: 8193e8cd Answer

Rationale

The correct answer is $\frac{1}{5}$. The mean of the list of numbers is found by dividing the sum of the numbers by the number of values in the list. Since there are 5 numbers in the list, the mean is $\frac{1}{5}$ of the sum of the numbers. Note that 1/5 and .2 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 3d73a58b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 3d73a58b

A gift shop buys souvenirs at a wholesale price of 7.00 dollars each and resells them each at a retail price that is 290% of the wholesale price. At the end of the season, any remaining souvenirs are marked at a discounted price that is 80% off the retail price. What is the discounted price of each remaining souvenir, in dollars?

ID: 3d73a58b Answer

Correct Answer: 203/50, 4.06

Rationale

The correct answer is 4.06. It's given that the retail price is 290% of the wholesale price of $\$7.00$. Thus, the retail price is $\$7.00\left(\frac{290}{100}\right)$, which is equivalent to $\$7.00(2.9)$, or $\$20.30$. It's also given that the discounted price is 80% off the retail price. Thus, the discounted price is $\$20.30\left(1-\frac{80}{100}\right)$, which is equivalent to $\$20.30(0.20)$, or $\$4.06$.

Question Difficulty: Hard

Question ID 674a4084

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 674a4084

An insect moves at a speed of $\frac{3}{20}$ feet per second. What is this speed, in yards per second? $(3 \text{ feet} = 1 \text{ yard})$

A. $\frac{1}{20}$

B. $\frac{9}{20}$

C. 6

D. 20

ID: 674a4084 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $3 \text{ feet} = 1 \text{ yard}$. It follows that a speed of $\frac{3}{20}$ feet per second is equivalent to $\left(\frac{\frac{3}{20} \text{ feet}}{1 \text{ second}}\right)\left(\frac{1 \text{ yard}}{3 \text{ feet}}\right)$, which is equivalent to $\left(\frac{3}{20}\right)\left(\frac{1}{3}\right)$, or $\frac{1}{20}$, yards per second.

Choice B is incorrect. This is the speed, in feet per second, that's equivalent to $\frac{3}{20}$ yards per second.

Choice C is incorrect. This is the speed, in yards per second, that's equivalent to 18, not $\frac{3}{20}$, feet per second.

Choice D is incorrect. This is the speed, in yards per second, that's equivalent to 60, not $\frac{3}{20}$, feet per second.

Question Difficulty: Medium

Question ID 54d93874

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 54d93874

	Masses (kilograms)					
Andrew	2.4	2.5	3.6	3.1	2.5	2.7
Maria	*x*	3.1	2.7	2.9	3.3	2.8

Andrew and Maria each collected six rocks, and the masses of the rocks are shown in the table above. The mean of the masses of the rocks Maria collected is 0.1 kilogram greater than the mean of the masses of the rocks Andrew collected. What is the value of x?

ID: 54d93874 Answer

Rationale

The correct answer is 2.6. Since the mean of a set of numbers can be found by adding the numbers together and dividing by how many numbers there are in the set, the mean mass, in kilograms, of the rocks Andrew collected is $\frac{2.4+2.5+3.6+3.1+2.5+2.7}{6}=\frac{16.8}{6}$, or 2.8. Since the mean mass of the rocks Maria collected is 0.1 kilogram greater than the mean mass of rocks Andrew collected, the mean mass of the rocks Maria collected is $2.8+0.1=2.9$ kilograms. The value of x can be found by writing an equation for finding the mean: $\frac{x+3.1+2.7+2.9+3.3+2.8}{6}=2.9$. Solving this equation gives $x=2.6$. Note that 2.6 and 13/5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 048811bd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 048811bd

What is 10% of 370?

A. 27

B. 37

C. 333

D. 360

ID: 048811bd Answer

Correct Answer: B

Rationale

Choice B is correct. 10% of a quantity means $\frac{10}{100}$ times the quantity. Therefore, 10% of 370 can be represented as $\frac{10}{100}(370)$, which is equivalent to $0.10(370)$, or 37. Therefore, 10% of 370 is 37.

Choice A is incorrect. This is 10% of 270, not 10% of 370. Choice C is incorrect. This is 90% of 370, not 10% of 370.

Choice D is incorrect. This is $370 - 10$, not 10% of 370.

Question Difficulty: Easy

Question ID 869a32f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 869a32f1

The high temperature, in degrees Fahrenheit (°F), in a certain city was recorded for each of 5 days. The data are shown below.

Day	1	2	3	4	5
High temperature (°F)	81	80	81	81	82

Over this 5-day period, which of the following is NOT equal to 81°F?

A. Median of the high temperatures

B. Mean of the high temperatures

C. Mode of the high temperatures

D. Range of the high temperatures

ID: 869a32f1 Answer

Correct Answer: D

Rationale

Choice D is correct. The range of a data set is the difference between the maximum and the minimum values in the set. The maximum value among the high temperatures in the table is 82°F and the minimum value is 80°F. Therefore, the range is 82°F – 80°F = 2°F.

Choice A is incorrect. The median of a data set is the middle value when the values in the set are ordered from least to greatest. Ordering the high temperatures this way gives the list 80, 81, 81, 81, 82. Therefore, the median high temperature is 81°F. Choice B is incorrect. The mean high temperature is $\frac{81+80+81+81+82}{5}=\frac{405}{5}=81$. Choice C is incorrect. The mode is the value that occurs the greatest number of times. For the set of high temperatures shown, 81 is the value that occurs 3 times, and therefore, 81°F is the mode of the high temperatures.

Question Difficulty: Easy

Question ID 6670e407

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■□□

ID: 6670e407

Number of High School Students Who Completed Summer Internships

High school	Year				
	2008	2009	2010	2011	2012
Foothill	87	80	75	76	70
Valley	44	54	65	76	82
Total	131	134	140	152	152

The table above shows the number of students from two different high schools who completed summer internships in each of five years. No student attended both schools. Which of the following statements are true about the number of students who completed summer internships for the 5 years shown?

I. The mean number from Foothill High School is greater than the mean number from Valley High School.

II. The median number from Foothill High School is greater than the median number from Valley High School.

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 6670e407 Answer

Correct Answer: C

Rationale

Choice C is correct. The mean of a data set is found by dividing the sum of the values by the number of values. Therefore, the mean number of students who completed summer internships from Foothill High School is $\frac{87+80+75+76+70}{5}=\frac{388}{5}$, or 77.6. Similarly, the mean number from Valley High School is $\frac{44+54+65+76+82}{5}=\frac{321}{5}$, or 64.2. Thus, the mean number from Foothill High School is greater than the mean number from Valley High School. When a data set has an odd number of elements, the median can be found by ordering the values from least to greatest and determining the value in the middle. Since there are five values in each data set, the third value in each ordered list is the median. Therefore, the median number from Foothill High School is 76 and the median number from Valley High School is 65. Thus, the median number from Foothill High School is greater than the median number from Valley High School.

Choices A, B, and D are incorrect and may result from various misconceptions or miscalculations.

Question Difficulty: Easy

Question ID 808f7d6c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 808f7d6c

If $t = 4u$, which of the following is equivalent to $2t$?

A. $8u$

B. $2u$

C. u

D. $\frac{1}{2}u$

ID: 808f7d6c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $t = 4u$. Multiplying both sides of this equation by 2 yields $2t = 2(4u)$, or $2t = 8u$.

Choice B is incorrect and may result from dividing, instead of multiplying, the right-hand side of the equation by 2. Choices C and D are incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID 566759ef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: 566759ef

Thomas installed a new stove in his restaurant. At the time of installation, the stove had a value of $800. Thomas estimates that each year the value of the stove will depreciate by 20% of the previous year's estimated value. What is the estimated value of the stove exactly 2 years after Thomas installed it?

A. $480

B. $512

C. $556

D. $640

ID: 566759ef Answer

Rationale

Choice B is correct. If the stove's value depreciates by 20% of the previous year's estimated value, then each year it retains 100% – 20% = 80%, or 0.80, of the previous year's estimated value. Since the stove's value was $800 when Thomas installed it, the estimated value after two years would be (0.80)(0.80)($800) = $512.

Choice A is incorrect. This is the value of the stove if each year it had depreciated by 20% of the original value rather than by 20% of the previous year's estimated value. Choice C is incorrect and may be the result of a computational error. Choice D is incorrect. This is the estimated value of the stove 1 year after Thomas installed it, not 2 years.

Question Difficulty: Medium

Question ID 6e4a60dd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 6e4a60dd

Rita's total bill at a restaurant was $25.00, including tax. If she left a tip of 20% of the total bill, what was the amount of the tip?

A. $3.50

B. $4.00

C. $4.50

D. $5.00

ID: 6e4a60dd Answer

Correct Answer: D

Rationale

Choice D is correct. The total bill was $25.00. The percentage 20% is equivalent to the decimal 0.2. The tip is the product of the percentage and the total bill; therefore, $0.2 \times 25 = 5$, so the tip was $5.00.

Choices A, B, and C are incorrect and may be the result of incorrectly converting the given percentage or a calculation error.

Question Difficulty: Easy

Question ID ad1d6adb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: ad1d6adb

The number of coins in a collection increased from 9 to 90. What was the percent increase in the number of coins in this collection?

A. 10%

B. 81%

C. 90%

D. 900%

ID: ad1d6adb Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the number of coins in the collection increased from 9 to 90. It follows that the number of coins in the collection increased by $90 - 9$, or 81. Let $x\%$ represent the percentage that 81 is of 9. The value of x can be found using the proportion $\frac{81}{9} = \frac{x}{100}$, or $9 = \frac{x}{100}$. Multiplying both sides of this equation by 100 yields $900 = x$. Thus, when the number of coins in the collection increased from 9 to 90, the percent increase was 900%.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 040f2a84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 040f2a84

The regular price of a shirt at a store is $\$11.70$. The sale price of the shirt is 80% less than the regular price, and the sale price is 30% greater than the store's cost for the shirt. What was the store's cost, in dollars, for the shirt? (Disregard the $\$$ sign when entering your answer. For example, if your answer is $\$4.97$, enter 4.97)

ID: 040f2a84 Answer

Correct Answer: 1.8, 9/5

Rationale

The correct answer is 1.8. It's given that the regular price of a shirt at a store is $\$11.70$, and the sale price of the shirt is 80% less than the regular price. It follows that the sale price of the shirt is $\$11.70\left(1-\frac{80}{100}\right)$, or $\$11.70(1-0.8)$, which is equivalent to $\$2.34$. It's also given that the sale price of the shirt is 30% greater than the store's cost for the shirt. Let x represent the store's cost for the shirt. It follows that $2.34=\left(1+\frac{30}{100}\right)x$, or $2.34=1.3x$. Dividing both sides of this equation by 1.3 yields $x=1.80$. Therefore, the store's cost, in dollars, for the shirt is 1.80. Note that 1.8 and 9/5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 41b71b4e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 41b71b4e

What number is 20% greater than 60 ?

A. 50

B. 72

C. 75

D. 132

ID: 41b71b4e Answer

Correct Answer: B

Rationale

Choice B is correct. The decimal equivalent of 20% is 0.2. The number that is 20% greater than 60 is also 120% of 60. The decimal equivalent of 120% is 1.2, and $1.2(60) = 72$.

Alternate approach: 10% of 60 is 6, and 20% of 60 is double that amount, or 12. It follows that the number that is 20% greater than 60 is 12 more than 60, or $60 + 12 = 72$.

Choice A is incorrect and may result from dividing, instead of multiplying, 60 by 1.2. Choice C is incorrect because it's 25% greater than 60, rather than 20% greater than 60. Choice D is incorrect and may result from multiplying 60 by 2.2 instead of 1.2.

Question Difficulty: Easy

Question ID eaab8bc1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: eaab8bc1

Out of 300 seeds that were planted, 80% sprouted. How many of these seeds sprouted?

ID: eaab8bc1 Answer

Correct Answer: 240

Rationale

The correct answer is 240. It's given that 80% of the 300 seeds sprouted. Therefore, the number of seeds that sprouted can be calculated by multiplying the number of seeds that were planted by $\frac{80}{100}$, which gives $300\left(\frac{80}{100}\right)$, or 240.

Question Difficulty: Easy

Question ID 8213b1b3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 8213b1b3

According to a set of standards, a certain type of substance can contain a maximum of 0.001% phosphorus by mass. If a sample of this substance has a mass of 140 grams, what is the maximum mass, in grams, of phosphorus the sample can contain to meet these standards?

ID: 8213b1b3 Answer

Correct Answer: .0014

Rationale

The correct answer is $.0014$. It's given that a certain type of substance can contain a maximum of 0.001% phosphorus by mass to meet a set of standards. If a sample of the substance has a mass of 140 grams, it follows that the maximum mass, in grams, of phosphorus the sample can contain to meet the standards is 0.001% of 140, or $\frac{0.001}{100}(140)$, which is equivalent to $(0.00001)(140)$, or 0.0014. Note that .0014 and 0.001 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 34f8cd89

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 34f8cd89

37% of the items in a box are green. Of those, 37% are also rectangular. Of the green rectangular items, 42% are also metal. Which of the following is closest to the percentage of the items in the box that are not rectangular green metal items?

A. 1.16%

B. 57.50%

C. 94.25%

D. 98.84%

ID: 34f8cd89 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that 37% of the items in a box are green. Let x represent the total number of items in the box. It follows that $\frac{37}{100}x$, or $0.37x$, items in the box are green. It's also given that of those, 37% are also rectangular. Therefore, $\frac{37}{100}(0.37x)$, or $0.1369x$, items in the box are green rectangular items. It's also given that of the green rectangular items, 42% are also metal. Therefore, $\frac{42}{100}(0.1369x)$, or $0.057498x$, items in the box are rectangular green metal items. The number of the items in the box that are not rectangular green metal items is the total number of items in the box minus the number of rectangular green metal items in the box. Therefore, the number of items in the box that are not rectangular green metal items is $x - 0.057498x$, or $0.942502x$. The percentage of items in the box that are not rectangular green metal items is the percentage that $0.942502x$ is of x. If $p\%$ represents this percentage, the value of p is $100\left(\frac{0.942502x}{x}\right)$, or 94.2502. Of the given choices, 94.25% is closest to the percentage of items in the box that are not rectangular green metal items.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 20b69297

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: 20b69297

Anita created a batch of green paint by mixing 2 ounces of blue paint with 3 ounces of yellow paint. She must mix a second batch using the same ratio of blue and yellow paint as the first batch. If she uses 5 ounces of blue paint for the second batch, how much yellow paint should Anita use?

A. Exactly 5 ounces

B. 3 ounces more than the amount of yellow paint used in the first batch

C. 1.5 times the amount of yellow paint used in the first batch

D. 1.5 times the amount of blue paint used in the second batch

ID: 20b69297 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch. For any batch of paint that uses the same ratio, the amount of yellow paint used will be $\frac{3}{2}$, or 1.5, times the amount of blue paint used in the batch. Therefore, the amount of yellow paint Anita will use in the second batch will be 1.5 times the amount of blue paint used in the second batch.

Alternate approach: It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch and that she will use 5 ounces of blue paint for the second batch. A proportion can be set up to solve for x, the amount of yellow paint she will use for the second batch: $\frac{2}{3} = \frac{5}{x}$. Multiplying both sides of this equation by 3 yields $2 = \frac{15}{x}$, and multiplying both sides of this equation by x yields $2x = 15$. Dividing both sides of this equation by 2 yields $x = 7.5$. Since Anita will use 7.5 ounces of yellow paint for the second batch, this is $\frac{7.5}{5} = 1.5$ times the amount of blue paint (5 ounces) used in the second batch.

Choices A, B, and C are incorrect and may result from incorrectly interpreting the ratio of blue paint to yellow paint used.

Question Difficulty: Hard

Question ID 94237701

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 94237701

For a certain computer game, individuals receive an integer score that ranges from 2 through 10. The table below shows the frequency distribution of the scores of the 9 players in group A and the 11 players in group B.

Score	Score Frequencies	
	Group A	Group B
2	1	0
3	1	0
4	2	0
5	1	4
6	3	2
7	0	0
8	0	2
9	1	1
10	0	2
Total	9	11

The median of the scores for group B is how much greater than the median of the scores for group A?

ID: 94237701 Answer

Rationale

The correct answer is 1. When there are an odd number of values in a data set, the median of the data set is the middle number when the data values are ordered from least to greatest. The scores for group A, ordered from least to greatest, are 2, 3, 4, 4, 5, 6, 6, 6, and 9. The median of the scores for group A is therefore 5. The scores for group B, ordered from least to greatest, are 5, 5, 5, 5, 6, 6, 8, 8, 9, 10, and 10. The median of the scores for group B is therefore 6. The median score for group B is $6-5=1$ more than the median score for group A.

Question Difficulty: Hard

Question ID d7a3179d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: d7a3179d

How many yards are equivalent to $1{,}116$ inches? $(1 \text{ yard} = 36 \text{ inches})$

ID: d7a3179d Answer

Correct Answer: 31

Rationale

The correct answer is 31. It's given that 1 yard is equal to 36 inches. Therefore, $1{,}116$ inches is equivalent to $(1{,}116 \text{ inches})\left(\frac{1 \text{ yard}}{36 \text{ inches}}\right)$, or 31 yards.

Question Difficulty: Easy

Question ID d6456c7a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■■

ID: d6456c7a

A certain park has an area of $11,863,808$ square yards. What is the area, in square miles, of this park? $(1 \text{ mile} = 1,760 \text{ yards})$

A. 1.96

B. 3.83

C. $3,444.39$

D. $6,740.8$

ID: d6456c7a Answer

Correct Answer: B

Rationale

Choice B is correct. Since 1 mile is equal to $1,760$ yards, 1 square mile is equal to $1,760^2$, or $3,097,600$, square yards. It's given that the park has an area of $11,863,808$ square yards. Therefore, the park has an area of $(11,863,808 \text{ square yards})\left(\frac{1 \text{ square mile}}{3,097,600 \text{ square yards}}\right)$, or $\frac{11,863,808}{3,097,600}$ square miles. Thus, the area, in square miles, of the park is 3.83.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the square root of the area of the park in square yards, not the area of the park in square miles.

Choice D is incorrect and may result from converting $11,863,808$ yards to miles, rather than converting $11,863,808$ square yards to square miles.

Question Difficulty: Hard

Question ID 4347a032

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 4347a032

How many teaspoons are equivalent to 44 tablespoons? $(3 \text{ teaspoons} = 1 \text{ tablespoon})$

A. 47

B. 88

C. 132

D. 176

ID: 4347a032 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that 3 teaspoons is equivalent to 1 tablespoon. Therefore, 44 tablespoons is equivalent to $(44 \text{ tablespoons})\left(\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}\right)$, or 132 teaspoons.

Choice A is incorrect. This is equivalent to approximately 15.66 tablespoons, not 44 tablespoons.

Choice B is incorrect. This is equivalent to approximately 29.33 tablespoons, not 44 tablespoons.

Choice D is incorrect. This is equivalent to approximately 58.66 tablespoons, not 44 tablespoons.

Question Difficulty: Easy

Question ID 51c9d65f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■■□

ID: 51c9d65f

For a certain rectangular region, the ratio of its length to its width is 35 to 10. If the width of the rectangular region increases by 7 units, how must the length change to maintain this ratio?

A. It must decrease by 24.5 units.

B. It must increase by 24.5 units.

C. It must decrease by 7 units.

D. It must increase by 7 units.

ID: 51c9d65f Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the ratio of the rectangular region's length to its width is 35 to 10. This can be written as a proportion: $\frac{\text{length}}{\text{width}} = \frac{35}{10}$, or $\frac{\ell}{w} = \frac{35}{10}$. This proportion can be rewritten as $10\ell = 35w$, or $\ell = 3.5w$. If the width of the rectangular region increases by 7, then the length will increase by some number x in order to maintain this ratio. The value of x can be found by replacing ℓ with $\ell + x$ and w with $w + 7$ in the equation, which gives $\ell + x = 3.5(w + 7)$. This equation can be rewritten using the distributive property as $\ell + x = 3.5w + 24.5$. Since $\ell = 3.5w$, the right-hand side of this equation can be rewritten by substituting ℓ for $3.5w$, which gives $\ell + x = \ell + 24.5$, or $x = 24.5$. Therefore, if the width of the rectangular region increases by 7 units, the length must increase by 24.5 units in order to maintain the given ratio.

Choice A is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease.

Choice C is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease.

Choice D is incorrect. Since the ratio of the length to the width of the rectangular region is 35 to 10, if the width of the rectangular region increases by 7 units, the length would have to increase by a proportional amount, which would have to be greater than 7 units.

Question Difficulty: Medium

Question ID 763e6769

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 763e6769

The ratio x to y is equivalent to the ratio 12 to t. When $x = 156$, what is the value of y in terms of t?

A. $13t$

B. $12t$

C. $144t$

D. $168t$

ID: 763e6769 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the ratio x to y is equivalent to the ratio 12 to t. This can be represented by $\frac{x}{y} = \frac{12}{t}$. Substituting 156 for x in this equation yields $\frac{156}{y} = \frac{12}{t}$. This can be rewritten as $12y = 156t$. Dividing both sides of this equation by 12 yields $y = 13t$. Therefore, when $x = 156$, the value of y in terms of t is $13t$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 25faa756

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: 25faa756

The number a is 60% greater than the positive number b. The number c is 45% less than a. The number c is how many times b?

ID: 25faa756 Answer

Correct Answer: .88, 22/25

Rationale

The correct answer is $.88$. It's given that the number a is 60% greater than the positive number b. Therefore, $a = (1 + \frac{60}{100})b$, which is equivalent to $a = (1 + 0.60)b$, or $a = 1.60b$. It's also given that the number c is 45% less than a. Therefore, $c = (1 - \frac{45}{100})a$, which is equivalent to $c = (1 - 0.45)a$, or $c = 0.55a$. Since $a = 1.60b$, substituting $1.60b$ for a in the equation $c = 0.55a$ yields $c = 0.55(1.60b)$, or $c = 0.88b$. Thus, the number c is 0.88 times the number b. Note that .88 and 22/25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ad911622

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■■

ID: ad911622

The value of a collectible comic book increased by 167% from the end of 2011 to the end of 2012 and then decreased by 16% from the end of 2012 to the end of 2013. What was the net percentage increase in the value of the collectible comic book from the end of 2011 to the end of 2013?

A. 124.28%

B. 140.28%

C. 151.00%

D. 209.72%

ID: ad911622 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the value of the comic book increased by 167% from the end of 2011 to the end of 2012. Therefore, if the value of the comic book at the end of 2011 was x dollars, then the value, in dollars, of the comic book at the end of 2012 was $x + \left(\frac{167}{100}\right)x$, which can be rewritten as $1x + 1.67x$, or $2.67x$. It's also given that the value of the comic book decreased by 16% from the end of 2012 to the end of 2013. Therefore, the value, in dollars, of the comic book at the end of 2013 was $2.67x - 2.67x\left(\frac{16}{100}\right)$, which can be rewritten as $2.67x - (2.67x)(0.16)$, or $2.2428x$. Thus, if the value of the comic book at the end of 2011 was x dollars, and the value of the comic book at the end of 2013 was $2.2428x$ dollars, then from the end of 2011 to the end of 2013, the value of the comic book increased by $2.2428x - 1x$, or $1.2428x$, dollars. Therefore, the increase in the value of the comic book from the end of 2011 to the end of 2013 is equal to 1.2428 times the value of the comic book at the end of 2011. It follows that from the end of 2011 to the end of 2013, the net percentage increase in the value of the comic book was $(1.2428)(100)\%$, or 124.28%.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the difference between the net percentage increase in the value of the comic book from the end of 2011 to the end of 2012 and the net percentage decrease in the value of the comic book from the end of 2012 to the end of 2013, not the net percentage increase in the value of the comic book from the end of 2011 to the end of 2013.

Choice D is incorrect. This is the net percentage increase in the value of the comic book from the end of 2011 to the end of 2013, if the value of the comic book increased by 167% from the end of 2011 to the end of 2012 and then increased, not decreased, by 16% from the end of 2012 to the end of 2013.

Question Difficulty: Hard

Question ID d72a2b4d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■■□

ID: d72a2b4d

In March, the price of a collectible card was $\$15.50$. In April, the price of the collectible card was $\$17.36$. The price of the collectible card in April was $p\%$ of the price of the collectible card in March. What is the value of p?

A. 12

B. 88

C. 112

D. 188

ID: d72a2b4d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the price of the collectible card was $\$15.50$ in March and $\$17.36$ in April. It's also given that the price of the collectible card in April was $p\%$ of the price in March. It follows that $\$17.36$ is $p\%$ of $\$15.50$. Therefore, the value of p can be calculated by solving the equation $17.36 = \left(\frac{p}{100}\right)(15.50)$, or $17.36 = \frac{15.50p}{100}$. Multiplying each side of this equation by 100 yields $1{,}736 = 15.50p$. Dividing each side of this equation by 15.50 yields $112 = p$. Therefore, the value of p is 112.

Choice A is incorrect. 12% is the percent increase in the price of the collectible card from March to April.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 4e375d1f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■□□

ID: 4e375d1f

How many meters are equivalent to $2{,}300$ centimeters? $(100 \text{ centimeters} = 1 \text{ meter})$

A. 0.043

B. 23

C. $2{,}400$

D. $230{,}000$

ID: 4e375d1f Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that 100 centimeters is equal to 1 meter. Therefore, $2{,}300$ centimeters is equivalent to $(2{,}300 \text{ centimeters})\left(\frac{1 \text{ meter}}{100 \text{ centimeters}}\right)$, or 23 meters.

Choice A is incorrect. 0.043 meters is equivalent to 4.3, not $2{,}300$, centimeters.

Choice C is incorrect. $2{,}400$ meters is equivalent to $240{,}000$, not $2{,}300$, centimeters.

Choice D is incorrect. $230{,}000$ meters is equivalent to $23{,}000{,}000$, not $2{,}300$, centimeters.

Question Difficulty: Easy

Question ID 771ee744

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	■□□

ID: 771ee744

There are 320 marbles in a container. Of these marbles, 10% are red. How many marbles in the container are red?

A. 32

B. 288

C. 320

D. 352

ID: 771ee744 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that 10% of the 320 marbles in a container are red. Therefore, the number of red marbles can be calculated by multiplying the number of marbles in the container by $\frac{10}{100}$, which gives $320\left(\frac{10}{100}\right)$, or 32.

Choice B is incorrect. This is the number of marbles in the container that aren't red.

Choice C is incorrect. This is the total number of marbles in the container.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 85939da5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■■

ID: 85939da5

Texting behavior	Talks on cell phone daily	Does not talk on cell phone daily	Total
Light	110	146	256
Medium	139	164	303
Heavy	166	74	240
Total	415	384	799

In a study of cell phone use, 799 randomly selected US teens were asked how often they talked on a cell phone and about their texting behavior. The data are summarized in the table above. Based on the data from the study, an estimate of the percent of US teens who are heavy texters is 30% and the associated margin of error is 3%. Which of the following is a correct statement based on the given margin of error?

A. Approximately 3% of the teens in the study who are classified as heavy texters are not really heavy texters.

B. It is not possible that the percent of all US teens who are heavy texters is less than 27%.

C. The percent of all US teens who are heavy texters is 33%.

D. It is doubtful that the percent of all US teens who are heavy texters is 35%.

ID: 85939da5 Answer

Correct Answer: D

Rationale

Choice D is correct. The given margin of error of 3% indicates that the actual percent of all US teens who are heavy texters is likely within 3% of the estimate of 30%, or between 27% and 33%. Therefore, it is unlikely, or doubtful, that the percent of all US teens who are heavy texters would be 35%.

Choice A is incorrect. The margin of error doesn't provide any information about the accuracy of reporting in the study. Choice B is incorrect. Based on the estimate and given margin of error, it is unlikely that the percent of all US teens who are heavy texters would be less than 27%, but it is possible. Choice C is incorrect. While the percent of all US teens who are heavy texters is likely between 27% and 33%, any value within this interval is equally likely. We can't be certain that the value is exactly 33%.

Question Difficulty: Hard

Question ID e29586d5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: e29586d5

Number of Contestants by Score and Day

	5 out of 5	4 out of 5	3 out of 5	2 out of 5	1 out of 5	0 out of 5	Total
Day 1	2	3	4	6	2	3	20
Day 2	2	3	5	5	4	1	20
Day 3	3	3	4	5	3	2	20
Total	7	9	13	16	9	6	60

The same 20 contestants, on each of 3 days, answered 5 questions in order to win a prize. Each contestant received 1 point for each correct answer. The number of contestants receiving a given score on each day is shown in the table above.

No contestant received the same score on two different days. If a contestant is selected at random, what is the probability that the selected contestant received a score of 5 on Day 2 or Day 3, given that the contestant received a score of 5 on one of the three days?

ID: e29586d5 Answer

Rationale

The correct answer is $\frac{5}{7}$. It is given that no contestant received the same score on two different days, so each of the contestants who received a score of 5 is represented in the "5 out of 5" column of the table exactly once. Therefore, the probability of selecting a contestant who received a score of 5 on Day 2 or Day 3, given that the contestant received a score of 5 on one of the three days, is found by dividing the total number of contestants who received a score of 5 on Day 2 or Day 3 $(2+3=5)$ by the total number of contestants who received a score of 5, which is given in the table as 7. So the probability is $\frac{5}{7}$. Note that 5/7, .7142, .7143, and 0.714 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID eccbf957

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: eccbf957

Each face of a fair 14-sided die is labeled with a number from 1 through 14, with a different number appearing on each face. If the die is rolled one time, what is the probability of rolling a 2?

A. $\frac{1}{14}$

B. $\frac{2}{14}$

C. $\frac{12}{14}$

D. $\frac{13}{14}$

ID: eccbf957 Answer

Correct Answer: A

Rationale

Choice A is correct. The total number of possible outcomes for rolling a fair 14-sided die is 14. The number of possible outcomes for rolling a 2 is 1. The probability of rolling a 2 is the number of possible outcomes for rolling a 2 divided by the total number of possible outcomes, or $\frac{1}{14}$.

Choice B is incorrect. This is the probability of rolling a number no greater than 2.

Choice C is incorrect. This is the probability of rolling a number greater than 2.

Choice D is incorrect. This is the probability of rolling a number other than 2.

Question Difficulty: Easy

Question ID affb2315

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: affb2315

There are 55 students in Spanish club. A sample of the Spanish club students was selected at random and asked whether they intend to enroll in a new study program. Of those surveyed, 20% responded that they intend to enroll in the study program. Based on this survey, which of the following is the best estimate of the total number of Spanish club students who intend to enroll in the study program?

A. 11

B. 20

C. 44

D. 55

ID: affb2315 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that 20% of the students surveyed responded that they intend to enroll in the study program. Therefore, the proportion of students in Spanish club who intend to enroll in the study program, based on the survey, is 0.20. Since there are 55 total students in Spanish club, the best estimate for the total number of these students who intend to enroll in the study program is $55(0.20)$, or 11.

Choice B is incorrect. This is the best estimate for the percentage, rather than the total number, of students in Spanish club who intend to enroll in the study program.

Choice C is incorrect. This is the best estimate for the total number of Spanish club students who do not intend to enroll in the study program.

Choice D is incorrect. This is the total number of students in Spanish club.

Question Difficulty: Easy

Question ID b1b5300b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: b1b5300b

Prices of 14 Different Cars

Type of car	Priced at no more than $25,000	Priced greater than $25,000	Total
Nonhybrid	5	3	8
Hybrid	2	4	6
Total	7	7	14

The table above shows information about 14 cars listed for sale on an auto dealership's website. If one of the cars listed for sale is selected at random, what is the probability that the car selected will be a hybrid car priced at no more than $25,000 ?

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{1}{3}$

D. $\frac{4}{7}$

ID: b1b5300b Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that there are 2 hybrid cars priced at no more than $25,000. It's also given that there are 14 cars total for sale. Therefore, the probability of selecting a hybrid priced at no more than $25,000 when one car is chosen at random is $\frac{2}{14} = \frac{1}{7}$.

Choice B is incorrect. This is the probability of selecting a hybrid car priced greater than $25,000 when choosing one car at random. Choice C is incorrect. This is the probability, when choosing randomly from only the hybrid cars, of selecting one priced at no more than $25,000. Choice D is incorrect. This is the probability of selecting a hybrid car when selecting at random from only the cars priced greater than $25,000.

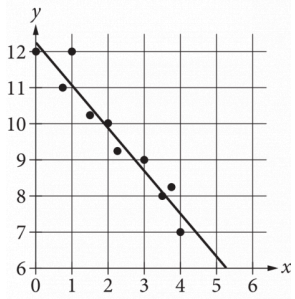
Question Difficulty: Medium

Question ID 1adb39f0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 1adb39f0

The scatterplot shows the relationship between two variables, *x* and *y*. A line of best fit for the data is also shown. Which of the following is closest to the difference between the *y*-coordinate of the data point with $x = 1$ and the *y*-value predicted by the line of best fit at $x = 1$?



A. 1

B. 2

C. 5

D. 12

ID: 1adb39f0 Answer

Correct Answer: A

Rationale

Choice A is correct. The data point with $x = 1$ has a y-coordinate of 12. The y-value predicted by the line of best fit at $x = 1$ is approximately 11. The difference between the y-coordinate of the data point and the y-value predicted by the line of best fit at $x = 1$ is $12 - 11$, or 1.

Choices B and C are incorrect and may result from incorrectly reading the scatterplot. Choice D is incorrect. This is the y-coordinate of the data point at $x = 1$.

Question Difficulty: Medium

Question ID c7e73ece

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■■

ID: c7e73ece

Views on Nuclear Energy Use

Response	Frequency
Strongly favor	56
Somewhat favor	214
Somewhat oppose	104
Strongly oppose	37

A researcher interviewed 411 randomly selected US residents and asked about their views on the use of nuclear energy. The table above summarizes the responses of the interviewees. If the population of the United States was 300 million when the survey was given, based on the sample data for the 411 US residents, what is the best estimate, in millions, of the difference between the number of US residents who somewhat favor or strongly favor the use of nuclear energy and the number of those who somewhat oppose or strongly oppose it? (Round your answer to the nearest whole number.)

ID: c7e73ece Answer

Rationale

The correct answer is 94. Of those interviewed, $56+214=270$ "strongly favor" or "somewhat favor" the use of nuclear energy, and $104+37=141$ interviewees "somewhat oppose" or "strongly oppose" the use of nuclear energy. The difference between the sizes of the two surveyed groups is $270-141=129$. The proportion of this difference among the entire group of interviewees is $\frac{129}{411}$. Because the sample of interviewees was selected at random from US residents, it is reasonable to assume that the proportion of this difference is the same among all US residents as in the sample. Therefore, the best estimate, in millions, of the difference between the number of US residents who somewhat favor or strongly favor the use of nuclear energy and the number of those who somewhat oppose or strongly oppose it is $\frac{129}{411}\times 300$, which to the nearest million is 94.

Question Difficulty: Hard

Question ID 1ea09200

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 1ea09200

A sample of 40 fourth-grade students was selected at random from a certain school. The 40 students completed a survey about the morning announcements, and 32 thought the announcements were helpful. Which of the following is the largest population to which the results of the survey can be applied?

A. The 40 students who were surveyed

B. All fourth-grade students at the school

C. All students at the school

D. All fourth-grade students in the county in which the school is located

ID: 1ea09200 Answer

Correct Answer: B

Rationale

Choice B is correct. Selecting a sample of a reasonable size at random to use for a survey allows the results from that survey to be applied to the population from which the sample was selected, but not beyond this population. In this case, the population from which the sample was selected is all fourth-grade students at a certain school. Therefore, the results of the survey can be applied to all fourth-grade students at the school.

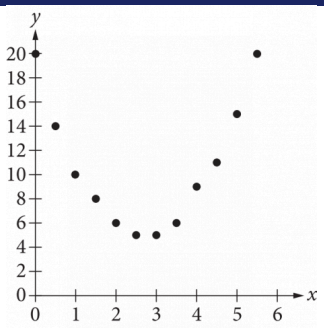
Choice A is incorrect. The results of the survey can be applied to the 40 students who were surveyed. However, this isn't the largest group to which the results of the survey can be applied. Choices C and D are incorrect. Since the sample was selected at random from among the fourth-grade students at a certain school, the results of the survey can't be applied to other students at the school or to other fourth-grade students who weren't represented in the survey results. Students in other grades in the school or other fourth-grade students in the country may feel differently about announcements than the fourth-grade students at the school.

Question Difficulty: Hard

Question ID 82aaa0a1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 82aaa0a1



Of the following, which is the best model for the data in the scatterplot?

A. $y = 2x^2 - 11x - 20$

B. $y = 2x^2 - 11x + 20$

C. $y = 2x^2 - 5x - 3$

D. $y = 2x^2 - 5x + 3$

ID: 82aaa0a1 Answer

Correct Answer: B

Rationale

Choice B is correct. The graphical model that most closely fits the data in the scatterplot is a model in which the number of data points above and below the model are approximately balanced. Fitting a graphical model to the data shown results in an upward-facing parabola with a y-intercept near $(0,20)$ and a vertex with an approximate x-value of 2.5. Of the given choices, only choice B gives an equation of an upward-facing parabola with a y-intercept at $(0,20)$. Furthermore, substituting 2.5 for x into the equation in choice B yields $y = 5$. This is approximately the y-value of the vertex of the model.

Choices A, C, and D are incorrect. These equations don't give a graphical model that best fits the data. At $x = 0$, they have y-values of -20, -3, and 3, respectively. At $x = 2.5$, they have y-values of -35, -3, and 3, respectively.

Question Difficulty: Easy

Question ID 37930b2a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: 37930b2a

Residents of a town were surveyed to determine whether they are satisfied with the concession stand at the local park. A random sample of 200 residents was selected. All 200 responded, and 87% said they are satisfied. Based on this information, which of the following statements must be true?

I. Of all the town residents, 87% would say they are satisfied with the concession stand at the local park.

II. If another random sample of 200 residents were surveyed, 87% would say they are satisfied.

A. Neither

B. I only

C. II only

D. I and II

ID: 37930b2a Answer

Correct Answer: A

Rationale

Choice A is correct. The purpose of surveying a random sample of residents is to approximate the percent of the town residents that are satisfied with the concession stand. The sample doesn't necessarily get the same result as surveying every resident of the town, nor would another sample necessarily have identical results. Therefore, although it's possible that either statement I or statement II could prove true by surveying every resident of the town, these statements cannot be proven true solely based on the results of the sample.

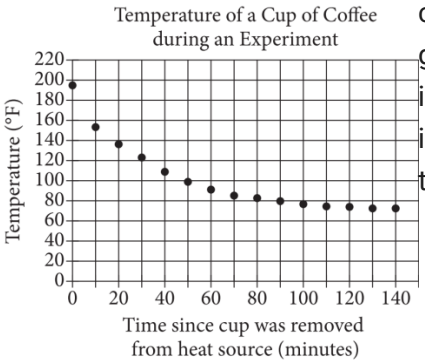
Choice B is incorrect because surveying a sample of the town residents may not have the same result as surveying all the town residents. Choices C and D are incorrect because surveying a different sample of residents could yield different results.

Question Difficulty: Medium

Question ID 83272c51

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 83272c51



In an experiment, a heated cup of coffee is removed from a heat source, and the cup of coffee is then left in a room that is kept at a constant temperature. The graph above shows the temperature, in degrees Fahrenheit (°F), of the coffee immediately after being removed from the heat source and at 10-minute intervals thereafter. During which of the following 10-minute intervals does the temperature of the coffee decrease at the greatest average rate?

A. Between 0 and 10 minutes

B. Between 30 and 40 minutes

C. Between 50 and 60 minutes

D. Between 90 and 100 minutes

ID: 83272c51 Answer

Correct Answer: A

Rationale

Choice A is correct. The average rate of change in temperature of the coffee in degrees Fahrenheit per minute is calculated by dividing the difference between two recorded temperatures by the number of minutes in the corresponding interval of time. Since the time intervals given are all 10 minutes, the average rate of change is greatest for the points with the greatest difference in temperature. Of the choices, the greatest difference in temperature occurs between 0 and 10 minutes.

Choices B, C, and D are incorrect and may result from misinterpreting the average rate of change from the graph.

Question Difficulty: Easy

Question ID 1353b86e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 1353b86e

Colors of Marbles in a Bag

Color	Number
Red	8
Blue	10
Green	22
Total	40

The table shows the number of different colors of marbles in a bag. If a marble is chosen at random from the bag, what is the probability that the marble will be blue?

A. $\frac{30}{40}$

B. $\frac{22}{40}$

C. $\frac{18}{40}$

D. $\frac{10}{40}$

ID: 1353b86e Answer

Correct Answer: D

Rationale

Choice D is correct. If a marble is chosen at random from the bag, the probability of choosing a marble of a certain color is the number of marbles of that color divided by the total number of marbles in the bag. Since there are 10 blue marbles in the bag, and there are 40 total marbles in the bag, the probability that the marble chosen will be blue is $\frac{10}{40}$.

Choices A, B, and C are incorrect. These represent the probability that the marble chosen won't be blue (choice A), will be green (choice B), and won't be green (choice C).

Question Difficulty: Easy

Question ID d89c1513

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: d89c1513

Customer Purchases at a Gas Station

	Beverage purchased	Beverage not purchased	Total
Gasoline purchased	60	25	85
Gasoline not purchased	35	15	50
Total	90	40	135

On Tuesday, a local gas station had 135 customers. The table above summarizes whether or not the customers on Tuesday purchased gasoline, a beverage, both, or neither. Based on the data in the table, what is the probability that a gas station customer selected at random on that day did not purchase gasoline?

A. $\frac{15}{50}$

B. $\frac{15}{40}$

C. $\frac{35}{50}$

D. $\frac{50}{135}$

ID: d89c1513 Answer

Correct Answer: D

Rationale

Choice D is correct. The total number of gas station customers on Tuesday was 135. The table shows that the number of customers who did not purchase gasoline was 50. Finding the ratio of the number of customers who did not purchase gasoline to the total number of customers gives the probability that a customer selected at random on that day did not purchase gasoline, which is $\frac{50}{135}$.

Choice A is incorrect and may result from finding the probability that a customer did not purchase a beverage, given that the customer did not purchase gasoline. Choice B is incorrect and may result from finding the probability that a customer did not purchase gasoline, given that the customer did not purchase a beverage. Choice C is incorrect and may result from finding the probability that a customer did purchase a beverage, given that the customer did not purchase gasoline.

Question Difficulty: Easy

Question ID e1ad3d41

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: e1ad3d41

Coat color	Eye color		
	Deep blue	Light brown	Total
Cream-tortoiseshell	16	16	32
Chocolate	12	4	16
Total	28	20	48

The data on the coat color and eye color for 48 Himalayan kittens available for adoption were collected and summarized in the table above. What fraction of the chocolate-colored kittens has deep blue eyes?

A. $\frac{12}{48}$

B. $\frac{12}{28}$

C. $\frac{16}{32}$

D. $\frac{12}{16}$

ID: e1ad3d41 Answer

Correct Answer: D

Rationale

Choice D is correct. The table shows that there are a total of 16 kittens that have a chocolate-colored coat. Of the 16 with a chocolate-colored coat, 12 have deep blue eyes. Therefore, the fraction of chocolate-colored kittens with deep blue eyes is simply the ratio of those two numbers, or $\frac{12}{16}$.

Choice A is incorrect; this is the fraction of all chocolate-colored kittens. Choice B is incorrect; this is the fraction of kittens with deep blue eyes that have a chocolate-colored coat. Choice C is incorrect; this is the fraction of cream-tortoiseshell-colored kittens with deep blue eyes.

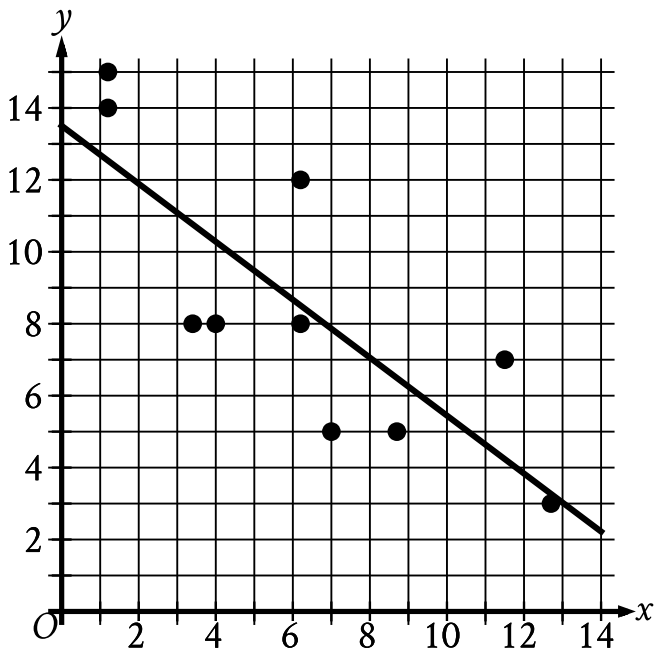
Question Difficulty: Medium

Question ID 8baf2118

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 8baf2118

The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown.



Which of the following equations best represents the line of best fit shown?

A. $y = 13.5 + 0.8x$

B. $y = 13.5 - 0.8x$

C. $y = -13.5 + 0.8x$

D. $y = -13.5 - 0.8x$

ID: 8baf2118 Answer

Correct Answer: B

Rationale

Choice B is correct. The line of best fit shown intersects the *y*-axis at a positive *y*-value and has a negative slope. The graph of an equation of the form $y = a + bx$, where a and b are constants, intersects the *y*-axis at a *y*-value of a and has a slope of b. Of the given choices, only choice B represents a line that intersects the *y*-axis at a positive *y*-value, 13.5, and has a negative slope, -0.8.

Choice A is incorrect. This equation represents a line that has a positive slope, not a negative slope.

Choice C is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value, and has a positive slope, not a negative slope.

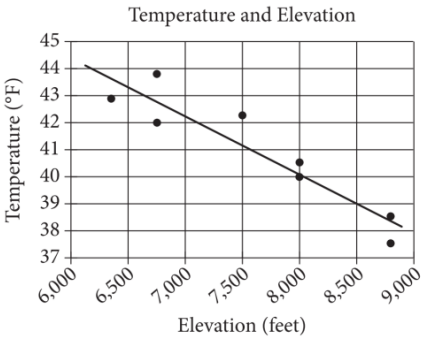
Choice D is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value.

Question Difficulty: Easy

Question ID ac5b6558

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: ac5b6558



The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. What temperature is predicted by the line of best fit for a location in the Lake Tahoe Basin with an elevation of 8,500 feet?

A. 37°F

B. 39°F

C. 41°F

D. 43°F

ID: ac5b6558 Answer

Correct Answer: B

Rationale

Choice B is correct. The line of best fit passes through the point $(8{,}500, 39)$. Therefore, the line of best fit predicts a temperature of 39°F for a location in Lake Tahoe Basin with an elevation of 8,500 feet.

Choice A is incorrect. This is the lowest temperature listed on the scatterplot, and the line of best fit never crosses this value for any of the elevations shown. Choice C is incorrect. According to the line of best fit, the temperature of 41°F is predicted for an elevation of slightly greater than 7,500 feet, not an elevation of 8,500 feet. Choice D is incorrect. According to the line of best fit, the temperature of 43°F is predicted for an elevation of roughly 6,700 feet, not an elevation of 8,500 feet.

Question Difficulty: Easy

Question ID 46545dd6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 46545dd6

Number of High School Students Who Completed Summer Internships

High school	Year				
	2008	2009	2010	2011	2012
Foothill	87	80	75	76	70
Valley	44	54	65	76	82
Total	131	134	140	152	152

The table above shows the number of students from two different high schools who completed summer internships in each of five years. No student attended both schools. Of the students who completed a summer internship in 2010, which of the following represents the fraction of students who were from Valley High School?

A. $\frac{10}{140}$

B. $\frac{65}{140}$

C. $\frac{75}{140}$

D. $\frac{65}{75}$

ID: 46545dd6 Answer

Correct Answer: B

Rationale

Choice B is correct. According to the table, 140 students from the two high schools completed summer internships in 2010. Of these, 65 were from Valley High School. Therefore, of the students who completed summer internships in 2010, $\frac{65}{140}$ represents the fraction who were from Valley High School.

Choice A is incorrect. This is the difference between the numbers of students from the two high schools who completed internships in 2010 divided by the total number of students from the two schools who completed internships that year. Choice C is incorrect. This is the fraction of students from Foothill High School who completed internships out of all the students who completed internships in 2010. Choice D is incorrect. This is the number of students from Valley High School who completed internships in 2010 divided by the number of students from Foothill High School who completed internships in 2010.

Question Difficulty: Easy

Question ID 16cea46c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 16cea46c

Voice type	Number of singers
Countertenor	4
Tenor	6
Baritone	10
Bass	5

A total of 25 men registered for singing lessons. The frequency table shows how many of these singers have certain voice types. If one of these singers is selected at random, what is the probability he is a baritone?

A. 0.10

B. 0.40

C. 0.60

D. 0.67

ID: 16cea46c Answer

Correct Answer: B

Rationale

Choice B is correct. This probability is calculated by dividing the number of baritone singers by the total number of men registered for singing lessons. It's given that a total of 25 men registered for singing lessons and that there are 10 baritones. Therefore, the probability of selecting a baritone from this group at random is $\frac{10}{25}$, which is equivalent to 0.40.

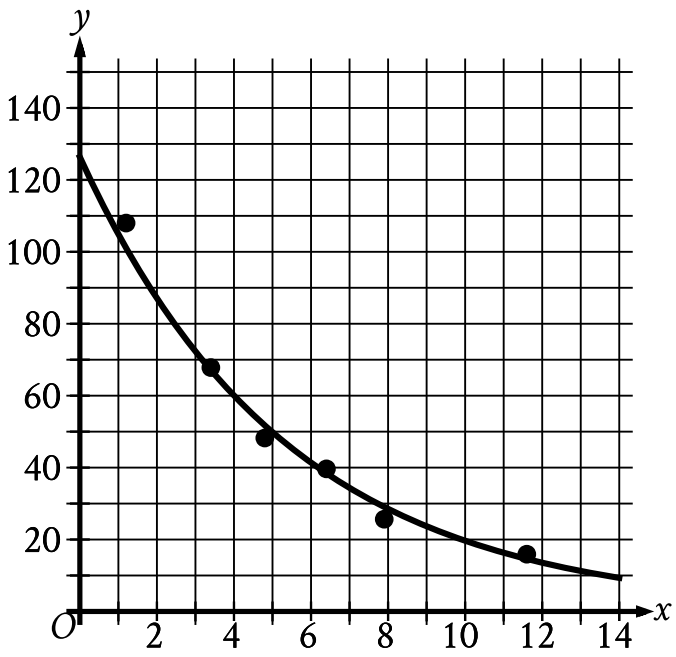
Choice A is incorrect. This would be the probability of selecting a baritone at random if there were 100 total men who registered for singing lessons. Choice C is incorrect. This is the probability of selecting a singer at random who isn't a baritone. Choice D is incorrect. This would be the probability of selecting a baritone at random if there were 15 total men registered for singing lessons.

Question Difficulty: Easy

Question ID fb866265

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: fb866265



The scatterplot shows the relationship between two variables, x and y. An equation for the exponential model shown can be written as $y = a(b)^x$, where a and b are positive constants. Which of the following is closest to the value of b?

A. 0.83

B. 1.83

C. 18.36

D. 126.35

ID: fb866265 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that an equation for the exponential model shown can be written as $y = a(b)^x$, where a and b are positive constants. For an exponential model written in this form, if the value of b is greater than 0 but less than 1, the model is decreasing. If the value of b is greater than 1, the model is increasing. The exponential model shown is decreasing. Therefore, the value of b is greater than 0 but less than 1. Of the given choices, only 0.83 is a value greater than 0 but less than 1. Thus, 0.83 is closest to the value of b.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 90eed2e5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: 90eed2e5

A city has 50 city council members. A reporter polled a random sample of 20 city council members and found that 6 of those polled supported a specific bill. Based on the sample, which of the following is the best estimate of the number of city council members in the city who support the bill?

A. 6

B. 9

C. 15

D. 30

ID: 90eed2e5 Answer

Rationale

Choice C is correct. Because a random sample of the city council was polled, the proportion of the sample who supported the bill is expected to be approximately equal to the proportion of the total city council who supports the bill. Since 6 of the 20 polled, or 30%, supported the bill, it can be estimated that 50×0.3, or 15, city council members support the bill.

Choice A is incorrect. This is the number of city council members in the sample who supported the bill. Choice B is incorrect and may result from a computational error. Choice D is incorrect. This is the number of city council members in the sample of city council members who were not polled.

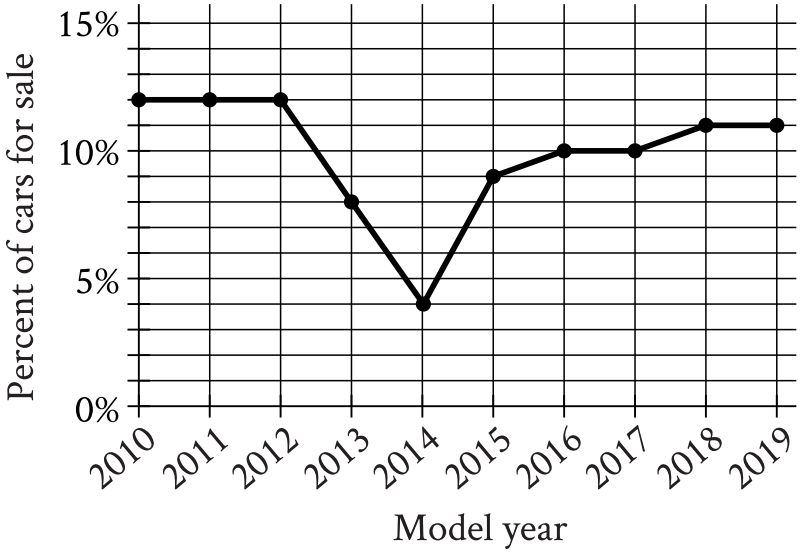
Question Difficulty: Easy

Question ID 4a2264b3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 4a2264b3

The line graph shows the percent of cars for sale at a used car lot on a given day by model year.



For what model year is the percent of cars for sale the smallest?

A. 2012

B. 2013

C. 2014

D. 2015

ID: 4a2264b3 Answer

Correct Answer: C

Rationale

Choice C is correct. For the given line graph, the percent of cars for sale at a used car lot on a given day is represented on the vertical axis. The percent of cars for sale is the smallest when the height of the line graph is the lowest. The lowest height of the line graph occurs for cars with a model year of 2014.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Easy

Question ID b680e76d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: b680e76d

A survey taken by 1,000 students at a school asked whether they played school sports. The table below summarizes all 1,000 responses from the students surveyed.

	Males	Females
Play a school sport	312	220
Do not play a school sport	?	216

How many of the males surveyed responded that they do not play a school sport?

A. 109

B. 252

C. 468

D. 688

ID: b680e76d Answer

Correct Answer: B

Rationale

Choice B is correct. The table summarizes all 1,000 responses from the students surveyed. If 312 are males who play a sport, 220 are females who play a sport, and 216 are females who do not play a sport, then 1,000 – 312 – 220 – 216 = 252 males who do not play a sport.

Choices A, C, and D are incorrect. If 109 males who do not play a sport responded, then the table summary would be 109 + 312 + 220 + 216 = 857 total student responses rather than 1,000. If 468 males who do not play a sport responded, then the table summary would be 468 + 312 + 220 + 216 = 1,216 total student responses rather than 1,000. If 688 males who do not play a sport responded, then the table summary would be 688 + 312 + 220 + 216 = 1,436 total student responses rather than 1,000.

Question Difficulty: Easy

Question ID 53d97af5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 53d97af5

A study was done on the weights of different types of fish in a pond. A random sample of fish were caught and marked in order to ensure that none were weighed more than once. The sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds. Which of the following conclusions is best supported by the sample data?

A. The majority of all fish in the pond weigh less than 2 pounds.

B. The average weight of all fish in the pond is approximately 2 pounds.

C. Approximately 30% of all fish in the pond weigh more than 2 pounds.

D. Approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

ID: 53d97af5 Answer

Correct Answer: D

Rationale

Choice D is correct. The sample of 150 largemouth bass was selected at random from all the largemouth bass in the pond, and since 30% of the fish in the sample weighed more than 2 pounds, it can be concluded that approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

Choices A, B, and C are incorrect. Since the sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds, this result can be generalized only to largemouth bass in the pond, not to all fish in the pond.

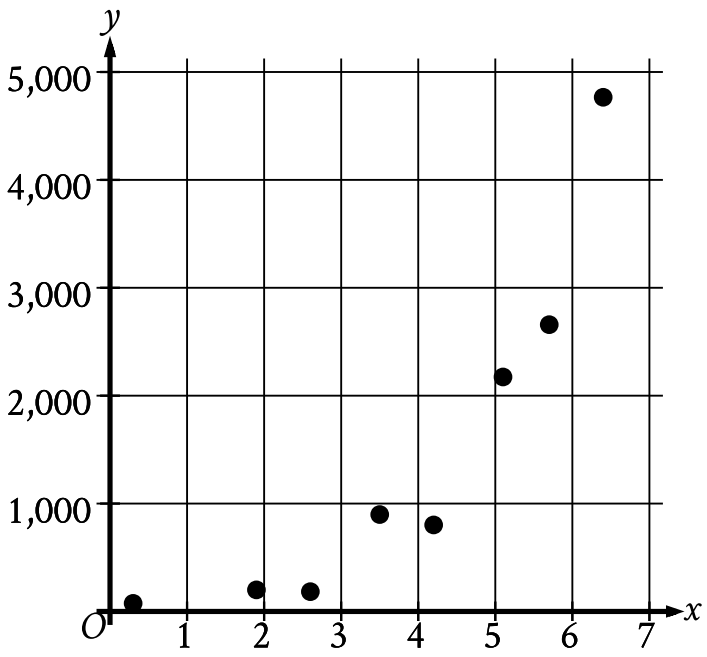
Question Difficulty: Medium

Question ID 15ce8207

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

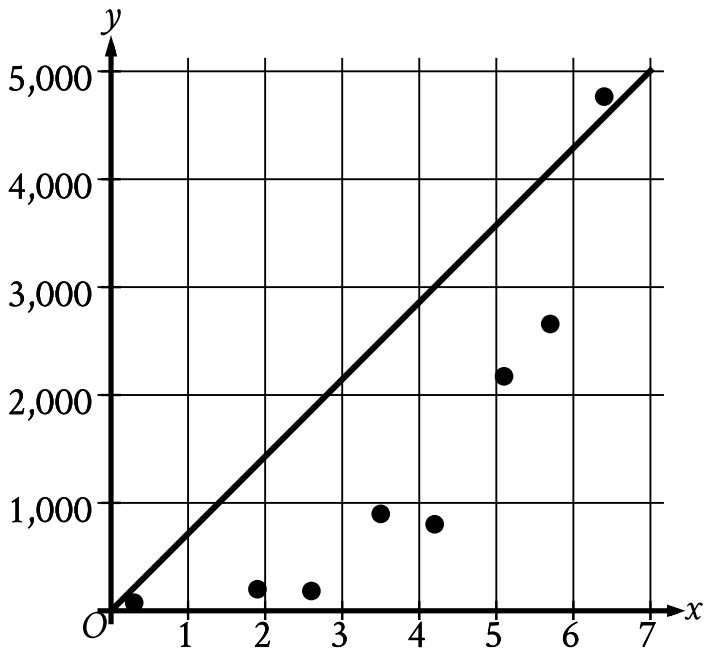
ID: 15ce8207

The scatterplot shows the relationship between two variables, x and y.

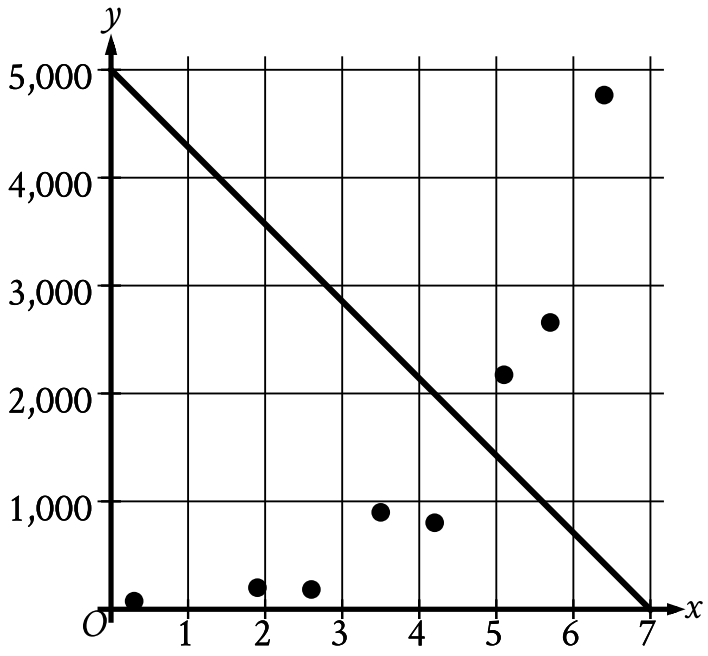


Which of the following graphs shows the most appropriate model for the data?

A.



B.


y
5,000
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O
1
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4
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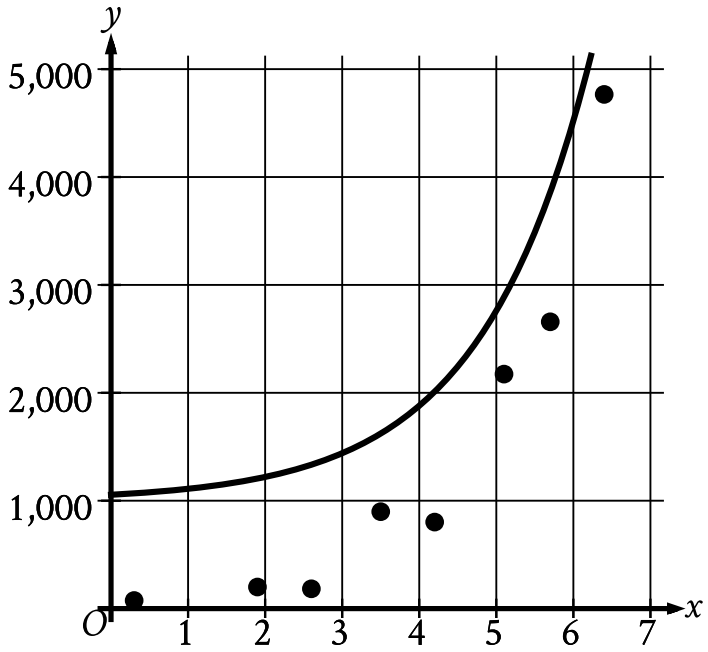
6
7
x

C.


y
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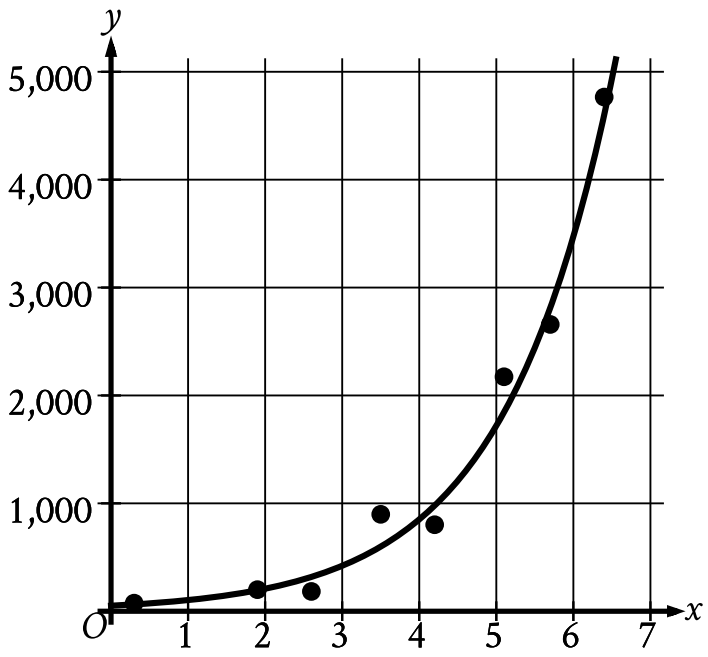
D.



ID: 15ce8207 Answer

Correct Answer: D

Rationale

Choice D is correct. An appropriate model should follow the trend of the data points and should have data points both above and below the model. The scatterplot shows that the data points have an increasing trend that is curved. Therefore, an appropriate model should be an increasing curve with data points both above and below the model. Of the given choices, only the model in choice D is an increasing curve with data points both above and below the model.

Choice A is incorrect. Since the trend of the data points isn't linear, a line isn't the most appropriate model for the data.

Choice B is incorrect. Since the trend of the data points is increasing and isn't linear, a decreasing line isn't the most appropriate model for the data.

Choice C is incorrect. All the data points are below the model shown in this graph.

Question Difficulty: Easy

Question ID d4413871

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: d4413871

	Blood type			
Rhesus factor	A	B	AB	O
+	33	9	3	37
–	7	2	1	*x*

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence $(+)$ or absence $(-)$ of the rhesus factor.

The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative $(-)$ is chosen at random, the probability that the person has blood type B is $\frac{1}{9}$. What is the value of x?

ID: d4413871 Answer

Rationale

The correct answer is 8. In this group, $\frac{1}{9}$ of the people who are rhesus negative have blood type B. The total number of people who are rhesus negative in the group is $7+2+1+x$, and there are 2 people who are rhesus negative with blood type B. Therefore, $\frac{2}{(7+2+1+x)}=\frac{1}{9}$. Combining like terms on the left-hand side of the equation yields $\frac{2}{(10+x)}=\frac{1}{9}$. Multiplying both sides of this equation by 9 yields $\frac{18}{(10+x)}=1$, and multiplying both sides of this equation by $(10+x)$ yields $18=10+x$. Subtracting 10 from both sides of this equation yields $8=x$.

Question Difficulty: Hard

Question ID 0301c5dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 0301c5dc

The table below shows the number of state parks in a certain state that contain camping facilities and bicycle paths.

	Has bicycle paths	Does not have bicycle paths
Has camping facilities	20	5
Does not have camping facilities	8	4

If one of these state parks is selected at random, what is the probability that it has camping facilities but does not have bicycle paths?

A. $\frac{5}{37}$

B. $\frac{5}{25}$

C. $\frac{8}{28}$

D. $\frac{5}{9}$

ID: 0301c5dc Answer

Correct Answer: A

Rationale

Choice A is correct. The total number of state parks in the state is $20+5+8+4=37$. According to the table, 5 of these have camping facilities but not bicycle paths. Therefore, if a state park is selected at random, the probability that it has camping facilities but not bicycle paths is $\frac{5}{37}$.

Choice B is incorrect. This is the probability that a state park selected at random from the state parks with camping facilities does not have bicycle paths. Choice C is incorrect. This is the probability that a state park selected at random from the state parks with bicycle paths does not have camping facilities. Choice D is incorrect. This is the probability that a state park selected at random from the state parks without bicycle paths does have camping facilities.

Question Difficulty: Medium

Question ID 0ae37ff3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 0ae37ff3

In a bag, there are 7 red, 4 white, 33 blue, and 33 yellow cubes. If one of these cubes is selected at random, what is the probability of selecting a cube that is neither blue nor yellow?

A. $\frac{6}{7}$

B. $\frac{7}{11}$

C. $\frac{1}{3}$

D. $\frac{1}{7}$

ID: 0ae37ff3 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that there are 7 red, 4 white, 33 blue, and 33 yellow cubes in the bag. Therefore, there are a total of $7 + 4 + 33 + 33$, or 77, cubes in the bag. If the cube is neither blue nor yellow, then it must be either red or white. Therefore, the probability of selecting a cube that is neither blue nor yellow is equivalent to the probability of selecting a cube that is either red or white. If one of these cubes is selected at random, the probability of selecting a cube that is either red or white is equal to the sum of the number of red cubes and white cubes divided by the total number of cubes in the bag. There are 7 red cubes, 4 white cubes, and 77 total cubes in the bag. Therefore, the probability of selecting a red or white cube is $\frac{7+4}{77}$, which is equivalent to $\frac{11}{77}$, or $\frac{1}{7}$. Thus, if one cube is selected at random, the probability of selecting a cube that is neither blue nor yellow is $\frac{1}{7}$.

Choice A is incorrect. This is the probability of selecting a cube that is either blue or yellow, rather than the probability of selecting a cube that is neither blue nor yellow.

Choice B is incorrect and may result from conceptual or calculation errors.

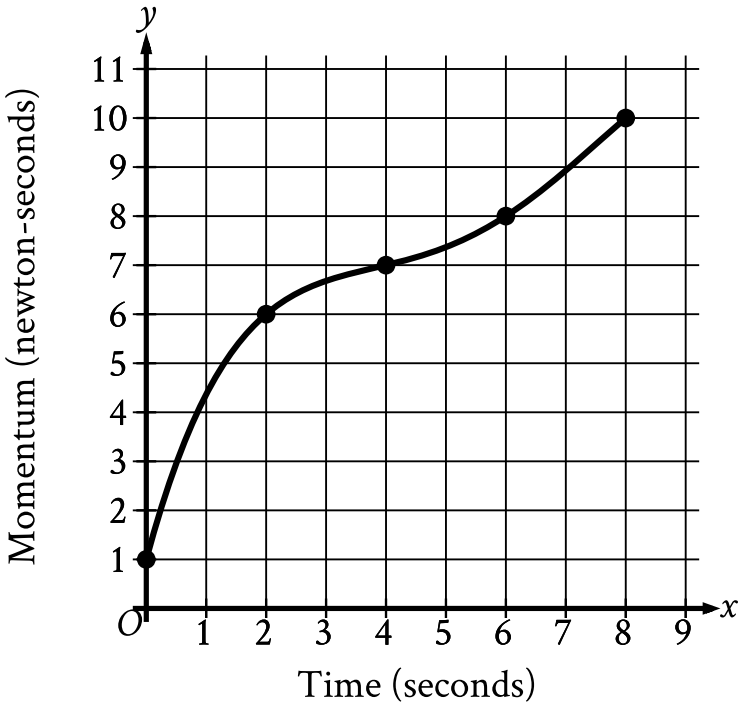
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 9bb4107c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 9bb4107c



The graph shows the momentum y, in newton-seconds, of an object x seconds after the object started moving, for $0 \leq x \leq 8$. What is the average rate of change, in newton-seconds per second, in the momentum of the object from $x = 2$ to $x = 6$?

ID: 9bb4107c Answer

Correct Answer: .5, 1/2

Rationale

The correct answer is $\frac{1}{2}$. For the graph shown, x represents time, in seconds, and y represents momentum, in newton-seconds. Therefore, the average rate of change, in newton-seconds per second, in the momentum of the object between two *x*-values is the difference in the corresponding *y*-values divided by the difference in the *x*-values. The graph shows that at $x = 2$, the corresponding *y*-value is 6. The graph also shows that at $x = 6$, the corresponding *y*-value is 8. It follows that the average rate of change, in newton-seconds per second, from $x = 2$ to $x = 6$ is $\frac{8-6}{6-2}$, which is equivalent to $\frac{2}{4}$, or $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

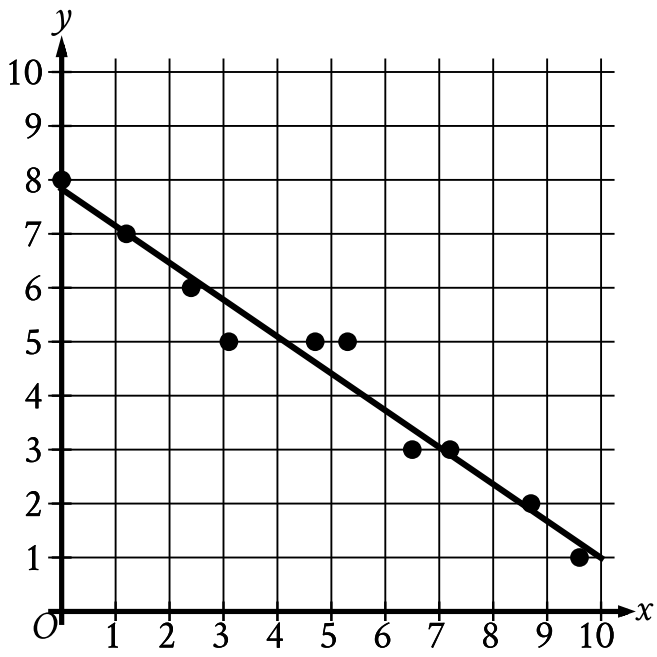
Question Difficulty: Medium

Question ID 2e74e403

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 2e74e403

In the given scatterplot, a line of best fit for the data is shown.



Which of the following is closest to the slope of this line of best fit?

A. 7

B. 0.7

C. -0.7

D. -7

ID: 2e74e403 Answer

Correct Answer: C

Rationale

Choice C is correct. A line of best fit is shown in the scatterplot such that as the value of x increases, the value of y decreases. It follows that the slope of the line of best fit shown is negative. The slope of a line in the *xy*-plane that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2-y_1}{x_2-x_1}$. The line of best fit shown passes approximately through the points $(0, 8)$ and $(10, 1)$. Substituting $(0, 8)$ for (x_1, y_1) and $(10, 1)$ for (x_2, y_2) in $\frac{y_2-y_1}{x_2-x_1}$ yields the slope of the line being approximately $\frac{1-8}{10-0}$, which is equivalent to $\frac{-7}{10}$, or -0.7. Therefore, of the given choices, -0.7 is the closest to the slope of this line of best fit.

Choice A is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice B is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID f8f79e11

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: f8f79e11

A park ranger asked a random sample of visitors how far they hiked during their visit. Based on the responses, the estimated mean was found to be 4.5 miles, with an associated margin of error of 0.5 miles. Which of the following is the best conclusion from these data?

A. It is likely that all visitors hiked between 4 and 5 miles.

B. It is likely that most visitors hiked exactly 4.5 miles.

C. It is not possible that any visitor hiked less than 3 miles.

D. It is plausible that the mean distance hiked for all visitors is between 4 and 5 miles.

ID: f8f79e11 Answer

Correct Answer: D

Rationale

Choice D is correct. The given estimated mean has an associated margin of error because from sample data, the population mean can't be determined precisely. Rather, from the sample mean, an interval can be determined within which it's plausible that the population's mean is likely to lie. Since the estimated mean is 4.5 miles with an associated margin of error of 0.5 miles, it follows that between $4.5-0.5$ miles and $4.5+0.5$ miles, or between 4 and 5 miles, is plausibly the mean distance hiked for all visitors.

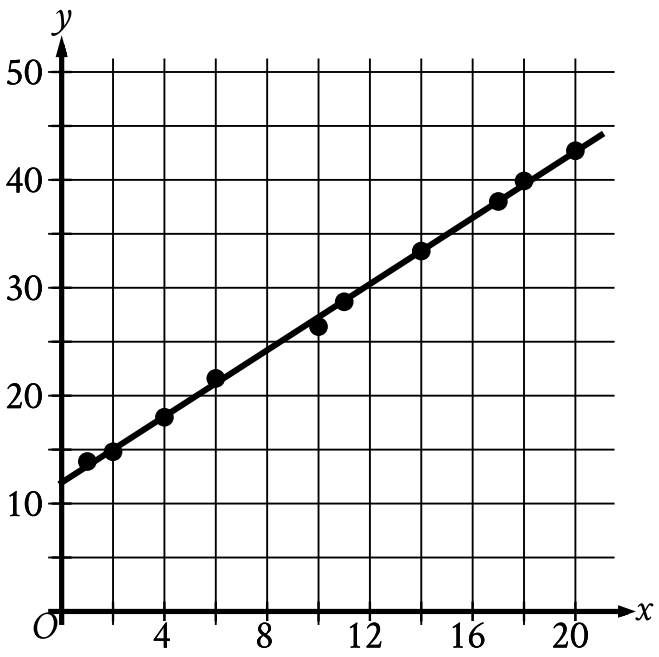
Choices A, B, and C are incorrect. Based on the estimated mean, no determination can be made about the number of miles hiked for all visitors to the park.

Question Difficulty: Medium

Question ID 2e8027b0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 2e8027b0



The scatterplot shows the relationship between two variables, x and y, for data set E. A line of best fit is shown. Data set F is created by multiplying the *y*-coordinate of each data point from data set E by 3.9. Which of the following could be an equation of a line of best fit for data set F?

A. $y = 46.8 + 5.9x$

B. $y = 46.8 + 1.5x$

C. $y = 12 + 5.9x$

D. $y = 12 + 1.5x$

ID: 2e8027b0 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation of a line of best fit for data set F can be written in the form $y = a + bx$, where a is the *y*-coordinate of the *y*-intercept of the line of best fit and b is the slope. The line of best fit shown for data set E has a *y*-intercept at approximately $(0, 12)$. It's given that data set F is created by multiplying the *y*-coordinate of each data point from data set E by 3.9. It follows that a line of best fit for data set F has a *y*-intercept at approximately $(0, 12(3.9))$, or $(0, 46.8)$. Therefore, the value of a is approximately 46.8. The slope of a line that passes through points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Since the line of best fit shown for data set E passes approximately through the point $(12, 30)$, it follows that a line of best fit for data set F passes approximately through the point $(12, 30(3.9))$, or $(12, 117)$. Substituting $(0, 46.8)$ and $(12, 117)$ for (x_1, y_1) and (x_2, y_2), respectively, in $\frac{y_2 - y_1}{x_2 - x_1}$ yields $\frac{117 - 46.8}{12 - 0}$, which is equivalent to $\frac{70.2}{12}$, or 5.85. Therefore, the value of b is approximately 5.85, or approximately 5.9. Thus, $y = 46.8 + 5.9x$ could be an equation of a line of best fit for data set F.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This could be an equation of a line of best fit for data set E, not data set F.

Question Difficulty: Hard

Question ID 9a144a01

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 9a144a01

Which of the following is true about the values of 2^x and $2x+2$ for $x>0$?

A. For all $x>0$, it is true that $2^x<2x+2$.

B. For all $x>0$, it is true that $2^x>2x+2$.

C. There is a constant c such that if $0<x<c$, then $2^x<2x+2$, but if $x>c$, then $2^x>2x+2$.

D. There is a constant c such that if $0<x<c$, then $2^x>2x+2$, but if $x>c$, then $2^x<2x+2$.

ID: 9a144a01 Answer

Correct Answer: C

Rationale

Choice C is correct. At $x=0$, the value of 2^x is less than the value of $2x+2$: $2^0<2(0)+2$, which is equivalent to $1<2$. As the value of x increases, the value of 2^x remains less than the value of $2x+2$ until $x=3$, which is when the two values are equal: $2^3=2(3)+2$, which is equivalent to $8=8$. Then, for $x>3$, the value of 2^x is greater than the value of $2x+2$. So there is a constant, 3, such that when $0<x<3$, then $2^x<2x+2$, but when $x>3$, then $2^x>2x+2$.

Choice A is incorrect because $2^x>2x+2$ when $x>3$. Choice B is incorrect because $2^x<2x+2$ when $0<x<3$. Choice D is incorrect because $2^x<2x+2$ when $0<x<3$ and $2^x>2x+2$ when $x>3$.

Question Difficulty: Medium

Question ID 47624288

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 47624288

The table gives the distribution of votes for a new school mascot and grade level for 80 students.

Mascot	Grade level			
	Sixth	Seventh	Eighth	Total
Badger	4	9	9	22
Lion	9	2	9	20
Longhorn	4	6	4	14
Tiger	6	9	9	24
Total	23	26	31	80

If one of these students is selected at random, what is the probability of selecting a student whose vote for new mascot was for a lion?

A. $\frac{1}{9}$

B. $\frac{1}{5}$

C. $\frac{1}{4}$

D. $\frac{2}{3}$

ID: 47624288 Answer

Correct Answer: C

Rationale

Choice C is correct. If one of these students is selected at random, the probability of selecting a student whose vote for the new mascot was for a lion is given by the number of votes for a lion divided by the total number of votes. The given table indicates that the number of votes for a lion is 20 votes, and the total number of votes is 80 votes. The table gives the distribution of votes for 80 students, and the table shows a total of 80 votes were counted. It follows that each of the 80 students voted exactly once. Thus, the probability of selecting a student whose vote for the new mascot was for a lion is $\frac{20}{80}$, or $\frac{1}{4}$.

Choice A is incorrect and may result from conceptual or computational errors.

Choice B is incorrect and may result from conceptual or computational errors.

Choice D is incorrect and may result from conceptual or computational errors.

Question Difficulty: Easy

Question ID e438ec3f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: e438ec3f

A grove has 6 rows of birch trees and 5 rows of maple trees. Each row of birch trees has 8 trees 20 feet or taller and 6 trees shorter than 20 feet. Each row of maple trees has 9 trees 20 feet or taller and 7 trees shorter than 20 feet. A tree from one of these rows will be selected at random. What is the probability of selecting a maple tree, given that the tree is 20 feet or taller?

A. $\frac{9}{164}$

B. $\frac{3}{10}$

C. $\frac{15}{31}$

D. $\frac{9}{17}$

ID: e438ec3f Answer

Correct Answer: C

Rationale

Choice C is correct. If a tree from one of these rows is selected at random, the probability of selecting a maple tree, given that the tree is 20 feet or taller, is equal to the number of maple trees that are 20 feet or taller divided by the total number of trees that are 20 feet or taller. It's given that there are 6 rows of birch trees, and each row of birch trees has 8 trees that are 20 feet or taller. This means that there are a total of $6(8)$, or 48, birch trees that are 20 feet or taller. It's given that there are 5 rows of maple trees, and each row of maple trees has 9 trees that are 20 feet or taller. This means that there are a total of $5(9)$, or 45, maple trees that are 20 feet or taller. It follows that there are a total of $48 + 45$, or 93, trees that are 20 feet or taller. Therefore, the probability of selecting a maple tree, given that the tree is 20 feet or taller, is $\frac{45}{93}$, or $\frac{15}{31}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

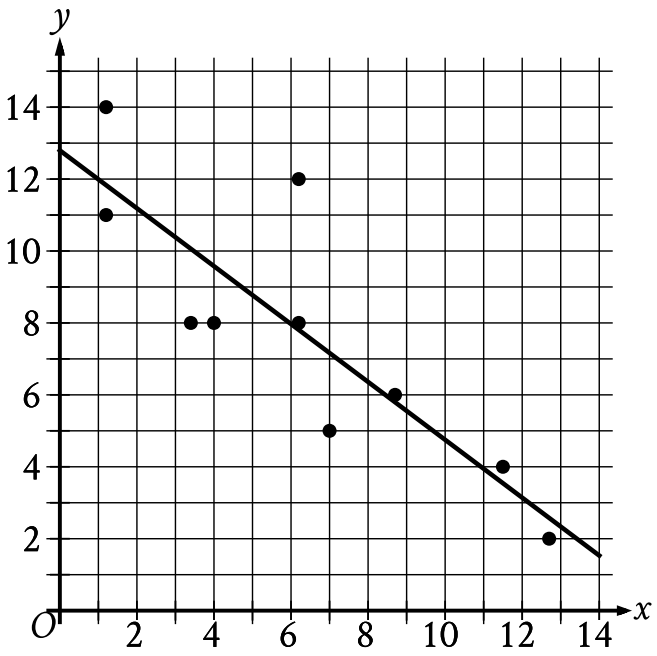
Question Difficulty: Hard

Question ID 03a16790

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 03a16790

The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown.



Which of the following is closest to the slope of the line of best fit shown?

A. -2.4

B. -0.8

C. 0.8

D. 2.4

ID: 03a16790 Answer

Correct Answer: B

Rationale

Choice B is correct. A line of best fit is shown in the scatterplot such that as the value of x increases, the value of y decreases. Thus, the slope of the line of best fit shown is negative. The slope of a line passing through two points, (x_1, y_1) and (x_2, y_2), can be calculated as $\frac{y_2-y_1}{x_2-x_1}$. The line of best fit shown passes approximately through the points $(1, 12)$ and $(11, 4)$. Substituting $(1, 12)$ and $(11, 4)$ for (x_1, y_1) and (x_2, y_2), respectively, in $\frac{y_2-y_1}{x_2-x_1}$ gives $\frac{4-12}{11-1}$, which is equivalent to $-\frac{8}{10}$, or -0.8. Therefore, of the given choices, -0.8 is closest to the slope of the line of best fit shown.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Choice D is incorrect. The line of best fit shown has a negative slope, not a positive slope.

Question Difficulty: Medium

Question ID 60caadfd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 60caadfd

Each rock in a collection of 70 rocks was classified as either igneous, metamorphic, or sedimentary, as shown in the frequency table.

Classification	Frequency
igneous	10
metamorphic	33
sedimentary	27

If one of these rocks is selected at random, what is the probability of selecting a rock that is igneous?

A. $\frac{10}{27}$

B. $\frac{10}{33}$

C. $\frac{10}{60}$

D. $\frac{10}{70}$

ID: 60caadfd Answer

Correct Answer: D

Rationale

Choice D is correct. If one of the rocks in the collection is selected at random, the probability of selecting a rock that is igneous is equal to the number of igneous rocks in the collection divided by the total number of rocks in the collection. According to the table, there are 10 igneous rocks in the collection, and it's given that there's a total of 70 rocks in the collection. Therefore, if one of the rocks in the collection is selected at random, the probability of selecting a rock that is igneous is $\frac{10}{70}$.

Choice A is incorrect. This is the number of igneous rocks in the collection divided by the number of sedimentary rocks in the collection, not divided by the total number of rocks in the collection.

Choice B is incorrect. This is the number of igneous rocks in the collection divided by the number of metamorphic rocks in the collection, not divided by the total number of rocks in the collection.

Choice C is incorrect. This is the number of igneous rocks in the collection divided by the number of rocks in the collection that aren't igneous, not divided by the total number of rocks in the collection.

Question Difficulty: Easy

Question ID b4f5a7ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: b4f5a7ca

A survey was conducted using a sample of history professors selected at random from the California State Universities. The professors surveyed were asked to name the publishers of their current texts. What is the largest population to which the results of the survey can be generalized?

A. All professors in the United States

B. All history professors in the United States

C. All history professors at all California State Universities

D. All professors at all California State Universities

ID: b4f5a7ca Answer

Correct Answer: C

Rationale

Choice C is correct. Selecting a sample at random when conducting a survey allows the results to be generalized to the population from which the sample was selected, but not beyond this population. In this situation, the population that the sample was selected from is history professors from the California State Universities. Therefore, the largest population to which the results of the survey can be generalized is all history professors at all California State Universities.

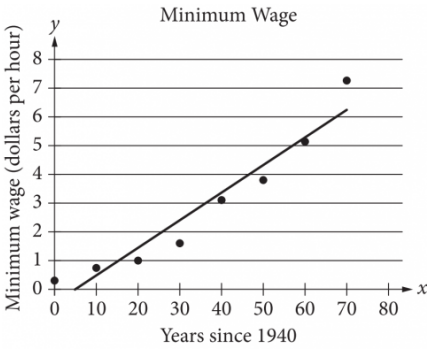
Choices A, B, and D are incorrect. Since the sample was selected at random from history professors from the California State Universities, the results of the survey can't be generalized to all professors in the United States, all history professors in the United States, or all professors at all California State Universities. All three of these populations may use different texts and therefore may name different publishers.

Question Difficulty: Medium

Question ID d6af3572

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: d6af3572



The scatterplot above shows the federal-mandated minimum wage every 10 years between 1940 and 2010. A line of best fit is shown, and its equation is $y = 0.096x - 0.488$. What does the line of best fit predict about the increase in the minimum wage over the 70-year period?

A. Each year between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.

B. Each year between 1940 and 2010, the average increase in minimum wage was 0.49 dollars.

C. Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.096 dollars.

D. Every 10 years between 1940 and 2010, the average increase in minimum wage was 0.488 dollars.

ID: d6af3572 Answer

Correct Answer: A

Rationale

Choice A is correct. The given equation is in slope-intercept form, or $y = mx + b$, where m is the value of the slope of the line of best fit. Therefore, the slope of the line of best fit is 0.096. From the definition of slope, it follows that an increase of 1 in the x-value corresponds to an increase of 0.096 in the y-value. Therefore, the line of best fit predicts that for each year between 1940 and 2010, the minimum wage will increase by 0.096 dollar per hour.

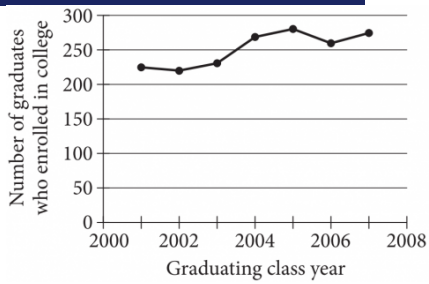
Choice B is incorrect and may result from using the y-coordinate of the y-intercept as the average increase, instead of the slope. Choice C is incorrect and may result from using the 10-year increments given on the x-axis to incorrectly interpret the slope of the line of best fit. Choice D is incorrect and may result from using the y-coordinate of the y-intercept as the average increase, instead of the slope, and from using the 10-year increments given on the x-axis to incorrectly interpret the slope of the line of best fit.

Question Difficulty: Hard

Question ID 74dee52b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 74dee52b



The line graph shows the number of graduates from the classes of 2001 through 2007 at a certain school who enrolled in college within 24 months of graduation. Of the following, which class had the fewest graduates who enrolled in college within 24 months of graduation?

A. 2002

B. 2004

C. 2005

D. 2007

ID: 74dee52b Answer

Correct Answer: A

Rationale

Choice A is correct. The year with the fewest graduates who enrolled in college within 24 months of graduation is the point with the lowest value on the vertical axis. This occurs at 2002.

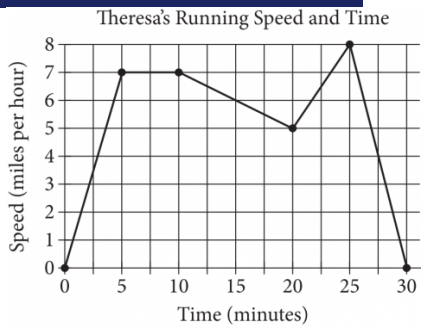
Choice B, C, and D are incorrect. The years 2004, 2005, and 2007 each had a greater number of graduates who enrolled in college within 24 months of graduation than did the year 2002.

Question Difficulty: Easy

Question ID 9d88a3e3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 9d88a3e3



Theresa ran on a treadmill for thirty minutes, and her time and speed are shown on the graph above. According to the graph, which of the following statements is NOT true concerning Theresa's run?

A. Theresa ran at a constant speed for five minutes.

B. Theresa's speed was increasing for a longer period of time than it was decreasing.

C. Theresa's speed decreased at a constant rate during the last five minutes.

D. Theresa's speed reached its maximum during the last ten minutes.

ID: 9d88a3e3 Answer

Correct Answer: B

Rationale

Choice B is correct. Theresa's speed was increasing from 0 to 5 minutes and from 20 to 25 minutes, which is a total of 10 minutes. Theresa's speed was decreasing from 10 minutes to 20 minutes and from 25 to 30 minutes, which is a total of 15 minutes. Therefore, Theresa's speed was NOT increasing for a longer period of time than it was decreasing.

Choice A is incorrect. Theresa ran at a constant speed for the 5-minute period from 5 to 10 minutes. Choice C is incorrect. Theresa's speed decreased at a constant rate during the last 5 minutes, which can be seen since the graph is linear during that time. Choice D is incorrect. Theresa's speed reached its maximum at 25 minutes, which is within the last 10 minutes.

Question Difficulty: Easy

Question ID e03f3477

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: e03f3477

A sample consisting of 720 adults who own televisions was selected at random for a study. Based on the sample, it is estimated that 32% of all adults who own televisions use their televisions to watch nature shows, with an associated margin of error of 3.41%. Which of the following is the most plausible conclusion about all adults who own televisions?

A. More than 35.41% of all adults who own televisions use their televisions to watch nature shows.

B. Between 28.59% and 35.41% of all adults who own televisions use their televisions to watch nature shows.

C. Since the sample included adults who own televisions and not just those who use their televisions to watch nature shows, no conclusion can be made.

D. Since the sample did not include all the people who watch nature shows, no conclusion can be made.

ID: e03f3477 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that based on a sample selected at random, it's estimated that 32% of all adults who own televisions use their televisions to watch nature shows, with an associated margin of error of 3.41%. Subtracting the margin of error from the estimate and adding the margin of error to the estimate gives an interval of plausible values for the true percentage of adults who own televisions who use their televisions to watch nature shows. This means it's plausible that between $32\% - 3.41\%$, or 28.59%, and $32\% + 3.41\%$, or 35.41%, of all adults who own televisions use their televisions to watch nature shows. Therefore, of the given choices, the most plausible conclusion is that between 28.59% and 35.41% of all adults who own televisions use their televisions to watch nature shows.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect. To make a plausible conclusion about all adults who own televisions, the sample must be selected at random from all adults who own televisions, not just those who use their televisions to watch nature shows.

Choice D is incorrect. Since the sample was selected at random from all adults who own televisions, a plausible conclusion can be made about all adults who own televisions.

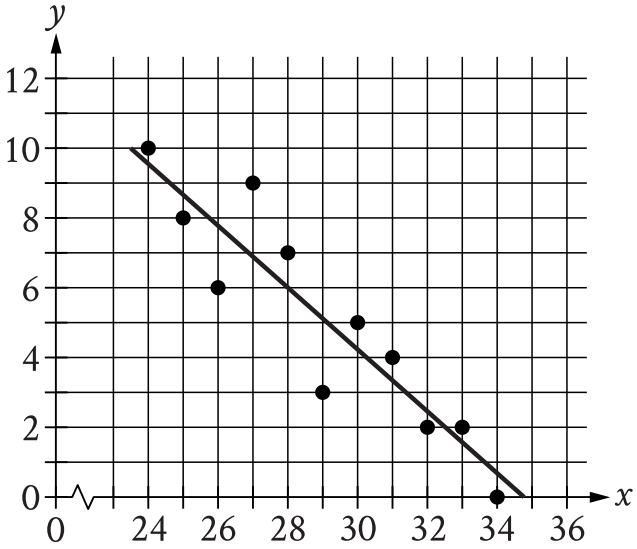
Question Difficulty: Medium

Question ID f46139df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: f46139df

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown.



At $x = 25.5$, which of the following is closest to the *y*-value predicted by the line of best fit?

A. 6.2

B. 7.3

C. 8.2

D. 9.1

ID: f46139df Answer

Correct Answer: C

Rationale

Choice C is correct. On the line of best fit, an *x*-value of 25.5 corresponds to a *y*-value between 8 and 8.5. Therefore, at $x = 25.5$, 8.2 is closest to the *y*-value predicted by the line of best fit.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID e5b5fbdd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: e5b5fbdd

Of the 8 planets in our solar system, 4 are considered rocky. If a student randomly selects 1 of those 8 planets as a topic for a report, what is the probability that the selected planet will be rocky?

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. 2

ID: e5b5fbdd Answer

Correct Answer: C

Rationale

Choice C is correct. If one of these planets is selected at random, the probability that the selected planet will be rocky is calculated by dividing the number of planets that are considered rocky by the total number of planets. It's given that 4 of the 8 total planets are considered rocky. Therefore, the probability that the selected planet will be rocky is $\frac{4}{8}$, which is equivalent to $\frac{1}{2}$.

Choices A and B are incorrect. These represent the probability if 1 of the 8 planets was considered rocky (choice A) and if 2 of the 8 planets were considered rocky (choice B). Choice D is incorrect and may result from dividing the total number of planets by the number of planets that are considered rocky.

Question Difficulty: Easy

Question ID 7ac5d686

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 7ac5d686

An inspector begins a day of work with a large sample of shirts that need to be checked for defects. The inspector works at a constant rate throughout the morning. What type of model is best to model the number of shirts remaining to be checked for defects at any given time throughout the morning?

A. A linear model with a positive slope

B. A linear model with a negative slope

C. An exponential growth model

D. An exponential decay model

ID: 7ac5d686 Answer

Rationale

Choice B is correct. Since the work is done at a constant rate, a linear model best models the situation. The number of shirts remaining is dependent on the length of time the inspector has worked; therefore, if the relationship were graphed, time would be the variable of the horizontal axis and the number of remaining shirts would be the variable of the vertical axis. Since the number of shirts decreases as the time worked increases, it follows that the slope of this graph is negative.

Choice A is incorrect and may result from incorrectly reasoning about the slope. Choices C and D are incorrect and may result from not identifying the constant rate of work as a characteristic of a linear model.

Question Difficulty: Medium

Question ID 1fc4f47b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 1fc4f47b

At a movie theater, there are a total of 350 customers. Each customer is located in either theater A, theater B, or theater C. If one of these customers is selected at random, the probability of selecting a customer who is located in theater A is 0.48, and the probability of selecting a customer who is located in theater B is 0.24. How many customers are located in theater C?

A. 28

B. 40

C. 84

D. 98

ID: 1fc4f47b Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that at a movie theater, there are a total of 350 customers and that each customer is located in either theater A, theater B, or theater C. If the probability of selecting a customer in theater A is 0.48, then $(0.48)(350)$, or 168, customers are located in theater A. If the probability of selecting a customer in theater B is 0.24, then $(0.24)(350)$, or 84, customers are located in theater B. It follows that there are $168 + 84$, or 252, customers in theater A and theater B. Therefore, there are $350 - 252$, or 98, customers in theater C.

Choice A is incorrect. This is the percent, not the number, of the customers that are located in theater C.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the number of customers that are located in theater B, not theater C.

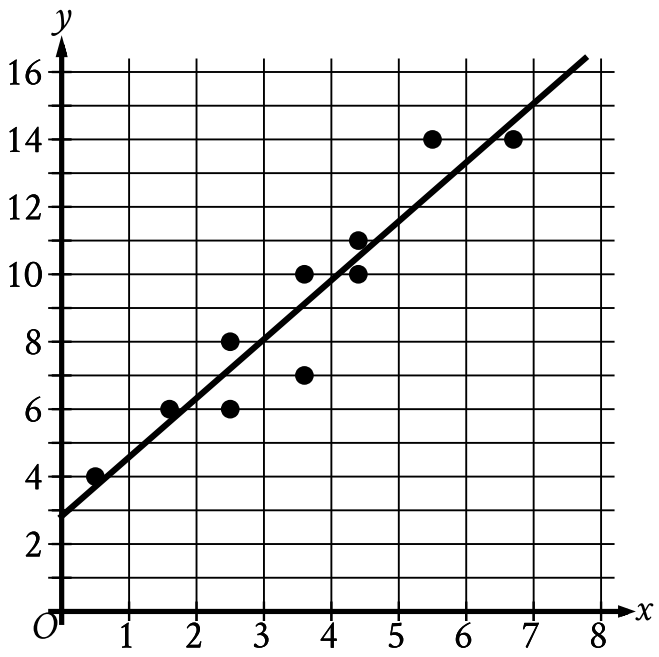
Question Difficulty: Medium

Question ID d230e963

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: d230e963

The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown.



Which of the following equations best represents the line of best fit shown?

A. $y = 2.8 + 1.7x$

B. $y = 2.8 - 1.7x$

C. $y = -2.8 + 1.7x$

D. $y = -2.8 - 1.7x$

ID: d230e963 Answer

Correct Answer: A

Rationale

Choice A is correct. The line of best fit shown intersects the *y*-axis at a positive *y*-value and has a positive slope. The graph of an equation of the form $y = a + bx$, where a and b are constants, intersects the *y*-axis at a *y*-value of a and has a slope of b. Of the given choices, only choice A represents a line that intersects the *y*-axis at a positive *y*-value, 2.8, and has a positive slope, 1.7.

Choice B is incorrect. This equation represents a line that has a negative slope, not a positive slope.

Choice C is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value.

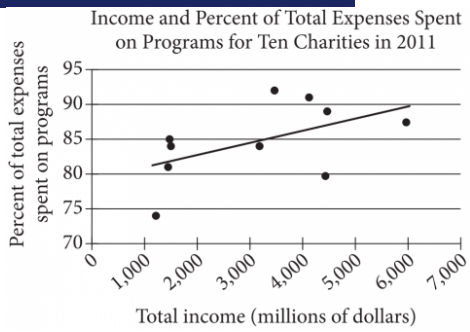
Choice D is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value, and has a negative slope, not a positive slope.

Question Difficulty: Easy

Question ID 7fd284ac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 7fd284ac



The scatterplot above shows data for ten charities along with the line of best fit. For the charity with the greatest percent of total expenses spent on programs, which of the following is closest to the difference of the actual percent and the percent predicted by the line of best fit?

A. 10%

B. 7%

C. 4%

D. 1%

ID: 7fd284ac Answer

Correct Answer: B

Rationale

Choice B is correct. The charity with the greatest percent of total expenses spent on programs is represented by the highest point on the scatterplot; this is the point that has a vertical coordinate slightly less than halfway between 90 and 95 and a horizontal coordinate slightly less than halfway between 3,000 and 4,000. Thus, the charity represented by this point has a total income of about $3,400 million and spends about 92% of its total expenses on programs. The percent predicted by the line of best fit is the vertical coordinate of the point on the line of best fit with horizontal coordinate $3,400 million; this vertical coordinate is very slightly more than 85. Thus, the line of best fit predicts that the charity with the greatest percent of total expenses spent on programs will spend slightly more than 85% on programs. Therefore, the difference between the actual percent (92%) and the prediction (slightly more than 85%) is slightly less than 7%.

Choice A is incorrect. There is no charity represented in the scatterplot for which the difference between the actual percent of total expenses spent on programs and the percent predicted by the line of best fit is as much as 10%. Choices C and D are incorrect. These choices may result from misidentifying in the scatterplot the point that represents the charity with the greatest percent of total expenses spent on programs.

Question Difficulty: Medium

Question ID e7d9649f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: e7d9649f

A random sample of 50 people from a town with a population of 14,878 were asked to name their favorite flavor of ice cream. If 7 people in the sample named chocolate as their favorite ice-cream flavor, about how many people in the town would be expected to name chocolate?

A. 350

B. 2,100

C. 7,500

D. 10,500

ID: e7d9649f Answer

Correct Answer: B

Rationale

Choice B is correct. Let x be the number of people in the entire town that would be expected to name chocolate. Since the sample of 50 people was selected at random, it is reasonable to expect that the proportion of people who named chocolate as their favorite ice-cream flavor would be the same for both the sample and the town population. Symbolically, this can be expressed as $\frac{7}{50} = \frac{x}{14{,}878}$. Using cross multiplication, $7 \times 14{,}878 = x \times 50$; solving for x yields 2,083. The choice closest to the value of 2,083 is choice B, 2,100.

Choices A, C, and D are incorrect and may be the result of errors when setting up the proportion, solving for the unknown, or incorrectly comparing the choices to the number of people expected to name chocolate, 2,083.

Question Difficulty: Easy

Question ID 2df8f293

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 2df8f293

Each vertex of a 14-sided polygon is labeled with one of the 14 letters A through N, with a different letter at each vertex. If one vertex is selected at random, what is the probability that the letter D will be at the selected vertex? (Express your answer as a decimal or fraction, not as a percent.)

ID: 2df8f293 Answer

Correct Answer: .0714, 1/14

Rationale

The correct answer is $\frac{1}{14}$. If one vertex of the polygon is selected at random, the probability that the letter D will be at the selected vertex is equal to the number of vertices labeled with the letter D divided by the total number of vertices. It's given that each vertex is labeled with one of the 14 letters A through N, with a different letter at each vertex. It follows that there is 1 vertex labeled with the letter D. It's also given that the polygon is 14-sided. It follows that there are a total of 14 vertices. Thus, the probability that the letter D will be at the selected vertex is $\frac{1}{14}$. Note that 1/14, .0714, and 0.071 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID ec7b0eb8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: ec7b0eb8

Texting behavior	Talks on cell phone daily	Does not talk on cell phone daily	Total
Light	110	146	256
Medium	139	164	303
Heavy	166	74	240
Total	415	384	799

In a study of cell phone use, 799 randomly selected US teens were asked how often they talked on a cell phone and about their texting behavior. The data are summarized in the table above. If one of the 799 teens surveyed is selected at random, what is the probability that the teen talks on a cell phone daily?

A. $\frac{1}{799}$

B. $\frac{415}{799}$

C. $\frac{384}{415}$

D. $\frac{384}{799}$

ID: ec7b0eb8 Answer

Correct Answer: B

Rationale

Choice B is correct. If one of the teens surveyed is selected at random, the probability that the teen talks on a cell phone daily is equal to the quotient of the total number of teens who reported that they talk on a cell phone daily, 415, and the total number of teens surveyed, 799. Therefore, this probability is equal to $\frac{415}{799}$.

Choice A is incorrect. This fraction represents the probability of selecting at random any one of the 799 teens surveyed. Choice C is incorrect and may result from conceptual errors. Choice D is incorrect. This fraction represents the probability of selecting at random one of the 799 teens surveyed who doesn't talk on a cell phone daily.

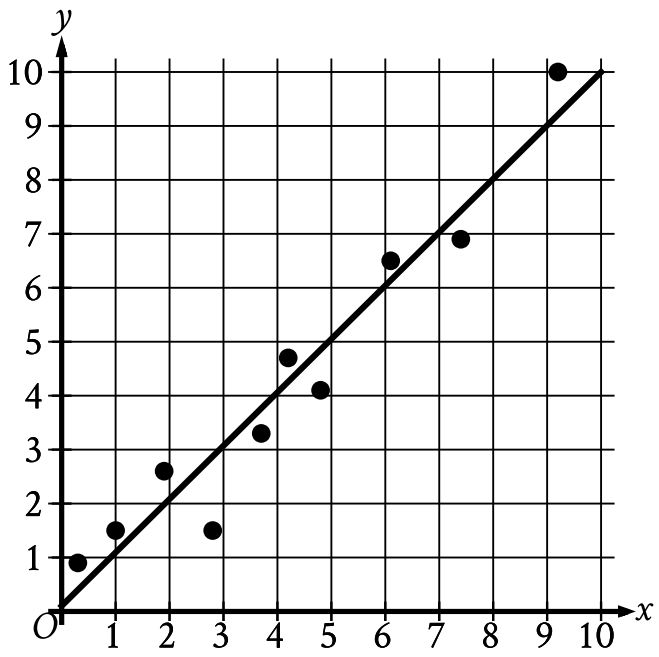
Question Difficulty: Easy

Question ID e17babed

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: e17babed

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown.



For how many of the 10 data points is the actual *y*-value greater than the *y*-value predicted by the line of best fit?

A. 3

B. 4

C. 6

D. 7

ID: e17babed Answer

Correct Answer: C

Rationale

Choice C is correct. Any data point that's located above the line of best fit has a *y*-value that's greater than the *y*-value predicted by the line of best fit. For the scatterplot shown, 6 of the data points are above the line of best fit. Therefore, 6 of the data points have an actual *y*-value that's greater than the *y*-value predicted by the line of best fit.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the number of data points that have an actual *y*-value that's less than the *y*-value predicted by the line of best fit.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 79201024

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 79201024

A band with 45 members has 11 members who play saxophone. If one band member is selected at random, what is the probability of selecting a band member who plays saxophone?

A. $\frac{1}{45}$

B. $\frac{11}{45}$

C. $\frac{34}{45}$

D. $\frac{45}{45}$

ID: 79201024 Answer

Correct Answer: B

Rationale

Choice B is correct. The probability of an event occurring is the ratio of the number of favorable outcomes to the total number of possible outcomes. It's given that there are 45 band members, which is the total number of possible outcomes. It's also given that there are 11 band members who play saxophone. Therefore, the number of favorable outcomes is 11. Thus, the probability of selecting a band member who plays saxophone is $\frac{11}{45}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the probability of selecting a band member who does not play saxophone.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 9bedc4a0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 9bedc4a0

A company that produces socks wants to estimate the percent of the socks produced in a typical week that are defective. A random sample of 310 socks produced in a certain week were inspected. Based on the sample, it is estimated that 12% of all socks produced by the company in this week are defective, with an associated margin of error of 3.62%. Based on the estimate and associated margin of error, which of the following is the most appropriate conclusion about all socks produced by the company during this week?

A. 3.62% of the socks are defective.

B. It is plausible that between 8.38% and 15.62% of the socks are defective.

C. 12% of the socks are defective.

D. It is plausible that more than 15.62% of the socks are defective.

ID: 9bedc4a0 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that, based on the sample, an estimate of 12% of all socks produced by the company in a certain week are defective, with an associated margin of error of 3.62%. This estimate, plus or minus the margin of error, gives an interval of plausible values for the actual percent of all socks produced by the company that week that are defective. Subtracting 3.62% from 12% yields 8.38%. Adding 3.62% to 12% yields 15.62%. Therefore, it is plausible that between 8.38% and 15.62% of all socks produced by the company are defective.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect. 12% is the estimated percent of defective socks based on the sample. However, since the margin of error for this estimate is known, the most appropriate conclusion is not that the percent of defective socks is exactly 12% but instead that it lies in an interval of plausible percents.

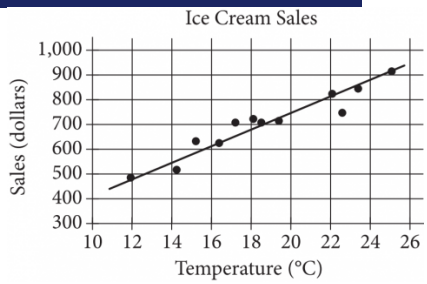
Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 1e1027a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 1e1027a7



The scatterplot above shows a company's ice cream sales d, in dollars, and the high temperature t, in degrees Celsius (°C), on 12 different days. A line of best fit for the data is also shown. Which of the following could be an equation of the line of best fit?

A. $d = 0.03t + 402$

B. $d = 10t + 402$

C. $d = 33t + 300$

D. $d = 33t + 84$

ID: 1e1027a7 Answer

Correct Answer: D

Rationale

Choice D is correct. On the line of best fit, d increases from approximately 480 to 880 between $t = 12$ and $t = 24$. The slope of the line of best fit is the difference in d-values divided by the difference in t-values, which gives $\frac{880-480}{24-12} = \frac{400}{12}$, or approximately 33. Writing the equation of the line of best fit in slope-intercept form gives $d = 33t + b$, where b is the y-coordinate of the y-intercept. This equation is satisfied by all points on the line, so $d = 480$ when $t = 12$. Thus, $480 = 33(12) + b$, which is equivalent to $480 = 396 + b$. Subtracting 396 from both sides of this equation gives $b = 84$. Therefore, an equation for the line of best fit could be $d = 33t + 84$.

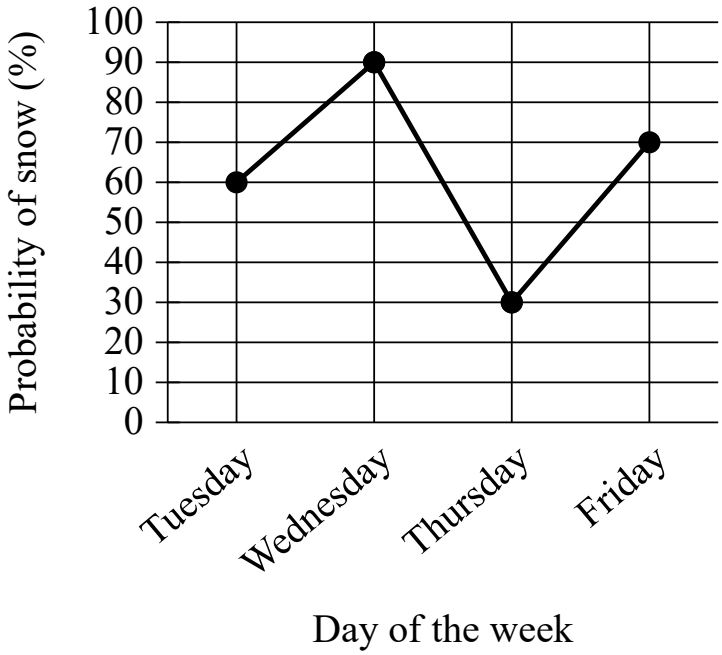
Choice A is incorrect and may result from an error in calculating the slope and misidentifying the y-coordinate of the y-intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$. Choice B is incorrect and may result from using the smallest value of t on the graph as the slope and misidentifying the y-coordinate of the y-intercept of the graph as the value of d at $t = 10$ rather than the value of d at $t = 0$. Choice C is incorrect and may result from misidentifying the y-coordinate of the y-intercept as the smallest value of d on the graph.

Question Difficulty: Hard

Question ID 13f67ddc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 13f67ddc



The line graph shows the probability of snow, as a percent, at a certain location for each day during a four-day period. According to the line graph, for which day during this four-day period is the probability of snow 30%?

A. Tuesday

B. Wednesday

C. Thursday

D. Friday

ID: 13f67ddc Answer

Correct Answer: C

Rationale

Choice C is correct. For the line graph shown, the probability of snow, as a percent, is represented on the vertical axis. According to the line graph, during this four-day period, the probability of snow is 30% for Thursday.

Choice A is incorrect. The probability of snow on Tuesday is 60%.

Choice B is incorrect. The probability of snow on Wednesday is 90%.

Choice D is incorrect. The probability of snow on Friday is 70%.

Question Difficulty: Easy

Question ID fc46af57

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: fc46af57

A bag containing 10,000 beads of assorted colors is purchased from a craft store. To estimate the percent of red beads in the bag, a sample of beads is selected at random. The percent of red beads in the bag was estimated to be 15%, with an associated margin of error of 2%. If r is the actual number of red beads in the bag, which of the following is most plausible?

A. $r > 1{,}700$

B. $1{,}300 < r < 1{,}700$

C. $200 < r < 1{,}500$

D. $r < 1{,}300$

ID: fc46af57 Answer

Correct Answer: B

Rationale

Choice B is correct. It was estimated that 15% of the beads in the bag are red. Since the bag contains 10,000 beads, it follows that there are an estimated $10{,}000 \times 0.15 = 1{,}500$ red beads. It's given that the margin of error is 2%, or $10{,}000 \times 0.02 = 200$ beads. If the estimate is too high, there could plausibly be $1{,}500 - 200 = 1{,}300$ red beads. If the estimate is too low, there could plausibly be $1{,}500 + 200 = 1{,}700$ red beads. Therefore, the most plausible statement of the actual number of red beads in the bag is $1{,}300 < r < 1{,}700$.

Choices A and D are incorrect and may result from misinterpreting the margin of error. It's unlikely that more than 1,700 beads or fewer than 1,300 beads in the bag are red. Choice C is incorrect because 200 is the margin of error for the number of red beads, not the lower bound of the range of red beads.

Question Difficulty: Medium

Question ID 6626cac3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: 6626cac3

	Phone	Email
Dinner dance	55%	80%
Football game	20%	10%
Picnic	20%	5%
Pool party	5%	5%
Total	100%	100%

An alumni association survey asked each high school graduate to select the one activity he or she preferred for the association's next event. Some of the people responded by phone, and the others responded by email. The table above shows the distribution of preferred activity, in percent, for each response type used. For the survey, the number of email responses was twice the number of phone responses. If a person who preferred a picnic is selected at random, what is the probability that the person responded by email?

ID: 6626cac3 Answer

Rationale

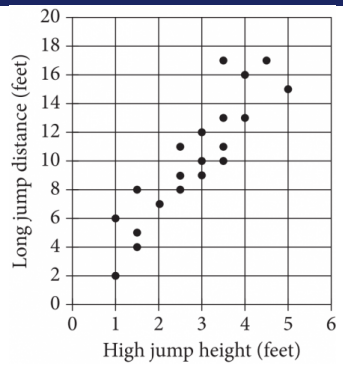
The correct answer is $\frac{1}{3}$. It's given that the number of email responses is twice the number of phone responses. Therefore, if the number of phone responses is p, then the number of email responses is $2p$. The table shows that 20% of people who responded by phone preferred a picnic. It follows that the expression $0.20p$ represents the number of these people. The table also shows that 5% of the people who responded by email preferred a picnic. The expression $0.05(2p)$, or $0.1p$, represents the number of these people. Therefore, a total of $0.20p + 0.1p$, or $0.3p$ people preferred a picnic. Thus, the probability of selecting at random a person who responded by email from the people who preferred a picnic is $\frac{0.1p}{0.3p}$, or $\frac{1}{3}$. Note that 1/3, .3333, and 0.333 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 3d985614

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 3d985614



Each dot in the scatterplot above represents the height *x*, in feet, in the high jump, and the distance *y*, in feet, in the long jump, made by each student in a group of twenty students. The graph of which of the following equations is a line that most closely fits the data?

A. $y = 0.82x + 3.30$

B. $y = 0.82x - 0.82$

C. $y = 3.30x + 0.82$

D. $y = 3.30x - 3.30$

ID: 3d985614 Answer

Correct Answer: C

Rationale

Choice C is correct. A line that most closely fits the data is a line with an approximately balanced number of data points above and below the line. Fitting a line to the data shown results in a line with an approximate slope of 3 and a y-intercept near the point $(0,1)$. An equation for the line can be written in slope-intercept form, $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept. The equation $y = 3.30x + 0.82$ in choice C fits the data most closely.

Choices A and B are incorrect because the slope of the lines of these equations is 0.82, which is a value that is too small to be the slope of the line that fits the data shown. Choice D is incorrect. The graph of this equation has a y-intercept at $(0,-3.30)$, not $(0,0.82)$. This line would lie below all of the data points, and therefore would not closely fit the data.

Question Difficulty: Medium

Question ID 308084c5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■■

ID: 308084c5

Sample	Percent in favor	Margin of error
A	52%	4.2%
B	48%	1.6%

The results of two random samples of votes for a proposition are shown above. The samples were selected from the same population, and the margins of error were calculated using the same method. Which of the following is the most appropriate reason that the margin of error for sample A is greater than the margin of error for sample B?

A. Sample A had a smaller number of votes that could not be recorded.

B. Sample A had a higher percent of favorable responses.

C. Sample A had a larger sample size.

D. Sample A had a smaller sample size.

ID: 308084c5 Answer

Correct Answer: D

Rationale

Choice D is correct. Sample size is an appropriate reason for the margin of error to change. In general, a smaller sample size increases the margin of error because the sample may be less representative of the whole population.

Choice A is incorrect. The margin of error will depend on the size of the sample of recorded votes, not the number of votes that could not be recorded. In any case, the smaller number of votes that could not be recorded for sample A would tend to decrease, not increase, the comparative size of the margin of error. Choice B is incorrect. Since the percent in favor for sample A is the same distance from 50% as the percent in favor for sample B, the percent of favorable responses doesn't affect the comparative size of the margin of error for the two samples. Choice C is incorrect. If sample A had a larger margin of error than sample B, then sample A would tend to be less representative of the population. Therefore, sample A is not likely to have a larger sample size.

Question Difficulty: Hard

Question ID f04d40b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: f04d40b2

From a population of $50{,}000$ people, $1{,}000$ were chosen at random and surveyed about a proposed piece of legislation. Based on the survey, it is estimated that 35% of people in the population support the legislation, with an associated margin of error of 3%. Based on these results, which of the following is a plausible value for the total number of people in the population who support the proposed legislation?

A. 350

B. 650

C. $16{,}750$

D. $31{,}750$

ID: f04d40b2 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that an estimated 35% of people in the population support the legislation, with an associated margin of error of 3%. Subtracting and adding the margin of error from the estimate gives an interval of plausible values for the true percentage of people in the population who support the legislation. Therefore, it's plausible that between 32% and 38% of people in this population support the legislation. The corresponding numbers of people represented by these percentages in the population can be calculated by multiplying the total population, $50{,}000$, by 0.32 and by 0.38, which gives $50{,}000(0.32) = 16{,}000$ and $50{,}000(0.38) = 19{,}000$, respectively. It follows that any value in the interval $16{,}000$ to $19{,}000$ is a plausible value for the total number of people in the population who support the proposed legislation. Of the choices given, only $16{,}750$ is in this interval.

Choice A is incorrect. This is the number of people in the sample, rather than in the population, who support the legislation.

Choice B is incorrect. This is the number of people in the sample who do not support the legislation.

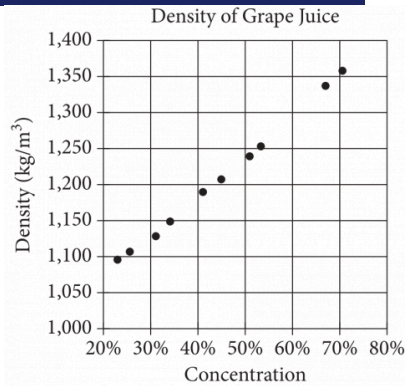
Choice D is incorrect. This is a plausible value for the total number of people in the population who do not support the proposed legislation.

Question Difficulty: Medium

Question ID c9dd92b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: c9dd92b1



The densities of different concentrations of grape juice are shown in the scatterplot above. According to the trend shown by the data, which of the following is closest to the predicted density, in kilograms per cubic meter (kg/m^3), for grape juice with a concentration of 60%?

A. 1,200

B. 1,250

C. 1,300

D. 1,350

ID: c9dd92b1 Answer

Correct Answer: C

Rationale

Choice C is correct. The data in the scatterplot show an increasing linear trend. The density when the juice concentration is 60% will be between the densities shown at about 53% and 67% concentration, or between about 1,255 and 1,340 kg/m^3. Of the choices given, only 1,300 falls within this range.

Choices A, B, and D are incorrect. These are the approximate densities of grape juice with a concentration of 45%, 55%, and 70%, respectively.

Question Difficulty: Easy

Question ID 9bf4c545

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■□□

ID: 9bf4c545

The members of a city council wanted to assess the opinions of all city residents about converting an open field into a dog park. The council surveyed a sample of 500 city residents who own dogs. The survey showed that the majority of those sampled were in favor of the dog park. Which of the following is true about the city council's survey?

A. It shows that the majority of city residents are in favor of the dog park.

B. The survey sample should have included more residents who are dog owners.

C. The survey sample should have consisted entirely of residents who do not own dogs.

D. The survey sample is biased because it is not representative of all city residents.

ID: 9bf4c545 Answer

Correct Answer: D

Rationale

Choice D is correct. The members of the city council wanted to assess opinions of all city residents. To gather an unbiased sample, the council should have used a random sampling design to select subjects from all city residents. The given survey introduced a sampling bias because the 500 city residents surveyed were all dog owners. This sample is not representative of all city residents because not all city residents are dog owners.

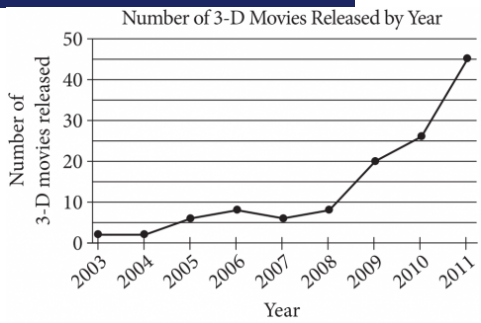
Choice A is incorrect because when the sampling method isn't random, there is no guarantee that the survey results will be reliable; hence, they cannot be generalized to the entire population. Choice B is incorrect because a larger sample of residents who are dog owners would not correct the sampling bias. Choice C is incorrect because a survey sample of entirely non–dog owners would likely have a biased opinion, just as a sample of dog owners would likely have a biased opinion.

Question Difficulty: Easy

Question ID a6b2fcce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: a6b2fcce



According to the line graph above, between which two consecutive years was there the greatest change in the number of 3-D movies released?

A. 2003–2004

B. 2008–2009

C. 2009–2010

D. 2010–2011

ID: a6b2fcce Answer

Correct Answer: D

Rationale

Choice D is correct. The change in the number of 3-D movies released between any two consecutive years can be found by first estimating the number of 3-D movies released for each of the two years and then finding the positive difference between these two estimates. Between 2003 and 2004, this change is approximately $2-2=0$ movies; between 2008 and 2009, this change is approximately $20-8=12$ movies; between 2009 and 2010, this change is approximately $26-20=6$ movies; and between 2010 and 2011, this change is approximately $46-26=20$ movies. Therefore, of the pairs of consecutive years in the choices, the greatest increase in the number of 3-D movies released occurred during the time period between 2010 and 2011.

Choices A, B, and C are incorrect. Between 2010 and 2011, approximately 20 more 3-D movies were released. The change in the number of 3-D movies released between any of the other pairs of consecutive years is significantly smaller than 20.

Question Difficulty: Easy

Question ID 7d68096f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 7d68096f

A trivia tournament organizer wanted to study the relationship between the number of points a team scores in a trivia round and the number of hours that a team practices each week. For the study, the organizer selected 55 teams at random from all trivia teams in a certain tournament. The table displays the information for the 40 teams in the sample that practiced for at least 3 hours per week.

Hours practiced	Number of points per round		
	6 to 13 points	14 or more points	Total
3 to 5 hours	6	4	10
More than 5 hours	4	26	30
Total	10	30	40

Which of the following is the largest population to which the results of the study can be generalized?

A. All trivia teams in the tournament that scored 14 or more points in the round

B. The 55 trivia teams in the sample

C. The 40 trivia teams in the sample that practiced for at least 3 hours per week

D. All trivia teams in the tournament

ID: 7d68096f Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the organizer selected 55 teams at random from all trivia teams in the tournament. A table is also given displaying the information for the 40 teams in the sample that practiced for at least 3 hours per week. Selecting a sample of a reasonable size at random to use for a survey allows the results from that survey to be applied to the population from which the sample was selected, but not beyond this population. Thus, only the sampling method information is necessary to determine the largest population to which the results of the study can be generalized. Since the organizer selected the sample at random from all trivia teams in the tournament, the largest population to which the results of the study can be generalized is all trivia teams in the tournament.

Choice A is incorrect. The sample was selected at random from all trivia teams in the tournament, not just from the teams that scored an average of 14 or more points per round.

Choice B is incorrect. If a study uses a sample selected at random from a population, the results of the study can be generalized to the population, not just the sample.

Choice C is incorrect. If a study uses a sample selected at random from a population, the results of the study can be generalized to the population, not just a subset of the sample.

Question Difficulty: Hard

Question ID f4b3672a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: f4b3672a

A certain forest is 253 acres. To estimate the number of trees in the forest, a ranger randomly selects 5 different 1-acre parcels in the forest and determines the number of trees in each parcel. The numbers of trees in the sample acres are 51, 59, 45, 52, and 73. Based on the mean of the sample, which of the following ranges contains the best estimate for the number of trees in the entire forest?

A. 11,000 to 12,000

B. 12,500 to 13,500

C. 13,500 to 14,500

D. 18,000 to 19,000

ID: f4b3672a Answer

Correct Answer: C

Rationale

Choice C is correct. The mean of the 5 samples is $\frac{51+59+45+52+73}{5}=56$ trees per acre. The best estimate for the total number of trees in the forest is the product of the mean number of trees per acre in the sample and the total number of acres in the forest. This is (56)(253) = 14,168, which is between 13,500 and 14,500.

Choice A is incorrect and may result from multiplying the minimum number of trees per acre in the sample, 45, by the number of acres, 253. Choice B is incorrect and may result from multiplying the median number of trees per acre in the sample, 52, by the number of acres, 253. Choice D is incorrect and may result from multiplying the maximum number of trees per acre in the sample, 73, by the number of acres, 253.

Question Difficulty: Easy

Question ID 585de39a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: 585de39a

On May 10, 2015, there were 83 million Internet subscribers in Nigeria. The major Internet providers were MTN, Globacom, Airtel, Etisalat, and Visafone. By September 30, 2015, the number of Internet subscribers in Nigeria had increased to 97 million. If an Internet subscriber in Nigeria on September 30, 2015, is selected at random, the probability that the person selected was an MTN subscriber is 0.43. There were p million MTN subscribers in Nigeria on September 30, 2015. To the nearest integer, what is the value of p ?

ID: 585de39a Answer

Rationale

The correct answer is 42. It's given that in Nigeria on September 30, 2015, the probability of selecting an MTN subscriber from all Internet subscribers is 0.43, that there were p million, or $p(1{,}000{,}000)$, MTN subscribers, and that there were 97 million, or 97,000,000, Internet subscribers. The probability of selecting an MTN subscriber from all Internet subscribers can be found by dividing the number of MTN subscribers by the total number of Internet subscribers. Therefore, the equation $\frac{p(1{,}000{,}000)}{97{,}000{,}000} = 0.43$ can be used to solve for p. Dividing 1,000,000 from the numerator and denominator of the expression on the left-hand side yields $\frac{p}{97} = 0.43$. Multiplying both sides of this equation by 97 yields $p = (0.43)(97) = 41.71$, which, to the nearest integer, is 42.

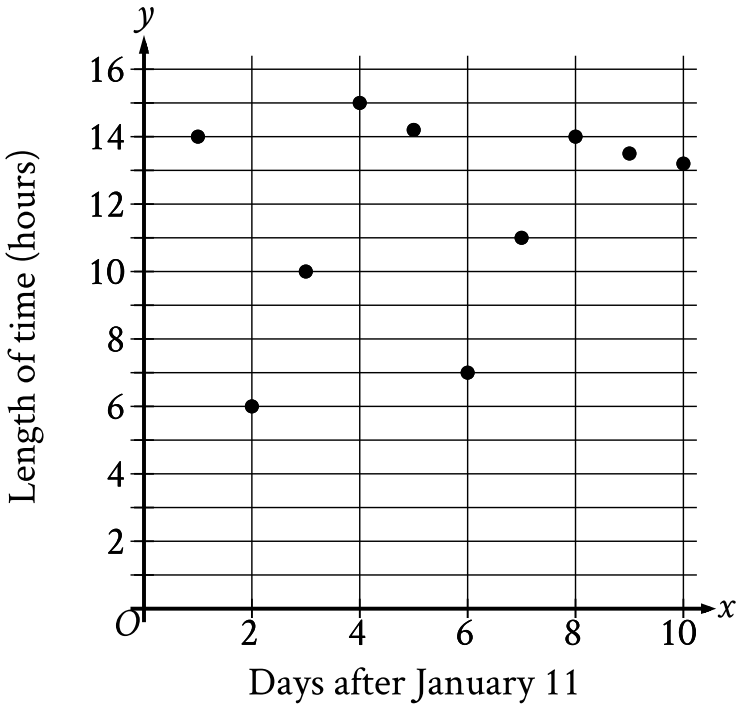
Question Difficulty: Hard

Question ID 7b52985c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 7b52985c

The scatterplot shows the relationship between the length of time y, in hours, a certain bird spent in flight and the number of days after January 11, x.



What is the average rate of change, in hours per day, of the length of time the bird spent in flight on January 13 to the length of time the bird spent in flight on January 15?

ID: 7b52985c Answer

Correct Answer: 4.5, 9/2

Rationale

The correct answer is $\frac{9}{2}$. It's given that the scatterplot shows the relationship between the length of time y, in hours, a certain bird spent in flight and the number of days after January 11, x. Since January 13 is 2 days after January 11, it follows that January 13 corresponds to an x-value of 2 in the scatterplot. In the scatterplot, when $x = 2$, the corresponding value of y is 6. In other words, on January 13, the bird spent 6 hours in flight. Since January 15 is 4 days after January 11, it follows that January 15 corresponds to an x-value of 4 in the scatterplot. In the scatterplot, when $x = 4$, the corresponding value of y is 15. In other words, on January 15, the bird spent 15 hours in flight. Therefore, the average rate of change, in hours per day, of the length of time the bird spent in flight on January 13 to the length of time the bird spent in flight on January 15 is the difference in the length of time, in hours, the bird spent in flight divided by the difference in the number of days after January 11, or $\frac{15-6}{4-2}$, which is equivalent to $\frac{9}{2}$. Note that 9/2 and 4.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 7ce2830a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 7ce2830a

A psychologist designed and conducted a study to determine whether playing a certain educational game increases middle school students' accuracy in adding fractions. For the study, the psychologist chose a random sample of 35 students from all of the students at one of the middle schools in a large city. The psychologist found that students who played the game showed significant improvement in accuracy when adding fractions. What is the largest group to which the results of the study can be generalized?

A. The 35 students in the sample

B. All students at the school

C. All middle school students in the city

D. All students in the city

ID: 7ce2830a Answer

Correct Answer: B

Rationale

Choice B is correct. The largest group to which the results of a study can be generalized is the population from which the random sample was chosen. In this case, the psychologist chose a random sample from all students at one particular middle school. Therefore, the largest group to which the results can be generalized is all the students at the school.

Choice A is incorrect because this isn't the largest group the results can be generalized to. Choices C and D are incorrect because these groups are larger than the population from which the random sample was chosen. Therefore, the sample isn't representative of these groups.

Question Difficulty: Hard

Question ID 12dbe3de

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 12dbe3de

A store received a shipment of 1,000 MP3 players, 4 of which were defective. If an MP3 player is randomly selected from this shipment, what is the probability that it is defective?

A. 0.004

B. 0.04

C. 0.4

D. 4

ID: 12dbe3de Answer

Correct Answer: A

Rationale

Choice A is correct. The probability of randomly selecting a defective MP3 player from the shipment is equal to the number of defective MP3 players divided by the total number of MP3 players in the shipment. Therefore, the probability is $\frac{4}{1,000}$, which is equivalent to 0.004.

Choice B is incorrect because 0.04 represents 4 defective MP3 players out of 100 rather than out of 1,000. Choice C is incorrect because 0.4 represents 4 defective MP3 players out of 10 rather than out of 1,000. Choice D is incorrect. This is the number of defective MP3 players in the shipment.

Question Difficulty: Easy

Question ID 642519d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: 642519d7

A polling agency recently surveyed 1,000 adults who were selected at random from a large city and asked each of the adults, “Are you satisfied with the quality of air in the city?” Of those surveyed, 78 percent responded that they were satisfied with the quality of air in the city. Based on the results of the survey, which of the following statements must be true?

Of all adults in the city, 78 percent are satisfied with the quality of air in the city.

If another 1,000 adults selected at random from the city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.

If 1,000 adults selected at random from a different city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.

A. None

B. II only

C. I and II only

D. I and III only

ID: 642519d7 Answer

Correct Answer: A

Rationale

Choice A is correct. Statement I need not be true. The fact that 78% of the 1,000 adults who were surveyed responded that they were satisfied with the air quality in the city does not mean that the exact same percentage of all adults in the city will be satisfied with the air quality in the city. Statement II need not be true because random samples, even when they are of the same size, are not necessarily identical with regard to percentages of people in them who have a certain opinion. Statement III need not be true for the same reason that statement II need not be true: results from different samples can vary. The variation may be even bigger for this sample since it would be selected from a different city. Therefore, none of the statements must be true.

Choices B, C, and D are incorrect because none of the statements must be true.

Question Difficulty: Medium

Question ID 0108ac2d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: 0108ac2d

At a large high school, 300 students were selected at random and were asked in a survey about a menu change in the school cafeteria. All 300 students completed the survey. It was estimated that 38% of the students were in support of a menu change, with a margin of error of 5.5%. Which of the following is the best interpretation of the survey results?

A. The percent of the students at the school who support a menu change is 38%.

B. The percent of the students at the school who support a menu change is greater than 38%.

C. Plausible values of the percent of the students at the school who support a menu change are between 32.5% and 43.5%.

D. Plausible values of the number of the students at the school who support a menu change are between 295 and 305.

ID: 0108ac2d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that an estimated 38% of sampled students at the school were in support of a menu change, with a margin of error of 5.5%. It follows that the percent of the students at the school who support a menu change is 38% plus or minus 5.5%. The lower bound of this estimation is $38-5.5$, or 32.5%. The upper bound of this estimation is $38+5.5$, or 43.5%. Therefore, plausible values of the percent of the students at the school who support a menu change are between 32.5% and 43.5%.

Choice A is incorrect. This is the percent of the sampled students at the school who support a menu change. Choices B and D are incorrect and may result from misinterpreting the margin of error.

Question Difficulty: Easy

Question ID 912cd125

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 912cd125

For a science project, Anka recorded whether it rained each weekday and weekend day for 12 weeks. Her results are summarized in the table below.

Weekday and Weekend Day Rain for 12 Weeks

	Rain	No rain	Total
Number of weekdays	12	48	60
Number of weekend days	8	16	24
Total	20	64	84

If one of the days on which there was no rain is selected at random, what is the probability the day was a weekend day?

A. $\frac{4}{21}$

B. $\frac{1}{4}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

ID: 912cd125 Answer

Correct Answer: B

Rationale

Choice B is correct. There were 64 days with no rain. It was a weekend day for 16 of those 64 days. So 16 out of 64 of the days with no rain were weekend days. Because the day is selected at random, each day has an equal chance of being selected, so the probability is $\frac{16}{64} = \frac{1}{4}$.

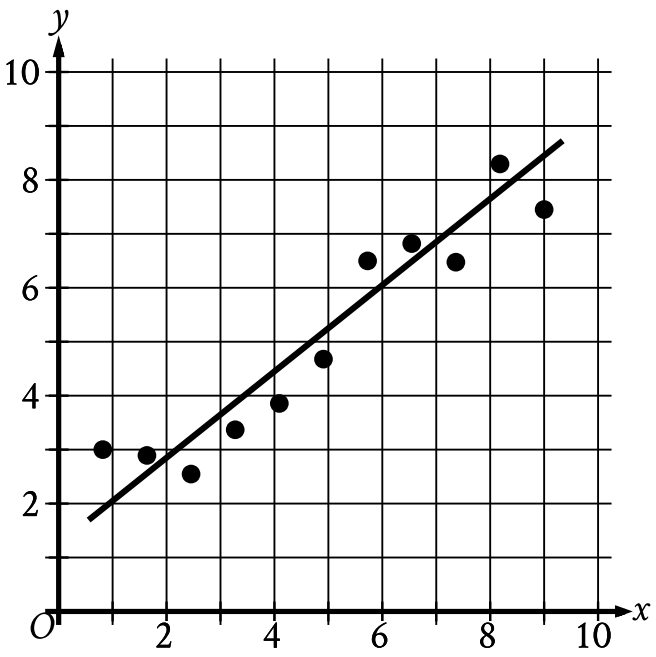
Choice A is incorrect. It is the probability that a day selected at random from any one of the days during the 12 weeks is a weekend day with no rain. Choice C is incorrect. It is the probability that a day selected at random from the weekend days has no rain. Choice D is incorrect. It is the probability that a day selected at random from the days with no rain is a weekday.

Question Difficulty: Medium

Question ID ad7dbb22

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: ad7dbb22



The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown. For how many of the 11 data points does the line of best fit predict a greater y-value than the actual y-value?

ID: ad7dbb22 Answer

Correct Answer: 6

Rationale

The correct answer is 6. The line of best fit predicts a greater *y*-value than the actual *y*-value for any data point that's located below the line of best fit. For the scatterplot shown, 6 of the data points are below the line of best fit. Therefore, the line of best fit predicts a greater *y*-value than the actual *y*-value for 6 of the data points.

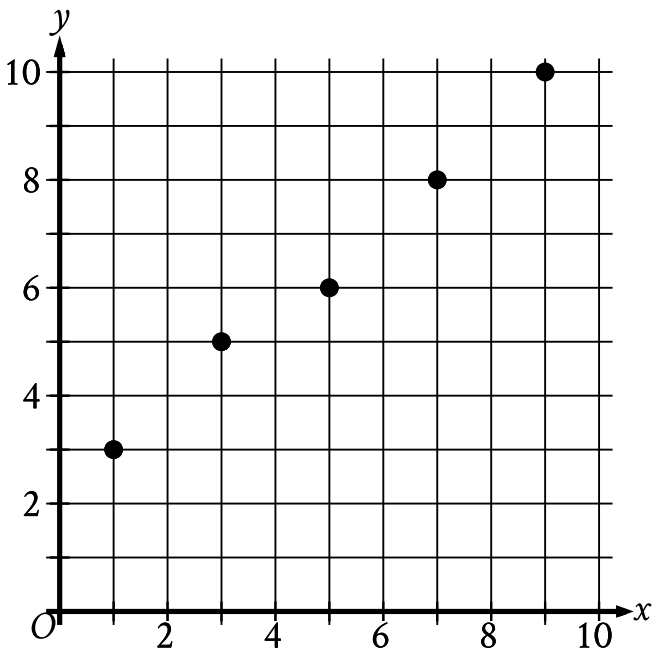
Question Difficulty: Medium

Question ID 16988f9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 16988f9c

The scatterplot shows the relationship between two variables, x and y.



Which equation is the most appropriate linear model for this relationship?

A. $y = -0.9x - 2.2$

B. $y = -0.9x + 2.2$

C. $y = -0.9x$

D. $y = 0.9x + 2.2$

ID: 16988f9c Answer

Correct Answer: D

Rationale

Choice D is correct. A linear model can be written in the form $y = mx + b$, where m is the slope of the graph of the model in the *xy*-plane and $(0, b)$ is the *y*-intercept. The graph of an appropriate linear model for this relationship passes near the points $(1, 3)$ and $(9, 10)$ in the *xy*-plane. Two points on a line, (x_1, y_1) and (x_2, y_2), can be used to find the slope of the line using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points $(1, 3)$ and $(9, 10)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{10 - 3}{9 - 1}$, or $m = 0.875$. Therefore, the value of m for an appropriate linear model is approximately 0.875. Substituting 0.875 for m in $y = mx + b$ yields $y = 0.875x + b$. Since an appropriate linear model passes near the point $(1, 3)$, the approximate value of b can be found by substituting 1 for x and 3 for y in the equation $y = 0.875x + b$, which yields $3 = (0.875)(1) + b$, or $3 = 0.875 + b$. Subtracting 0.875 from both sides of this equation yields $2.125 = b$. Therefore, the value of b for an appropriate linear model is approximately 2.125. Thus, of the given choices, $y = 0.9x + 2.2$ is the most appropriate linear model for this relationship.

Alternate approach: A linear model can be written in the form $y = mx + b$, where m is the slope of the graph of the model in the *xy*-plane and $(0, b)$ is the *y*-intercept. The scatterplot shows that as the *x*-values of the data points increase, the *y*-values of the data points increase, which means the graph of an appropriate linear model has a positive slope. Of the given choices, $y = 0.9x + 2.2$ is the only linear model whose graph has a positive slope.

Choice A is incorrect. The graph of this model has a negative slope, not a positive slope.

Choice B is incorrect. The graph of this model has a negative slope, not a positive slope.

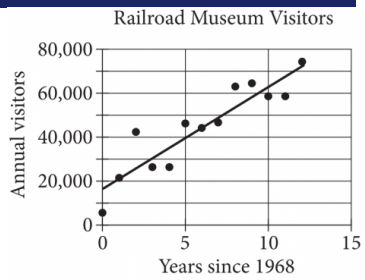
Choice C is incorrect. The graph of this model has a negative slope, not a positive slope.

Question Difficulty: Easy

Question ID 3c5b19ef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 3c5b19ef



The scatterplot above shows the number of visitors to a railroad museum in Pennsylvania each year from 1968 to 1980, where t is the number of years since 1968 and n is the number of visitors. A line of best fit is also shown. Which of the following could be an equation of the line of best fit shown?

A. $n = 16{,}090 + 4{,}680t$

B. $n = 4{,}690 + 16{,}090t$

C. $n = 16{,}090 + 9{,}060t$

D. $n = 9{,}060 + 16{,}090t$

ID: 3c5b19ef Answer

Correct Answer: A

Rationale

Choice A is correct. An equation of a line of best fit can be written in the form $y = a + bx$, where a is the y-intercept of the line and b is the slope. In the scatterplot shown, the line of best fit intersects the y-axis just over halfway between 10,000 and 20,000, or approximately 16,000. The line of best fit also intersects the graph at $(5{,}40{,}000)$. Using the slope formula $b = \frac{y_2 - y_1}{x_2 - x_1}$ and two points that lie on the graph such as $(5{,}40{,}000)$ and $(0{,}16{,}000)$, the slope can be approximated as $\frac{40{,}000 - 16{,}000}{5 - 0}$, or 4,800. Only choice A has a y-intercept near the estimate of 16,000 and a slope near the estimate of 4,800. Therefore, an equation of the line of best fit could be $n = 16{,}090 + 4{,}680t$.

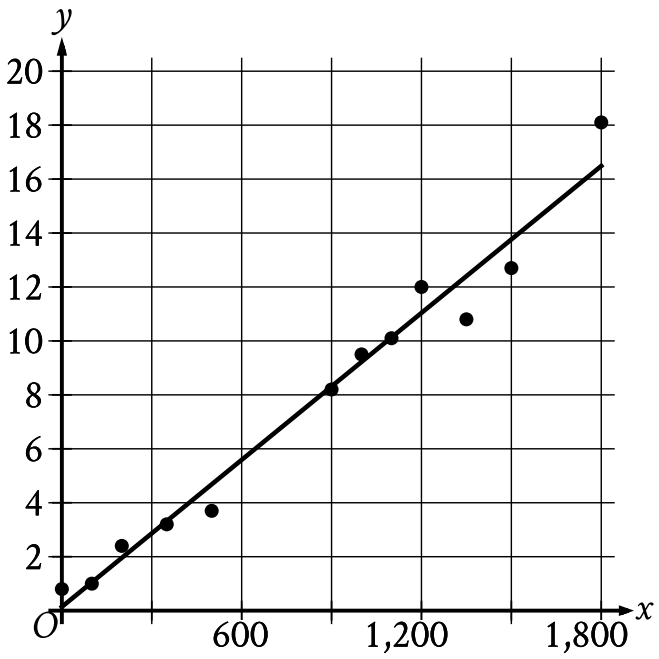
Choice B is incorrect because the values for the slope and the y-coordinate of the y-intercept are switched. Choice C is incorrect because the value for the slope is approximately double the actual slope. Choice D is incorrect because the values for the slope and the y-intercept are switched and because the slope is approximately double the actual slope.

Question Difficulty: Medium

Question ID ae32cc3c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: ae32cc3c



Twelve data points are shown in the scatterplot. A line of best fit for the data is also shown. At $x = 1{,}200$, which of the following is closest to the *y*-value predicted by the line of best fit?

A. 16

B. 14

C. 11

D. 6

ID: ae32cc3c Answer

Correct Answer: C

Rationale

Choice C is correct. On the line of best fit, an *x*-value of $1{,}200$ corresponds to a *y*-value between 10 and 12. Therefore, of the given choices, 11 is closest to the *y*-value predicted by the line of best fit at $x = 1{,}200$.

Choice A is incorrect. This is the integer value closest to the *y*-value predicted by the line of best fit at $x = 1{,}800$.

Choice B is incorrect. This is the integer value closest to the *y*-value predicted by the line of best fit at $x = 1{,}500$.

Choice D is incorrect. This is the integer value closest to the *y*-value predicted by the line of best fit at $x = 600$.

Question Difficulty: Easy

Question ID 6a715bed

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: 6a715bed

The table summarizes the distribution of age and assigned group for 90 participants in a study.

	0–9 years	10–19 years	20+ years	Total
Group A	7	14	9	30
Group B	6	4	20	30
Group C	17	12	1	30
Total	30	30	30	90

One of these participants will be selected at random. What is the probability of selecting a participant from group A, given that the participant is at least 10 years of age? (Express your answer as a decimal or fraction, not as a percent.)

ID: 6a715bed Answer

Correct Answer: .3833, 23/60

Rationale

The correct answer is $\frac{23}{60}$. It's given that one of the participants will be selected at random. The probability of selecting a participant from group A given that the participant is at least 10 years of age is the number of participants in group A who are at least 10 years of age divided by the total number of participants who are at least 10 years of age. The table shows that in group A, there are 14 participants who are $10–19$ years of age and 9 participants who are $20+$ years of age. Therefore, there are $14 + 9$, or 23, participants in group A who are at least 10 years of age. The table also shows that there are a total of 30 participants who are $10–19$ years of age and 30 participants who are $20+$ years of age. Therefore, there are a total of $30 + 30$, or 60, participants who are at least 10 years of age. It follows that the probability of selecting a participant from group A given that the participant is at least 10 years of age is $\frac{23}{60}$. Note that 23/60, .3833, and 0.383 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 82dfb646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■□□

ID: 82dfb646

A market researcher selected 200 people at random from a group of people who indicated that they liked a certain book. The 200 people were shown a movie based on the book and then asked whether they liked or disliked the movie. Of those surveyed, 95% said they disliked the movie. Which of the following inferences can appropriately be drawn from this survey result?

A. At least 95% of people who go see movies will dislike this movie.

B. At least 95% of people who read books will dislike this movie.

C. Most people who dislike this book will like this movie.

D. Most people who like this book will dislike this movie.

ID: 82dfb646 Answer

Correct Answer: D

Rationale

Choice D is correct. The sample was selected from a group of people who indicated that they liked the book. It is inappropriate to generalize the result of the survey beyond the population from which the participants were selected. Choice D is the most appropriate inference from the survey results because it describes a conclusion about people who liked the book, and the results of the survey indicate that most people who like the book disliked the movie.

Choices A, B, and C are incorrect because none of these inferences can be drawn from the survey results. Choices A and B need not be true. The people surveyed all liked the book on which the movie was based, which is not necessarily true of all people who go see movies or all people who read books. Thus, the people surveyed are not representative of all people who go see movies or all people who read books. Therefore, the results of this survey cannot appropriately be extended to at least 95% of people who go see movies or to at least 95% of people who read books. Choice C need not be true because the sample includes only people who liked the book, and so the results do not extend to people who dislike the book.

Question Difficulty: Easy

Question ID 30db8f77

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 30db8f77

At a conference, there are a total of 275 attendees. Each attendee is assigned to either group A, group B, or group C. If one of these attendees is selected at random, the probability of selecting an attendee who is assigned to group A is 0.44 and the probability of selecting an attendee who is assigned to group B is 0.24. How many attendees are assigned to group C?

ID: 30db8f77 Answer

Correct Answer: 88

Rationale

The correct answer is 88. It's given that there are a total of 275 attendees and each attendee is assigned to either group A, group B, or group C. It's also given that if one of these attendees is selected at random, the probability of selecting an attendee who is assigned to group A is 0.44 and the probability of selecting an attendee who is assigned to group B is 0.24. It follows that there are $0.44(275)$, or 121, attendees who are assigned to group A and $0.24(275)$, or 66, attendees who are assigned to group B. The number of attendees who are assigned to group C is the number of attendees who are not assigned to group A or group B. In other words, the number of attendees who are assigned to group C is the total number of attendees minus the number of attendees who are assigned to group A and group B. Therefore, the number of attendees who are assigned to group C is $275 - 121 - 66$, or 88.

Question Difficulty: Medium

Question ID 43744269

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 43744269

An airplane descends from an altitude of $9{,}500$ feet to $5{,}000$ feet at a constant rate of 400 feet per minute. What type of function best models the relationship between the descending airplane's altitude and time?

A. Decreasing exponential

B. Decreasing linear

C. Increasing exponential

D. Increasing linear

ID: 43744269 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the airplane descends at a constant rate of 400 feet per minute. Since the altitude decreases by a constant amount during each fixed time period, the relationship between the airplane's altitude and time is linear. Since the airplane descends from an altitude of $9{,}500$ feet to $5{,}000$ feet, the airplane's altitude is decreasing with time. Thus, the relationship is best modeled by a decreasing linear function.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

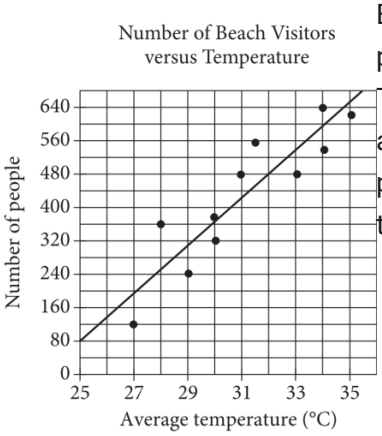
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID d0430601

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: d0430601



Each dot in the scatterplot above represents the temperature and the number of people who visited a beach in Lagos, Nigeria, on one of eleven different days. The line of best fit for the data is also shown. The line of best fit for the data has a slope of approximately 57. According to this estimate, how many additional people per day are predicted to visit the beach for each 5°C increase in average temperature?

ID: d0430601 Answer

Rationale

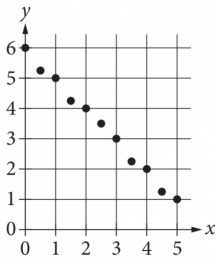
The correct answer is 285. The number of people predicted to visit the beach each day is represented by the y-values of the line of best fit, and the average temperature, in degrees Celsius ($°C$), is represented by the x-values. Since the slope of the line of best fit is approximately 57, the y-value, or the number of people predicted to visit the beach each day, increases by 57 for every x-value increase of 1, or every $1°C$ increase in average temperature. Therefore, an increase of $5°C$ in average temperature corresponds to a y-value increase of $57(5) = 285$ additional people per day predicted to visit the beach.

Question Difficulty: Hard

Question ID 9296553d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 9296553d



Which of the following could be an equation for a line of best fit for the data in the scatterplot?

A. $y = -x + 6$

B. $y = -x - 6$

C. $y = 6x + 1$

D. $y = 6x - 1$

ID: 9296553d Answer

Correct Answer: A

Rationale

Choice A is correct. A line of best fit for the data in a scatterplot is a line that follows the trend of the data with approximately half the data points above and half the data points below the line. Based on the given data, a line of best fit will have a positive y-intercept on or near the point $(0,6)$ and a negative slope. All of the choices are in slope-intercept form $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept. Only choice A is an equation of a line with a positive y-intercept at $(0,6)$ and a negative slope, -1.

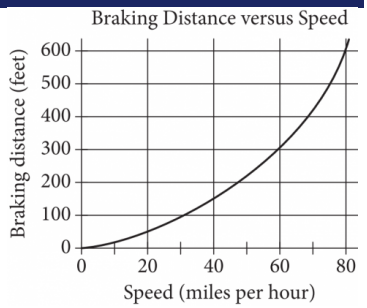
Choice B is incorrect. This equation is for a line that has a negative y-intercept, not a positive y-intercept. Choices C and D are incorrect and may result from one or more sign errors and from switching the values of the y-intercept and the slope in the equation.

Question Difficulty: Easy

Question ID d6121490

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: d6121490



The graph above shows the relationship between the speed of a particular car, in miles per hour, and its corresponding braking distance, in feet. Approximately how many feet greater will the car's braking distance be when the car is traveling at 50 miles per hour than when the car is traveling at 30 miles per hour?

A. 75

B. 125

C. 175

D. 250

ID: d6121490 Answer

Correct Answer: B

Rationale

Choice B is correct. According to the graph, when the car is traveling at 50 miles per hour, the braking distance is approximately 225 feet, and when the car is traveling at 30 miles per hour, the braking distance is approximately 100 feet. The difference between these braking distances is $225 - 100$, or 125 feet.

Choice A is incorrect and may result from finding the braking distance for 20 miles per hour, the difference between the given speeds. Choice C is incorrect and may result from subtracting the speed from the braking distance at 50 miles per hour. Choice D is incorrect and may result from finding the difference in the braking distances at 60 and 20 miles per hour.

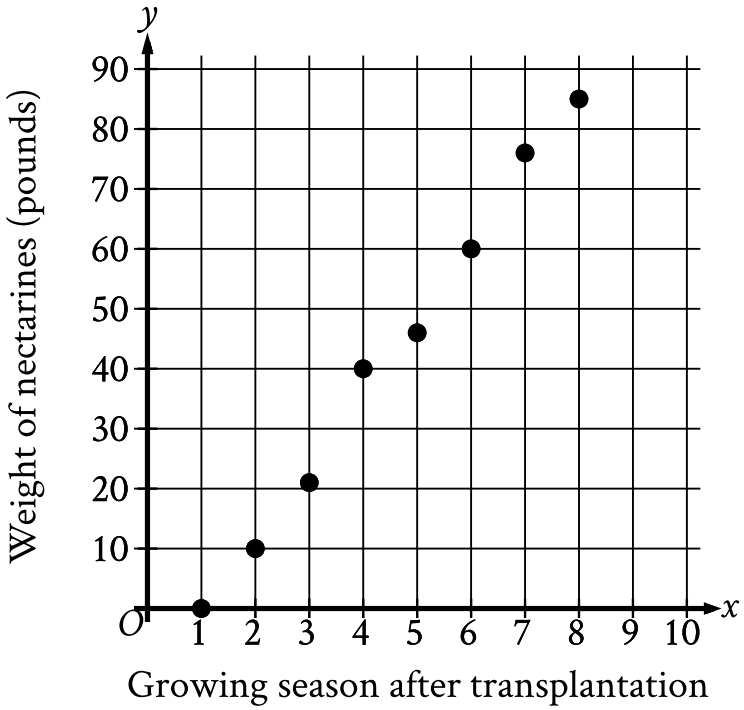
Question Difficulty: Easy

Question ID b58dbf88

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: b58dbf88

An orchard owner recorded the weight, in pounds, of all nectarines that grew on a dwarf nectarine tree during each growing season after the tree's transplantation. The scatterplot shows this weight, in pounds, for each growing season after the tree's transplantation.



What was the weight, to the nearest pound, of all nectarines that grew on the tree during the 4th growing season after the tree's transplantation?

ID: b58dbf88 Answer

Correct Answer: 40

Rationale

The correct answer is 40. For each data point on the scatterplot, the *x*-value represents the growing season after transplantation and the *y*-value represents the weight, in pounds, of all nectarines that grew on the tree during the season. The scatterplot shows a data point at $(4, 40)$. It follows that during the 4th growing season after the tree's transplantation, 40 pounds of nectarines grew on the tree.

Question Difficulty: Easy

Question ID ab7740a8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: ab7740a8

In which of the following tables is the relationship between the values of x and their corresponding y-values nonlinear?

A.

x	1	2	3	4
y	8	11	14	17

B.

x	1	2	3	4
y	4	8	12	16

C.

x	1	2	3	4
y	8	13	18	23

D.

x	1	2	3	4
y	6	12	24	48

ID: ab7740a8 Answer

Correct Answer: D

Rationale

Choice D is correct. The relationship between the values of x and their corresponding y-values is nonlinear if the rate of change between these pairs of values isn't constant. The table for choice D gives four pairs of values: $(1,6)$, $(2,12)$, $(3,24)$, and $(4,48)$. Finding the rate of change, or slope, between $(1,6)$ and $(2,12)$ by using the slope formula, $\frac{y_2-y_1}{x_2-x_1}$, yields $\frac{12-6}{2-1}$, or 6. Finding the rate of change between $(2,12)$ and $(3,24)$ yields $\frac{24-12}{3-2}$, or 12. Finding the rate of change between $(3,24)$ and $(4,48)$ yields $\frac{48-24}{4-3}$, or 24. Since the rate of change isn't constant for these pairs of values, this table shows a nonlinear relationship.

Choices A, B, and C are incorrect. The rate of change between the values of x and their corresponding y-values in each of these tables is constant, being 3, 4, and 5, respectively. Therefore, each of these tables shows a linear relationship.

Question Difficulty: Medium

Question ID 2a08d878

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 2a08d878

There are *n* nonfiction books and 12 fiction books on a bookshelf. If one of these books is selected at random, what is the probability of selecting a nonfiction book, in terms of *n* ?

A. $\frac{n}{12}$

B. $\frac{n}{n+12}$

C. $\frac{12}{n}$

D. $\frac{12}{n+12}$

ID: 2a08d878 Answer

Correct Answer: B

Rationale

Choice B is correct. Since there are n nonfiction and 12 fiction books on the bookshelf, $n+12$ represents the total number of books. If one of these books is selected at random, the probability of selecting a nonfiction book is equivalent to the number of nonfiction books divided by the total number of books. Therefore, the probability of selecting a nonfiction book, in terms of n, is $\frac{n}{n+12}$.

Choice A is incorrect. This expression represents the number of nonfiction books divided by the number of fiction books.
Choice C is incorrect. This expression represents the number of fiction books divided by the number of nonfiction books.
Choice D is incorrect. This expression represents the probability of selecting a fiction book.

Question Difficulty: Easy

Question ID 38a9ac45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 38a9ac45

If 1,200 customers register for new accounts at a social media website every day, what fraction of the first 60,000 new accounts are registered in the first 5 days?

A. $\frac{1}{5}$

B. $\frac{1}{10}$

C. $\frac{1}{12}$

D. $\frac{1}{50}$

ID: 38a9ac45 Answer

Correct Answer: B

Rationale

Choice B is correct. If 1,200 customers register for new accounts every day, then (1,200)(5) = 6,000 customers registered for new accounts in the first 5 days. Therefore, of the first 60,000 new accounts that were registered, $\frac{6,000}{60,000}$, or $\frac{1}{10}$, were registered in the first 5 days.

Choice A is incorrect. The fraction $\frac{1}{5}$ represents the fraction of accounts registered in 1 of the first 5 days. Choice C is incorrect and may result from conceptual or computation errors. Choice D is incorrect. The fraction $\frac{1}{50}$ represents the fraction of the first 60,000 accounts that were registered in 1 day.

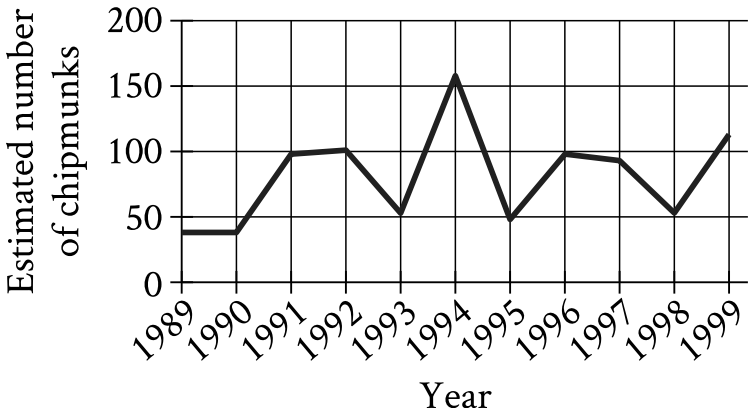
Question Difficulty: Medium

Question ID 2e511919

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 2e511919

The line graph shows the estimated number of chipmunks in a state park on April 1 of each year from 1989 to 1999.



Based on the line graph, in which year was the estimated number of chipmunks in the state park the greatest?

A. 1989

B. 1994

C. 1995

D. 1998

ID: 2e511919 Answer

Correct Answer: B

Rationale

Choice B is correct. For the given line graph, the estimated number of chipmunks is represented on the vertical axis. The greatest estimated number of chipmunks in the state park is indicated by the greatest height in the line graph. This height is achieved when the year is 1994.

Choice A is incorrect and may result from conceptual errors. Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

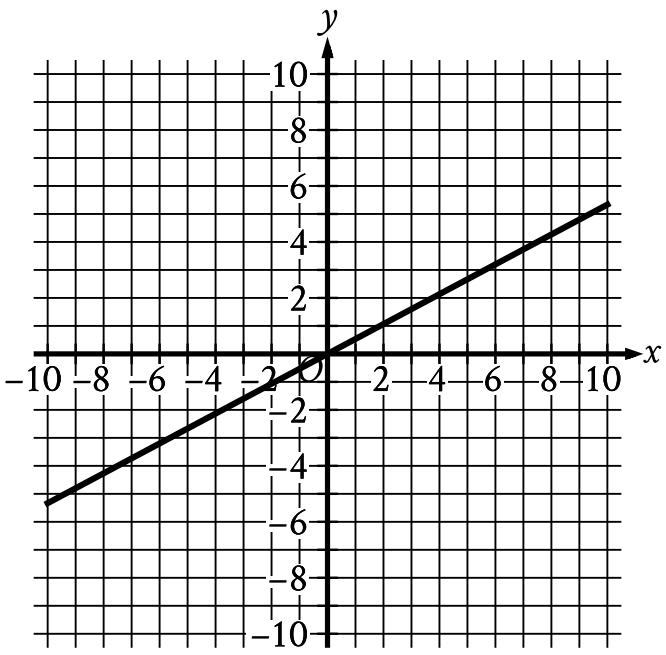
Question Difficulty: Easy

Question ID c141366d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: c141366d

The graph of function f is shown, where $y = f(x)$.



Which of the following describes function f?

A. Increasing linear

B. Decreasing linear

C. Increasing exponential

D. Decreasing exponential

ID: c141366d Answer

Correct Answer: A

Rationale

Choice A is correct. The graph of function f shows that as x increases, $f(x)$ also increases, which means $f(x)$ is an increasing function. The graph of f is a line, which indicates a constant rate of change. A function that has a constant rate of change is a linear function. Therefore, function f can be described as increasing linear.

Choice B is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases.

Choice C is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases, and the graph of an exponential function isn't a line.

Choice D is incorrect. The graph of an exponential function isn't a line.

Question Difficulty: Easy

Question ID a478f9f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: a478f9f5

Each of 157 gemstones can be classified as one of three classifications, as shown in the frequency table.

Classification	Frequency
color X	119
color Y	3
color Z	35

If one of the gemstones is selected at random, what is the probability of selecting a gemstone of color Y?

A. $\frac{3}{157}$

B. $\frac{35}{157}$

C. $\frac{119}{157}$

D. $\frac{154}{157}$

ID: a478f9f5 Answer

Correct Answer: A

Rationale

Choice A is correct. If one of the gemstones is selected at random, the probability of selecting a gemstone of color Y is equal to the number of gemstones of color Y divided by the total number of gemstones. According to the table, there are 3 gemstones of color Y, and it's given that the total number of gemstones is 157. Therefore, if one of the gemstones is selected at random, the probability of selecting a gemstone of color Y is $\frac{3}{157}$.

Choice B is incorrect. This is the probability of selecting a gemstone of color Z.

Choice C is incorrect. This is the probability of selecting a gemstone of color X.

Choice D is incorrect. This is the probability of selecting a gemstone that's not of color Y.

Question Difficulty: Easy

Question ID aa43b41f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: aa43b41f

Near the end of a US cable news show, the host invited viewers to respond to a poll on the show's website that asked, "Do you support the new federal policy discussed during the show?" At the end of the show, the host reported that 28% responded "Yes," and 70% responded "No." Which of the following best explains why the results are unlikely to represent the sentiments of the population of the United States?

A. The percentages do not add up to 100%, so any possible conclusions from the poll are invalid.

B. Those who responded to the poll were not a random sample of the population of the United States.

C. There were not 50% "Yes" responses and 50% "No" responses.

D. The show did not allow viewers enough time to respond to the poll.

ID: aa43b41f Answer

Correct Answer: B

Rationale

Choice B is correct. In order for the poll results from a sample of a population to represent the entire population, the sample must be representative of the population. A sample that is randomly selected from a population is more likely than a sample of the type described to represent the population. In this case, the people who responded were people with access to cable television and websites, which aren't accessible to the entire population. Moreover, the people who responded also chose to watch the show and respond to the poll. The people who made these choices aren't representative of the entire population of the United States because they were not a random sample of the population of the United States.

Choices A, C, and D are incorrect because they present reasons unrelated to whether the sample is representative of the population of the United States.

Question Difficulty: Hard

Question ID b6569d0e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: b6569d0e

United States Presidents from 1789 to 2015

Ages	Number
40–44	2
45–49	7
50–54	13
55–59	11
60–64	7
65–69	3

The table above gives the number of United States presidents from 1789 to 2015 whose age at the time they first took office is within the interval listed. Of those presidents who were at least 50 years old when they first took office, what fraction were at least 60 years old?

A. $\frac{10}{43}$

B. $\frac{10}{34}$

C. $\frac{10}{24}$

D. $\frac{25}{34}$

ID: b6569d0e Answer

Correct Answer: B

Rationale

Choice B is correct. The sample space is restricted to the presidents who were at least 50 years old when they first took office. Therefore, the sum of the values in the final four rows of the table, $13+11+7+3=34$, is the total number of presidents in the sample space. The number of presidents who were at least 60 years old is the sum of the values in the final two rows of the table: $7+3=10$. Thus, the fraction of the 34 presidents who were at least 50 years old when they first took office who were at least 60 years old is $\frac{10}{34}$.

Choice A is incorrect. This is the fraction of all presidents in the table who were at least 60 years old when they first took office. Choice C is incorrect and may result from treating the number of presidents who were between 50 and 59 years old when they first took office, instead of the number of presidents who were at least 50 years old, as the sample space. Choice D is incorrect and may result from a calculation error.

Question Difficulty: Medium

Question ID 5dc386fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: 5dc386fb

The table below shows the distribution of US states according to whether they have a state-level sales tax and a state-level income tax.

2013 State-Level Taxes

	State sales tax	No state sales tax
State income tax	39	4
No state income tax	6	1

To the nearest tenth of a percent, what percent of states with a state-level sales tax do not have a state-level income tax?

A. 6.0%

B. 12.0%

C. 13.3%

D. 14.0%

ID: 5dc386fb Answer

Correct Answer: C

Rationale

Choice C is correct. The sum of the number of states with a state-level sales tax is $39 + 6 = 45$. Of these states, 6 don't have a state-level income tax. Therefore, $\frac{6}{45} = 0.1333...$, or about 13.3%, of states with a state-level sales tax don't have a state-level income tax.

Choice A is incorrect. This is the number of states that have a state-level sales tax and no state-level income tax. Choice B is incorrect. This is the percent of states that have a state-level sales tax and no state-level income tax. Choice D is incorrect. This is the percent of states that have no state-level income tax.

Question Difficulty: Hard

Question ID 4096a482

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 4096a482

Based on a random sample from a population, a researcher estimated that the mean value of a certain variable for the population is 20.5, with an associated margin of error of 1. Which of the following is the most appropriate conclusion?

A. It is plausible that the actual mean value of the variable for the population is between 19.5 and 21.5.

B. It is not possible that the mean value of the variable for the population is less than 19.5 or greater than 21.5.

C. Every value of the variable in the population is between 19.5 and 21.5.

D. The mean value of the variable for the population is 20.5.

ID: 4096a482 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that based on a random sample from a population, the estimated mean value for a certain variable for the population is 20.5, with an associated margin of error of 1. This means that it is plausible that the actual mean value of the variable for the population is between $20.5 - 1$ and $20.5 + 1$. Therefore, the most appropriate conclusion is that it is plausible that the actual mean value of the variable for the population is between 19.5 and 21.5.

Choice B is incorrect. The estimated mean value and associated margin of error describe only plausible values, not all the possible values, for the actual mean value of the variable, so this is not an appropriate conclusion.

Choice C is incorrect. The estimated mean value and associated margin of error describe only plausible values for the actual mean value of the variable, not all the possible values of the variable, so this is not an appropriate conclusion.

Choice D is incorrect. Since 20.5 is the estimated mean value of the variable based on a random sample, the actual mean value of the variable may not be exactly 20.5. Therefore, this is not an appropriate conclusion.

Question Difficulty: Medium

Question ID 4a422e3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 4a422e3e

To determine the mean number of children per household in a community, Tabitha surveyed 20 families at a playground. For the 20 families surveyed, the mean number of children per household was 2.4. Which of the following statements must be true?

A. The mean number of children per household in the community is 2.4.

B. A determination about the mean number of children per household in the community should not be made because the sample size is too small.

C. The sampling method is flawed and may produce a biased estimate of the mean number of children per household in the community.

D. The sampling method is not flawed and is likely to produce an unbiased estimate of the mean number of children per household in the community.

ID: 4a422e3e Answer

Correct Answer: C

Rationale

Choice C is correct. In order to use a sample mean to estimate the mean for a population, the sample must be representative of the population (for example, a simple random sample). In this case, Tabitha surveyed 20 families in a playground. Families in the playground are more likely to have children than other households in the community. Therefore, the sample isn't representative of the population. Hence, the sampling method is flawed and may produce a biased estimate.

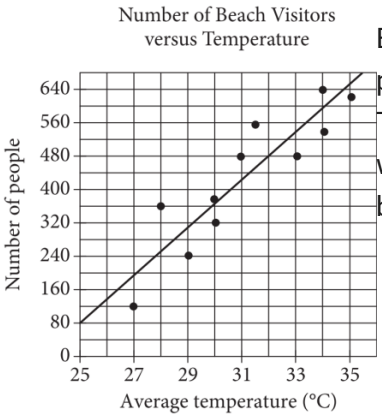
Choices A and D are incorrect because they incorrectly assume the sampling method is unbiased. Choice B is incorrect because a sample of size 20 could be large enough to make an estimate if the sample had been representative of all the families in the community.

Question Difficulty: Hard

Question ID 8156d446

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 8156d446



Each dot in the scatterplot above represents the temperature and the number of people who visited a beach in Lagos, Nigeria, on one of eleven different days. The line of best fit for the data is also shown. According to the line of best fit, what is the number of people, rounded to the nearest 10, predicted to visit this beach on a day with an average temperature of 32°C?

ID: 8156d446 Answer

Rationale

The correct answer is 480. An average temperature of $32°C$ corresponds to the value 32 on the x-axis. On the line of best fit, an x-value of 32 corresponds to a y-value of 480. The values on the y-axis correspond to the number of people predicted to visit this beach. Therefore, 480 people are predicted to visit this beach on a day with an average temperature of $32°C$.

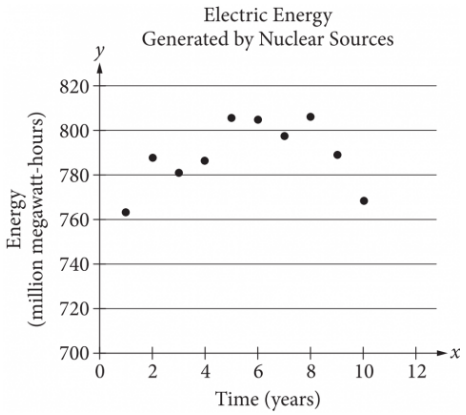
Question Difficulty: Easy

Question ID e821a26d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: e821a26d

The scatterplot below shows the amount of electric energy generated, in millions of megawatt-hours, by nuclear sources over a 10-year period.



Of the following equations, which best models the data in the scatterplot?

A. $y = 1.674x^2 + 19.76x - 745.73$

B. $y = -1.674x^2 - 19.76x - 745.73$

C. $y = 1.674x^2 + 19.76x + 745.73$

D. $y = -1.674x^2 + 19.76x + 745.73$

ID: e821a26d Answer

Correct Answer: D

Rationale

Choice D is correct. The data in the scatterplot roughly fall in the shape of a downward-opening parabola; therefore, the coefficient for the x^2 term must be negative. Based on the location of the data points, the y-intercept of the parabola should be somewhere between 740 and 760. Therefore, of the equations given, the best model is $y = -1.674x^2 + 19.76x + 745.73$.

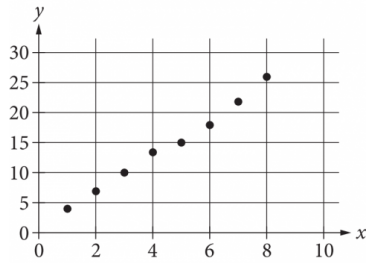
Choices A and C are incorrect. The positive coefficient of the x^2 term means that these equations each define upward-opening parabolas, whereas a parabola that fits the data in the scatterplot must open downward. Choice B is incorrect because it defines a parabola with a y-intercept that has a negative y-coordinate, whereas a parabola that fits the data in the scatterplot must have a y-intercept with a positive y-coordinate.

Question Difficulty: Hard

Question ID 9eb896c5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 9eb896c5



Which of the following could be the equation for a line of best fit for the data shown in the scatterplot above?

A. $y = 3x + 0.8$

B. $y = 0.8x + 3$

C. $y = -0.8x + 3$

D. $y = -3x + 0.8$

ID: 9eb896c5 Answer

Correct Answer: A

Rationale

Choice A is correct. The data show a strong linear relationship between x and y. The line of best fit for a set of data is a linear equation that minimizes the distances from the data points to the line. An equation for the line of best fit can be written in slope-intercept form, $y = mx + b$, where m is the slope of the graph of the line and b is the y-coordinate of the y-intercept of the graph. Since, for the data shown, the y-values increase as the x-values increase, the slope of a line of best fit must be positive. The data shown lie almost in a line, so the slope can be roughly estimated using the formula for slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$. The leftmost and rightmost data points have coordinates of about $(1,4)$ and $(8,26)$, so the slope is approximately $\frac{26-4}{8-1} = \frac{22}{7}$, which is a little greater than 3. Extension of the line to the left would intersect the y-axis at about $(0,1)$. Only choice A represents a line with a slope close to 3 and a y-intercept close to $(0,1)$.

Choice B is incorrect and may result from switching the slope and y-intercept. The line with a y-intercept of $(0,3)$ and a slope of 0.8 is farther from the data points than the line with a slope of 3 and a y-intercept of $(0,0.8)$. Choices C and D are incorrect. They represent lines with negative slopes, not positive slopes.

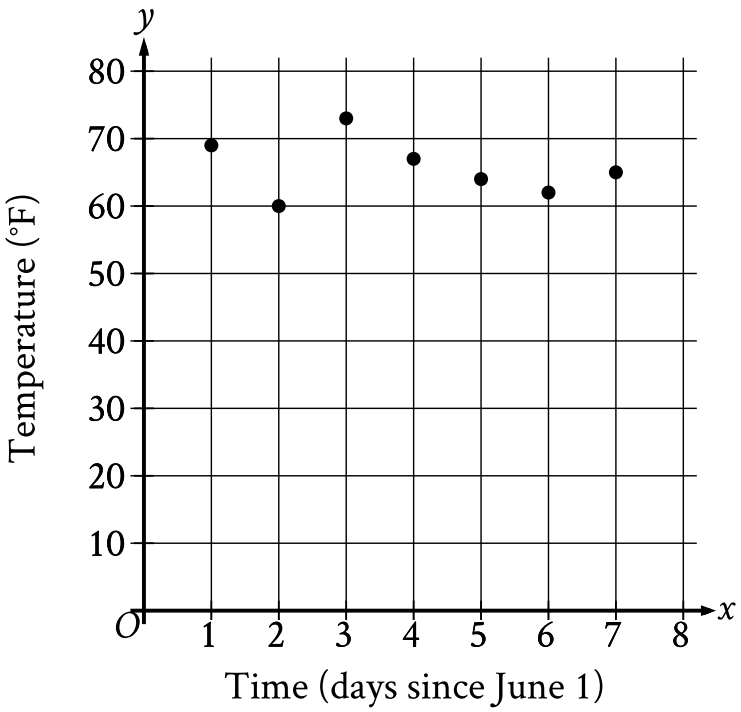
Question Difficulty: Medium

Question ID d112bc9d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: d112bc9d

The scatterplot shows the temperature y, in $^\circ\text{F}$, recorded by a meteorologist at various times x, in days since June 1.



During which of the following time periods did the greatest increase in recorded temperature take place?

A. From $x = 6$ to $x = 7$

B. From $x = 5$ to $x = 6$

C. From $x = 2$ to $x = 3$

D. From $x = 1$ to $x = 2$

ID: d112bc9d Answer

Correct Answer: C

Rationale

Choice C is correct. The scatterplot shows that there was an increase in recorded temperature from $x = 2$ to $x = 3$ and from $x = 6$ to $x = 7$. When $x = 2$, the recorded temperature was approximately 60°F and when $x = 3$, the recorded temperature was greater than 70°F. This means that the increase in recorded temperature from $x = 2$ to $x = 3$ was greater than $(70 - 60)^\circ\text{F}$, or 10°F. When $x = 6$, the recorded temperature was greater than 60°F and when $x = 7$, the recorded temperature was less than 70°F. This means that the increase in recorded temperature from $x = 6$ to $x = 7$ was less than $(70 - 60)^\circ\text{F}$, or 10°F. It follows that the greatest increase in recorded temperature took place from $x = 2$ to $x = 3$.

Choice A is incorrect. The increase in recorded temperature from $x = 6$ to $x = 7$ was less than the increase in recorded temperature from $x = 2$ to $x = 3$.

Choice B is incorrect. From $x = 5$ to $x = 6$, a decrease, not an increase, in recorded temperature took place.

Choice D is incorrect. From $x = 1$ to $x = 2$, a decrease, not an increase, in recorded temperature took place.

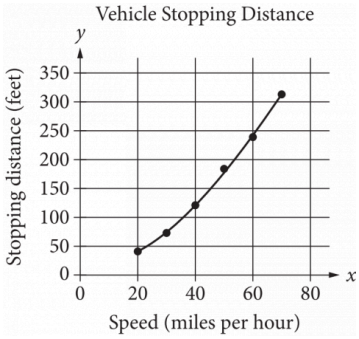
Question Difficulty: Easy

Question ID 5c24c861

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 5c24c861

A study was done to determine a new car's stopping distance when it was traveling at different speeds. The study was done on a dry road with good surface conditions. The results are shown below, along with the graph of a quadratic function that models the data.



According to the model, which of the following is the best estimate for the stopping distance, in feet, if the vehicle was traveling 55 miles per hour?

A. 25

B. 30

C. 210

D. 250

ID: 5c24c861 Answer

Correct Answer: C

Rationale

Correct Answer Rationale
Choice C is correct. According to the model, the stopping distance, in feet, of a vehicle traveling 55 miles per hour is about 200 feet. Of the choices given, the best estimate of the stopping distance for a car traveling 55 miles per hour is 210 feet.

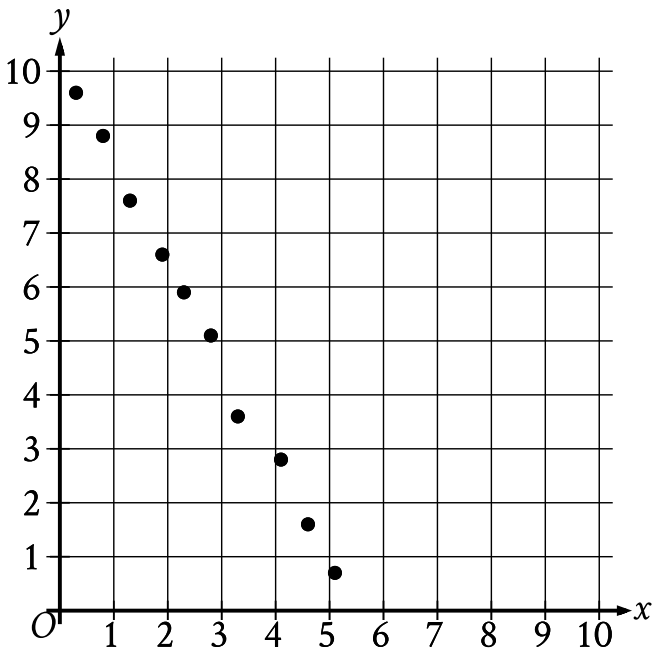
Incorrect Answer Rationale
Choices A, B, and D are incorrect and may be the result of incorrectly reading the given quadratic model. The corresponding x-values to the y-values of 25 and 30 are not part of the model. The corresponding x-value to a y-value of 250 is approximately 60 mph, not 55 mph.

Question Difficulty: Easy

Question ID 5f3ee607

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 5f3ee607



Which of the following equations is the most appropriate linear model for the data shown in the scatterplot?

A. $y = -1.9x - 10.1$

B. $y = -1.9x + 10.1$

C. $y = 1.9x - 10.1$

D. $y = 1.9x + 10.1$

ID: 5f3ee607 Answer

Correct Answer: B

Rationale

Choice B is correct. The equation representing a linear model can be written in the form $y = a + bx$, or $y = bx + a$, where b is the slope of the graph of the model and $(0, a)$ is the *y*-intercept of the graph of the model. The scatterplot shows that as the *x*-values of the data points increase, the *y*-values of the data points decrease, which means the graph of an appropriate linear model has a negative slope. Therefore, $b < 0$. The scatterplot also shows that the data points are close to the *y*-axis at a positive value of y. Therefore, the *y*-intercept of the graph of an appropriate linear model has a positive *y*-coordinate, which means $a > 0$. Of the given choices, only choice B, $y = -1.9x + 10.1$, has a negative value for b, the slope, and a positive value for a, the *y*-coordinate of the *y*-intercept.

Choice A is incorrect. The graph of this model has a *y*-intercept with a negative *y*-coordinate, not a positive *y*-coordinate.

Choice C is incorrect. The graph of this model has a positive slope, not a negative slope, and a *y*-intercept with a negative *y*-coordinate, not a positive *y*-coordinate.

Choice D is incorrect. The graph of this model has a positive slope, not a negative slope.

Question Difficulty: Easy

Question ID 9ba3e283

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■■

ID: 9ba3e283

In State X, Mr. Camp's eighth-grade class consisting of 26 students was surveyed and 34.6 percent of the students reported that they had at least two siblings. The average eighth-grade class size in the state is 26. If the students in Mr. Camp's class are representative of students in the state's eighth-grade classes and there are 1,800 eighth-grade classes in the state, which of the following best estimates the number of eighth-grade students in the state who have fewer than two siblings?

A. 16,200

B. 23,400

C. 30,600

D. 46,800

ID: 9ba3e283 Answer

Correct Answer: C

Rationale

Choice C is correct. It is given that 34.6% of 26 students in Mr. Camp's class reported that they had at least two siblings. Since 34.6% of 26 is 8.996, there must have been 9 students in the class who reported having at least two siblings and 17 students who reported that they had fewer than two siblings. It is also given that the average eighth-grade class size in the state is 26 and that Mr. Camp's class is representative of all eighth-grade classes in the state. This means that in each eighth-grade class in the state there are about 17 students who have fewer than two siblings. Therefore, the best estimate of the number of eighth-grade students in the state who have fewer than two siblings is 17 × (number of eighth-grade classes in the state), or $17 \times 1{,}800 = 30{,}600$.

Choice A is incorrect because 16,200 is the best estimate for the number of eighth-grade students in the state who have at least, not fewer than, two siblings. Choice B is incorrect because 23,400 is half of the estimated total number of eighth-grade students in the state; however, since the students in Mr. Camp's class are representative of students in the eighth-grade classes in the state and more than half of the students in Mr. Camp's class have fewer than two siblings, more than half of the students in each eighth-grade class in the state have fewer than two siblings, too. Choice D is incorrect because 46,800 is the estimated total number of eighth-grade students in the state.

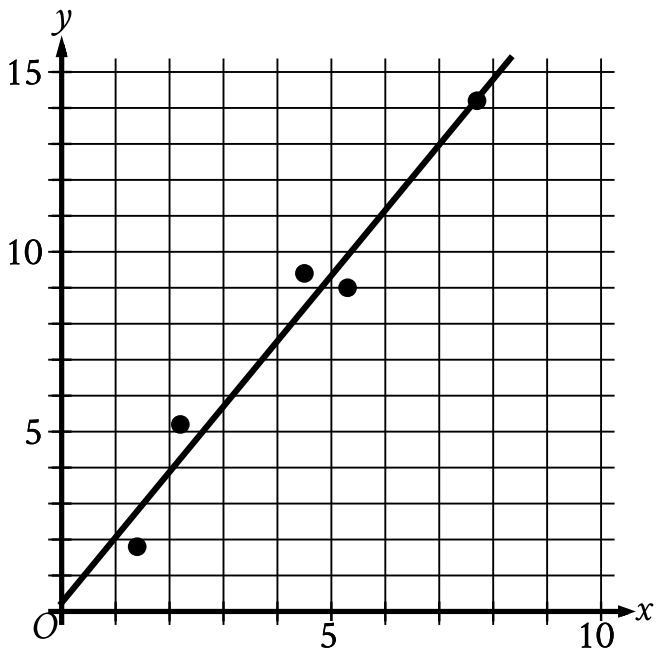
Question Difficulty: Hard

Question ID 4cc05491

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 4cc05491

In the given scatterplot, a line of best fit for the data is shown.



Which of the following is closest to the slope of the line of best fit shown?

A. 0.2

B. 0.7

C. 1.8

D. 2.6

ID: 4cc05491 Answer

Correct Answer: C

Rationale

Choice C is correct. A line in the *xy*-plane that passes through points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2-y_1}{x_2-x_1}$. The line of best fit shown passes approximately through the points $(0, 0.2)$ and $(5, 9.3)$. It follows that the slope of this line is approximately $\frac{9.3-0.2}{5-0}$, which is equivalent to $\frac{9.1}{5}$, or 1.82. Therefore, of the given choices, 1.8 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This value is closest to the *y*-coordinate of the *y*-intercept of the line of best fit shown.

Choice B is incorrect and may result from conceptual or calculation errors.

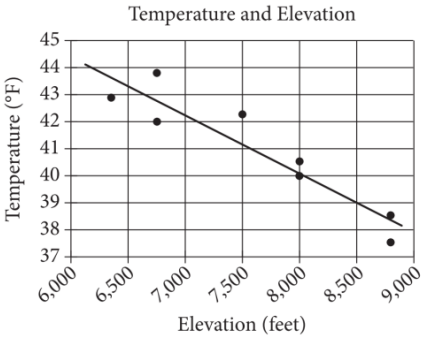
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 661dfddd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 661dfddd



The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. Which of the following statements best describes the association between the elevation and the temperature of locations in the Lake Tahoe Basin?

A. As the elevation increases, the temperature tends to increase.

B. As the elevation increases, the temperature tends to decrease.

C. As the elevation decreases, the temperature tends to decrease.

D. There is no association between the elevation and the temperature.

ID: 661dfddd Answer

Correct Answer: B

Rationale

Choice B is correct. The association between the elevation and the temperature of locations in the Lake Tahoe Basin can be described by looking at the direction of the line of best fit. The line of best fit slopes downward, which corresponds to the temperature decreasing as the elevation increases.

Choices A and C are incorrect. Both of these choices would be represented by a line of best fit that slopes from the lower left to the upper right of the graph, which isn't what's shown on the graph. Choice D is incorrect. This choice would be represented by a line of best fit that is horizontal or has a slope very close to 0. This is not what's shown on the graph.

Question Difficulty: Easy

Question ID a03b7e02

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: a03b7e02

The table shows selected values from function f.

x	$f(x)$
-1	16
0	17
1	18
2	19

Which of the following is the best description of function f?

A. Decreasing linear

B. Increasing linear

C. Decreasing exponential

D. Increasing exponential

ID: a03b7e02 Answer

Correct Answer: B

Rationale

Choice B is correct. The given values show that as x increases, $f(x)$ also increases, which means that f is an increasing function. Furthermore, $f(x)$ increases at a constant rate of 1 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

Choice A is incorrect. For a decreasing linear function, as x increases, $f(x)$ decreases rather than increases.

Choice C is incorrect. For a decreasing exponential function, for each increase of x by 1, $f(x)$ decreases by a fixed percentage rather than increases at a constant rate.

Choice D is incorrect. For an increasing exponential function, for each increase of x by 1, $f(x)$ increases by a fixed percentage rather than at a constant rate.

Question Difficulty: Easy

Question ID 97631565

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: 97631565

Scott selected 20 employees at random from all 400 employees at a company. He found that 16 of the employees in this sample are enrolled in exactly three professional development courses this year. Based on Scott's findings, which of the following is the best estimate of the number of employees at the company who are enrolled in exactly three professional development courses this year?

A. 4

B. 320

C. 380

D. 384

ID: 97631565 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that from the sample of 20 employees at the company, 16 of the employees are enrolled in exactly three professional development courses this year. Since $\left(\frac{16}{20}\right)$ is equal to 0.80, or $\frac{80}{100}$, it follows that 80% of the employees in the sample are enrolled in exactly three professional development courses this year. Therefore, the best estimate for the percentage of employees at the company who are enrolled in exactly three professional development courses this year is 80%. It's given that there are a total of 400 employees at the company. Therefore, the best estimate of the number of employees at the company who are enrolled in exactly three professional development courses this year is $\left(\frac{80}{100}\right)(400)$, or 320.

Choice A is incorrect. This is the number of employees from the sample who aren't enrolled in exactly three professional development courses this year.

Choice C is incorrect. This is the number of employees who weren't selected for the sample.

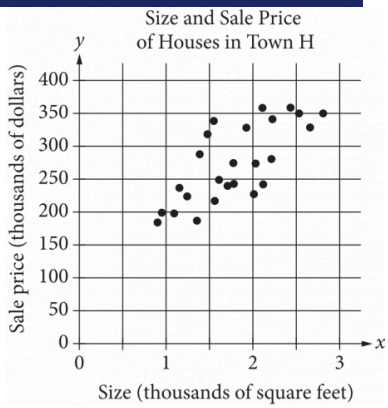
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 79137c1b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 79137c1b



The scatterplot above shows the size x and the sale price y of 25 houses for sale in Town H. Which of the following could be an equation for a line of best fit for the data?

A. $y = 200x + 100$

B. $y = 100x + 100$

C. $y = 50x + 100$

D. $y = 100x$

ID: 79137c1b Answer

Correct Answer: B

Rationale

Choice B is correct. From the shape of the cluster of points, the line of best fit should pass roughly through the points $(1,200)$ and $(2.5,350)$. Therefore, these two points can be used to find an approximate equation for the line of best fit. The slope of this line of best fit is therefore $\frac{y_2-y_1}{x_2-x_1}=\frac{350-200}{2.5-1}$, or 100. The equation for the line of best fit, in slope-intercept form, is $y=100x+b$ for some value of b. Using the point $(1,200)$, 1 can be substituted for x and 200 can be substituted for y: $200=100(1)+b$, or $b=100$. Substituting this value into the slope-intercept form of the equation gives $y=100x+100$.

Choice A is incorrect. The line defined by $y=200x+100$ passes through the points $(1,300)$ and $(2,500)$, both of which are well above the cluster of points, so it cannot be a line of best fit. Choice C is incorrect. The line defined by $y=50x+100$ passes through the points $(1,150)$ and $(2,200)$, both of which lie at the bottom of the cluster of points, so it cannot be a line of best fit. Choice D is incorrect and may result from correctly calculating the slope of a line of best fit but incorrectly assuming the y-intercept is at $(0,0)$.

Question Difficulty: Hard

Question ID b8150b17

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: b8150b17

For a particular machine that produces beads, 29 out of every 100 beads it produces have a defect. A bead produced by the machine will be selected at random. What is the probability of selecting a bead that has a defect?

A. $\frac{1}{2,900}$

B. $\frac{1}{29}$

C. $\frac{29}{100}$

D. $\frac{29}{10}$

ID: b8150b17 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that 29 out of every 100 beads that the machine produces have a defect. It follows that if the machine produces k beads, then the number of beads that have a defect is $\frac{29}{100}k$, for some constant k. If a bead produced by the machine will be selected at random, the probability of selecting a bead that has a defect is given by the number of beads with a defect, $\frac{29}{100}k$, divided by the number of beads produced by the machine, k. Therefore, the probability of selecting a bead that has a defect is $\frac{\frac{29}{100}k}{k}$, or $\frac{29}{100}$.

Choice A is incorrect and may result from conceptual or computational errors.

Choice B is incorrect and may result from conceptual or computational errors.

Choice D is incorrect and may result from conceptual or computational errors.

Question Difficulty: Easy

Question ID 1dcea480

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 1dcea480

A bag contains a total of 60 marbles. A marble is to be chosen at random from the bag. If the probability that a blue marble will be chosen is 0.35, how many marbles in the bag are blue?

A. 21

B. 25

C. 35

D. 39

ID: 1dcea480 Answer

Rationale

Choice A is correct. Multiplying the number of marbles in the bag by the probability of selecting a blue marble gives the number of blue marbles in the bag. Since the bag contains a total of 60 marbles and the probability that a blue marble will be selected from the bag is 0.35, there are a total of $(0.35)(60) = 21$ blue marbles in the bag.

Choice B is incorrect and may result from subtracting 35 from 60. Choice C is incorrect. This would be the number of blue marbles in the bag if there were a total of 100 marbles, not 60 marbles. Choice D is incorrect. This is the number of marbles in the bag that aren't blue.

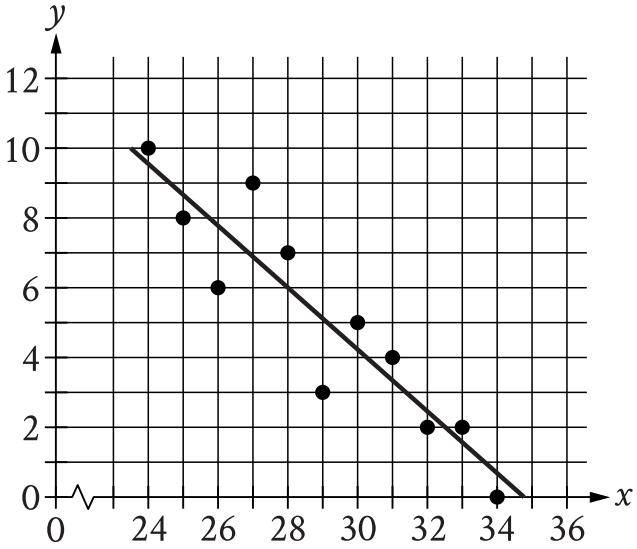
Question Difficulty: Easy

Question ID fdfc90e4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: fdfc90e4

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown.



At $x = 32$, which of the following is closest to the *y*-value predicted by the line of best fit?

A. 0.4

B. 1.5

C. 2.4

D. 3.3

ID: fdfc90e4 Answer

Correct Answer: C

Rationale

Choice C is correct. At $x = 32$, the line of best fit has a *y*-value between 2 and 3. The only choice with a value between 2 and 3 is choice C.

Choice A is incorrect. This is the difference between the *y*-value predicted by the line of best fit and the actual *y*-value at $x = 32$ rather than the *y*-value predicted by the line of best fit at $x = 32$.

Choice B is incorrect. This is the *y*-value predicted by the line of best fit at $x = 31$ rather than at $x = 32$.

Choice D is incorrect. This is the *y*-value predicted by the line of best fit at $x = 33$ rather than at $x = 32$.

Question Difficulty: Medium

Question ID c943acba

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: c943acba

On a street with 7 houses, 2 houses are blue. If a house from this street is selected at random, what is the probability of selecting a house that is blue?

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{5}{7}$

D. $\frac{7}{7}$

ID: c943acba Answer

Correct Answer: B

Rationale

Choice B is correct. If a house from the street is selected at random, the probability of selecting a house that is blue is equal to the number of houses on the street that are blue divided by the total number of houses on the street. Since there are 2 blue houses on a street with 7 total houses, the probability of selecting a house that is blue from this street is $\frac{2}{7}$.

Choice A is incorrect. This is the probability of selecting a house that is blue from a street on which 1 of the 7 houses is blue.

Choice C is incorrect. This is the probability of selecting a house that is not blue from this street.

Choice D is incorrect. This is the probability of selecting a house that is blue from a street on which all the houses are blue.

Question Difficulty: Easy

Question ID 1e562f24

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 1e562f24

To estimate the proportion of a population that has a certain characteristic, a random sample was selected from the population. Based on the sample, it is estimated that the proportion of the population that has the characteristic is 0.49, with an associated margin of error of 0.04. Based on this estimate and margin of error, which of the following is the most appropriate conclusion about the proportion of the population that has the characteristic?

A. It is plausible that the proportion is between 0.45 and 0.53.

B. It is plausible that the proportion is less than 0.45.

C. The proportion is exactly 0.49.

D. It is plausible that the proportion is greater than 0.53.

ID: 1e562f24 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the estimate for the proportion of the population that has the characteristic is 0.49 with an associated margin of error of 0.04. Subtracting the margin of error from the estimate and adding the margin of error to the estimate gives an interval of plausible values for the true proportion of the population that has the characteristic. Therefore, it's plausible that the proportion of the population that has this characteristic is between 0.45 and 0.53.

Choice B is incorrect. A value less than 0.45 is outside the interval of plausible values for the proportion of the population that has the characteristic.

Choice C is incorrect. The value 0.49 is an estimate for the proportion based on this sample. However, since the margin of error for this estimate is known, the most appropriate conclusion is not that the proportion is exactly one value but instead lies in an interval of plausible values.

Choice D is incorrect. A value greater than 0.53 is outside the interval of plausible values for the proportion of the population that has the characteristic.

Question Difficulty: Medium

Question ID 89f8d08a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 89f8d08a

A store manager reviewed the receipts from 80 customers who were selected at random from all the customers who made purchases last Thursday. Of those selected, 20 receipts showed that the customer had purchased fruit. If 1,500 customers made purchases last Thursday, which of the following is the most appropriate conclusion?

A. Exactly 75 customers must have purchased fruit last Thursday.

B. Exactly 375 customers must have purchased fruit last Thursday.

C. The best estimate for the number of customers who purchased fruit last Thursday is 75.

D. The best estimate for the number of customers who purchased fruit last Thursday is 375.

ID: 89f8d08a Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the manager took a random selection of the receipts of 80 customers from a total of 1,500. It's also given that of those 80 receipts, 20 showed that the customer had purchased fruit. This means that an appropriate estimate of the fraction of customers who purchased fruit is $\frac{20}{80}$, or $\frac{1}{4}$. Multiplying this fraction by the total number of customers yields $\left(\frac{1}{4}\right)(1{,}500) = 375$. Therefore, the best estimate for the number of customers who purchased fruit is 375.

Choices A and B are incorrect because an exact number of customers can't be known from taking a random selection. Additionally, choice A may also be the result of a calculation error. Choice C is incorrect and may result from a calculation error.

Question Difficulty: Medium

Question ID 6a305cd0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■□□

ID: 6a305cd0

In a study, the data from a random sample of a population had a mean of 37, with an associated margin of error of 3. Which of the following is the most appropriate conclusion that can be made about the population mean?

A. It is less than 37.

B. It is greater than 37.

C. It is between 34 and 40.

D. It is less than 34 or greater than 40.

ID: 6a305cd0 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the mean of the data from a random sample of a population is 37, with an associated margin of error of 3. The most appropriate conclusion that can be made is that the mean of the entire population will fall between 37, plus or minus 3. Therefore, the population mean is between $37-3=34$ and $37+3=40$.

Choice A is incorrect. While it's an appropriate conclusion that the population mean is as low as $37-3$, or 34, it isn't appropriate to conclude that the population mean is less than 34. Choice B is incorrect. While it's an appropriate conclusion that the population mean is as high as $37+3$, or 40, it isn't appropriate to conclude that the population mean is greater than 40. Choice D is incorrect. It isn't an appropriate conclusion that the population mean is less than 34 or greater than 40.

Question Difficulty: Easy

Question ID 916ffe9b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■■

ID: 916ffe9b

Poll Results

Angel Cruz	483
Terry Smith	320

The table shows the results of a poll. A total of 803 voters selected at random were asked which candidate they would vote for in the upcoming election. According to the poll, if $6{,}424$ people vote in the election, by how many votes would Angel Cruz be expected to win?

A. 163

B. $1{,}304$

C. $3{,}864$

D. $5{,}621$

ID: 916ffe9b Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that 483 out of 803 voters responded that they would vote for Angel Cruz. Therefore, the proportion of voters from the poll who responded they would vote for Angel Cruz is $\frac{483}{803}$. It's also given that there are a total of $6{,}424$ voters in the election. Therefore, the total number of people who would be expected to vote for Angel Cruz is $6{,}424\left(\frac{483}{803}\right)$, or $3{,}864$. Since $3{,}864$ of the $6{,}424$ total voters would be expected to vote for Angel Cruz, it follows that $6{,}424 - 3{,}864$, or $2{,}560$ voters would be expected not to vote for Angel Cruz. The difference in the number of votes for and against Angel Cruz is $3{,}864 - 2{,}560$, or $1{,}304$ votes. Therefore, if $6{,}424$ people vote in the election, Angel Cruz would be expected to win by $1{,}304$ votes.

Choice A is incorrect. This is the difference in the number of voters from the poll who responded that they would vote for and against Angel Cruz.

Choice C is incorrect. This is the total number of people who would be expected to vote for Angel Cruz.

Choice D is incorrect. This is the difference between the total number of people who vote in the election and the number of voters from the poll.

Question Difficulty: Hard

Question ID a3384df0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: a3384df0

Penguin Exhibit

Type of penguin	Male	Female	Total
Chinstrap	41	59	100
Emperor	8	27	35
Gentoo	49	54	103
Macaroni	42	40	82
Total	140	180	320

The number of penguins in a zoo exhibit, sorted by gender and type of penguin, is shown in the table above. Which type of penguin has a female population that is the closest to being $\frac{1}{3}$ of the total female penguin population in the exhibit?

A. Chinstrap

B. Emperor

C. Gentoo

D. Macaroni

ID: a3384df0 Answer

Correct Answer: A

Rationale

Choice A is correct. It is given that there are 180 female penguins in the exhibit. Therefore, $\frac{1}{3}$ of the female penguins is $\frac{1}{3} \times 180 = 60$ penguins. According to the table, there are 59 female chinstrap penguins, 27 female emperor penguins, 54 female gentoo penguins, and 40 female macaroni penguins. So the female chinstrap penguin population is the closest to 60, or $\frac{1}{3}$ of the total female population in the exhibit.

Choices B, C, and D are incorrect and may result from reading data from the table incorrectly. Since the total female penguin population is 180, $\frac{1}{3}$ of the total female penguin population is 60. The numbers of female emperor (27), female gentoo (54), and female macaroni (40) penguins are not as close to 60 as the number of female chinstrap penguins (59).

Question Difficulty: Medium

Question ID 0a99e5bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 0a99e5bb

$-13, 4, 23$

A data set of three numbers is shown. If a number from this data set is selected at random, what is the probability of selecting a negative number?

A. 0

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. 1

ID: 0a99e5bb Answer

Correct Answer: B

Rationale

Choice B is correct. If a number from the data set is selected at random, the probability of selecting a negative number is the count of negative numbers in the data set divided by the total count of numbers in the data set. It's given that a data set of three numbers is shown. It follows that the total count of numbers in the data set is 3. In the data set shown, -13 is the only negative number. It follows that the count of negative numbers in the data set is 1. Therefore, if a number from the data set is selected at random, the probability of selecting a negative number is $\frac{1}{3}$.

Choice A is incorrect. This is the probability of selecting a negative number from a data set that doesn't contain any negative numbers.

Choice C is incorrect. This is the probability of selecting a positive number, not a negative number, from the data set.

Choice D is incorrect. This is the probability of selecting a negative number from a data set that contains only negative numbers.

Question Difficulty: Easy

Question ID 9b5b23fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 9b5b23fc

For $x > 0$, the function f is defined as follows: $f(x)$ equals 201% of x

Which of the following could describe this function?

A. Decreasing exponential

B. Decreasing linear

C. Increasing exponential

D. Increasing linear

ID: 9b5b23fc Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that for $x > 0$, $f(x)$ is equal to 201% of x. This is equivalent to $f(x) = \frac{201}{100}x$, or $f(x) = 2.01x$, for $x > 0$. This function indicates that as x increases, $f(x)$ also increases, which means f is an increasing function. Furthermore, $f(x)$ increases at a constant rate of 2.01 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect. This could describe the function $f(x) = (2.01)^x$, where $f(x)$ is equal to 201% of $f(x - 1)$, not x, for $x > 0$.

Question Difficulty: Hard

Question ID 4e527894

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■□□

ID: 4e527894

There are 20 buttons in a bag: 8 white buttons, 2 orange buttons, and 10 brown buttons. If one of these buttons is selected at random, what is the probability of selecting a white button?

A. $\frac{2}{20}$

B. $\frac{8}{20}$

C. $\frac{10}{20}$

D. $\frac{12}{20}$

ID: 4e527894 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that there are 20 buttons in a bag and 8 of the buttons are white. If one button from the bag is selected at random, the probability of selecting a white button is the number of white buttons in the bag divided by the total number of buttons in the bag. Therefore, if one button from the bag is selected at random, the probability of selecting a white button is $\frac{8}{20}$.

Choice A is incorrect. This is the probability of selecting an orange button from the bag.

Choice C is incorrect. This is the probability of selecting a brown button from the bag.

Choice D is incorrect. This is the probability of selecting a button that isn't white from the bag.

Question Difficulty: Easy

Question ID af142f8d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: af142f8d

	Amount invested	Balance increase
Account A	$500	6% annual interest
Account B	$1,000	$25 per year

Two investments were made as shown in the table above. The interest in Account A is compounded once per year. Which of the following is true about the investments?

A. Account A always earns more money per year than Account B.

B. Account A always earns less money per year than Account B.

C. Account A earns more money per year than Account B at first but eventually earns less money per year.

D. Account A earns less money per year than Account B at first but eventually earns more money per year.

ID: af142f8d Answer

Correct Answer: A

Rationale

Choice A is correct. Account A starts with $500 and earns interest at 6% per year, so in the first year Account A earns (500)(0.06) = $30, which is greater than the $25 that Account B earns that year. Compounding interest can be modeled by an increasing exponential function, so each year Account A will earn more money than it did the previous year. Therefore, each year Account A earns at least $30 in interest. Since Account B always earns $25 each year, Account A always earns more money per year than Account B.

Choices B and D are incorrect. Account A earns $30 in the first year, which is greater than the $25 Account B earns in the first year. Therefore, neither the statement that Account A always earns less money per year than Account B nor the statement that Account A earns less money than Account B at first can be true. Choice C is incorrect. Since compounding interest can be modeled by an increasing exponential function, each year Account A will earn more money than it did the previous year. Therefore, Account A always earns at least $30 per year, which is more than the $25 per year that Account B earns.

Question Difficulty: Hard

Question ID 9ee22c16

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	■■□

ID: 9ee22c16

A random sample of 400 town voters were asked if they plan to vote for Candidate A or Candidate B for mayor. The results were sorted by gender and are shown in the table below.

	Plan to vote for Candidate A	Plan to vote for Candidate B
Female	202	20
Male	34	144

The town has a total of 6,000 voters. Based on the table, what is the best estimate of the number of voters who plan to vote for Candidate A?

ID: 9ee22c16 Answer

Rationale

The correct answer is 3,540. According to the table, of 400 voters randomly sampled, the total number of men and women who plan to vote for Candidate A is $202+34=236$. The best estimate of the total number of voters in the town who plan to vote for Candidate A is the fraction of voters in the sample who plan to vote for Candidate A, $\frac{236}{400}$, multiplied by the total voter population of 6000. Therefore, the answer is $\left(\frac{236}{400}\right)(6{,}000)=3{,}540$.

Question Difficulty: Medium

Question ID 46b2e169

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: 46b2e169

A box contains 13 red pens and 37 blue pens. If one of these pens is selected at random, what is the probability of selecting a red pen? (Express your answer as a decimal or fraction, not as a percent.)

ID: 46b2e169 Answer

Correct Answer: .26, 13/50

Rationale

The correct answer is $\frac{13}{50}$. It's given that a box contains 13 red pens and 37 blue pens. If one of these pens is selected at random, the probability of selecting a red pen is the number of red pens in the box divided by the number of red and blue pens in the box. The number of red and blue pens in the box is $13 + 37$, or 50. Since there are 13 red pens in the box, it follows that the probability of selecting a red pen is $\frac{13}{50}$. Note that 13/50 and .26 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID f8696cd8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: f8696cd8

	Human Resources	Accounting
Bachelor's degree	4	3
Master's degree	2	6

The table above shows the number of people who work in the Human Resources and Accounting departments of a company and the highest level of education they have completed. A person from one of these departments is to be chosen at random. If the person chosen works in the Human Resources department, what is the probability that the highest level of education the person completed is a master's degree?

A. $\frac{2}{15}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{8}{15}$

ID: f8696cd8 Answer

Correct Answer: B

Rationale

Choice B is correct. In total, there are 6 people in the Human Resources department. Of those 6, 2 have a master's degree as their highest level of education. Therefore, the probability of an employee selected at random from the Human Resources department having a master's degree is $\frac{2}{6}$, which simplifies to $\frac{1}{3}$.

Choice A is incorrect; it is the probability that an employee selected at random from either department will be in the Human Resources department and have a master's degree. Choice C is incorrect; it is the probability that an employee with a master's degree selected at random will be in the Human Resources department. Choice D is incorrect; it is the probability that an employee selected at random from either department will have a master's degree.

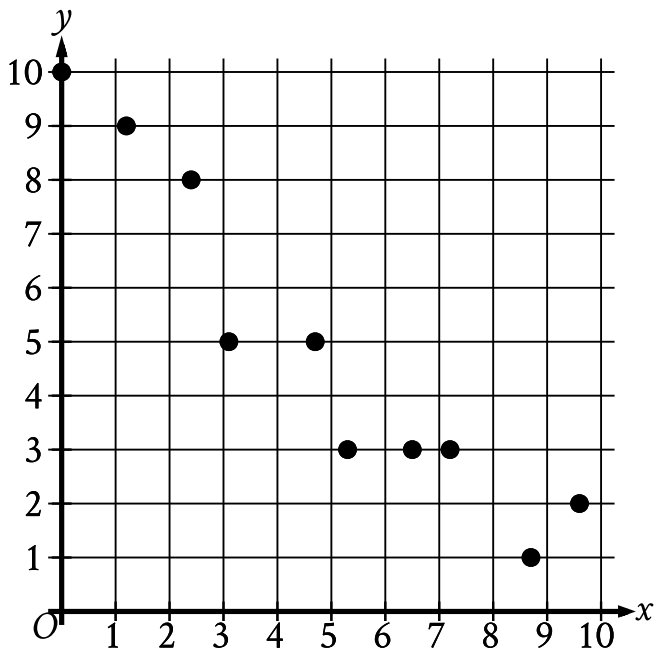
Question Difficulty: Medium

Question ID 50b2807e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 50b2807e

The scatterplot shows the relationship between two variables, x and y.



Which of the following equations is the most appropriate linear model for the data shown?

A. $y = 0.9 + 9.4x$

B. $y = 0.9 - 9.4x$

C. $y = 9.4 + 0.9x$

D. $y = 9.4 - 0.9x$

ID: 50b2807e Answer

Correct Answer: D

Rationale

Choice D is correct. The data points suggest that as the variable x increases, the variable y decreases, which implies that an appropriate linear model for the data has a negative slope. The data points also show that when x is close to 0, y is greater than 9. Therefore, the *y*-intercept of the graph of an appropriate linear model has a *y*-coordinate greater than 9. The graph of an equation of the form $y = a + bx$, where a and b are constants, has a *y*-intercept with a *y*-coordinate of a and has a slope of b. Of the given choices, only choice D represents a graph that has a negative slope, -0.9, and a *y*-intercept with a *y*-coordinate greater than 9, 9.4.

Choice A is incorrect. The graph of this equation has a positive slope, not a negative slope, and a *y*-intercept with a *y*-coordinate less than 1, not greater than 9.

Choice B is incorrect. The graph of this equation has a *y*-intercept with a *y*-coordinate less than 1, not greater than 9.

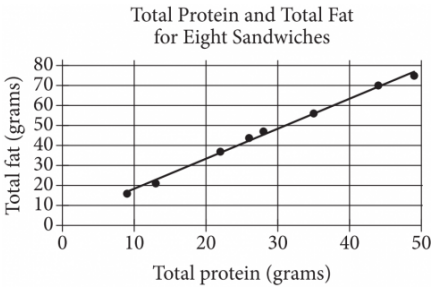
Choice C is incorrect. The graph of this equation has a positive slope, not a negative slope.

Question Difficulty: Medium

Question ID 9d95e7ad

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■■

ID: 9d95e7ad



The scatterplot above shows the numbers of grams of both total protein and total fat for eight sandwiches on a restaurant menu. The line of best fit for the data is also shown. According to the line of best fit, which of the following is closest to the predicted increase in total fat, in grams, for every increase of 1 gram in total protein?

A. 2.5

B. 2.0

C. 1.5

D. 1.0

ID: 9d95e7ad Answer

Correct Answer: C

Rationale

Choice C is correct. The predicted increase in total fat, in grams, for every increase of 1 gram in total protein is represented by the slope of the line of best fit. Any two points on the line can be used to calculate the slope of the line as the change in total fat over the change in total protein. For instance, it can be estimated that the points $(20,34)$ and $(30,48)$ are on the line of best fit, and the slope of the line that passes through them is $\frac{48-34}{30-20}=\frac{14}{10}$, or 1.4. Of the choices given, 1.5 is the closest to the slope of the line of best fit.

Choices A, B, and D are incorrect and may be the result of incorrectly finding ordered pairs that lie on the line of best fit or of incorrectly calculating the slope.

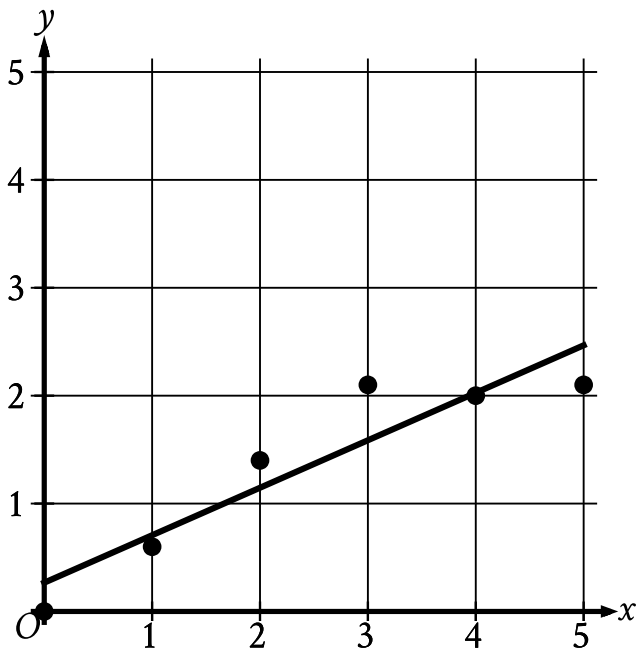
Question Difficulty: Hard

Question ID 39aa146d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 39aa146d

The scatterplot shows the relationship between x and y. A line of best fit is also shown.



Which of the following is closest to the slope of the line of best fit shown?

A. -2.27

B. -0.44

C. 0.44

D. 2.27

ID: 39aa146d Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the scatterplot shows the relationship between two variables, x and y, and a line of best fit is shown. For the line of best fit shown, for each increase in the value of x by 1, the corresponding value of y increases by a constant rate. It follows that the relationship between the variables x and y has a positive linear trend. A line in the *xy*-plane that passes through the points (a, b) and (c, d) has a slope of $\frac{d-b}{c-a}$. The line of best fit shown passes approximately through the points $(0, 0.25)$ and $(4, 2)$. It follows that the slope of this line is approximately $\frac{2-0.25}{4-0}$, which is equivalent to 0.4375. Therefore, of the given choices, 0.44 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend.

Choice B is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 58171b5e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■■□

ID: 58171b5e

Each year, the value of an investment increases by 0.49% of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

A. Decreasing exponential

B. Decreasing linear

C. Increasing exponential

D. Increasing linear

ID: 58171b5e Answer

Correct Answer: C

Rationale

Choice C is correct. Because the value of the investment increases each year, the function that best models how the value of the investment changes over time is an increasing function. It's given that each year, the value of the investment increases by 0.49% of its value the previous year. Since the value of the investment changes by a fixed percentage each year, the function that best models how the value of the investment changes over time is an exponential function. Therefore, the function that best models how the value of the investment changes over time is an increasing exponential function.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID ecd09c38

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■■

ID: ecd09c38

Employees working for a customer service line at an electric company recorded all the calls last Monday and noted whether the caller asked for repairs and whether the caller asked about a bill. The results are summarized in the table below.

	Asked for repairs	Did not ask for repairs	Total
Asked about a bill	48	623	671
Did not ask about a bill	130	90	220
Total	178	713	891

If a caller last Monday who asked about his or her bill is selected at random, which of the following is closest to the probability that the customer also asked for repairs?

A. 0.05

B. 0.07

C. 0.20

D. 0.27

ID: ecd09c38 Answer

Correct Answer: B

Rationale

Choice B is correct. According to the table, a total of 671 customers asked about a bill. Of these, 48 also asked for repairs. Therefore, if a customer who asked about a bill is selected at random, the probability that the customer also asked for repairs is $\frac{48}{671} \approx 0.07$.

Choice A is incorrect. This is the probability that a customer selected at random from all customers who called on Monday both asked for repairs and asked about a bill. Choice C is incorrect. This is the probability that a customer selected at random from all customers who called on Monday asked for repairs, regardless of whether or not the customer asked about a bill. Choice D is incorrect. This is the probability that a customer selected at random from those who asked for repairs also asked about a bill.

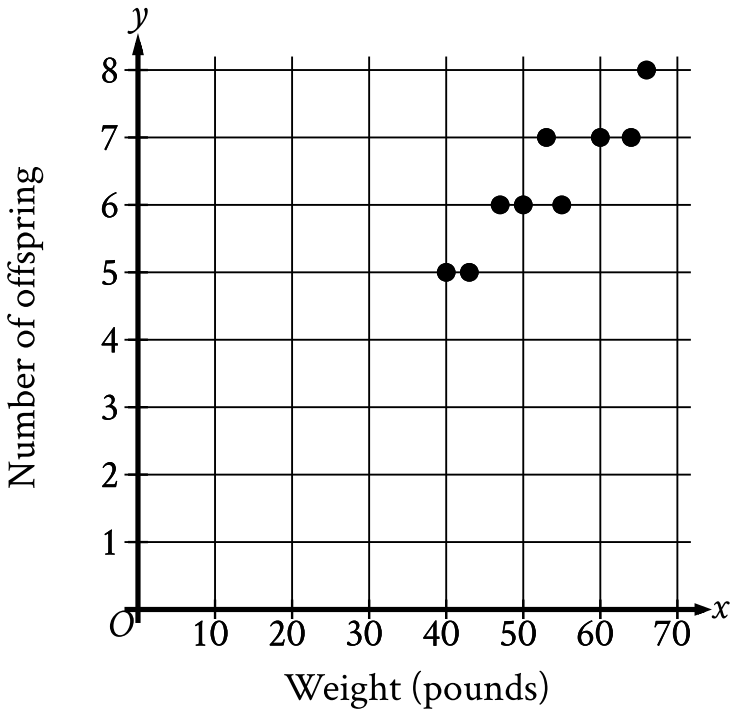
Question Difficulty: Hard

Question ID 8d63b6f1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: 8d63b6f1

The scatterplot shows the relationship between the weight, in pounds, of each of 9 female gray wolves on April 30 and the number of offspring each gray wolf produced.



How many offspring did the 50-pound gray wolf produce?

A. 8

B. 7

C. 6

D. 5

ID: 8d63b6f1 Answer

Correct Answer: C

Rationale

Choice C is correct. For each point on the scatterplot shown, the *x*-value represents the weight, in pounds, of a female gray wolf and the *y*-value represents the number of offspring that wolf produced. The point on the graph with an *x*-value of 50 has a *y*-value of 6. Therefore, the 50-pound gray wolf produced 6 offspring.

Choice A is incorrect. One of the wolves produced 8 offspring, but its weight was greater than 50 pounds.

Choice B is incorrect. Three of the wolves produced 7 offspring each, but their weights were each greater than 50 pounds.

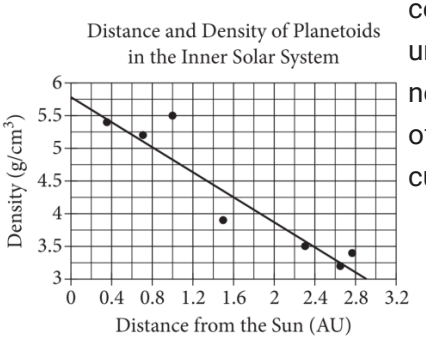
Choice D is incorrect. Two of the wolves produced 5 offspring each, but their weights were each less than 50 pounds.

Question Difficulty: Easy

Question ID cf0ae57a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	■□□

ID: cf0ae57a



The scatterplot above shows the densities of 7 planetoids, in grams per cubic centimeter, with respect to their average distances from the Sun in astronomical units (AU). The line of best fit is also shown. An astronomer has discovered a new planetoid about 1.2 AU from the Sun. According to the line of best fit, which of the following best approximates the density of the planetoid, in grams per cubic centimeter?

A. 3.6

B. 4.1

C. 4.6

D. 5.5

ID: cf0ae57a Answer

Correct Answer: C

Rationale

Choice C is correct. According to the line of best fit, a planetoid with a distance from the Sun of 1.2 AU has a predicted density between $4.5\ g/cm^3$ and $4.75\ g/cm^3$. The only choice in this range is 4.6.

Choices A, B, and D are incorrect and may result from misreading the information in the scatterplot.

Question Difficulty: Easy

Question ID e9ed719f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	■■□

ID: e9ed719f

The table summarizes the distribution of color and shape for 100 tiles of equal area.

	Red	Blue	Yellow	Total
Square	10	20	25	55
Pentagon	20	10	15	45
Total	30	30	40	100

If one of these tiles is selected at random, what is the probability of selecting a red tile? (Express your answer as a decimal or fraction, not as a percent.)

ID: e9ed719f Answer

Correct Answer: .3, 3/10

Rationale

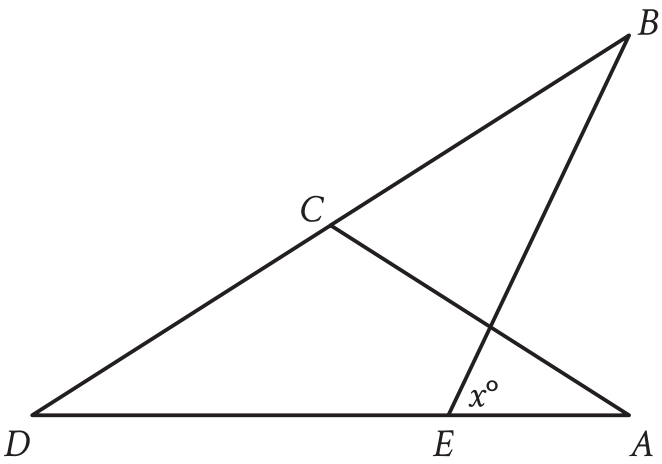
The correct answer is $\frac{3}{10}$. It's given that there are a total of 100 tiles of equal area, which is the total number of possible outcomes. According to the table, there are a total of 30 red tiles. The probability of an event occurring is the ratio of the number of favorable outcomes to the total number of possible outcomes. By definition, the probability of selecting a red tile is given by $\frac{30}{100}$, or $\frac{3}{10}$. Note that 3/10 and .3 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 6d99b141

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 6d99b141



Note: Figure not drawn to scale.

In the figure, $AC = CD$. The measure of angle EBC is 45°, and the measure of angle ACD is 104°. What is the value of x?

ID: 6d99b141 Answer

Correct Answer: 83

Rationale

The correct answer is 83. It's given that in the figure, $AC = CD$. Thus, triangle ACD is an isosceles triangle and the measure of angle CDA is equal to the measure of angle CAD. The sum of the measures of the interior angles of a triangle is 180°. Thus, the sum of the measures of the interior angles of triangle ACD is 180°. It's given that the measure of angle ACD is 104°. It follows that the sum of the measures of angles CDA and CAD is $(180 - 104)^\circ$, or 76°. Since the measure of angle CDA is equal to the measure of angle CAD, the measure of angle CDA is half of 76°, or 38°. The sum of the measures of the interior angles of triangle BDE is 180°. It's given that the measure of angle EBC is 45°. Since the measure of angle BDE, which is the same angle as angle CDA, is 38°, it follows that the measure of angle DEB is $(180 - 45 - 38)^\circ$, or 97°. Since angle DEB and angle AEB form a straight line, the sum of the measures of these angles is 180°. It's given in the figure that the measure of angle AEB is x°. It follows that $97 + x = 180$. Subtracting 97 from both sides of this equation yields $x = 83$.

Question Difficulty: Hard

Question ID 4b7bb316

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 4b7bb316

The length of each edge of a box is 29 inches. Each side of the box is in the shape of a square. The box does not have a lid. What is the exterior surface area, in square inches, of this box without a lid?

ID: 4b7bb316 Answer

Correct Answer: 4205

Rationale

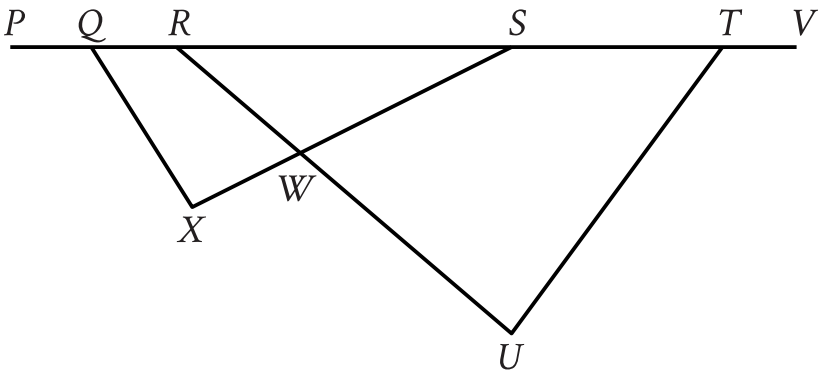
The correct answer is $4{,}205$. The exterior surface area of a figure is the sum of the areas of all its faces. It's given that the box does not have a lid and that each side of the box is in the shape of a square. Therefore, the box consists of 5 congruent square faces. It's also given that the length of each edge is 29 inches. Let s represent the length of an edge of a square. It follows that the area of a square is equal to s^2. Therefore, the area of each of the 5 square faces is equal to 29^2, or 841, square inches. Since the box consists of 5 congruent square faces, it follows that the sum of the areas of all its faces, or the exterior surface area of this box without a lid, is $5(841)$, or $4{,}205$, square inches.

Question Difficulty: Medium

Question ID e10d8313

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: e10d8313



Note: Figure not drawn to scale.

In the figure shown, points Q, R, S, and T lie on line segment PV, and line segment RU intersects line segment SX at point W. The measure of $\angle SQX$ is 48°, the measure of $\angle SXQ$ is 86°, the measure of $\angle SWU$ is 85°, and the measure of $\angle VTU$ is 162°. What is the measure, in degrees, of $\angle TUR$?

ID: e10d8313 Answer

Correct Answer: 123

Rationale

The correct answer is 123. The triangle angle sum theorem states that the sum of the measures of the interior angles of a triangle is 180 degrees. It's given that the measure of $\angle SQX$ is 48° and the measure of $\angle SXQ$ is 86°. Since points S, Q, and X form a triangle, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle QSX$ is $180 - 48 - 86$, or 46. It's also given that the measure of $\angle SWU$ is 85°. Since $\angle SWU$ and $\angle SWR$ are supplementary angles, the sum of their measures is 180 degrees. It follows that the measure, in degrees, of $\angle SWR$ is $180 - 85$, or 95. Since points R, S, and W form a triangle, and $\angle RSW$ is the same angle as $\angle QSX$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle WRS$ is $180 - 46 - 95$, or 39. It's given that the measure of $\angle VTU$ is 162°. Since $\angle VTU$ and $\angle STU$ are supplementary angles, the sum of their measures is 180 degrees. It follows that the measure, in degrees, of $\angle STU$ is $180 - 162$, or 18. Since points R, T, and U form a triangle, and $\angle URT$ is the same angle as $\angle WRS$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle TUR$ is $180 - 39 - 18$, or 123.

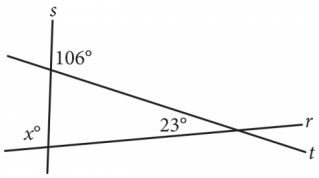
Question Difficulty: Hard

Question ID f88f27e5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: f88f27e5

Intersecting lines *r*, *s*, and *t* are shown below.



What is the value of *x* ?

ID: f88f27e5 Answer

Rationale

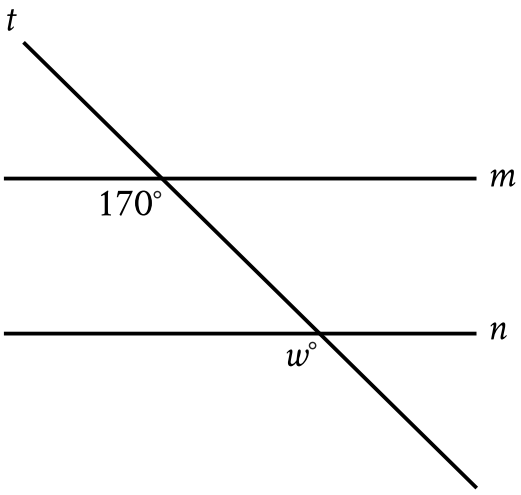
The correct answer is 97. The intersecting lines form a triangle, and the angle with measure of $x°$ is an exterior angle of this triangle. The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles of the triangle. One of these angles has measure of $23°$ and the other, which is supplementary to the angle with measure $106°$, has measure of $180° - 106° = 74°$. Therefore, the value of x is $23 + 74 = 97$.

Question Difficulty: Hard

Question ID 5207e508

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 5207e508



Note: Figure not drawn to scale.

In the figure, line m is parallel to line n. What is the value of w?

A. 17

B. 30

C. 70

D. 170

ID: 5207e508 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that lines m and n are parallel. Since line t intersects both lines m and n, it's a transversal. The angles in the figure marked as 170° and w° are on the same side of the transversal, where one is an interior angle with line m as a side, and the other is an exterior angle with line n as a side. Thus, the marked angles are corresponding angles. When two parallel lines are intersected by a transversal, corresponding angles are congruent and, therefore, have equal measure. It follows that $w^\circ = 170^\circ$. Therefore, the value of w is 170.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID f67e4efc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: f67e4efc

A right circular cylinder has a volume of 45π. If the height of the cylinder is 5, what is the radius of the cylinder?

A. 3

B. 4.5

C. 9

D. 40

ID: f67e4efc Answer

Correct Answer: A

Rationale

Choice A is correct. The volume of a right circular cylinder with a radius of r is the product of the area of the base, πr^2, and the height, h. The volume of the right circular cylinder described is 45π and its height is 5. If the radius is r, it follows that $45\pi = \pi(r)^2(5)$. Dividing both sides of this equation by 5π yields $9 = r^2$. Taking the square root of both sides yields $r = 3$ or $r = -3$. Since r represents the radius, the value must be positive. Therefore, the radius is 3.

Choice B is incorrect and may result from finding that the square of the radius is 9, but then from dividing 9 by 2, rather than taking the square root of 9. Choice C is incorrect. This represents the square of the radius. Choice D is incorrect and may result from solving the equation $45\pi = \pi(r)^2(5)$ for r^2, not r, by dividing by π on both sides and then by subtracting, not dividing, 5 from both sides.

Question Difficulty: Medium

Question ID e5c57163

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: e5c57163

Square A has side lengths that are 166 times the side lengths of square B. The area of square A is k times the area of square B. What is the value of k?

ID: e5c57163 Answer

Correct Answer: 27556

Rationale

The correct answer is $27{,}556$. The area of a square is s^2, where s is the side length of the square. Let x represent the length of each side of square B. Substituting x for s in s^2 yields x^2. It follows that the area of square B is x^2. It's given that square A has side lengths that are 166 times the side lengths of square B. Since x represents the length of each side of square B, the length of each side of square A can be represented by the expression $166x$. It follows that the area of square A is $(166x)^2$, or $27{,}556x^2$. It's given that the area of square A is k times the area of square B. Since the area of square A is equal to $27{,}556x^2$, and the area of square B is equal to x^2, an equation representing the given statement is $27{,}556x^2 = kx^2$. Since x represents the length of each side of square B, the value of x must be positive. Therefore, the value of x^2 is also positive, so it does not equal 0. Dividing by x^2 on both sides of the equation $27{,}556x^2 = kx^2$ yields $27{,}556 = k$. Therefore, the value of k is $27{,}556$.

Question Difficulty: Hard

Question ID 93f48423

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 93f48423

What is the area, in square inches, of a rectangle with a length of 7 inches and a width of 6 inches?

A. 13

B. 20

C. 42

D. 84

ID: 93f48423 Answer

Correct Answer: C

Rationale

Choice C is correct. The area, A, of a rectangle is given by the formula $A = \ell w$, where ℓ represents the length of the rectangle and w represents its width. It's given that the rectangle has a length of 7 inches and a width of 6 inches. Substituting 7 for ℓ and 6 for w in the formula $A = \ell w$ yields $A = (7)(6)$, or $A = 42$. Thus, the area, in square inches, of the rectangle is 42.

Choice A is incorrect. This is the sum, not the product, of the length and width of the rectangle.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is twice the area, in square inches, of the rectangle.

Question Difficulty: Easy

Question ID 5252e606

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 5252e606

The side length of a square is 55 centimeters (cm). What is the area, in cm^2, of the square?

A. 110

B. 220

C. $3{,}025$

D. $12{,}100$

ID: 5252e606 Answer

Correct Answer: C

Rationale

Choice C is correct. The area A, in square centimeters (cm^2), of a square with side length s, in cm, is given by the formula $A = s^2$. It's given that the square has a side length of 55 cm. Substituting 55 for s in the formula $A = s^2$ yields $A = 55^2$, or $A = 3{,}025$. Therefore, the area, in cm^2, of the square is $3{,}025$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the perimeter, in cm, of the square, not its area, in cm^2.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 5afbdc8e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 5afbdc8e

What is the length of one side of a square that has the same area as a circle with radius 2 ?

A. 2

B. $\sqrt{2\pi}$

C. $2\sqrt{\pi}$

D. 2π

ID: 5afbdc8e Answer

Correct Answer: C

Rationale

Choice C is correct. The area A of a circle with radius r is given by the formula $A = \pi r^2$. Thus, a circle with radius 2 has area $\pi(2^2)$, which can be rewritten as 4π. The area of a square with side length s is given by the formula $A = s^2$. Thus, if a square has the same area as a circle with radius 2, then $s^2 = 4\pi$. Since the side length of a square must be a positive number, taking the square root of both sides of $s^2 = 4\pi$ gives $s = \sqrt{4\pi}$. Using the properties of square roots, $\sqrt{4\pi}$ can be rewritten as $(\sqrt{4})(\sqrt{\pi})$, which is equivalent to $2\sqrt{\pi}$. Therefore, $s = 2\sqrt{\pi}$.

Choice A is incorrect. The side length of the square isn't equal to the radius of the circle. Choices B and D are incorrect and may result from incorrectly simplifying the expression $\sqrt{4\pi}$.

Question Difficulty: Medium

Question ID 983412ea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 983412ea

A right square prism has a height of 14 units. The volume of the prism is $2{,}016$ cubic units. What is the length, in units, of an edge of the base?

ID: 983412ea Answer

Correct Answer: 12

Rationale

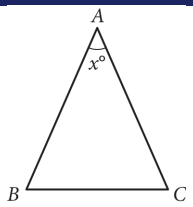
The correct answer is 12. The volume, V, of a right square prism can be calculated using the formula $V = s^2h$, where s represents the length of an edge of the base and h represents the height of the prism. It's given that the volume of the prism is $2{,}016$ cubic units and the height is 14 units. Substituting $2{,}016$ for V and 14 for h in the formula $V = s^2h$ yields $2{,}016 = (s^2)(14)$. Dividing both sides of this equation by 14 yields $144 = s^2$. Taking the square root of both sides of this equation yields two solutions: $-12 = s$ and $12 = s$. The length can't be negative, so $12 = s$. Therefore, the length, in units, of an edge of the base is 12.

Question Difficulty: Hard

Question ID c8d60e48

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: c8d60e48



In the given triangle, $AB = AC$ and $\angle ABC$ has a measure of $67°$. What is the value of x?

A. 36

B. 46

C. 58

D. 70

ID: c8d60e48 Answer

Correct Answer: B

Rationale

Choice B is correct. Since $AB = AC$, the measures of their corresponding angles, $\angle ABC$ and $\angle ACB$, are equal. Since $\angle ABC$ has a measure of $67°$, the measure of $\angle ACB$ is also $67°$. Since the sum of the measures of the interior angles in a triangle is $180°$, it follows that $67 + 67 + x = 180$, or $134 + x = 180$. Subtracting by 134 on both sides of this equation yields $x = 46$.

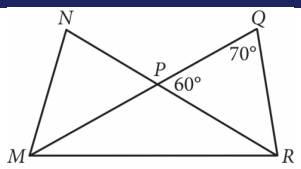
Choices A, C, and D are incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID 947a3cde

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 947a3cde



In the figure above, $\overline{MQ}$ and $\overline{NR}$ intersect at point P, $NP = QP$, and $MP = PR$. What is the measure, in degrees, of $\angle QMR$? (Disregard the degree symbol when gridding your answer.)

ID: 947a3cde Answer

Rationale

The correct answer is 30. It is given that the measure of $\angle QPR$ is $60°$. Angle MPR and $\angle QPR$ are collinear and therefore are supplementary angles. This means that the sum of the two angle measures is $180°$, and so the measure of $\angle MPR$ is $120°$. The sum of the angles in a triangle is $180°$. Subtracting the measure of $\angle MPR$ from $180°$ yields the sum of the other angles in the triangle MPR. Since $180 - 120 = 60$, the sum of the measures of $\angle QMR$ and $\angle NRM$ is $60°$. It is given that $MP = PR$, so it follows that triangle MPR is isosceles. Therefore $\angle QMR$ and $\angle NRM$ must be congruent. Since the sum of the measure of these two angles is $60°$, it follows that the measure of each angle is $30°$.

An alternate approach would be to use the exterior angle theorem, noting that the measure of $\angle QPR$ is equal to the sum of the measures of $\angle QMR$ and $\angle NRM$. Since both angles are equal, each of them has a measure of $30°$.

Question Difficulty: Hard

Question ID 1f0b582e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 1f0b582e

Square X has a side length of 12 centimeters. The perimeter of square Y is 2 times the perimeter of square X. What is the length, in centimeters, of one side of square Y?

A. 6

B. 10

C. 14

D. 24

ID: 1f0b582e Answer

Correct Answer: D

Rationale

Choice D is correct. The perimeter, P, of a square can be found using the formula $P = 4s$, where s is the length of each side of the square. It's given that square X has a side length of 12 centimeters. Substituting 12 for s in the formula for the perimeter of a square yields $P = 4(12)$, or $P = 48$. Therefore, the perimeter of square X is 48 centimeters. It's also given that the perimeter of square Y is 2 times the perimeter of square X. Therefore, the perimeter of square Y is $2(48)$, or 96, centimeters. Substituting 96 for P in the formula $P = 4s$ gives $96 = 4s$. Dividing both sides of this equation by 4 gives $24 = s$. Therefore, the length of one side of square Y is 24 centimeters.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

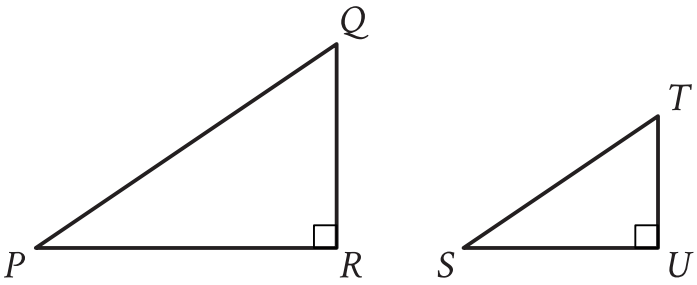
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID d5f349b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: d5f349b7



Note: Figures not drawn to scale.

Right triangles PQR and STU are similar, where P corresponds to S. If the measure of angle Q is 18°, what is the measure of angle S?

A. 18°

B. 72°

C. 82°

D. 162°

ID: d5f349b7 Answer

Correct Answer: B

Rationale

Choice B is correct. In similar triangles, corresponding angles are congruent. It's given that right triangles PQR and STU are similar, where angle P corresponds to angle S. It follows that angle P is congruent to angle S. In the triangles shown, angle R and angle U are both marked as right angles, so angle R and angle U are corresponding angles. It follows that angle Q and angle T are corresponding angles, and thus, angle Q is congruent to angle T. It's given that the measure of angle Q is 18°, so the measure of angle T is also 18°. Angle U is a right angle, so the measure of angle U is 90°. The sum of the measures of the interior angles of a triangle is 180°. Thus, the sum of the measures of the interior angles of triangle STU is 180 degrees. Let s represent the measure, in degrees, of angle S. It follows that $s + 18 + 90 = 180$, or $s + 108 = 180$. Subtracting 108 from both sides of this equation yields $s = 72$. Therefore, if the measure of angle Q is 18 degrees, then the measure of angle S is 72 degrees.

Choice A is incorrect. This is the measure of angle T.

Choice C is incorrect and may result from conceptual or calculation errors.

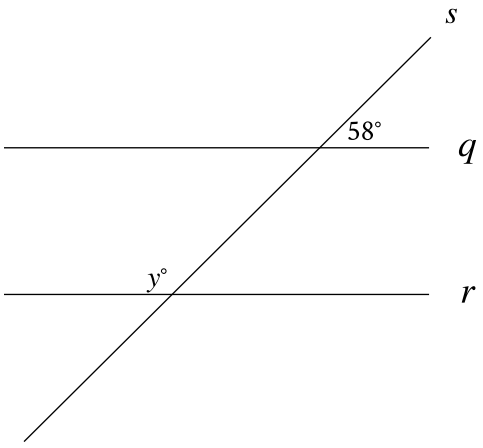
Choice D is incorrect. This is the sum of the measures of angle S and angle U.

Question Difficulty: Easy

Question ID 686b5212

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 686b5212



Note: Figure not drawn to scale.

In the figure, line q is parallel to line r, and both lines are intersected by line s. If $y = 2x + 8$, what is the value of x?

ID: 686b5212 Answer

Correct Answer: 57

Rationale

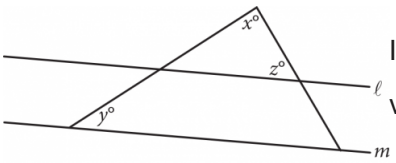
The correct answer is 57. Based on the figure, the angle with measure y° and the angle vertical to the angle with measure 58° are same side interior angles. Since vertical angles are congruent, the angle vertical to the angle with measure 58° also has measure 58°. It's given that lines q and r are parallel. Therefore, same side interior angles between lines q and r are supplementary. It follows that $y + 58 = 180$. If $y = 2x + 8$, then the value of x can be found by substituting $2x + 8$ for y in the equation $y + 58 = 180$, which yields $(2x + 8) + 58 = 180$, or $2x + 66 = 180$. Subtracting 66 from both sides of this equation yields $2x = 114$. Dividing both sides of this equation by 2 yields $x = 57$. Thus, if $y = 2x + 8$, the value of x is 57.

Question Difficulty: Medium

Question ID a6dbad6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: a6dbad6b



Note: Figure not drawn to scale.

In the figure above, lines ℓ and m are parallel, $y = 20$, and $z = 60$. What is the value of x?

A. 120

B. 100

C. 90

D. 80

ID: a6dbad6b Answer

Correct Answer: B

Rationale

Choice B is correct. Let the measure of the third angle in the smaller triangle be $a°$. Since lines ℓ and m are parallel and cut by transversals, it follows that the corresponding angles formed are congruent. So $a° = y° = 20°$. The sum of the measures of the interior angles of a triangle is $180°$, which for the interior angles in the smaller triangle yields $a + x + z = 180$. Given that $z = 60$ and $a = 20$, it follows that $20 + x + 60 = 180$. Solving for x gives $x = 180 - 60 - 20$, or $x = 100$.

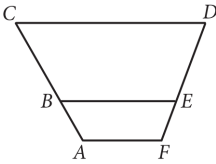
Choice A is incorrect and may result from incorrectly assuming that angles $x + z = 180$. Choice C is incorrect and may result from incorrectly assuming that the smaller triangle is a right triangle, with x as the right angle. Choice D is incorrect and may result from a misunderstanding of the exterior angle theorem and incorrectly assuming that $x = y + z$.

Question Difficulty: Easy

Question ID 81b664bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 81b664bc



In the figure above, $\overline{AF}$, $\overline{BE}$, and $\overline{CD}$ are parallel. Points B and E lie on $\overline{AC}$ and $\overline{FD}$, respectively. If $AB = 9$, $BC = 18.5$, and $FE = 8.5$, what is the length of $\overline{ED}$, to the nearest tenth?

A. 16.8

B. 17.5

C. 18.4

D. 19.6

ID: 81b664bc Answer

Correct Answer: B

Rationale

Choice B is correct. Since $\overline{AF}$, $\overline{BE}$, and $\overline{CD}$ are parallel, quadrilaterals $AFEB$ and $BEDC$ are similar. Let x represent the length of $\overline{ED}$. With similar figures, the ratios of the lengths of corresponding sides are equal. It follows that $\frac{9}{18.5} = \frac{8.5}{x}$. Multiplying both sides of this equation by 18.5 and by x yields $9x = (18.5)(8.5)$, or $9x = 157.25$. Dividing both sides of this equation by 9 yields $x = 17.47$, which to the nearest tenth is 17.5.

Choices A, C, and D are incorrect and may result from errors made when setting up the proportion.

Question Difficulty: Medium

Question ID 59cb654c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 59cb654c

The area of a square is 64 square inches. What is the side length, in inches, of this square?

A. 8

B. 16

C. 64

D. 128

ID: 59cb654c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the area of a square is 64 square inches. The area A, in square inches, of a square is given by the formula $A = s^2$, where s is the side length, in inches, of the square. Substituting 64 for A in this formula yields $64 = s^2$. Taking the positive square root of both sides of this equation yields $8 = s$. Thus, the side length, in inches, of this square is 8.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the area, in square inches, of the square, not the side length, in inches, of the square.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID e86f0651

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: e86f0651

A circle has a radius of 43 meters. What is the area, in square meters, of the circle?

A. $\frac{43\pi}{2}$

B. 43π

C. 86π

D. $1{,}849\pi$

ID: e86f0651 Answer

Correct Answer: D

Rationale

Choice D is correct. The area, A, of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the circle has a radius of 43 meters. Substituting 43 for r in the formula $A = \pi r^2$ yields $A = \pi(43)^2$, or $A = 1{,}849\pi$. Therefore, the area, in square meters, of the circle is $1{,}849\pi$.

Choice A is incorrect. This is the area, in square meters, of a circle with a radius of $\sqrt{\frac{43}{2}}$ meters.

Choice B is incorrect. This is the area, in square meters, of a circle with a radius of $\sqrt{43}$ meters.

Choice C is incorrect. This is the circumference, in meters, of the circle.

Question Difficulty: Medium

Question ID ec5d4823

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: ec5d4823

What is the volume, in cubic centimeters, of a right rectangular prism that has a length of 4 centimeters, a width of 9 centimeters, and a height of 10 centimeters?

ID: ec5d4823 Answer

Rationale

The correct answer is 360. The volume of a right rectangular prism is calculated by multiplying its dimensions: length, width, and height. Multiplying the values given for these dimensions yields a volume of $(4)(9)(10) = 360$ cubic centimeters.

Question Difficulty: Medium

Question ID 9966235e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 9966235e

A cube has an edge length of 68 inches. A solid sphere with a radius of 34 inches is inside the cube, such that the sphere touches the center of each face of the cube. To the nearest cubic inch, what is the volume of the space in the cube not taken up by the sphere?

A. $149{,}796$

B. $164{,}500$

C. $190{,}955$

D. $310{,}800$

ID: 9966235e Answer

Correct Answer: A

Rationale

Choice A is correct. The volume of a cube can be found by using the formula $V = s^3$, where V is the volume and s is the edge length of the cube. Therefore, the volume of the given cube is $V = 68^3$, or $314{,}432$ cubic inches. The volume of a sphere can be found by using the formula $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Therefore, the volume of the given sphere is $V = \frac{4}{3}\pi(34)^3$, or approximately $164{,}636$ cubic inches. The volume of the space in the cube not taken up by the sphere is the difference between the volume of the cube and volume of the sphere. Subtracting the approximate volume of the sphere from the volume of the cube gives $314{,}432 - 164{,}636 = 149{,}796$ cubic inches.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a0369739

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: a0369739

In triangle ABC, the measure of angle B is 90° and $\overline{BD}$ is an altitude of the triangle. The length of $\overline{AB}$ is 15 and the length of $\overline{AC}$ is 23 greater than the length of $\overline{AB}$. What is the value of $\frac{BC}{BD}$?

A. $\frac{15}{38}$

B. $\frac{15}{23}$

C. $\frac{23}{15}$

D. $\frac{38}{15}$

ID: a0369739 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that in triangle ABC, the measure of angle B is 90° and $\overline{BD}$ is an altitude of the triangle. Therefore, the measure of angle BDC is 90°. It follows that angle B is congruent to angle D and angle C is congruent to angle C. By the angle-angle similarity postulate, triangle ABC is similar to triangle BDC. Since triangles ABC and BDC are similar, it follows that $\frac{AC}{AB} = \frac{BC}{BD}$. It's also given that the length of $\overline{AB}$ is 15 and the length of $\overline{AC}$ is 23 greater than the length of $\overline{AB}$. Therefore, the length of $\overline{AC}$ is $15 + 23$, or 38. Substituting 15 for AB and 38 for AC in the equation $\frac{AC}{AB} = \frac{BC}{BD}$ yields $\frac{38}{15} = \frac{BC}{BD}$. Therefore, the value of $\frac{BC}{BD}$ is $\frac{38}{15}$.

Choice A is incorrect. This is the value of $\frac{BD}{BC}$. Choice B is incorrect and may result from conceptual or calculation errors.

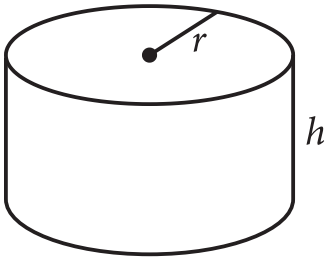
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a07ed090

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: a07ed090



The figure shown is a right circular cylinder with a radius of r and height of h. A second right circular cylinder (not shown) has a volume that is 392 times as large as the volume of the cylinder shown. Which of the following could represent the radius R, in terms of r, and the height H, in terms of h, of the second cylinder?

A. $R = 8r$ and $H = 7h$

B. $R = 8r$ and $H = 49h$

C. $R = 7r$ and $H = 8h$

D. $R = 49r$ and $H = 8h$

ID: a07ed090 Answer

Correct Answer: C

Rationale

Choice C is correct. The volume of a right circular cylinder is equal to $\pi a^2 b$, where a is the radius of a base of the cylinder and b is the height of the cylinder. It's given that the cylinder shown has a radius of r and a height of h. It follows that the volume of the cylinder shown is equal to $\pi r^2 h$. It's given that the second right circular cylinder has a radius of R and a height of H. It follows that the volume of the second cylinder is equal to $\pi R^2 H$. Choice C gives $R = 7r$ and $H = 8h$. Substituting $7r$ for R and $8h$ for H in the expression that represents the volume of the second cylinder yields $\pi(7r)^2(8h)$, or $\pi\left(49r^2\right)(8h)$, which is equivalent to $\pi\left(392r^2h\right)$, or $392\left(\pi r^2 h\right)$. This expression is equal to 392 times the volume of the cylinder shown, $\pi r^2 h$. Therefore, $R = 7r$ and $H = 8h$ could represent the radius R, in terms of r, and the height H, in terms of h, of the second cylinder.

Choice A is incorrect. Substituting $8r$ for R and $7h$ for H in the expression that represents the volume of the second cylinder yields $\pi(8r)^2(7h)$, or $\pi\left(64r^2\right)(7h)$, which is equivalent to $\pi\left(448r^2h\right)$, or $448\left(\pi r^2 h\right)$. This expression is equal to 448, not 392, times the volume of the cylinder shown.

Choice B is incorrect. Substituting $8r$ for R and $49h$ for H in the expression that represents the volume of the second cylinder yields $\pi(8r)^2(49h)$, or $\pi\left(64r^2\right)(49h)$, which is equivalent to $\pi\left(3{,}136r^2h\right)$, or $3{,}136\left(\pi r^2 h\right)$. This expression is equal to $3{,}136$, not 392, times the volume of the cylinder shown.

Choice D is incorrect. Substituting $49r$ for R and $8h$ for H in the expression that represents the volume of the second cylinder yields $\pi(49r)^2(8h)$, or $\pi\left(2{,}401r^2\right)(8h)$, which is equivalent to $\pi\left(19{,}208r^2h\right)$, or $19{,}208\left(\pi r^2 h\right)$. This expression is equal to $19{,}208$, not 392, times the volume of the cylinder shown.

Question Difficulty: Hard

Question ID cbe8ca31

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: cbe8ca31

In $\triangle XYZ$, the measure of $\angle X$ is 24° and the measure of $\angle Y$ is 98°. What is the measure of $\angle Z$?

A. 58°

B. 74°

C. 122°

D. 212°

ID: cbe8ca31 Answer

Correct Answer: A

Rationale

Choice A is correct. The triangle angle sum theorem states that the sum of the measures of the interior angles of a triangle is 180°. It's given that in $\triangle XYZ$, the measure of $\angle X$ is 24° and the measure of $\angle Y$ is 98°. It follows that the measure of $\angle Z$ is $(180 - 24 - 98)^\circ$, or 58°.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the sum of the measures of $\angle X$ and $\angle Y$, not the measure of $\angle Z$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 3b931fb0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 3b931fb0

A right circular cylinder has a volume of 377 cubic centimeters. The area of the base of the cylinder is 13 square centimeters. What is the height, in centimeters, of the cylinder?

ID: 3b931fb0 Answer

Correct Answer: 29

Rationale

The correct answer is 29. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. Since the base of the cylinder is a circle with radius r, the area of the base of the cylinder is πr^2. It's given that a right circular cylinder has a volume of 377 cubic centimeters; therefore, $V = 377$. It's also given that the area of the base of the cylinder is 13 square centimeters; therefore, $\pi r^2 = 13$. Substituting 377 for V and 13 for πr^2 in the formula $V = \pi r^2 h$ yields $377 = 13h$. Dividing both sides of this equation by 13 yields $29 = h$. Therefore, the height of the cylinder, in centimeters, is 29.

Question Difficulty: Medium

Question ID 94364a79

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 94364a79

Two nearby trees are perpendicular to the ground, which is flat. One of these trees is 10 feet tall and has a shadow that is 5 feet long. At the same time, the shadow of the other tree is 2 feet long. How tall, in feet, is the other tree?

A. 3

B. 4

C. 8

D. 27

ID: 94364a79 Answer

Correct Answer: B

Rationale

Choice B is correct. Each tree and its shadow can be modeled using a right triangle, where the height of the tree and the length of its shadow are the legs of the triangle. At a given point in time, the right triangles formed by two nearby trees and their respective shadows will be similar. Therefore, if the height of the other tree is x, in feet, the value of x can be calculated by solving the proportional relationship $\frac{10 \text{ feet tall}}{5 \text{ feet long}} = \frac{x \text{ feet tall}}{2 \text{ feet long}}$. This equation is equivalent to $\frac{10}{5} = \frac{x}{2}$, or $2 = \frac{x}{2}$. Multiplying each side of the equation $2 = \frac{x}{2}$ by 2 yields $4 = x$. Therefore, the other tree is 4 feet tall.

Choice A is incorrect and may result from calculating the difference between the lengths of the shadows, rather than the height of the other tree.

Choice C is incorrect and may result from calculating the difference between the height of the 10-foot-tall tree and the length of the shadow of the other tree, rather than calculating the height of the other tree.

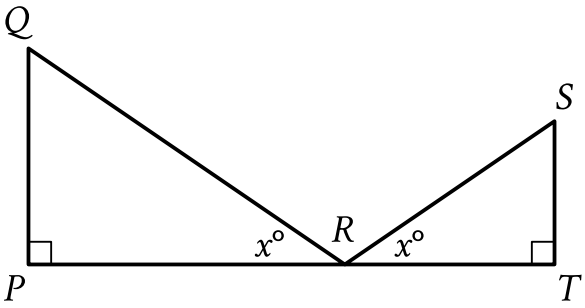
Choice D is incorrect and may result from a conceptual or calculation error.

Question Difficulty: Medium

Question ID 51f26ce8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 51f26ce8



Note: Figure not drawn to scale.

$\triangle QPR$ is similar to $\triangle STR$. The lengths represented by $\overline{ST}$, $\overline{QP}$, $\overline{PR}$, and $\overline{QR}$ in the figure are 14, 15, 20, and 25, respectively. What is the length of $\overline{SR}$?

A. $\frac{350}{15}$

B. $\frac{350}{20}$

C. $\frac{210}{20}$

D. $\frac{210}{25}$

ID: 51f26ce8 Answer

Correct Answer: A

Rationale

Choice A is correct. The figure shows that angle P in $\triangle QPR$ and angle T in $\triangle STR$ are right angles. It follows that angle P is congruent to angle T. The figure also shows that the measures of angle QRP and angle SRT are both x°. Therefore, angle QRP is congruent to angle SRT. It's given that $\triangle QPR$ is similar to $\triangle STR$. Since angle P is congruent to angle T, and angle QRP is congruent to angle SRT, it follows that $\overline{QR}$ corresponds to $\overline{SR}$, and $\overline{QP}$ corresponds to $\overline{ST}$. Since corresponding sides of similar triangles are proportional, it follows that $\frac{SR}{QR} = \frac{ST}{QP}$. It's also given that the lengths of $\overline{ST}$, $\overline{QP}$, and $\overline{QR}$ are 14, 15, and 25, respectively. Substituting 14 for ST, 15 for QP, and 25 for QR in the equation $\frac{SR}{QR} = \frac{ST}{QP}$ yields $\frac{SR}{25} = \frac{14}{15}$. Multiplying each side of this equation by 25 yields $SR = \left(\frac{14}{15}\right)(25)$, or $SR = \frac{350}{15}$. Thus, the length of $\overline{SR}$ is $\frac{350}{15}$.

Choice B is incorrect. This is the result of solving the equation $\frac{SR}{25} = \frac{14}{20}$, not $\frac{SR}{25} = \frac{14}{15}$.

Choice C is incorrect. This is the result of solving the equation $\frac{SR}{14} = \frac{15}{20}$, not $\frac{SR}{25} = \frac{14}{15}$.

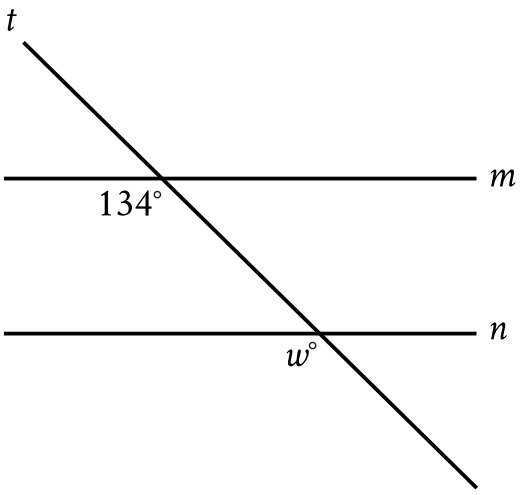
Choice D is incorrect. This is the result of solving the equation $\frac{SR}{14} = \frac{15}{25}$, not $\frac{SR}{25} = \frac{14}{15}$.

Question Difficulty: Medium

Question ID c24e1bda

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: c24e1bda



Note: Figure not drawn to scale.

In the figure, line m is parallel to line n. What is the value of w?

A. 13

B. 34

C. 66

D. 134

ID: c24e1bda Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that lines m and n are parallel. Since line t intersects both lines m and n, it's a transversal. The angles in the figure marked as 134° and w° are on the same side of the transversal, where one is an interior angle with line m as a side, and the other is an exterior angle with line n as a side. Thus, the marked angles are corresponding angles. When two parallel lines are intersected by a transversal, corresponding angles are congruent and, therefore, have equal measure. It follows that $w^\circ = 134^\circ$. Therefore, the value of w is 134.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

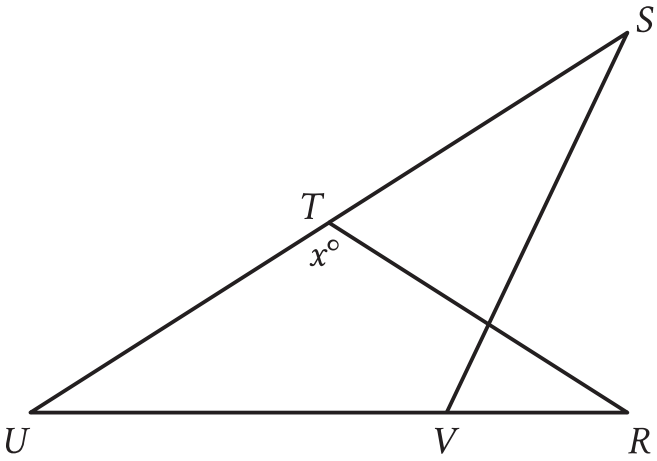
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 2d2cb85e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 2d2cb85e



Note: Figure not drawn to scale.

In the figure, $RT = TU$, the measure of angle VST is 29°, and the measure of angle RVS is 41°. What is the value of x?

ID: 2d2cb85e Answer

Correct Answer: 156

Rationale

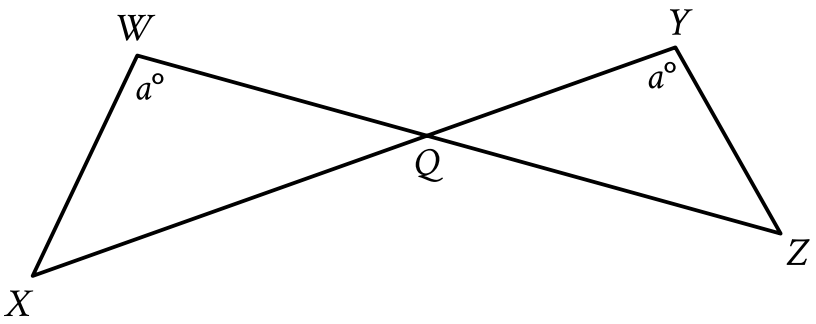
The correct answer is 156. In the figure shown, the sum of the measures of angle UVS and angle RVS is 180°. It's given that the measure of angle RVS is 41°. Therefore, the measure of angle UVS is $(180 - 41)^\circ$, or 139°. The sum of the measures of the interior angles of a triangle is 180°. In triangle UVS, the measure of angle UVS is 139° and it's given that the measure of angle VST is 29°. Thus, the measure of angle VUS is $(180 - 139 - 29)^\circ$, or 12°. It's given that $RT = TU$. Therefore, triangle TUR is an isosceles triangle and the measure of VUS is equal to the measure of angle TRU. In triangle TUR, the measure of angle VUS is 12° and the measure of angle TRU is 12°. Thus, the measure of angle UTR is $(180 - 12 - 12)^\circ$, or 156°. The figure shows that the measure of angle UTR is x°, so the value of x is 156.

Question Difficulty: Hard

Question ID 345cc36a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 345cc36a



Note: Figure not drawn to scale.

In the figure shown, $\overline{WZ}$ and $\overline{XY}$ intersect at point Q. $YQ = 63$, $WQ = 70$, $WX = 60$, and $XQ = 120$. What is the length of $\overline{YZ}$?

ID: 345cc36a Answer

Correct Answer: 54

Rationale

The correct answer is 54. The figure shown includes two triangles, triangle WQX and triangle YQZ, such that angle WQX and angle YQZ are vertical angles. It follows that angle WQX is congruent to angle YQZ. It's also given in the figure that the measures of angle W and angle Y are a°. Therefore angle W is congruent to angle Y. Since triangle WQX and triangle YQZ have two pairs of congruent angles, triangle WQX is similar to triangle YQZ by the angle-angle similarity postulate, where $\overline{YZ}$ corresponds to $\overline{WX}$, and $\overline{YQ}$ corresponds to $\overline{WQ}$. Since the lengths of corresponding sides in similar triangles are proportional, it follows that $\frac{YZ}{WX} = \frac{YQ}{WQ}$. It's given that $YQ = 63$, $WQ = 70$, and $WX = 60$. Substituting 63 for YQ, 70 for WQ, and 60 for WX in the equation $\frac{YZ}{WX} = \frac{YQ}{WQ}$ yields $\frac{YZ}{60} = \frac{63}{70}$. Multiplying each side of this equation by 60 yields $YZ = \left(\frac{63}{70}\right)(60)$, or $YZ = 54$. Therefore, the length of $\overline{YZ}$ is 54.

Question Difficulty: Hard

Question ID 901c3215

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 901c3215

In triangles ABC and DEF, angles B and E each have measure 27° and angles C and F each have measure 41°. Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF?

A. The measure of angle A

B. The length of side AB

C. The lengths of sides BC and EF

D. No additional information is necessary.

ID: 901c3215 Answer

Correct Answer: C

Rationale

Choice C is correct. Since angles B and E each have the same measure and angles C and F each have the same measure, triangles ABC and DEF are similar, where side BC corresponds to side EF. To determine whether two similar triangles are congruent, it is sufficient to determine whether one pair of corresponding sides are congruent. Therefore, to determine whether triangles ABC and DEF are congruent, it is sufficient to determine whether sides BC and EF have equal length. Thus, the lengths of BC and EF are sufficient to determine whether triangle ABC is congruent to triangle DEF.

Choice A is incorrect and may result from conceptual errors. Choice B is incorrect and may result from conceptual errors.

Choice D is incorrect. The given information is sufficient to determine that triangles ABC and DEF are similar, but not whether they are congruent.

Question Difficulty: Hard

Question ID f7dbde16

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: f7dbde16

In triangles LMN and RST, angles L and R each have measure 60°, $LN = 10$, and $RT = 30$. Which additional piece of information is sufficient to prove that triangle LMN is similar to triangle RST?

A. $MN = 7$ and $ST = 7$

B. $MN = 7$ and $ST = 21$

C. The measures of angles M and S are 70° and 60°, respectively.

D. The measures of angles M and T are 70° and 50°, respectively.

ID: f7dbde16 Answer

Correct Answer: D

Rationale

Choice D is correct. Two triangles are similar if they have three pairs of congruent corresponding angles. It's given that angles L and R each measure 60°, and so these corresponding angles are congruent. If angle M is 70°, then angle N must be 50° so that the sum of the angles in triangle LMN is 180°. If angle T is 50°, then angle S must be 70° so that the sum of the angles in triangle RST is 180°. Therefore, if the measures of angles M and T are 70° and 50°, respectively, then corresponding angles M and S are both 70°, and corresponding angles N and T are both 50°. It follows that triangles LMN and RST have three pairs of congruent corresponding angles, and so the triangles are similar. Therefore, the additional piece of information that is sufficient to prove that triangle LMN is similar to triangle RST is that the measures of angles M and T are 70° and 50°, respectively.

Choice A is incorrect. If the measures of two sides in one triangle are proportional to the corresponding sides in another triangle and the included angles are congruent, then the triangles are similar. However, the two sides given are not proportional and the angle given is not included by the given sides.

Choice B is incorrect. If the measures of two sides in one triangle are proportional to the corresponding sides in another triangle and the included angles are congruent, then the triangles are similar. However, the angle given is not included between the proportional sides.

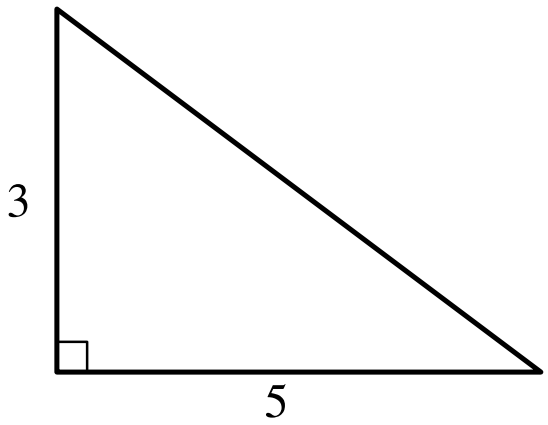
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID a4ed5285

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: a4ed5285



Note: Figure not drawn to scale.

The figure shows the lengths, in inches, of two sides of a right triangle. What is the area of the triangle, in square inches?

ID: a4ed5285 Answer

Correct Answer: 7.5, 15/2

Rationale

The correct answer is $\frac{15}{2}$. The area, A, of a triangle is given by the formula $A = \frac{1}{2}bh$, where b is the length of the base of the triangle and h is the height of the triangle. In the right triangle shown, the length of the base of the triangle is 5 inches, and the height is 3 inches. It follows that $b = 5$ and $h = 3$. Substituting 5 for b and 3 for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(5)(3)$, which is equivalent to $A = \frac{1}{2}(15)$, or $A = \frac{15}{2}$. Therefore, the area of the triangle, in square inches, is $\frac{15}{2}$. Note that 15/2 and 7.5 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID e336a1d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: e336a1d2

A cube has an edge length of 41 inches. What is the volume, in cubic inches, of the cube?

A. 164

B. $1{,}681$

C. $10{,}086$

D. $68{,}921$

ID: e336a1d2 Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a cube can be found using the formula $V = s^3$, where s is the edge length of the cube. It's given that a cube has an edge length of 41 inches. Substituting 41 inches for s in this equation yields $V = 41^3$ cubic inches, or $V = 68{,}921$ cubic inches. Therefore, the volume of the cube is $68{,}921$ cubic inches.

Choice A is incorrect. This is the perimeter, in inches, of the cube.

Choice B is incorrect. This is the area, in square inches, of a face of the cube.

Choice C is incorrect. This is the surface area, in square inches, of the cube.

Question Difficulty: Medium

Question ID e4b4e9ea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: e4b4e9ea

The length of the edge of the base of a right square prism is 6 units. The volume of the prism is $2{,}880$ cubic units. What is the height, in units, of the prism?

A. $4\sqrt{30}$

B. 36

C. $24\sqrt{5}$

D. 80

ID: e4b4e9ea Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a right square prism is given by the formula $V = s^2h$, where s represents the length of the edge of the base and h represents the height of the prism. It's given that the volume of a right square prism is $2{,}880$ cubic units and the length of the edge of the base is 6 units. Substituting $2{,}880$ for V and 6 for s in the formula $V = s^2h$ yields $2{,}880 = (6^2)h$, or $2{,}880 = 36h$. Dividing both sides of this equation by 36 yields $80 = h$. Therefore, the height, in units, of the prism is 80.

Choice A is incorrect. This is the height, in units, of a right square prism where the length of the edge of the base is 6 units and the volume of the prism is $144\sqrt{30}$, not $2{,}880$, units.

Choice B is incorrect. This is the area, in square units, of the base, not the height, in units, of the prism.

Choice C is incorrect. This is the height, in units, of a right square prism where the length of the edge of the base is 6 units and the volume of the prism is $864\sqrt{5}$, not $2{,}880$, units.

Question Difficulty: Medium

Question ID c0586eb5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: c0586eb5

A cylinder has a diameter of 8 inches and a height of 12 inches. What is the volume, in cubic inches, of the cylinder?

A. 16π

B. 96π

C. 192π

D. 768π

ID: c0586eb5 Answer

Correct Answer: C

Rationale

Choice C is correct. The base of a cylinder is a circle with a diameter equal to the diameter of the cylinder. The volume, V, of a cylinder can be found by multiplying the area of the circular base, A, by the height of the cylinder, h, or $V = Ah$. The area of a circle can be found using the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the diameter of the cylinder is 8 inches. Thus, the radius of this circle is 4 inches. Therefore, the area of the circular base of the cylinder is $A = \pi(4)^2$, or 16π square inches. It's given that the height h of the cylinder is 12 inches. Substituting 16π for A and 12 for h in the formula $V = Ah$ gives $V = 16\pi(12)$, or 192π cubic inches.

Choice A is incorrect. This is the area of the circular base of the cylinder.

Choice B is incorrect and may result from using 8, instead of 16, as the value of r^2 in the formula for the area of a circle.

Choice D is incorrect and may result from using 8, instead of 4, for the radius of the circular base.

Question Difficulty: Medium

Question ID 151eda3c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 151eda3c

A manufacturing company produces two sizes of cylindrical containers that each have a height of 50 centimeters. The radius of container A is 16 centimeters, and the radius of container B is 25% longer than the radius of container A. What is the volume, in cubic centimeters, of container B?

A. $16{,}000\,\pi$

B. $20{,}000\,\pi$

C. $25{,}000\,\pi$

D. $31{,}250\,\pi$

ID: 151eda3c Answer

Correct Answer: B

Rationale

Choice B is correct. If the radius of container A is 16 centimeters and the radius of container B is 25% longer than the radius of container A, then the radius of container B is $16+(0.25)(16)=20$ centimeters. The volume of a cylinder is $\pi r^2 h$, where r is the radius of the cylinder and h is its height. Substituting $r=20$ and $h=50$ into $\pi r^2 h$ yields that the volume of cylinder B is $\pi(20)^2(50)=20{,}000\,\pi$ cubic centimeters.

Choice A is incorrect and may result from multiplying the radius of cylinder B by the radius of cylinder A rather than squaring the radius of cylinder B. Choice C is incorrect and may result from multiplying the radius of cylinder B by 25 rather than squaring it. Choice D is incorrect and may result from taking the radius of cylinder B to be 25 centimeters rather than 20 centimeters.

Question Difficulty: Medium

Question ID d0b6d927

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: d0b6d927

A rectangle has an area of 63 square meters and a length of 9 meters. What is the width, in meters, of the rectangle?

A. 7

B. 54

C. 81

D. 567

ID: d0b6d927 Answer

Correct Answer: A

Rationale

Choice A is correct. The area A, in square meters, of a rectangle is the product of its length ℓ, in meters, and its width w, in meters; thus, $A = \ell w$. It's given that a rectangle has an area of 63 square meters and a length of 9 meters. Substituting 63 for A and 9 for ℓ in the equation $A = \ell w$ yields $63 = 9w$. Dividing both sides of this equation by 9 yields $7 = w$. Therefore, the width, in meters, of the rectangle is 7.

Choice B is incorrect. This is the difference between the area, in square meters, and the length, in meters, of the rectangle, not the width, in meters, of the rectangle.

Choice C is incorrect. This is the square of the length, in meters, not the width, in meters, of the rectangle.

Choice D is incorrect. This is the product of the area, in square meters, and the length, in meters, of the rectangle, not the width, in meters, of the rectangle.

Question Difficulty: Easy

Question ID d621cffb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: d621cffb

A sphere has a radius of $\frac{17}{5}$ feet. What is the volume, in cubic feet, of the sphere?

A. $\frac{5\pi}{17}$

B. $\frac{68\pi}{15}$

C. $\frac{32\pi}{5}$

D. $\frac{19{,}652\pi}{375}$

ID: d621cffb Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a sphere can be found using the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. It's given that the sphere has a radius of $\frac{17}{5}$ feet. Substituting $\frac{17}{5}$ for r in the formula $V = \frac{4}{3}\pi r^3$ yields $V = \frac{4}{3}\pi\left(\frac{17}{5}\right)^3$, which is equivalent to $V = \frac{4}{3}\pi\left(\frac{4{,}913}{125}\right)$, or $V = \frac{19{,}652\pi}{375}$. Therefore, the volume, in cubic feet, of the sphere is $\frac{19{,}652\pi}{375}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the volume, in cubic feet, of a sphere with a radius of $\sqrt[3]{\frac{17}{5}}$ feet.

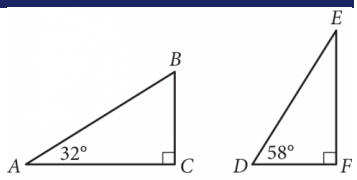
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 933fee1a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 933fee1a



Triangles *ABC* and *DEF* are shown above. Which of the following is equal to the ratio $\frac{BC}{AB}$?

A. $\frac{DE}{DF}$

B. $\frac{DF}{DE}$

C. $\frac{DF}{EF}$

D. $\frac{EF}{DE}$

ID: 933fee1a Answer

Correct Answer: B

Rationale

Choice B is correct. In right triangle ABC, the measure of angle B must be 58° because the sum of the measure of angle A, which is 32°, and the measure of angle B is 90°. Angle D in the right triangle DEF has measure 58°. Hence, triangles ABC and DEF are similar (by angle-angle similarity). Since $\overline{BC}$ is the side opposite to the angle with measure 32° and AB is the hypotenuse in right triangle ABC, the ratio $\frac{BC}{AB}$ is equal to $\frac{DF}{DE}$.

Alternate approach: The trigonometric ratios can be used to answer this question. In right triangle ABC, the ratio $\frac{BC}{AB} = \sin(32°)$. The angle E in triangle DEF has measure 32° because $M(\angle D) + M(\angle E) = 90°$. In triangle DEF, the ratio $\frac{DF}{DE} = \sin(32°)$. Therefore, $\frac{DF}{DE} = \frac{BC}{AB}$.

Choice A is incorrect because $\frac{DE}{DF}$ is the reciprocal of the ratio $\frac{BC}{AB}$. Choice C is incorrect because $\frac{DF}{EF} = \frac{BC}{AC}$, not $\frac{BC}{AB}$. Choice D is incorrect because $\frac{EF}{DE} = \frac{AC}{AB}$, not $\frac{BC}{AB}$.

Question Difficulty: Medium

Question ID ba8ca563

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: ba8ca563

A cube has a volume of $474{,}552$ cubic units. What is the surface area, in square units, of the cube?

ID: ba8ca563 Answer

Correct Answer: 36504

Rationale

The correct answer is $36{,}504$. The volume of a cube can be found using the formula $V = s^3$, where s represents the edge length of a cube. It's given that this cube has a volume of $474{,}552$ cubic units. Substituting $474{,}552$ for V in $V = s^3$ yields $474{,}552 = s^3$. Taking the cube root of both sides of this equation yields $78 = s$. Thus, the edge length of the cube is 78 units. Since each face of a cube is a square, it follows that each face has an edge length of 78 units. The area of a square can be found using the formula $A = s^2$. Substituting 78 for s in this formula yields $A = 78^2$, or $A = 6{,}084$. Therefore, the area of one face of this cube is $6{,}084$ square units. Since a cube has 6 faces, the surface area, in square units, of this cube is $6(6{,}084)$, or $36{,}504$.

Question Difficulty: Hard

Question ID b1e1c2f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: b1e1c2f5

In right triangle ABC, angle C is the right angle and $BC = 162$. Point D on side AB is connected by a line segment with point E on side AC such that line segment DE is parallel to side BC and $CE = 2AE$. What is the length of line segment DE?

ID: b1e1c2f5 Answer

Correct Answer: 54

Rationale

The correct answer is 54. It's given that in triangle ABC, point D on side AB is connected by a line segment with point E on side AC such that line segment DE is parallel to side BC. It follows that parallel segments DE and BC are intersected by sides AB and AC. If two parallel segments are intersected by a third segment, corresponding angles are congruent. Thus, corresponding angles C and AED are congruent and corresponding angles B and ADE are congruent. Since triangle ADE has two angles that are each congruent to an angle in triangle ABC, triangle ADE is similar to triangle ABC by the angle-angle similarity postulate, where side DE corresponds to side BC, and side AE corresponds to side AC. Since the lengths of corresponding sides in similar triangles are proportional, it follows that $\frac{DE}{BC} = \frac{AE}{AC}$. Since point E lies on side AC, $AE + CE = AC$. It's given that $CE = 2AE$. Substituting $2AE$ for CE in the equation $AE + CE = AC$ yields $AE + 2AE = AC$, or $3AE = AC$. It's given that $BC = 162$. Substituting 162 for BC and $3AE$ for AC in the equation $\frac{DE}{BC} = \frac{AE}{AC}$ yields $\frac{DE}{162} = \frac{AE}{3AE}$, or $\frac{DE}{162} = \frac{1}{3}$. Multiplying both sides of this equation by 162 yields $DE = 54$. Thus, the length of line segment DE is 54.

Question Difficulty: Hard

Question ID 0d43db90

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 0d43db90

The perimeter of triangle ABC is 17 inches, the length of side AB is 4 inches, and the length of side AC is 7 inches. What is the length, in inches, of side BC?

A. 4

B. 6

C. 7

D. 11

ID: 0d43db90 Answer

Correct Answer: B

Rationale

Choice B is correct. The perimeter of a triangle is the sum of the lengths of all three sides of the triangle. It's given that the lengths of side AB and side AC are 4 inches and 7 inches, respectively. Let x represent the length, in inches, of side BC. The sum of the lengths, in inches, of all three sides of triangle ABC can be represented by the expression $4 + 7 + x$. Since it's given that the perimeter of triangle ABC is 17 inches, it follows that $17 = 4 + 7 + x$, or $17 = 11 + x$. Subtracting 11 from both sides of this equation yields $6 = x$. Therefore, the length, in inches, of side BC is 6.

Choice A is incorrect. This is the length, in inches, of side AB.

Choice C is incorrect. This is the length, in inches, of side AC.

Choice D is incorrect. This is the sum of the lengths, in inches, of sides AB and AC.

Question Difficulty: Easy

Question ID e0874bc2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: e0874bc2

The table gives the perimeters of similar triangles TUV and XYZ, where $\overline{TU}$ corresponds to $\overline{XY}$. The length of $\overline{TU}$ is 18.

	Perimeter
Triangle TUV	37
Triangle XYZ	333

What is the length of $\overline{XY}$?

A. 2

B. 18

C. 55

D. 162

ID: e0874bc2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that triangle XYZ is similar to triangle TUV. Therefore, each side of triangle XYZ is k times its corresponding side of triangle TUV, where k is a constant. It follows that the perimeter of triangle XYZ is k times the perimeter of triangle TUV. It's also given that $\overline{TU}$ corresponds to $\overline{XY}$ and the length of $\overline{TU}$ is 18. Let x represent the length of $\overline{XY}$. It follows that $x = 18k$. The table shows that the perimeters of triangles TUV and XYZ are 37 and 333, respectively. It follows that $333 = 37k$, or $9 = k$. Substituting 9 for k in the equation $x = 18k$ yields $x = (18)(9)$, or $x = 162$. Therefore, the length of $\overline{XY}$ is 162.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the length of $\overline{TU}$, not the length of $\overline{XY}$.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 899c6042

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 899c6042

A right circular cone has a height of 22 centimeters (cm) and a base with a diameter of 6 cm. The volume of this cone is $n\pi$ cm^3. What is the value of n?

ID: 899c6042 Answer

Correct Answer: 66

Rationale

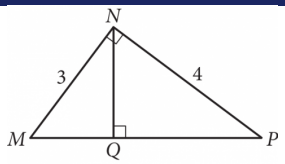
The correct answer is 66. It's given that the right circular cone has a height of 22 centimeters (cm) and a base with a diameter of 6 cm. Since the diameter of the base of the cone is 6 cm, the radius of the base is 3 cm. The volume V, in cm^3, of a right circular cone can be found using the formula $V = \frac{1}{3}\pi r^2 h$, where h is the height, in cm, and r is the radius, in cm, of the base of the cone. Substituting 22 for h and 3 for r in this formula yields $V = \frac{1}{3}\pi(3)^2(22)$, or $V = 66\pi$. Therefore, the volume of the cone is 66π cm^3. It's given that the volume of the cone is $n\pi$ cm^3. Therefore, the value of n is 66.

Question Difficulty: Hard

Question ID 740bf79f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 740bf79f



In the figure above, what is the length of $\overline{NQ}$?

A. 2.2

B. 2.3

C. 2.4

D. 2.5

ID: 740bf79f Answer

Correct Answer: C

Rationale

Choice C is correct. First, $\overline{MP}$ is the hypotenuse of right $\triangle MNP$, whose legs have lengths 3 and 4. Therefore, $(MP)^2 = 3^2 + 4^2$, so $(MP)^2 = 25$ and $MP = 5$. Second, because $\angle MNP$ corresponds to $\angle NQP$ and because $\angle MPN$ corresponds to $\angle NPQ$, $\triangle MNP$ is similar to $\triangle NQP$. The ratio of corresponding sides of similar triangles is constant, so $\frac{NQ}{MN} = \frac{NP}{MP}$. Since $MP = 5$ and it's given that $MN = 3$ and $NP = 4$, $\frac{NQ}{3} = \frac{4}{5}$. Solving for NQ results in $NQ = \frac{12}{5}$, or 2.4.

Choices A, B, and D are incorrect and may result from setting up incorrect ratios.

Question Difficulty: Hard

Question ID 3b225698

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 3b225698

Triangle XYZ is similar to triangle RST such that X, Y, and Z correspond to R, S, and T, respectively. The measure of $\angle Z$ is 20° and $2XY = RS$. What is the measure of $\angle T$?

A. 2°

B. 10°

C. 20°

D. 40°

ID: 3b225698 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that triangle XYZ is similar to triangle RST, such that X, Y, and Z correspond to R, S, and T, respectively. Since corresponding angles of similar triangles are congruent, it follows that the measure of $\angle Z$ is congruent to the measure of $\angle T$. It's given that the measure of $\angle Z$ is 20°. Therefore, the measure of $\angle T$ is 20°.

Choice A is incorrect and may result from a conceptual error. Choice B is incorrect. This is half the measure of $\angle Z$.

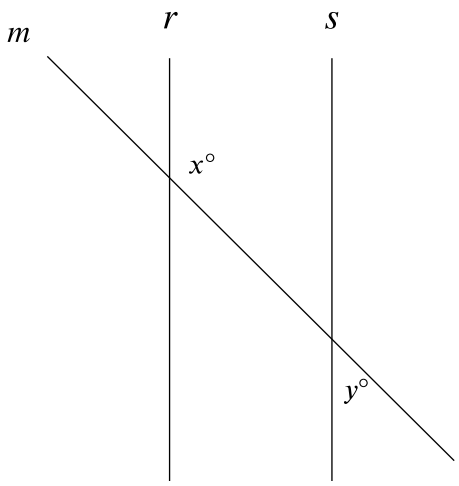
Choice D is incorrect. This is twice the measure of $\angle Z$.

Question Difficulty: Hard

Question ID a4c05a1b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: a4c05a1b



Note: Figure not drawn to scale.

In the figure shown, lines r and s are parallel, and line m intersects both lines. If $y < 65$, which of the following must be true?

A. $x < 115$

B. $x > 115$

C. $x + y < 180$

D. $x + y > 180$

ID: a4c05a1b Answer

Correct Answer: B

Rationale

Choice B is correct. In the figure shown, the angle measuring y° is congruent to its vertical angle formed by lines s and m, so the measure of the vertical angle is also y°. The vertical angle forms a same-side interior angle pair with the angle measuring x°. It's given that lines r and s are parallel. Therefore, same-side interior angles in the figure are supplementary, which means the sum of the measure of the vertical angle and the measure of the angle measuring x° is 180°, or $x + y = 180$. Subtracting x from both sides of this equation yields $y = 180 - x$. Substituting $180 - x$ for y in the inequality $y < 65$ yields $180 - x < 65$. Adding x to both sides of this inequality yields $180 < 65 + x$. Subtracting 65 from both sides of this inequality yields $115 < x$, or $x > 115$. Thus, if $y < 65$, it must be true that $x > 115$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. $x + y$ must be equal to, not less than, 180.

Choice D is incorrect. $x + y$ must be equal to, not greater than, 180.

Question Difficulty: Medium

Question ID 38517165

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 38517165

A circle has a circumference of 31π centimeters. What is the diameter, in centimeters, of the circle?

ID: 38517165 Answer

Correct Answer: 31

Rationale

The correct answer is 31. The circumference of a circle is equal to $2\pi r$ centimeters, where r represents the radius, in centimeters, of the circle, and the diameter of the circle is equal to $2r$ centimeters. It's given that a circle has a circumference of 31π centimeters. Therefore, $31\pi = 2\pi r$. Dividing both sides of this equation by π yields $31 = 2r$. Since the diameter of the circle is equal to $2r$ centimeters, it follows that the diameter, in centimeters, of the circle is 31.

Question Difficulty: Medium

Question ID d3fe472f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: d3fe472f

Triangle ABC is similar to triangle XYZ, such that A, B, and C correspond to X, Y, and Z respectively. The length of each side of triangle XYZ is 2 times the length of its corresponding side in triangle ABC. The measure of side AB is 16. What is the measure of side XY?

A. 14

B. 16

C. 18

D. 32

ID: d3fe472f Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that triangle ABC is similar to triangle XYZ, such that A, B, and C correspond to X, Y, and Z, respectively. Therefore, side AB corresponds to side XY. Since the length of each side of triangle XYZ is 2 times the length of its corresponding side in triangle ABC, it follows that the measure of side XY is 2 times the measure of side AB. Thus, since the measure of side AB is 16, then the measure of side XY is $2(16)$, or 32.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the measure of side AB, not side XY.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID f9d40000

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: f9d40000

In $\triangle XYZ$, the measure of $\angle X$ is 23° and the measure of $\angle Y$ is 66°. What is the measure of $\angle Z$?

A. 43°

B. 89°

C. 91°

D. 179°

ID: f9d40000 Answer

Correct Answer: C

Rationale

Choice C is correct. The triangle angle sum theorem states that the sum of the measures of the interior angles of a triangle is 180°. It's given that in $\triangle XYZ$, the measure of $\angle X$ is 23° and the measure of $\angle Y$ is 66°. It follows that the measure of $\angle Z$ is $(180 - 23 - 66)^\circ$, or 91°.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the sum of the measures of $\angle X$ and $\angle Y$, not the measure of $\angle Z$.

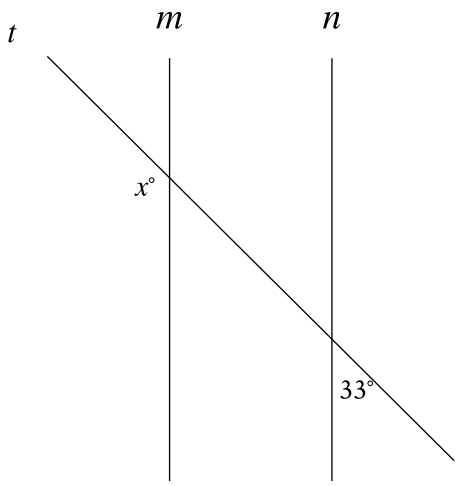
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 0d3f51dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 0d3f51dc



Note: Figure not drawn to scale.

In the figure, line m is parallel to line n, and line t intersects both lines. What is the value of x?

A. 33

B. 57

C. 123

D. 147

ID: 0d3f51dc Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that line m is parallel to line n, and line t intersects both lines. It follows that line t is a transversal. When two lines are parallel and intersected by a transversal, exterior angles on the same side of the transversal are supplementary. Thus, $x + 33 = 180$. Subtracting 33 from both sides of this equation yields $x = 147$. Therefore, the value of x is 147.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID fd8745fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: fd8745fc

In triangle JKL, the measures of $\angle K$ and $\angle L$ are each 48°. What is the measure of $\angle J$, in degrees? (Disregard the degree symbol when entering your answer.)

ID: fd8745fc Answer

Correct Answer: 84

Rationale

The correct answer is 84. The sum of the measures of the interior angles of a triangle is 180°. It's given that in triangle JKL, the measures of $\angle K$and $\angle L$ are each 48°. Adding the measures, in degrees, of $\angle K$ and $\angle L$ gives $48 + 48$, or 96. Therefore, the measure of $\angle J$, in degrees, is $180 - 96$, or 84.

Question Difficulty: Medium

Question ID b434e103

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: b434e103

In $\triangle RST$, the measure of $\angle R$ is 63°. Which of the following could be the measure, in degrees, of $\angle S$?

A. 116

B. 118

C. 126

D. 180

ID: b434e103 Answer

Correct Answer: A

Rationale

Choice A is correct. The sum of the measures of the angles of a triangle is 180°. Therefore, the sum of the measures of $\angle R$, $\angle S$, and $\angle T$ is 180°. It's given that the measure of $\angle R$ is 63°. It follows that the sum of the measures of $\angle S$ and $\angle T$ is $(180 - 63)^\circ$, or 117°. Therefore, the measure of $\angle S$, in degrees, must be less than 117. Of the given choices, only 116 is less than 117. Thus, the measure, in degrees, of $\angle S$ could be 116.

Choice B is incorrect. If the measure of $\angle S$ is 118°, then the sum of the measures of the angles of the triangle is greater than, not equal to, 180°.

Choice C is incorrect. If the measure of $\angle S$ is 126°, then the sum of the measures of the angles of the triangle is greater than, not equal to, 180°.

Choice D is incorrect. This is the sum of the measures of the angles of a triangle, in degrees.

Question Difficulty: Easy

Question ID b0dc920d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: b0dc920d

A manufacturer determined that right cylindrical containers with a height that is 4 inches longer than the radius offer the optimal number of containers to be displayed on a shelf. Which of the following expresses the volume, *V*, in cubic inches, of such containers, where *r* is the radius, in inches?

A. $V = 4\pi r^3$

B. $V = \pi(2r)^3$

C. $V = \pi r^2 + 4\pi r$

D. $V = \pi r^3 + 4\pi r^2$

ID: b0dc920d Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a right cylinder is given by the formula $V = \pi r^2 h$, where r represents the radius of the base of the cylinder and h represents the height. Since the height is 4 inches longer than the radius, the expression $r+4$ represents the height of each cylindrical container. It follows that the volume of each container is represented by the equation $V = \pi r^2(r+4)$. Distributing the expression πr^2 into each term in the parentheses yields $V = \pi r^3 + 4\pi r^2$.

Choice A is incorrect and may result from representing the height as $4r$ instead of $r+4$. Choice B is incorrect and may result from representing the height as $2r$ instead of $r+4$. Choice C is incorrect and may result from representing the volume of a right cylinder as $V = \pi rh$ instead of $V = \pi r^2 h$.

Question Difficulty: Hard

Question ID c7bed21d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: c7bed21d

Quadrilateral $P'Q'R'S'$ is similar to quadrilateral $PQRS$, where P, Q, R, and S correspond to P', Q', R', and S', respectively. The measure of angle P is 30°, the measure of angle Q is 50°, and the measure of angle R is 70°. The length of each side of $P'Q'R'S'$ is 3 times the length of each corresponding side of $PQRS$. What is the measure of angle P'?

A. 10°

B. 30°

C. 40°

D. 90°

ID: c7bed21d Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that quadrilateral $P'Q'R'S'$ is similar to quadrilateral $PQRS$, where P, Q, R, and S correspond to P', Q', R', and S', respectively. Since corresponding angles of similar quadrilaterals are congruent, it follows that the measure of angle P is equal to the measure of angle P'. It's given that the measure of angle P is 30°. Therefore, the measure of angle P' is 30°.

Choice A is incorrect. This is $\frac{1}{3}$ the measure of angle P'.

Choice C is incorrect and may result from conceptual or calculation errors.

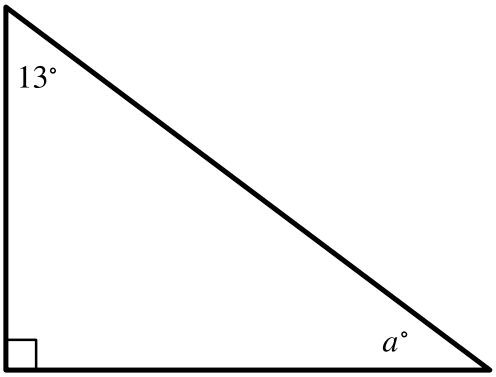
Choice D is incorrect. This is 3 times the measure of angle P'.

Question Difficulty: Medium

Question ID 69f4bbdc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 69f4bbdc



Note: Figure not drawn to scale.

In the right triangle shown, what is the value of a?

A. 13

B. 77

C. 90

D. 103

ID: 69f4bbdc Answer

Correct Answer: B

Rationale

Choice B is correct. The triangle shown is a right triangle, where the interior angle shown with a right angle symbol has a measure of 90°. It's shown that the other two interior angles measure 13° and a°. The sum of the measures of the interior angles of a triangle is 180°; therefore, $90 + 13 + a = 180$. Combining like terms on the left-hand side of this equation yields $103 + a = 180$. Subtracting 103 from both sides of this equation yields $a = 77$.

Choice A is incorrect. This is the measure, in degrees, of the other acute interior angle of the right triangle, not the value of a.

Choice C is incorrect. This is the measure, in degrees, of the right angle of the right triangle, not the value of a.

Choice D is incorrect. This is the sum of the measures, in degrees, of the other two interior angles of the right triangle, not the value of a.

Question Difficulty: Easy

Question ID 3563d76d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 3563d76d

At a certain time and day, the Washington Monument in Washington, DC, casts a shadow that is 300 feet long. At the same time, a nearby cherry tree casts a shadow that is 16 feet long. Given that the Washington Monument is approximately 555 feet tall, which of the following is closest to the height, in feet, of the cherry tree?

A. 10

B. 20

C. 30

D. 35

ID: 3563d76d Answer

Rationale

Choice C is correct. There is a proportional relationship between the height of an object and the length of its shadow. Let c represent the height, in feet, of the cherry tree. The given relationship can be expressed by the proportion $\frac{555}{300} = \frac{c}{16}$. Multiplying both sides of this equation by 16 yields $c = 29.6$. This height is closest to the value given in choice C, 30.

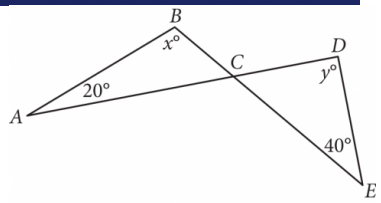
Choices A, B, and D are incorrect and may result from calculation errors.

Question Difficulty: Easy

Question ID dfc420b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: dfc420b2



Note: Figure not drawn to scale.

In the figure above, $\overline{AD}$ intersects $\overline{BE}$ at C. If $x = 100$, what is the value of y?

A. 100

B. 90

C. 80

D. 60

ID: dfc420b2 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that $x = 100$; therefore, substituting 100 for x in triangle ABC gives two known angle measures for this triangle. The sum of the measures of the interior angles of any triangle equals 180°. Subtracting the two known angle measures of triangle ABC from 180° gives the third angle measure: $180° - 100° - 20° = 60°$. This is the measure of angle BCA. Since vertical angles are congruent, the measure of angle DCE is also 60°. Subtracting the two known angle measures of triangle CDE from 180° gives the third angle measure: $180° - 60° - 40° = 80°$. Therefore, the value of y is 80.

Choice A is incorrect and may result from a calculation error. Choice B is incorrect and may result from classifying angle CDE as a right angle. Choice D is incorrect and may result from finding the measure of angle BCA or DCE instead of the measure of angle CDE.

Question Difficulty: Easy

Question ID 901e3285

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 901e3285

In triangle *ABC*, the measure of angle *A* is $50°$. If triangle *ABC* is isosceles, which of the following is NOT a possible measure of angle *B* ?

A. $50°$

B. $65°$

C. $80°$

D. $100°$

ID: 901e3285 Answer

Correct Answer: D

Rationale

Choice D is correct. The sum of the three interior angles in a triangle is $180°$. It's given that angle A measures $50°$. If angle B measured $100°$, the measure of angle C would be $180° - (50° + 100°) = 30°$. Thus, the measures of the angles in the triangle would be $50°$, $100°$, and $30°$. However, an isosceles triangle has two angles of equal measure. Therefore, angle B can't measure $100°$.

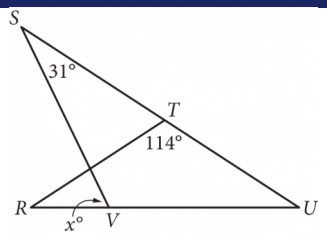
Choice A is incorrect. If angle B has measure $50°$, then angle C would measure $180° - (50° + 50°) = 80°$, and $50°$, $50°$, and $80°$ could be the angle measures of an isosceles triangle. Choice B is incorrect. If angle B has measure $65°$, then angle C would measure $180° - (65° + 50°) = 65°$, and $50°$, $65°$, and $65°$ could be the angle measures of an isosceles triangle. Choice C is incorrect. If angle B has measure $80°$, then angle C would measure $180° - (80° + 50°) = 50°$, and $50°$, $80°$, and $50°$ could be the angle measures of an isosceles triangle.

Question Difficulty: Medium

Question ID bd7f6e30

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: bd7f6e30



In the figure above, $RT = TU$.

What is the value of x?

A. 72

B. 66

C. 64

D. 58

ID: bd7f6e30 Answer

Correct Answer: C

Rationale

Choice C is correct. Since $RT = TU$, it follows that $\triangle RTU$ is an isosceles triangle with base RU. Therefore, $\angle TRU$ and $\angle TUR$ are the base angles of an isosceles triangle and are congruent. Let the measures of both $\angle TRU$ and $\angle TUR$ be $t°$. According to the triangle sum theorem, the sum of the measures of the three angles of a triangle is $180°$. Therefore, $114° + 2t° = 180°$, so $t = 33$.

Note that $\angle TUR$ is the same angle as $\angle SUV$. Thus, the measure of $\angle SUV$ is $33°$. According to the triangle exterior angle theorem, an external angle of a triangle is equal to the sum of the opposite interior angles. Therefore, $x°$ is equal to the sum of the measures of $\angle VSU$ and $\angle SUV$; that is, $31° + 33° = 64°$. Thus, the value of x is 64.

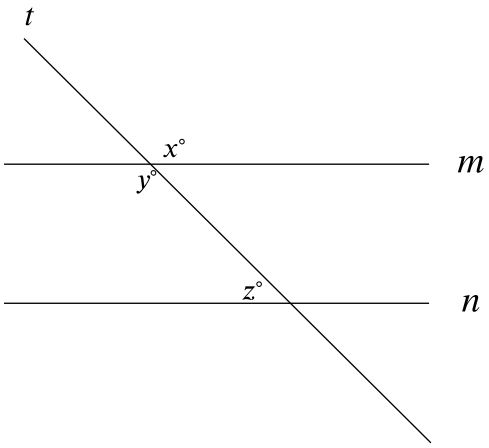
Choice B is incorrect. This is the measure of $\angle STR$, but $\angle STR$ is not congruent to $\angle SVR$. Choices A and D are incorrect and may result from a calculation error.

Question Difficulty: Hard

Question ID 2adbf1b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 2adbf1b1



Note: Figure not drawn to scale.

In the figure, lines m and n are parallel. If $x = 6k + 13$ and $y = 8k - 29$, what is the value of z?

A. 3

B. 21

C. 41

D. 139

ID: 2adbf1b1 Answer

Correct Answer: C

Rationale

Choice C is correct. Vertical angles, which are angles that are opposite each other when two lines intersect, are congruent. The figure shows that lines t and m intersect. It follows that the angle with measure x° and the angle with measure y° are vertical angles, so $x = y$. It's given that $x = 6k + 13$ and $y = 8k - 29$. Substituting $6k + 13$ for x and $8k - 29$ for y in the equation $x = y$ yields $6k + 13 = 8k - 29$. Subtracting $6k$ from both sides of this equation yields $13 = 2k - 29$. Adding 29 to both sides of this equation yields $42 = 2k$, or $2k = 42$. Dividing both sides of this equation by 2 yields $k = 21$. It's given that lines m and n are parallel, and the figure shows that lines m and n are intersected by a transversal, line t. If two parallel lines are intersected by a transversal, then the same-side interior angles are supplementary. It follows that the same-side interior angles with measures y° and z° are supplementary, so $y + z = 180$. Substituting $8k - 29$ for y in this equation yields $8k - 29 + z = 180$. Substituting 21 for k in this equation yields $8(21) - 29 + z = 180$, or $139 + z = 180$. Subtracting 139 from both sides of this equation yields $z = 41$. Therefore, the value of z is 41.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of k, not z. Choice D is incorrect. This is the value of x or y, not z.

Question Difficulty: Medium

Question ID 8c1aa743

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 8c1aa743

Rectangles $ABCD$ and $EFGH$ are similar. The length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. The area of $ABCD$ is 54 square units. What is the area, in square units, of $EFGH$?

A. 9

B. 36

C. 324

D. $1{,}944$

ID: 8c1aa743 Answer

Correct Answer: D

Rationale

Choice D is correct. The area of a rectangle is given by bh, where b is the length of the base of the rectangle and h is its height. Let x represent the length, in units, of the base of rectangle $ABCD$, and let y represent its height, in units. Substituting x for b and y for h in the formula bh yields xy. Therefore, the area, in square units, of $ABCD$ can be represented by the expression xy. It's given that the length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. Therefore, the length, in units, of the base of $EFGH$ can be represented by the expression $6x$, and its height, in units, can be represented by the expression $6y$. Substituting $6x$ for b and $6y$ for h in the formula bh yields $(6x)(6y)$, which is equivalent to $36xy$. Therefore, the area, in square units, of $EFGH$ can be represented by the expression $36xy$. It's given that the area of $ABCD$ is 54 square units. Since xy represents the area, in square units, of $ABCD$, substituting 54 for xy in the expression $36xy$ yields $36(54)$, or $1{,}944$. Therefore, the area, in square units, of $EFGH$ is $1{,}944$.

Choice A is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{1}{6}}$, not 6, times the length of the corresponding side of $ABCD$.

Choice B is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{2}{3}}$, not 6, times the length of the corresponding side of $ABCD$.

Choice C is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{6}$, not 6, times the length of the corresponding side of $ABCD$.

Question Difficulty: Hard

Question ID 0837c3b9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 0837c3b9

Triangle *ABC* and triangle *DEF* are similar triangles, where $\overline{AB}$ and $\overline{DE}$ are corresponding sides. If $DE = 2AB$ and the perimeter of triangle *ABC* is 20, what is the perimeter of triangle *DEF* ?

A. 10

B. 40

C. 80

D. 120

ID: 0837c3b9 Answer

Correct Answer: B

Rationale

Choice B is correct. Since triangles ABC and DEF are similar and $DE = 2AB$, the length of each side of triangle DEF is two times the length of its corresponding side in triangle ABC. Therefore, the perimeter of triangle DEF is two times the perimeter of triangle ABC. Since the perimeter of triangle ABC is 20, the perimeter of triangle DEF is 40.

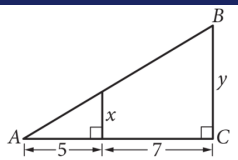
Choice A is incorrect. This is half, not two times, the perimeter of triangle ABC. Choice C is incorrect. This is two times the perimeter of triangle DEF rather than two times the perimeter of triangle ABC. Choice D is incorrect. This is six times, not two times, the perimeter of triangle ABC.

Question Difficulty: Easy

Question ID eeb4143c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: eeb4143c



Note: Figure not drawn to scale.

The area of triangle *ABC* above is at least 48 but no more than 60. If *y* is an integer, what is one possible value of *x* ?

ID: eeb4143c Answer

Rationale

The correct answer is either $\frac{10}{3}$, $\frac{15}{4}$, or $\frac{25}{6}$. The area of triangle ABC can be expressed as $\frac{1}{2}(5+7)y$ or $6y$. It's given that the area of triangle ABC is at least 48 but no more than 60. It follows that $48 \le 6y \le 60$. Dividing by 6 to isolate y in this compound inequality yields $8 \le y \le 10$. Since y is an integer, $y = 8, 9,$ or 10. In the given figure, the two right triangles shown are similar because they have two pairs of congruent angles: their respective right angles and angle A. Therefore, the following proportion is true: $\frac{x}{y} = \frac{5}{12}$. Substituting 8 for y in the proportion results in $\frac{x}{8} = \frac{5}{12}$. Cross multiplying and solving for x yields $\frac{10}{3}$. Substituting 9 for y in the proportion results in $\frac{x}{9} = \frac{5}{12}$. Cross multiplying and solving for x yields $\frac{15}{4}$. Substituting 10 for y in the proportion results in $\frac{x}{10} = \frac{5}{12}$. Cross multiplying and solving for x yields $\frac{25}{6}$. Note that 10/3, 15/4, 25/6, 3.333, 3.75, 4.166, and 4.167 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 5b2b8866

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 5b2b8866

A rectangular poster has an area of 360 square inches. A copy of the poster is made in which the length and width of the original poster are each increased by 20%. What is the area of the copy, in square inches?

ID: 5b2b8866 Answer

Correct Answer: 2592/5, 518.4

Rationale

The correct answer is 518.4. It's given that the area of the original poster is 360 square inches. Let ℓ represent the length, in inches, of the original poster, and let w represent the width, in inches, of the original poster. Since the area of a rectangle is equal to its length times its width, it follows that $360 = \ell w$. It's also given that a copy of the poster is made in which the length and width of the original poster are each increased by 20%. It follows that the length of the copy is the length of the original poster plus 20% of the length of the original poster, which is equivalent to $\ell + \frac{20}{100}\ell$ inches. This length can be rewritten as $\ell + 0.2\ell$ inches, or 1.2ℓ inches. Similarly, the width of the copy is the width of the original poster plus 20% of the width of the original poster, which is equivalent to $w + \frac{20}{100}w$ inches. This width can be rewritten as $w + 0.2w$ inches, or $1.2w$ inches. Since the area of a rectangle is equal to its length times its width, it follows that the area, in square inches, of the copy is equal to $(1.2\ell)(1.2w)$, which can be rewritten as $(1.2)(1.2)(\ell w)$. Since $360 = \ell w$, the area, in square inches, of the copy can be found by substituting 360 for ℓw in the expression $(1.2)(1.2)(\ell w)$, which yields $(1.2)(1.2)(360)$, or 518.4. Therefore, the area of the copy, in square inches, is 518.4.

Question Difficulty: Hard

Question ID 9f934297

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 9f934297

A right rectangular prism has a length of 28 centimeters (cm), a width of 15 cm, and a height of 16 cm. What is the surface area, in cm^2, of the right rectangular prism?

ID: 9f934297 Answer

Correct Answer: 2216

Rationale

The correct answer is $2{,}216$. The surface area of a prism is the sum of the areas of all its faces. A right rectangular prism consists of six rectangular faces, where opposite faces are congruent. It's given that this prism has a length of 28 cm, a width of 15 cm, and a height of 16 cm. Thus, for this prism, there are two faces with area $(28)(15)$ cm^2, two faces with area $(28)(16)$ cm^2, and two faces with area $(15)(16)$ cm^2. Therefore, the surface area, in cm^2, of the right rectangular prism is $2(28)(15) + 2(28)(16) + 2(15)(16)$, or $2{,}216$.

Question Difficulty: Hard

Question ID 575f1e12

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 575f1e12

What is the area, in square centimeters, of a rectangle with a length of 34 centimeters (cm) and a width of 29 cm?

ID: 575f1e12 Answer

Correct Answer: 986

Rationale

The correct answer is 986. The area, A, of a rectangle is given by $A = \ell w$, where ℓ is the length of the rectangle and w is its width. It's given that the length of the rectangle is 34 centimeters (cm) and the width is 29 cm. Substituting 34 for ℓ and 29 for w in the equation $A = \ell w$ yields $A = (34)(29)$, or $A = 986$. Therefore, the area, in square centimeters, of this rectangle is 986.

Question Difficulty: Easy

Question ID dc71597b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: dc71597b

A right circular cone has a volume of $\frac{1}{3}\pi$ cubic feet and a height of 9 feet.

What is the radius, in feet, of the base of the cone?

A. $\frac{1}{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. 3

ID: dc71597b Answer

Correct Answer: A

Rationale

Choice A is correct. The equation for the volume of a right circular cone is $V=\frac{1}{3}\pi r^2 h$. It's given that the volume of the right circular cone is $\frac{1}{3}\pi$ cubic feet and the height is 9 feet. Substituting these values for V and h, respectively, gives $\frac{1}{3}\pi=\frac{1}{3}\pi r^2(9)$. Dividing both sides of the equation by $\frac{1}{3}\pi$ gives $1=r^2(9)$. Dividing both sides of the equation by 9 gives $\frac{1}{9}=r^2$. Taking the square root of both sides results in two possible values for the radius, $\sqrt{\left(\frac{1}{9}\right)}$ or $-\sqrt{\left(\frac{1}{9}\right)}$. Since the radius can't have a negative value, that leaves $\sqrt{\left(\frac{1}{9}\right)}$ as the only possibility. Applying the quotient property of square roots, $\sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}}$, results in $r=\frac{\sqrt{1}}{\sqrt{9}}$, or $r=\frac{1}{3}$.

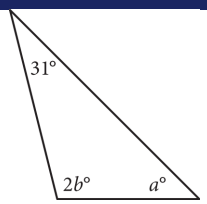
Choices B and C are incorrect and may result from incorrectly evaluating $\sqrt{\left(\frac{1}{9}\right)}$. Choice D is incorrect and may result from solving $r^2=9$ instead of $r^2=\frac{1}{9}$.

Question Difficulty: Hard

Question ID 410bdbe6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 410bdbe6



In the triangle above, $a = 45$. What is the value of b ?

A. 52

B. 59

C. 76

D. 104

ID: 410bdbe6 Answer

Correct Answer: A

Rationale

Choice A is correct. The sum of the measures of the three interior angles of a triangle is 180°. Therefore, $31 + 2b + a = 180$. Since it's given that $a = 45$, it follows that $31 + 2b + 45 = 180$, or $2b = 104$. Dividing both sides of this equation by 2 yields $b = 52$.

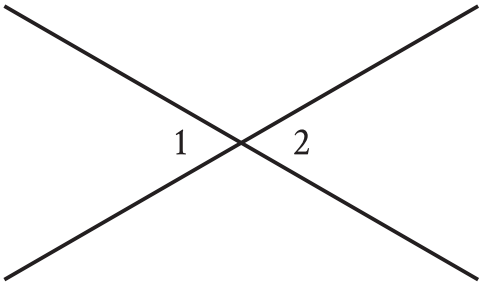
Choice B is incorrect and may result from a calculation error. Choice C is incorrect. This is the value of $a + 31$. Choice D is incorrect. This is the value of $2b$.

Question Difficulty: Easy

Question ID a456f28c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: a456f28c



Note: Figure not drawn to scale.

In the figure, two lines intersect at a point. Angle 1 and angle 2 are vertical angles. The measure of angle 1 is 72°. What is the measure of angle 2?

A. 72°

B. 108°

C. 144°

D. 288°

ID: a456f28c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that angle 1 and angle 2 are vertical angles, and the measure of angle 1 is 72°. Vertical angles have equal measures. Therefore, the measure of angle 2 is 72°.

Choice B is incorrect. This is the measure of an angle that is supplementary, not congruent, to angle 1.

Choice C is incorrect. This is the sum of the measures of angle 1 and angle 2.

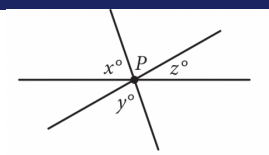
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 087cdcfd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 087cdcfd



Note: Figure not drawn to scale.

In the figure, three lines intersect at point *P*. If $x = 65$ and $y = 75$, what is the value of *z* ?

A. 140

B. 80

C. 40

D. 20

ID: 087cdcfd Answer

Correct Answer: C

Rationale

Choice C is correct. The angle that is shown as lying between the y° angle and the z° angle is a vertical angle with the x° angle. Since vertical angles are congruent and $x = 65$, the angle between the y° angle and the z° angle measures 65°. Since the 65° angle, the y° angle, and the z° angle are adjacent and form a straight angle, it follows that the sum of the measures of these three angles is 180°, which is represented by the equation $65° + y° + z° = 180°$. It's given that y = 75. Substituting 75 for y yields $65° + 75° + z° = 180°$, which can be rewritten as $140° + z° = 180°$. Subtracting 140° from both sides of this equation yields $z° = 40°$. Therefore, $z = 40$.

Choice A is incorrect and may result from finding the value of $x + y$ rather than z. Choices B and D are incorrect and may result from conceptual or computational errors.

Question Difficulty: Easy

Question ID c88183f7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: c88183f7

A rectangle has a length of 13 and a width of 6. What is the perimeter of the rectangle?

A. 12

B. 26

C. 38

D. 52

ID: c88183f7 Answer

Correct Answer: C

Rationale

Choice C is correct. The perimeter of a quadrilateral is the sum of the lengths of its four sides. It's given that the rectangle has a length of 13 and a width of 6. It follows that the rectangle has two sides with length 13 and two sides with length 6. Therefore, the perimeter of the rectangle is $13 + 13 + 6 + 6$, or 38.

Choice A is incorrect. This is the sum of the lengths of the two sides with length 6, not the sum of the lengths of all four sides of the rectangle.

Choice B is incorrect. This is the sum of the lengths of the two sides with length 13, not the sum of the lengths of all four sides of the rectangle.

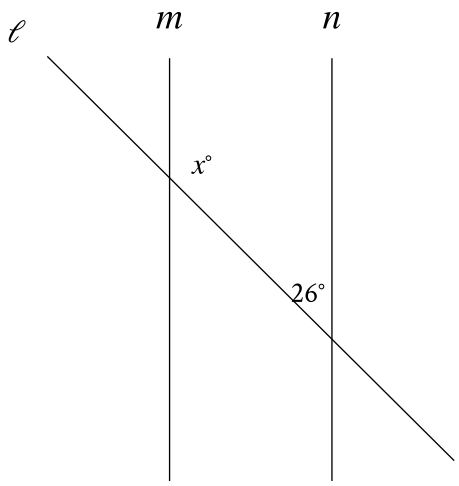
Choice D is incorrect. This is the perimeter of a rectangle that has four sides with length 13, not two sides with length 13 and two sides with length 6.

Question Difficulty: Easy

Question ID afa3c48b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: afa3c48b



Note: Figure not drawn to scale.

In the figure shown, line m is parallel to line n. What is the value of x?

A. 13

B. 26

C. 52

D. 154

ID: afa3c48b Answer

Correct Answer: D

Rationale

Choice D is correct. The sum of consecutive interior angles between two parallel lines and on the same side of the transversal is 180 degrees. Since it's given that line m is parallel to line n, it follows that $x + 26 = 180$. Subtracting 26 from both sides of this equation yields 154. Therefore, the value of x is 154.

Choice A is incorrect. This is half of the given angle measure.

Choice B is incorrect. This is the value of the given angle measure.

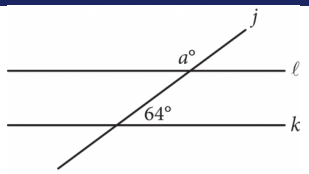
Choice C is incorrect. This is twice the value of the given angle measure.

Question Difficulty: Easy

Question ID 992f4e93

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 992f4e93



Note: Figure not drawn to scale.

In the figure above, lines ℓ and k are parallel.

What is the value of a ?

A. 26

B. 64

C. 116

D. 154

ID: 992f4e93 Answer

Correct Answer: C

Rationale

Choice C is correct. Since lines ℓ and k are parallel, corresponding angles formed by the intersection of line j with lines ℓ and k are congruent. Therefore, the angle with measure a° must be the supplement of the angle with measure 64°. The sum of two supplementary angles is 180°, so a = 180 – 64 = 116.

Choice A is incorrect and likely results from thinking the angle with measure a° is the complement of the angle with measure 64°. Choice B is incorrect and likely results from thinking the angle with measure a° is congruent to the angle with measure 64°. Choice D is incorrect and likely results from a conceptual or computational error.

Question Difficulty: Easy

Question ID f1747a6a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: f1747a6a

In triangle ABC, the measure of angle B is 52° and the measure of angle C is 17°. What is the measure of angle A?

A. 21°

B. 35°

C. 69°

D. 111°

ID: f1747a6a Answer

Correct Answer: D

Rationale

Choice D is correct. The sum of the angle measures of a triangle is 180°. Adding the measures of angles B and C gives $52 + 17 = 69^\circ$. Therefore, the measure of angle A is $180 - 69 = 111^\circ$.

Choice A is incorrect and may result from subtracting the sum of the measures of angles B and C from 90°, instead of from 180°.

Choice B is incorrect and may result from subtracting the measure of angle C from the measure of angle B.

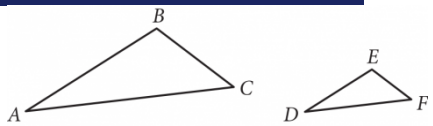
Choice C is incorrect and may result from adding the measures of angles B and C but not subtracting the result from 180°.

Question Difficulty: Easy

Question ID 1c3d613c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 1c3d613c



Note: Figures not drawn to scale.

Triangle *ABC* and triangle *DEF* are shown. The relationship between the side lengths of the two triangles is such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = 3$. If the measure of angle *BAC* is 20°, what is the measure, in degrees, of angle *EDF*? (Disregard the degree symbol when gridding your answer.)

ID: 1c3d613c Answer

Rationale

The correct answer is 20. By the equality given, the three pairs of corresponding sides of the two triangles are in the same proportion. By the side-side-side (SSS) similarity theorem, triangle ABC is similar to triangle DEF. In similar triangles, the measures of corresponding angles are congruent. Since angle BAC corresponds to angle EDF, these two angles are congruent and their measures are equal. It's given that the measure of angle BAC is 20°, so the measure of angle EDF is also 20°.

Question Difficulty: Medium

Question ID 08b7a3f5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 08b7a3f5

A triangular prism has a height of 8 centimeters (cm) and a volume of $216\ \text{cm}^3$. What is the area, in cm^2, of the base of the prism? (The volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism.)

ID: 08b7a3f5 Answer

Correct Answer: 27

Rationale

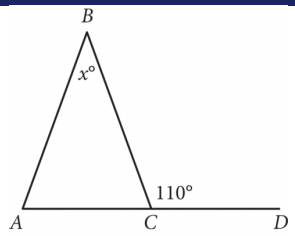
The correct answer is 27. It's given that a triangular prism has a volume of 216 cubic centimeters (cm^3) and the volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism. Therefore, $216 = Bh$. It's also given that the triangular prism has a height of $8\ \text{cm}$. Therefore, $h = 8$. Substituting 8 for h in the equation $216 = Bh$ yields $216 = B(8)$. Dividing both sides of this equation by 8 yields $27 = B$. Therefore, the area, in cm^2, of the base of the prism is 27.

Question Difficulty: Medium

Question ID 5733ce30

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 5733ce30



In the given figure, $\overline{AC}$ extends to point *D*. If the measure of $\angle BAC$ is equal to the measure of $\angle BCA$, what is the value of *x* ?

A. 110

B. 70

C. 55

D. 40

ID: 5733ce30 Answer

Correct Answer: D

Rationale

Choice D is correct. Since $\angle BCD$ and $\angle BCA$ form a linear pair of angles, their measures sum to 180°. It's given that the measure of $\angle BCD$ is 110°. Therefore, $110° + \angle BCA = 180°$. Subtracting 110° from both sides of this equation gives the measure of $\angle BCA$ as 70°. It's also given that the measure of $\angle BAC$ is equal to the measure of $\angle BCA$. Thus, the measure of $\angle BAC$ is also 70°. The measures of the interior angles of a triangle sum to 180°. Thus, $70° + 70° + x° = 180°$. Combining like terms on the left-hand side of this equation yields $140° + x° = 180°$. Subtracting 140° from both sides of this equation yields $x° = 40°$, or $x = 40$.

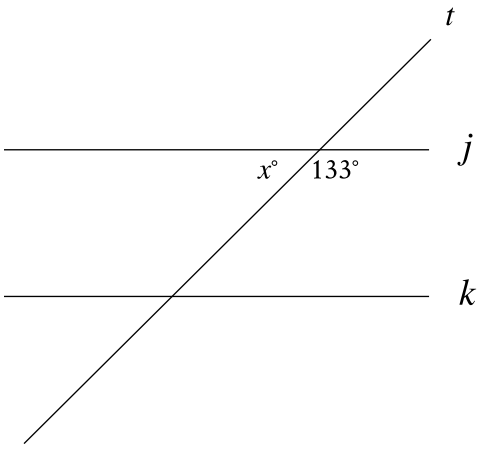
Choice A is incorrect. This is the value of the measure of $\angle BCD$. Choice B is incorrect. This is the value of the measure of each of the other two interior angles, $\angle BCA$ and $\angle BAC$. Choice C is incorrect and may result from an error made when identifying the relationship between the exterior angle of a triangle and the interior angles of the triangle.

Question Difficulty: Easy

Question ID 3b4b5b1e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 3b4b5b1e



Note: Figure not drawn to scale.

In the figure, line j is parallel to line k. What is the value of x?

ID: 3b4b5b1e Answer

Correct Answer: 47

Rationale

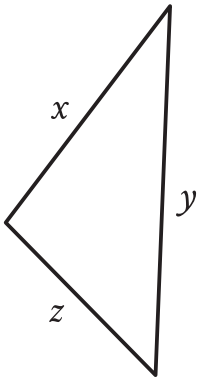
The correct answer is 47. Based on the figure, the angle with measure x° and the angle with measure 133° together form a straight line. Therefore, these two angles are supplementary, so the sum of their measures is 180°. It follows that $x + 133 = 180$. Subtracting 133 from both sides of this equation yields $x = 47$.

Question Difficulty: Easy

Question ID 29e9b28c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 29e9b28c



Note: Figure not drawn to scale.

The triangle shown has a perimeter of 22 units. If $x = 9$ units and $y = 7$ units, what is the value of z, in units?

A. 6

B. 7

C. 9

D. 16

ID: 29e9b28c Answer

Correct Answer: A

Rationale

Choice A is correct. The perimeter of a triangle is the sum of the lengths of its three sides. The triangle shown has side lengths x, y, and z. It's given that the triangle has a perimeter of 22 units. Therefore, $x + y + z = 22$. If $x = 9$ units and $y = 7$ units, the value of z, in units, can be found by substituting 9 for x and 7 for y in the equation $x + y + z = 22$, which yields $9 + 7 + z = 22$, or $16 + z = 22$. Subtracting 16 from both sides of this equation yields $z = 6$. Therefore, if $x = 9$ units and $y = 7$ units, the value of z, in units, is 6.

Choice B is incorrect. This is the value of y, in units, not the value of z, in units.

Choice C is incorrect. This is the value of x, in units, not the value of z, in units.

Choice D is incorrect. This is the value of $x + y$, in units, not the value of z, in units.

Question Difficulty: Easy

Question ID 5b4757df

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 5b4757df

In triangle RST, angle T is a right angle, point L lies on $\overline{RS}$, point K lies on $\overline{ST}$, and $\overline{LK}$ is parallel to $\overline{RT}$. If the length of $\overline{RT}$ is 72 units, the length of $\overline{LK}$ is 24 units, and the area of triangle RST is 792 square units, what is the length of $\overline{KT}$, in units?

ID: 5b4757df Answer

Correct Answer: 14.66, 14.67, 44/3

Rationale

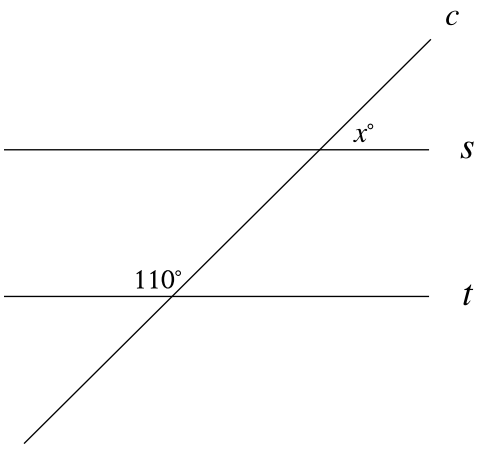
The correct answer is $\frac{44}{3}$. It's given that in triangle RST, angle T is a right angle. The area of a right triangle can be found using the formula $A = \frac{1}{2}\ell_1\ell_2$, where A represents the area of the right triangle, ℓ_1 represents the length of one leg of the triangle, and ℓ_2 represents the length of the other leg of the triangle. In triangle RST, the two legs are $\overline{RT}$ and $\overline{ST}$. Therefore, if the length of $\overline{RT}$ is 72 and the area of triangle RST is 792, then $792 = \frac{1}{2}(72)(ST)$, or $792 = (36)(ST)$. Dividing both sides of this equation by 36 yields $22 = ST$. Therefore, the length of $\overline{ST}$ is 22. It's also given that point L lies on $\overline{RS}$, point K lies on $\overline{ST}$, and $\overline{LK}$ is parallel to $\overline{RT}$. It follows that angle LKS is a right angle. Since triangles RST and LSK share angle S and have right angles T and K, respectively, triangles RST and LSK are similar triangles. Therefore, the ratio of the length of $\overline{RT}$ to the length of $\overline{LK}$ is equal to the ratio of the length of $\overline{ST}$ to the length of $\overline{SK}$. If the length of $\overline{RT}$ is 72 and the length of $\overline{LK}$ is 24, it follows that the ratio of the length of $\overline{RT}$ to the length of $\overline{LK}$ is $\frac{72}{24}$, or 3, so the ratio of the length of $\overline{ST}$ to the length of $\overline{SK}$ is 3. Therefore, $\frac{22}{SK} = 3$. Multiplying both sides of this equation by SK yields $22 = (3)(SK)$. Dividing both sides of this equation by 3 yields $\frac{22}{3} = SK$. Since the length of $\overline{ST}$, 22, is the sum of the length of $\overline{SK}$, $\frac{22}{3}$, and the length of $\overline{KT}$, it follows that the length of $\overline{KT}$ is $22 - \frac{22}{3}$, or $\frac{44}{3}$. Note that 44/3, 14.66, and 14.67 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID cf0d3050

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: cf0d3050



Note: Figure not drawn to scale.

In the figure shown, line c intersects parallel lines s and t. What is the value of x?

ID: cf0d3050 Answer

Correct Answer: 70

Rationale

The correct answer is 70. Based on the figure, the angle with measure 110° and the angle vertical to the angle with measure x° are same side interior angles. Since vertical angles are congruent, the angle vertical to the angle with measure x° also has measure x°. It's given that lines s and t are parallel. Therefore, same side interior angles between lines s and t are supplementary. It follows that $x + 110 = 180$. Subtracting 110 from both sides of this equation yields $x = 70$.

Question Difficulty: Easy

Question ID 0bb39de4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 0bb39de4

Triangles ABC and DEF are congruent, where A corresponds to D, and B and E are right angles. The measure of angle A is 18°. What is the measure of angle F?

A. 18°

B. 72°

C. 90°

D. 162°

ID: 0bb39de4 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that triangle ABC is congruent to triangle DEF. Corresponding angles of congruent triangles are congruent and, therefore, have equal measure. It's given that angle A corresponds to angle D, and that the measure of angle A is 18°. It's also given that the measures of angles B and E are 90°. Since these angles have equal measure, they are corresponding angles. It follows that angle C corresponds to angle F. Let x° represent the measure of angle C. Since the sum of the measures of the interior angles of a triangle is 180°, it follows that $18^\circ + 90^\circ + x^\circ = 180^\circ$, or $108^\circ + x^\circ = 180^\circ$. Subtracting 108° from both sides of this equation yields $x^\circ = 72^\circ$. Therefore, the measure of angle C is 72°. Since angle C corresponds to angle F, it follows that the measure of angle F is also 72°.

Choice A is incorrect. This is the measure of angle D, not the measure of angle F.

Choice C is incorrect. This is the measure of angle E, not the measure of angle F.

Choice D is incorrect. This is the sum of the measures of angles E and F, not the measure of angle F.

Question Difficulty: Easy

Question ID 3453aafc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 3453aafc

What is the area, in square centimeters, of a rectangle with a length of 36 centimeters and a width of 34 centimeters?

A. 70

B. 140

C. $1{,}156$

D. $1{,}224$

ID: 3453aafc Answer

Correct Answer: D

Rationale

Choice D is correct. The area A, in square centimeters, of a rectangle can be found using the formula $A = \ell w$, where ℓ is the length, in centimeters, of the rectangle and w is its width, in centimeters. It's given that the rectangle has a length of 36 centimeters and a width of 34 centimeters. Substituting 36 for ℓ and 34 for w in the formula $A = \ell w$ yields $A = 36(34)$, or $A = 1{,}224$. Therefore, the area, in square centimeters, of this rectangle is $1{,}224$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the perimeter, in centimeters, not the area, in square centimeters, of the rectangle.

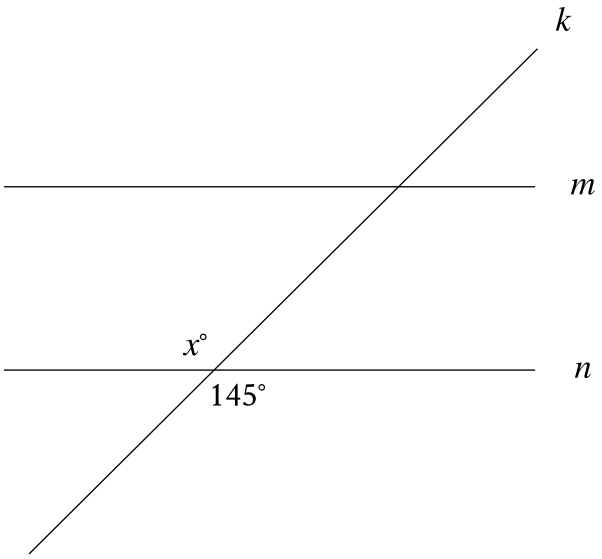
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 43236565

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 43236565



Note: Figure not drawn to scale.

In the figure, line m is parallel to line n, and line k intersects both lines. Which of the following statements is true?

A. The value of x is less than 145.

B. The value of x is greater than 145.

C. The value of x is equal to 145.

D. The value of x cannot be determined.

ID: 43236565 Answer

Correct Answer: C

Rationale

Choice C is correct. Vertical angles, or angles that are opposite each other when two lines intersect, are congruent. It's given that line k intersects line n. Based on the figure, the angle with measure x° and the angle with measure 145° are vertical angles. Therefore, the value of x is equal to 145.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID f243c383

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: f243c383

Two identical rectangular prisms each have a height of 90 centimeters (cm). The base of each prism is a square, and the surface area of each prism is $K\ \text{cm}^2$. If the prisms are glued together along a square base, the resulting prism has a surface area of $\frac{92}{47}K\ \text{cm}^2$. What is the side length, in cm, of each square base?

A. 4

B. 8

C. 9

D. 16

ID: f243c383 Answer

Correct Answer: B

Rationale

Choice B is correct. Let x represent the side length, in cm, of each square base. If the two prisms are glued together along a square base, the resulting prism has a surface area equal to twice the surface area of one of the prisms, minus the area of the two square bases that are being glued together, which yields $2K - 2x^2\ \text{cm}^2$. It's given that this resulting surface area is equal to $\frac{92}{47}K\ \text{cm}^2$, so $2K - 2x^2 = \frac{92}{47}K$. Subtracting $\frac{92}{47}K$ from both sides of this equation yields $2K - \frac{92}{47}K - 2x^2 = 0$. This equation can be rewritten by multiplying $2K$ on the left-hand side by $\frac{47}{47}$, which yields $\frac{94}{47}K - \frac{92}{47}K - 2x^2 = 0$, or $\frac{2}{47}K - 2x^2 = 0$. Adding $2x^2$ to both sides of this equation yields $\frac{2}{47}K = 2x^2$. Multiplying both sides of this equation by $\frac{47}{2}$ yields $K = 47x^2$. The surface area K, in cm^2, of each rectangular prism is equivalent to the sum of the areas of the two square bases and the areas of the four lateral faces. Since the height of each rectangular prism is $90\ \text{cm}$ and the side length of each square base is $x\ \text{cm}$, it follows that the area of each square base is $x^2\ \text{cm}^2$ and the area of each lateral face is $90x\ \text{cm}^2$. Therefore, the surface area of each rectangular prism can be represented by the expression $2x^2 + 4(90x)$, or $2x^2 + 360x$. Substituting this expression for K in the equation $K = 47x^2$ yields $2x^2 + 360x = 47x^2$. Subtracting $2x^2$ and $360x$ from both sides of this equation yields $0 = 45x^2 - 360x$. Factoring x from the right-hand side of this equation yields $0 = x(45x - 360)$. Applying the zero product property, it follows that $x = 0$ and $45x - 360 = 0$. Adding 360 to both sides of the equation $45x - 360 = 0$ yields $45x = 360$. Dividing both sides of this equation by 45 yields $x = 8$. Since a side length of a rectangular prism can't be 0, the length of each square base is $8\ \text{cm}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

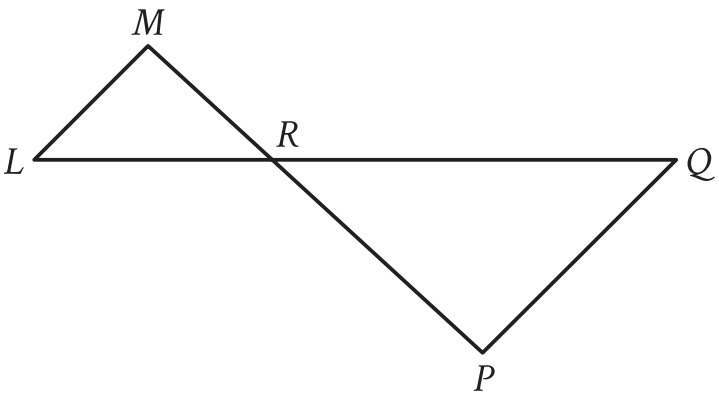
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID adae6543

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: adae6543



Note: Figure not drawn to scale.

In the figure, $\overline{LQ}$ intersects $\overline{MP}$ at point R, and $\overline{LM}$ is parallel to $\overline{PQ}$. The lengths of $\overline{MR}$, $\overline{LR}$, and $\overline{RP}$ are 6, 7, and 11, respectively. What is the length of $\overline{LQ}$?

A. $\frac{119}{11}$

B. $\frac{77}{6}$

C. $\frac{113}{6}$

D. $\frac{119}{6}$

ID: adae6543 Answer

Correct Answer: D

Rationale

Choice D is correct. The figure shows that angle MRL and angle PRQ are vertical angles. Since vertical angles are congruent, angle MRL and angle PRQ are congruent. It's given that $\overline{LM}$ is parallel to $\overline{PQ}$. The figure also shows that $\overline{LQ}$ intersects $\overline{LM}$ and $\overline{PQ}$. If two parallel segments are intersected by a third segment, alternate interior angles are congruent. Thus, alternate interior angles MLR and PQR are congruent. Since triangles LMR and PQR have two pairs of congruent angles, the triangles are similar. Sides LR and MR in triangle LMR correspond to sides RQ and RP, respectively, in triangle PQR. Since the lengths of corresponding sides in similar triangles are proportional, it follows that $\frac{RQ}{LR} = \frac{RP}{MR}$. It's given that the lengths of $\overline{MR}$, $\overline{LR}$, and $\overline{RP}$ are 6, 7, and 11, respectively. Substituting 6 for MR, 7 for LR, and 11 for RP in the equation $\frac{RQ}{LR} = \frac{RP}{MR}$ yields $\frac{RQ}{7} = \frac{11}{6}$. Multiplying each side of this equation by 7 yields $RQ = \left(\frac{11}{6}\right)(7)$, or $RQ = \frac{77}{6}$. It's given that $\overline{LQ}$ intersects $\overline{MP}$ at point R, so $LQ = LR + RQ$. Substituting 7 for LR and $\frac{77}{6}$ for RQ in this equation yields $LQ = 7 + \frac{77}{6}$, or $LQ = \frac{119}{6}$. Therefore, the length of $\overline{LQ}$ is $\frac{119}{6}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the length of $\overline{RQ}$, not $\overline{LQ}$.

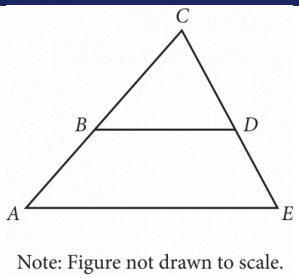
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6dd463ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 6dd463ca



Note: Figure not drawn to scale.

In the figure above, segments *AE* and *BD* are parallel. If angle *BDC* measures 58° and angle *ACE* measures 62°, what is the measure of angle *CAE* ?

A. 58°

B. 60°

C. 62°

D. 120°

ID: 6dd463ca Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that angle ACE measures $62°$. Since segments AE and BD are parallel, angles BDC and CEA are congruent. Therefore, angle CEA measures $58°$. The sum of the measures of angles ACE, CEA, and CAE is $180°$ since the sum of the interior angles of triangle ACE is equal to $180°$. Let the measure of angle CAE be $x°$. Therefore, $62+58+x=180$, which simplifies to $x=60$. Thus, the measure of angle CAE is $60°$.

Choice A is incorrect. This is the measure of angle AEC, not that of angle CAE. Choice C is incorrect. This is the measure of angle ACE, not that of CAE. Choice D is incorrect. This is the sum of the measures of angles ACE and CEA.

Question Difficulty: Medium

Question ID f731d88b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: f731d88b

In convex pentagon $ABCDE$, segment AB is parallel to segment DE. The measure of angle B is 139 degrees, and the measure of angle D is 174 degrees. What is the measure, in degrees, of angle C?

ID: f731d88b Answer

Correct Answer: 47

Rationale

The correct answer is 47. It's given that the measure of angle B is 139 degrees. Therefore, the exterior angle formed by extending segment AB at point B has measure $180 - 139$, or 41, degrees. It's given that segment AB is parallel to segment DE. Extending segment BC at point C and extending segment DE at point D until the two segments intersect results in a transversal that intersects two parallel line segments. One of these intersection points is point B, and let the other intersection point be point X. Since segment AB is parallel to segment DE, alternate interior angles are congruent. Angle CXD and the exterior angle formed by extending segment AB at point B are alternate interior angles. Therefore, the measure of angle CXD is 41 degrees. It's given that the measure of angle D in pentagon $ABCDE$ is 174 degrees. Therefore, angle CDX has measure $180 - 174$, or 6, degrees. Since angle C in pentagon $ABCDE$ is an exterior angle of triangle CDX, it follows that the measure of angle C is the sum of the measures of angles CDX and CXD. Therefore, the measure, in degrees, of angle C is $6 + 41$, or 47.

Alternate approach: A line can be created that's perpendicular to segments AB and DE and passes through point C. Extending segments AB and DE at points B and D, respectively, until they intersect this line yields two right triangles. Let these intersection points be point X and point Y, and the two right triangles be triangle BXC and triangle DYC. It's given that the measure of angle B is 139 degrees. Therefore, angle CBX has measure $180 - 139$, or 41, degrees. Since the measure of angle CBX is 41 degrees and the measure of angle BXC is 90 degrees, it follows that the measure of angle XCB is $180 - 90 - 41$, or 49, degrees. It's given that the measure of angle D is 174 degrees. Therefore, angle YDC has measure $180 - 174$, or 6, degrees. Since the measure of angle YDC is 6 degrees and the measure of angle CYD is 90 degrees, it follows that the measure of angle DCY is $180 - 90 - 6$, or 84, degrees. Since angles XCB, DCY, and angle C in pentagon $ABCDE$ form segment XY, it follows that the sum of the measures of those angles is 180 degrees. Therefore, the measure, in degrees, of angle C is $180 - 49 - 84$, or 47.

Question Difficulty: Hard

Question ID 93de3f84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 93de3f84

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A. 11

B. 22

C. 44

D. 66

ID: 93de3f84 Answer

Correct Answer: C

Rationale

Choice C is correct. The volume of right circular cylinder A is given by the expression $\pi r^2 h$, where r is the radius of its circular base and h is its height. The volume of a cylinder with twice the radius and half the height of cylinder A is given by $\pi(2r)^2\left(\frac{1}{2}\right)h$, which is equivalent to $4\pi r^2\left(\frac{1}{2}\right)h = 2\pi r^2 h$. Therefore, the volume is twice the volume of cylinder A, or $2 \times 22 = 44$.

Choice A is incorrect and likely results from not multiplying the radius of cylinder A by 2. Choice B is incorrect and likely results from not squaring the 2 in 2r when applying the volume formula. Choice D is incorrect and likely results from a conceptual error.

Question Difficulty: Hard

Question ID f60bb551

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: f60bb551

The area of a rectangle is 630 square inches. The length of the rectangle is 70 inches. What is the width, in inches, of this rectangle?

A. 9

B. 70

C. 315

D. 560

ID: f60bb551 Answer

Correct Answer: A

Rationale

Choice A is correct. The area A, in square inches, of a rectangle is the product of its length ℓ, in inches, and its width w, in inches; thus, $A = \ell w$. It's given that the area of a rectangle is 630 square inches and the length of the rectangle is 70 inches. Substituting 630 for A and 70 for ℓ in the equation $A = \ell w$ yields $630 = 70w$. Dividing both sides of this equation by 70 yields $9 = w$. Therefore, the width, in inches, of this rectangle is 9.

Choice B is incorrect. This is the length, not the width, in inches, of the rectangle.

Choice C is incorrect. This is half the area, in square inches, not the width, in inches, of the rectangle.

Choice D is incorrect. This is the difference between the area, in square inches, and the length, in inches, of the rectangle, not the width, in inches, of the rectangle.

Question Difficulty: Easy

Question ID d2047497

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: d2047497

What is the area of a rectangle with a length of 17 centimeters (cm) and a width of 7 cm?

A. $24\ \text{cm}^2$

B. $48\ \text{cm}^2$

C. $119\ \text{cm}^2$

D. $576\ \text{cm}^2$

ID: d2047497 Answer

Correct Answer: C

Rationale

Choice C is correct. The area of a rectangle with length l and width w can be found using the formula $A = lw$. It's given that the rectangle has a length of 17 cm and a width of 7 cm. Therefore, the area of this rectangle is $A = 17(7)$, or $119\ \text{cm}^2$.

Choice A is incorrect. This is the sum of the length and width of the rectangle, not the area.

Choice B is incorrect. This is the perimeter of the rectangle, not the area.

Choice D is incorrect. This is the sum of the length and width of the rectangle squared, not the area.

Question Difficulty: Easy

Question ID 4efea6a3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 4efea6a3

The area of a rectangle is 57 square inches. The length of the longest side of the rectangle is 19 inches. What is the length, in inches, of the shortest side of this rectangle?

ID: 4efea6a3 Answer

Correct Answer: 3

Rationale

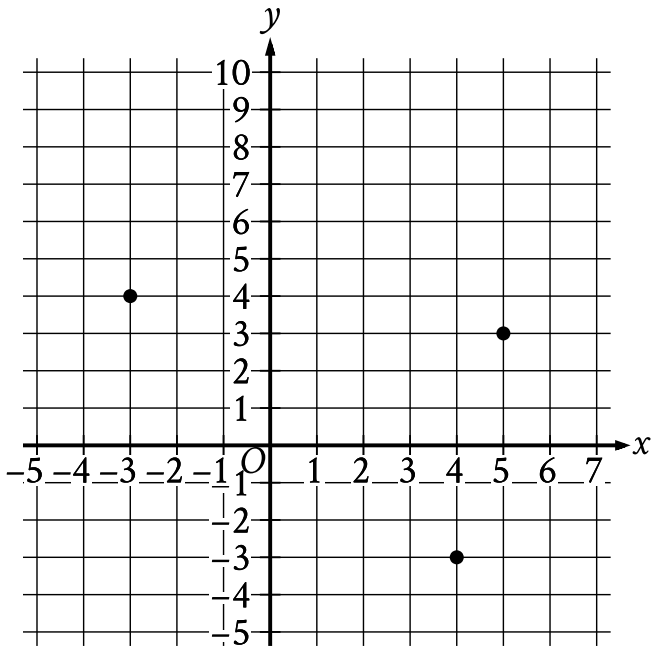
The correct answer is 3. The area of a rectangle can be calculated by multiplying the length of its longest side by the length of its shortest side. It's given that the area of the rectangle is 57 square inches and the length of the longest side of the rectangle is 19 inches. Let x represent the length, in inches, of the shortest side of this rectangle. It follows that $57 = 19x$. Dividing both sides of this equation by 19 yields $3 = x$. Therefore, the length, in inches, of the shortest side of the rectangle is 3.

Question Difficulty: Easy

Question ID eb70d2d0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: eb70d2d0



What is the area, in square units, of the triangle formed by connecting the three points shown?

ID: eb70d2d0 Answer

Correct Answer: 24.5, 49/2

Rationale

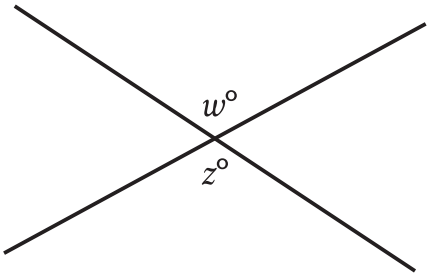
The correct answer is 24.5. It's given that a triangle is formed by connecting the three points shown, which are $(-3, 4)$, $(5, 3)$, and $(4, -3)$. Let this triangle be triangle A. The area of triangle A can be found by calculating the area of the rectangle that circumscribes it and subtracting the areas of the three triangles that are inside the rectangle but outside triangle A. The rectangle formed by the points $(-3, 4)$, $(5, 4)$, $(5, -3)$, and $(-3, -3)$ circumscribes triangle A. The width, in units, of this rectangle can be found by calculating the distance between the points $(5, 4)$ and $(5, -3)$. This distance is $4 - (-3)$, or 7. The length, in units, of this rectangle can be found by calculating the distance between the points $(5, 4)$ and $(-3, 4)$. This distance is $5 - (-3)$, or 8. It follows that the area, in square units, of the rectangle is $(7)(8)$, or 56. One of the triangles that lies inside the rectangle but outside triangle A is formed by the points $(-3, 4)$, $(5, 4)$, and $(5, 3)$. The length, in units, of a base of this triangle can be found by calculating the distance between the points $(5, 4)$ and $(5, 3)$. This distance is $4 - 3$, or 1. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(5, 4)$ and $(-3, 4)$. This distance is $5 - (-3)$, or 8. It follows that the area, in square units, of this triangle is $\frac{1}{2}(8)(1)$, or 4. A second triangle that lies inside the rectangle but outside triangle A is formed by the points $(4, -3)$, $(5, 3)$, and $(5, -3)$. The length, in units, of a base of this triangle can be found by calculating the distance between the points $(5, 3)$ and $(5, -3)$. This distance is $3 - (-3)$, or 6. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(5, -3)$ and $(4, -3)$. This distance is $5 - 4$, or 1. It follows that the area, in square units, of this triangle is $\frac{1}{2}(1)(6)$, or 3. The third triangle that lies inside the rectangle but outside triangle A is formed by the points $(-3, 4)$, $(-3, -3)$, and $(4, -3)$. The length, in units, of a base of this triangle can be found by calculating the distance between the points $(4, -3)$ and $(-3, -3)$. This distance is $4 - (-3)$, or 7. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(-3, 4)$ and $(-3, -3)$. This distance is $4 - (-3)$, or 7. It follows that the area, in square units, of this triangle is $\frac{1}{2}(7)(7)$, or 24.5. Thus, the area, in square units, of the triangle formed by connecting the three points shown is $56 - 4 - 3 - 24.5$, or 24.5. Note that 24.5 and 49/2 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 64d1f49f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 64d1f49f



Note: Figure not drawn to scale.

In the figure, two lines intersect at a point. If $w = 136$, what is the value of z?

A. 36

B. 44

C. 68

D. 136

ID: 64d1f49f Answer

Correct Answer: D

Rationale

Choice D is correct. In the figure shown, the angles with measures w° and z° are vertical angles. Since vertical angles are congruent, $w = z$. Therefore, if $w = 136$, the value of z is 136.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the measure, in degrees, of an angle that's supplementary, not congruent, to the angle with measure w°.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID f329442c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: f329442c

Circle A has a radius of $3n$ and circle B has a radius of $129n$, where n is a positive constant. The area of circle B is how many times the area of circle A?

A. 43

B. 86

C. 129

D. $1{,}849$

ID: f329442c Answer

Correct Answer: D

Rationale

Choice D is correct. The area of a circle can be found by using the formula $A = \pi r^2$, where A is the area and r is the radius of the circle. It's given that the radius of circle *A* is $3n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(3n)^2$, or $9\pi n^2$. It's also given that the radius of circle *B* is $129n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(129n)^2$, or $16{,}641\pi n^2$. Dividing the area of circle *B* by the area of circle *A* gives $\frac{16{,}641\pi n^2}{9\pi n^2}$, which simplifies to $1{,}849$. Therefore, the area of circle *B* is $1{,}849$ times the area of circle *A*.

Choice A is incorrect. This is how many times greater the radius of circle *B* is than the radius of circle *A*.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the coefficient on the term that describes the radius of circle *B*.

Question Difficulty: Hard

Question ID f39f88b7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: f39f88b7

A triangle has a base length of 40 centimeters and a height of 90 centimeters. What is the area, in square centimeters, of the triangle?

ID: f39f88b7 Answer

Correct Answer: 1800

Rationale

The correct answer is $1{,}800$. The area, A, of a triangle can be found using the formula $A = \frac{1}{2}bh$, where b is the base length of the triangle and h is the height of the triangle. It's given that the triangle has a base length of 40 centimeters and a height of 90 centimeters. Substituting 40 for b and 90 for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(40)(90)$, or $A = 1{,}800$. Therefore, the area, in square centimeters, of the triangle is $1{,}800$.

Question Difficulty: Easy

Question ID ae33e0a1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: ae33e0a1

A right circular cylinder has a base diameter of 22 centimeters and a height of 6 centimeters. What is the volume, in cubic centimeters, of the cylinder?

A. 132π

B. 264π

C. 726π

D. $2{,}904\pi$

ID: ae33e0a1 Answer

Correct Answer: C

Rationale

Choice C is correct. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. It's given that a right circular cylinder has a height of 6 centimeters. Therefore, $h = 6$. It's also given that the cylinder has a base diameter of 22 centimeters. The radius of a circle is half the diameter of the circle. Since the base of a right circular cylinder is a circle, it follows that the radius of the base of the right circular cylinder is $\frac{22}{2}$, or 11, centimeters. Therefore, $r = 11$. Substituting 11 for r and 6 for h in the formula $V = \pi r^2 h$ yields $V = \pi(11)^2(6)$, which is equivalent to $V = \pi(121)(6)$, or $V = 726\pi$. Therefore, the volume, in cubic centimeters, of the cylinder is 726π.

Choice A is incorrect. This is the volume of a right circular cylinder that has a base diameter of $2\sqrt{22}$, not 22, centimeters and a height of 6 centimeters.

Choice B is incorrect. This is the volume of a right circular cylinder that has a base diameter of $4\sqrt{11}$, not 22, centimeters and a height of 6 centimeters.

Choice D is incorrect. This is the volume of a right circular cylinder that has a base diameter of 44, not 22, centimeters and a height of 6 centimeters.

Question Difficulty: Medium

Question ID 76670c80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 76670c80

Each side of a square has a length of 45. What is the perimeter of this square?

ID: 76670c80 Answer

Correct Answer: 180

Rationale

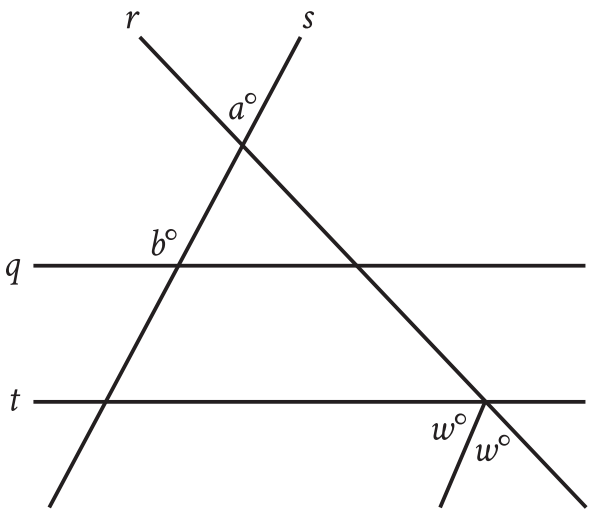
The correct answer is 180. The perimeter of a polygon is equal to the sum of the lengths of the sides of the polygon. It's given that each side of the square has a length of 45. Since a square is a polygon with 4 sides, the perimeter of this square is $45 + 45 + 45 + 45$, or 180.

Question Difficulty: Easy

Question ID 17912810

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 17912810



Note: Figure not drawn to scale.

In the figure, parallel lines q and t are intersected by lines r and s. If $a = 43$ and $b = 122$, what is the value of w?

ID: 17912810 Answer

Correct Answer: 101/2, 50.5

Rationale

The correct answer is $\frac{101}{2}$. In the figure, lines q, r, and s form a triangle. One interior angle of this triangle is vertical to the angle marked a°; therefore, the interior angle also has measure a°. It's given that $a = 43$. Therefore, the interior angle of the triangle has measure 43°. A second interior angle of the triangle forms a straight line, q, with the angle marked b°. Therefore, the sum of the measures of these two angles is 180°. It's given that $b = 122$. Therefore, the angle marked b° has measure 122° and the second interior angle of the triangle has measure $(180 - 122)^\circ$, or 58°. The sum of the interior angles of a triangle is 180°. Therefore, the measure of the third interior angle of the triangle is $(180 - 43 - 58)^\circ$, or 79°. It's given that parallel lines q and t are intersected by line r. It follows that the triangle's interior angle with measure 79° is congruent to the same side interior angle between lines q and t formed by lines t and r. Since this angle is supplementary to the two angles marked w°, the sum of 79°, w°, and w° is 180°. It follows that $79 + w + w = 180$, or $79 + 2w = 180$. Subtracting 79 from both sides of this equation yields $2w = 101$. Dividing both sides of this equation by 2 yields $w = \frac{101}{2}$. Note that 101/2 and 50.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 4420e500

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 4420e500

What is the area of a rectangle with a length of 4 centimeters (cm) and a width of 2 cm?

A. $6\ \text{cm}^2$

B. $8\ \text{cm}^2$

C. $12\ \text{cm}^2$

D. $36\ \text{cm}^2$

ID: 4420e500 Answer

Correct Answer: B

Rationale

Choice B is correct. The area of a rectangle with length ℓ and width w can be found using the formula $A = \ell w$. It's given that the rectangle has a length of 4 cm and a width of 2 cm. Therefore, the area of this rectangle is $(4\ \text{cm})(2\ \text{cm})$, or $8\ \text{cm}^2$.

Choice A is incorrect. This is the sum, in cm, of the length and width of the rectangle, not the area, in cm^2.

Choice C is incorrect. This is the perimeter, in cm, of the rectangle, not the area, in cm^2.

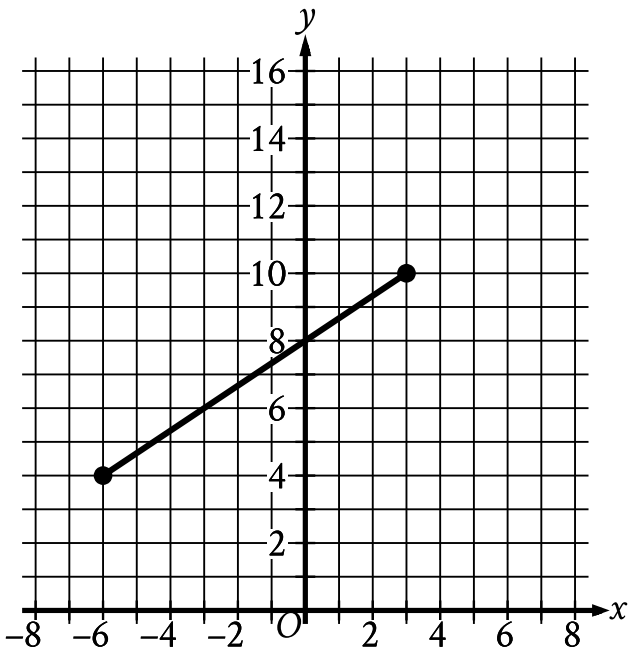
Choice D is incorrect. This is the sum of the length and width of the rectangle squared, not the area.

Question Difficulty: Easy

Question ID 099526fc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 099526fc



The line segment shown in the *xy*-plane represents one of the legs of a right triangle. The area of this triangle is $36\sqrt{13}$ square units. What is the length, in units, of the other leg of this triangle?

A. 12

B. 24

C. $3\sqrt{13}$

D. $18\sqrt{13}$

ID: 099526fc Answer

Correct Answer: B

Rationale

Choice B is correct. The length of a segment in the *xy*-plane can be found using the distance formula, $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, where (x_1, y_1) and (x_2, y_2) are the endpoints of the segment. The segment shown has endpoints at $(-6, 4)$ and $(3, 10)$. Substituting $(-6, 4)$ and $(3, 10)$ for (x_1, y_1) and (x_2, y_2), respectively, in the distance formula yields $\sqrt{(3 - (-6))^2 + (10 - 4)^2}$, or $\sqrt{9^2 + 6^2}$, which is equivalent to $\sqrt{81 + 36}$, or $\sqrt{117}$. Let x represent the length, in units, of the other leg of this triangle. The area, A, of a right triangle can be calculated using the formula $A = \frac{1}{2}bh$, where b and h are the lengths of the legs of the triangle. It's given that the area of the triangle is $36\sqrt{13}$ square units. Substituting $36\sqrt{13}$ for A, $\sqrt{117}$ for b, and x for h in the formula $A = \frac{1}{2}bh$ yields $36\sqrt{13} = \frac{1}{2}\left(\sqrt{117}\right)(x)$. Multiplying both sides of this equation by 2 yields $72\sqrt{13} = x\sqrt{117}$. Dividing both sides of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{13}}{\sqrt{117}} = x$. Multiplying the numerator and denominator on the left-hand side of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{1{,}521}}{117} = x$, or $\frac{72(39)}{117} = x$, which is equivalent to $\frac{2{,}808}{117} = x$, or $24 = x$. Therefore, the length, in units, of the other leg of this triangle is 24.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. $3\sqrt{13}$ is equivalent to $\sqrt{117}$, which is the length, in units, of the line segment shown in the *xy*-plane, not the length, in units, of the other leg of the triangle.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 165c30c4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 165c30c4

A rectangle has a length of 64 inches and a width of 32 inches. What is the area, in square inches, of the rectangle?

ID: 165c30c4 Answer

Correct Answer: 2048

Rationale

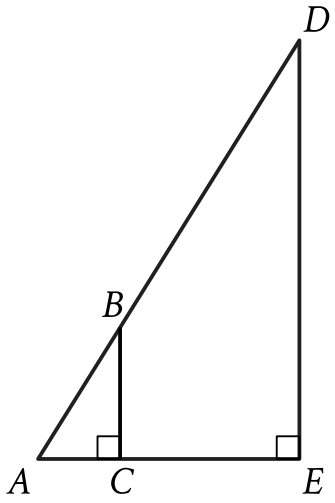
The correct answer is $2{,}048$. The area A, in square inches, of a rectangle is equal to the product of its length ℓ, in inches, and its width w, in inches, or $A = \ell w$. It's given that the rectangle has a length of 64 inches and a width of 32 inches. Substituting 64 for ℓ and 32 for w in the equation $A = \ell w$ yields $A = (64)(32)$, or $A = 2{,}048$. Therefore, the area, in square inches, of the rectangle is $2{,}048$.

Question Difficulty: Easy

Question ID 694b7fce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 694b7fce



Note: Figure not drawn to scale.

In the figure shown, $AB = \sqrt{34}$ units, $AC = 3$ units, and $CE = 21$ units. What is the area, in square units, of triangle ADE?

ID: 694b7fce Answer

Correct Answer: 480

Rationale

The correct answer is 480. It's given in the figure that angle ACB and angle AED are right angles. It follows that angle ACB is congruent to angle AED. It's also given that angle BAC and angle DAE are the same angle. It follows that angle BAC is congruent to angle DAE. Since triangles ABC and ADE have two pairs of congruent angles, the triangles are similar. Sides AB and AC in triangle ABC correspond to sides AD and AE, respectively, in triangle ADE. Corresponding sides in similar triangles are proportional. Therefore, $\frac{AD}{AB} = \frac{AE}{AC}$. It's given that $AC = 3$ units and $CE = 21$ units. Therefore, $AE = 24$ units. It's also given that $AB = \sqrt{34}$ units. Substituting 3 for AC, 24 for AE, and $\sqrt{34}$ for AB in the equation $\frac{AD}{AB} = \frac{AE}{AC}$ yields $\frac{AD}{\sqrt{34}} = \frac{24}{3}$, or $\frac{AD}{\sqrt{34}} = 8$. Multiplying each side of this equation by $\sqrt{34}$ yields $AD = 8\sqrt{34}$. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2 + b^2 = c^2$. Since triangle ADE is a right triangle, it follows that AD represents the length of the hypotenuse, c, and DE and AE represent the lengths of the legs, a and b. Substituting 24 for b and $8\sqrt{34}$ for c in the equation $a^2 + b^2 = c^2$ yields $a^2 + (24)^2 = \left(8\sqrt{34}\right)^2$, which is equivalent to $a^2 + 576 = 64(34)$, or $a^2 + 576 = 2{,}176$. Subtracting 576 from both sides of this equation yields $a^2 = 1{,}600$. Taking the square root of both sides of this equation yields $a = \pm 40$. Since a represents a length, which must be positive, the value of a is 40. Therefore, $DE = 40$. Since DE and AE represent the lengths of the legs of triangle ADE, it follows that DE and AE can be used to calculate the area, in square units, of the triangle as $\frac{1}{2}(40)(24)$, or 480. Therefore, the area, in square units, of triangle ADE is 480.

Question Difficulty: Hard

Question ID f7e626b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: f7e626b2

The dimensions of a right rectangular prism are 4 inches by 5 inches by 6 inches. What is the surface area, in square inches, of the prism?

A. 30

B. 74

C. 120

D. 148

ID: f7e626b2 Answer

Rationale

Choice D is correct. The surface area is found by summing the area of each face. A right rectangular prism consists of three pairs of congruent rectangles, so the surface area is found by multiplying the areas of three adjacent rectangles by 2 and adding these products. For this prism, the surface area is equal to $2(4\cdot5)+2(5\cdot6)+2(4\cdot6)$, or $2(20)+2(30)+2(24)$, which is equal to 148.

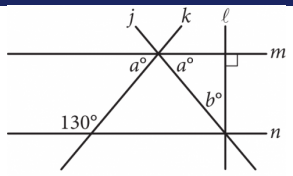
Choice A is incorrect. This is the area of one of the faces of the prism. Choice B is incorrect and may result from adding the areas of three adjacent rectangles without multiplying by 2. Choice C is incorrect. This is the volume, in cubic inches, of the prism.

Question Difficulty: Hard

Question ID 3828f53d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 3828f53d



Note: Figure not drawn to scale.

In the figure above, lines *m* and *n* are parallel.
What is the value of *b* ?

A. 40

B. 50

C. 65

D. 80

ID: 3828f53d Answer

Correct Answer: A

Rationale

Choice A is correct. Given that lines m and n are parallel, the angle marked 130° must be supplementary to the leftmost angle marked a° because they are same-side interior angles. Therefore, 130° + a° = 180°, which yields a = 50°. Lines ℓ and m intersect at a right angle, so lines j, ℓ, and m form a right triangle where the two acute angles are a° and b°. The acute angles of a right triangle are complementary, so a° + b° = 90°, which yields 50° + b° = 90°, and b = 40.

Choice B is incorrect. This is the value of a, not b. Choice C is incorrect and may be the result of dividing 130° by 2. Choice D is incorrect and may be the result of multiplying b by 2.

Question Difficulty: Easy

Question ID 739f1bbc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 739f1bbc

In triangle ABC, $AB = 4{,}680$ millimeters (mm) and $BC = 4{,}680$ mm. Which statement is sufficient to prove that triangle ABC is equilateral?

A. $AC = 4{,}680$ mm

B. $AC = 468$ mm

C. $AC = 46.8$ mm

D. $AC = 4.68$ mm

ID: 739f1bbc Answer

Correct Answer: A

Rationale

Choice A is correct. In an equilateral triangle, all three sides have the same length. It's given that in triangle ABC, $AB = 4{,}680$ mm and $BC = 4{,}680$ mm. Therefore, if $AC = 4{,}680$ mm, then all three sides of triangle ABC have the same length, so triangle ABC is equilateral. Therefore, $AC = 4{,}680$ mm is sufficient to prove that triangle ABC is equilateral.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 4ff7b652

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■□

ID: 4ff7b652

Right triangles LMN and PQR are similar, where L and M correspond to P and Q, respectively. Angle M has a measure of 53°. What is the measure of angle Q?

A. 37°

B. 53°

C. 127°

D. 143°

ID: 4ff7b652 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that triangle LMN is similar to triangle PQR. Corresponding angles of similar triangles are congruent. Since angle M and angle Q correspond to each other, they must be congruent. Therefore, if the measure of angle M is 53°, then the measure of angle Q is also 53°.

Choice A is incorrect and may result from concluding that angle M and angle Q are complementary rather than congruent.

Choice C is incorrect and may result from concluding that angle M and angle Q are supplementary rather than congruent.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID cecbdeba

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: cecbdeba

A right circular cylinder has a volume of 432 cubic centimeters. The area of the base of the cylinder is 24 square centimeters. What is the height, in centimeters, of the cylinder?

A. 18

B. 24

C. 216

D. $10{,}368$

ID: cecbdeba Answer

Correct Answer: A

Rationale

Choice A is correct. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where πr^2 is the area of the base of the cylinder and h is the height. It's given that a right circular cylinder has a volume of 432 cubic centimeters and the area of the base is 24 square centimeters. Substituting 432 for V and 24 for πr^2 in the formula $V = \pi r^2 h$ yields $432 = 24h$. Dividing both sides of this equation by 24 yields $18 = h$. Therefore, the height of the cylinder, in centimeters, is 18.

Choice B is incorrect. This is the area of the base, in square centimeters, not the height, in centimeters, of the cylinder.

Choice C is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is 2, not 24, cubic centimeters.

Choice D is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is $\frac{1}{24}$, not 24, cubic centimeters.

Question Difficulty: Medium

Question ID 42b4493b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 42b4493b

In a right triangle, the measure of one of the acute angles is 51°. What is the measure, in degrees, of the other acute angle?

A. 6

B. 39

C. 49

D. 51

ID: 42b4493b Answer

Correct Answer: B

Rationale

Choice B is correct. The sum of the measures of the interior angles of a triangle is 180 degrees. Since the triangle is a right triangle, it has one angle that measures 90 degrees. Therefore, the sum of the measures, in degrees, of the remaining two angles is $180 - 90$, or 90. It's given that the measure of one of the acute angles in the triangle is 51 degrees. Therefore, the measure, in degrees, of the other acute angle is $90 - 51$, or 39.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

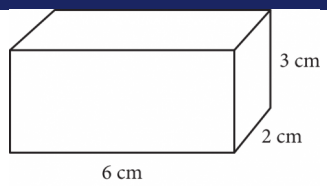
Choice D is incorrect. This is the measure, in degrees, of the acute angle whose measure is given.

Question Difficulty: Easy

Question ID d683a9cc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: d683a9cc



The figure shows the lengths, in centimeters (cm), of the edges of a right rectangular prism. The volume V of a right rectangular prism is ℓwh, where ℓ is the length of the prism, w is the width of the prism, and h is the height of the prism. What is the volume, in cubic centimeters, of the prism?

A. 36

B. 24

C. 12

D. 11

ID: d683a9cc Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the volume of a right rectangular prism is ℓwh. The prism shown has a length of 6 cm, a width of 2 cm, and a height of 3 cm. Thus, $\ell wh = (6)(2)(3)$, or 36 cubic centimeters.

Choice B is incorrect. This is the volume of a rectangular prism with edge lengths of 6, 2, and 2. Choice C is incorrect and may result from only finding the product of the length and width of the base of the prism. Choice D is incorrect and may result from finding the sum, not the product, of the edge lengths of the prism.

Question Difficulty: Easy

Question ID a2e76b60

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: a2e76b60

A cylindrical can containing pieces of fruit is filled to the top with syrup before being sealed. The base of the can has an area of $75\ \text{cm}^2$, and the height of the can is 10 cm. If $110\ \text{cm}^3$ of syrup is needed to fill the can to the top, which of the following is closest to the total volume of the pieces of fruit in the can?

A. $7.5\ \text{cm}^3$

B. $185\ \text{cm}^3$

C. $640\ \text{cm}^3$

D. $750\ \text{cm}^3$

ID: a2e76b60 Answer

Correct Answer: C

Rationale

Choice C is correct. The total volume of the cylindrical can is found by multiplying the area of the base of the can, $75\ \text{cm}^2$, by the height of the can, 10 cm, which yields $750\ \text{cm}^3$. If the syrup needed to fill the can has a volume of $110\ \text{cm}^3$, then the remaining volume for the pieces of fruit is $750 - 110 = 640\ \text{cm}^3$.

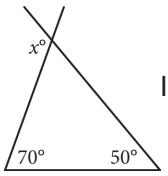
Choice A is incorrect because if the fruit had a volume of $7.5\ \text{cm}^3$, there would be $750 - 7.5 = 742.5\ \text{cm}^3$ of syrup needed to fill the can to the top. Choice B is incorrect because if the fruit had a volume of $185\ \text{cm}^3$, there would be $750 - 185 = 565\ \text{cm}^3$ of syrup needed to fill the can to the top. Choice D is incorrect because it is the total volume of the can, not just of the pieces of fruit.

Question Difficulty: Medium

Question ID 36200a38

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■□□

ID: 36200a38



In the figure above, two sides of a triangle are extended. What is the value of x?

A. 110

B. 120

C. 130

D. 140

ID: 36200a38 Answer

Correct Answer: B

Rationale

Choice B is correct. The sum of the interior angles of a triangle is 180°. The measures of the two interior angles of the given triangle are shown. Therefore, the measure of the third interior angle is 180° − 70° − 50° = 60°. The angles of measures x° and 60° are supplementary, so their sum is 180°. Therefore, x = 180 − 60 = 120.

Choice A is incorrect and may be the result of misinterpreting x° as supplementary to 70°. Choice C is incorrect and may be the result of misinterpreting x° as supplementary to 50°. Choice D is incorrect and may be the result of a calculation error.

Question Difficulty: Easy

Question ID 306264ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 306264ab

A right triangle has sides of length $2\sqrt{2}$, $6\sqrt{2}$, and $\sqrt{80}$ units. What is the area of the triangle, in square units?

A. $8\sqrt{2}+\sqrt{80}$

B. 12

C. $24\sqrt{80}$

D. 24

ID: 306264ab Answer

Correct Answer: B

Rationale

Choice B is correct. The area, A, of a triangle can be found using the formula $A=\frac{1}{2}bh$, where b is the length of the base of the triangle and h is the height of the triangle. It's given that the triangle is a right triangle. Therefore, its base and height can be represented by the two legs. It's also given that the triangle has sides of length $2\sqrt{2}$, $6\sqrt{2}$, and $\sqrt{80}$ units. Since $\sqrt{80}$ units is the greatest of these lengths, it's the length of the hypotenuse. Therefore, the two legs have lengths $2\sqrt{2}$ and $6\sqrt{2}$ units. Substituting these values for b and h in the formula $A=\frac{1}{2}bh$ gives $A=\frac{1}{2}\left(2\sqrt{2}\right)\left(6\sqrt{2}\right)$, which is equivalent to $A=6\sqrt{4}$ square units, or $A=12$ square units.

Choice A is incorrect. This expression represents the perimeter, rather than the area, of the triangle.

Choice C is incorrect and may result from conceptual or calculation errors.

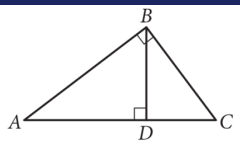
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6a3fbec3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	■■■

ID: 6a3fbec3



Note: Figure not drawn to scale.

In the figure above, $BD = 6$ and $AD = 8$.

What is the length of $\overline{DC}$?

ID: 6a3fbec3 Answer

Rationale

The correct answer is 4.5. According to the properties of right triangles, BD divides triangle ABC into two similar triangles, ABD and BCD. The corresponding sides of ABD and BCD are proportional, so the ratio of BD to AD is the same as the ratio of DC to BD. Expressing this information as a proportion gives $\frac{6}{8} = \frac{DC}{6}$. Solving the proportion for DC results in $DC = 4.5$. Note that 4.5 and 9/2 are examples of ways to enter a correct answer.

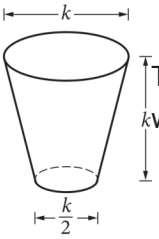
Question Difficulty: Hard

Question ID 37dde49f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: 37dde49f

Volume = $\frac{7\pi k^3}{48}$



The glass pictured above can hold a maximum volume of 473 cubic centimeters, which is approximately 16 fluid ounces. What is the value of k, in centimeters?

A. 2.52

B. 7.67

C. 7.79

D. 10.11

ID: 37dde49f Answer

Correct Answer: D

Rationale

Choice D is correct. Using the volume formula $V = \frac{7\pi k^3}{48}$ and the given information that the volume of the glass is 473 cubic centimeters, the value of k can be found as follows:

$$473 = \frac{7\pi k^3}{48} \quad k^3 = \frac{473(48)}{7\pi} \quad k = \sqrt[3]{\frac{473(48)}{7\pi}} \approx 10.10690$$

Therefore, the value of k is approximately 10.11 centimeters.

Choices A, B, and C are incorrect. Substituting the values of k from these choices in the formula results in volumes of approximately 7 cubic centimeters, 207 cubic centimeters, and 217 cubic centimeters, respectively, all of which contradict the given information that the volume of the glass is 473 cubic centimeters.

Question Difficulty: Medium

Question ID 02b02213

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■□□

ID: 02b02213

What is the perimeter, in inches, of a rectangle with a length of 4 inches and a width of 9 inches?

A. 13

B. 17

C. 22

D. 26

ID: 02b02213 Answer

Correct Answer: D

Rationale

Choice D is correct. The perimeter of a figure is equal to the sum of the measurements of the sides of the figure. It's given that the rectangle has a length of 4 inches and a width of 9 inches. Since a rectangle has 4 sides, of which opposite sides are parallel and equal, it follows that the rectangle has two sides with a length of 4 inches and two sides with a width of 9 inches. Therefore, the perimeter of this rectangle is $4 + 4 + 9 + 9$, or 26 inches.

Choice A is incorrect. This is the sum, in inches, of the length and the width of the rectangle.

Choice B is incorrect. This is the sum, in inches, of the two lengths and the width of the rectangle.

Choice C is incorrect. This is the sum, in inches, of the length and the two widths of the rectangle.

Question Difficulty: Easy

Question ID 459dd6c5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 459dd6c5

Triangles ABC and DEF are similar. Each side length of triangle ABC is 4 times the corresponding side length of triangle DEF. The area of triangle ABC is 270 square inches. What is the area, in square inches, of triangle DEF?

ID: 459dd6c5 Answer

Correct Answer: 135/8, 16.87, 16.88

Rationale

The correct answer is $\frac{135}{8}$. It's given that triangles ABC and DEF are similar and each side length of triangle ABC is 4 times the corresponding side length of triangle DEF. For two similar triangles, if each side length of the first triangle is k times the corresponding side length of the second triangle, then the area of the first triangle is k^2 times the area of the second triangle. Therefore, the area of triangle ABC is 4^2, or 16, times the area of triangle DEF. It's given that the area of triangle ABC is 270 square inches. Let a represent the area, in square inches, of triangle DEF. It follows that 270 is 16 times a, or $270 = 16a$. Dividing both sides of this equation by 16 yields $\frac{270}{16} = a$, which is equivalent to $\frac{135}{8} = a$. Thus, the area, in square inches, of triangle DEF is $\frac{135}{8}$. Note that 135/8, 16.87, and 16.88 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 310c87fe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■■

ID: 310c87fe

A cube has a surface area of 54 square meters. What is the volume, in cubic meters, of the cube?

A. 18

B. 27

C. 36

D. 81

ID: 310c87fe Answer

Correct Answer: B

Rationale

Choice B is correct. The surface area of a cube with side length s is equal to $6s^2$. Since the surface area is given as 54 square meters, the equation $54 = 6s^2$ can be used to solve for s. Dividing both sides of the equation by 6 yields $9 = s^2$. Taking the square root of both sides of this equation yields $3 = s$ and $-3 = s$. Since the side length of a cube must be a positive value, $s = -3$ can be discarded as a possible solution, leaving $s = 3$. The volume of a cube with side length s is equal to s^3. Therefore, the volume of this cube, in cubic meters, is 3^3, or 27.

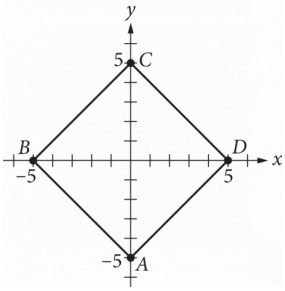
Choices A, C, and D are incorrect and may result from calculation errors.

Question Difficulty: Hard

Question ID cf53cb56

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	■■□

ID: cf53cb56



In the *xy*-plane shown, square *ABCD* has its diagonals on the *x*- and *y*-axes.
What is the area, in square units, of the square?

A. 20

B. 25

C. 50

D. 100

ID: cf53cb56 Answer

Correct Answer: C

Rationale

Choice C is correct. The two diagonals of square ABCD divide the square into 4 congruent right triangles, where each triangle has a vertex at the origin of the graph shown. The formula for the area of a triangle is $A = \frac{1}{2}bh$, where b is the base length of the triangle and h is the height of the triangle. Each of the 4 congruent right triangles has a height of 5 units and a base length of 5 units. Therefore, the area of each triangle is $A = \frac{1}{2}(5)(5)$, or 12.5 square units. Since the 4 right triangles are congruent, the area of each is $\frac{1}{4}$ of the area of square ABCD. It follows that the area of the square ABCD is equal to 4×12.5, or 50 square units.

Choices A and D are incorrect and may result from using 5 or 25, respectively, as the area of one of the 4 congruent right triangles formed by diagonals of square ABCD. However, the area of these triangles is 12.5. Choice B is incorrect and may result from using 5 as the length of one side of square ABCD. However, the length of a side of square ABCD is $5\sqrt{2}$.

Question Difficulty: Medium

Question ID bcb66188

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: bcb66188

Triangle FGH is similar to triangle JKL, where angle F corresponds to angle J and angles G and K are right angles. If $\sin(F) = \frac{308}{317}$, what is the value of $\sin(J)$?

A. $\frac{75}{317}$

B. $\frac{308}{317}$

C. $\frac{317}{308}$

D. $\frac{317}{75}$

ID: bcb66188 Answer

Correct Answer: B

Rationale

Choice B is correct. If two triangles are similar, then their corresponding angles are congruent. It's given that right triangle FGH is similar to right triangle JKL and angle F corresponds to angle J. It follows that angle F is congruent to angle J and, therefore, the measure of angle F is equal to the measure of angle J. The sine ratios of angles of equal measure are equal. Since the measure of angle F is equal to the measure of angle J, $\sin(F) = \sin(J)$. It's given that $\sin(F) = \frac{308}{317}$. Therefore, $\sin(J)$ is $\frac{308}{317}$.

Choice A is incorrect. This is the value of $\cos(J)$, not the value of $\sin(J)$.

Choice C is incorrect. This is the reciprocal of the value of $\sin(J)$, not the value of $\sin(J)$.

Choice D is incorrect. This is the reciprocal of the value of $\cos(J)$, not the value of $\sin(J)$.

Question Difficulty: Medium

Question ID 33e29881

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: 33e29881

In right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. The value of $\sin(R)$ is $\frac{\sqrt{15}}{4}$. What is the value of $\cos(S)$?

A. $\frac{\sqrt{15}}{15}$

B. $\frac{\sqrt{15}}{4}$

C. $\frac{4\sqrt{15}}{15}$

D. $\sqrt{15}$

ID: 33e29881 Answer

Correct Answer: B

Rationale

Choice B is correct. The sine of any acute angle is equal to the cosine of its complement. It's given that in right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. Therefore, angle R and angle S are complementary, and the value of $\sin R$ is equal to the value of $\cos S$. It's given that the value of $\sin R$ is $\frac{\sqrt{15}}{4}$, so the value of $\cos S$ is also $\frac{\sqrt{15}}{4}$.

Choice A is incorrect. This is the value of $\tan S$. Choice C is incorrect. This is the value of $\frac{1}{\cos S}$.

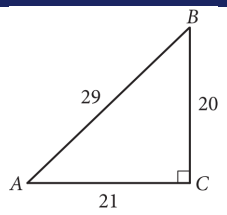
Choice D is incorrect. This is the value of $\frac{1}{\tan S}$.

Question Difficulty: Medium

Question ID 902dc959

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: 902dc959



In the figure above, what is the value of $\tan(A)$?

A. $\frac{20}{29}$

B. $\frac{21}{29}$

C. $\frac{20}{21}$

D. $\frac{21}{20}$

ID: 902dc959 Answer

Correct Answer: C

Rationale

Choice C is correct. Angle A is an acute angle in a right triangle, so the value of tan(A) is equivalent to the ratio of the length of the side opposite angle A, 20, to the length of the nonhypotenuse side adjacent to angle A, 21. Therefore, $\tan(A) = \frac{20}{21}$.

Choice A is incorrect. This is the value of sin(A). Choice B is incorrect. This is the value of cos(A). Choice D is incorrect. This is the value of tan(B).

Question Difficulty: Medium

Question ID 858fd1cf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 858fd1cf

A circle in the *xy*-plane has its center at $(-1, 1)$. Line t is tangent to this circle at the point $(5, -4)$. Which of the following points also lies on line t?

A. $(0, \frac{6}{5})$

B. $(4, 7)$

C. $(10, 2)$

D. $(11, 1)$

ID: 858fd1cf Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the circle has its center at $(-1, 1)$ and that line t is tangent to this circle at the point $(5, -4)$. Therefore, the points $(-1, 1)$ and $(5, -4)$ are the endpoints of the radius of the circle at the point of tangency. The slope of a line or line segment that contains the points (a, b) and (c, d) can be calculated as $\frac{d-b}{c-a}$. Substituting $(-1, 1)$ for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-1}{5-(-1)}$, or $-\frac{5}{6}$. Thus, the slope of this radius is $-\frac{5}{6}$. A line that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. It follows that line t is perpendicular to the radius at the point $(5, -4)$, so the slope of line t is the negative reciprocal of the slope of this radius. The negative reciprocal of $-\frac{5}{6}$ is $\frac{6}{5}$. Therefore, the slope of line t is $\frac{6}{5}$. Since the slope of line t is the same between any two points on line t, a point lies on line t if the slope of the line segment connecting the point and $(5, -4)$ is $\frac{6}{5}$. Substituting choice C, $(10, 2)$, for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-2}{5-10}$, or $\frac{6}{5}$. Therefore, the point $(10, 2)$ lies on line t.

Choice A is incorrect. The slope of the line segment connecting $(0, \frac{6}{5})$ and $(5, -4)$ is $\frac{-4-\frac{6}{5}}{5-0}$, or $-\frac{26}{25}$, not $\frac{6}{5}$.

Choice B is incorrect. The slope of the line segment connecting $(4, 7)$ and $(5, -4)$ is $\frac{-4-7}{5-4}$, or -11, not $\frac{6}{5}$.

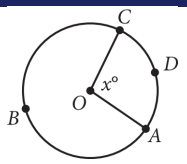
Choice D is incorrect. The slope of the line segment connecting $(11, 1)$ and $(5, -4)$ is $\frac{-4-1}{5-11}$, or $\frac{5}{6}$, not $\frac{6}{5}$.

Question Difficulty: Hard

Question ID c8345903

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: c8345903



The circle above has center O, the length of arc $\overset{\frown}{ADC}$ is 5π, and $x = 100$. What is the length of arc $\overset{\frown}{ABC}$?

A. 9π

B. 13π

C. 18π

D. $\frac{13}{2}\pi$

ID: c8345903 Answer

Correct Answer: B

Rationale

Choice B is correct. The ratio of the lengths of two arcs of a circle is equal to the ratio of the measures of the central angles that subtend the arcs. It's given that arc $\overset{\frown}{ADC}$ is subtended by a central angle with measure 100°. Since the sum of the measures of the angles about a point is 360°, it follows that arc $\overset{\frown}{ABC}$ is subtended by a central angle with measure $360° - 100° = 260°$. If s is the length of arc $\overset{\frown}{ABC}$, then s must satisfy the ratio $\frac{s}{5\pi} = \frac{260}{100}$. Reducing the fraction $\frac{260}{100}$ to its simplest form gives $\frac{13}{5}$. Therefore, $\frac{s}{5\pi} = \frac{13}{5}$. Multiplying both sides of $\frac{s}{5\pi} = \frac{13}{5}$ by 5π yields $s = 13\pi$.

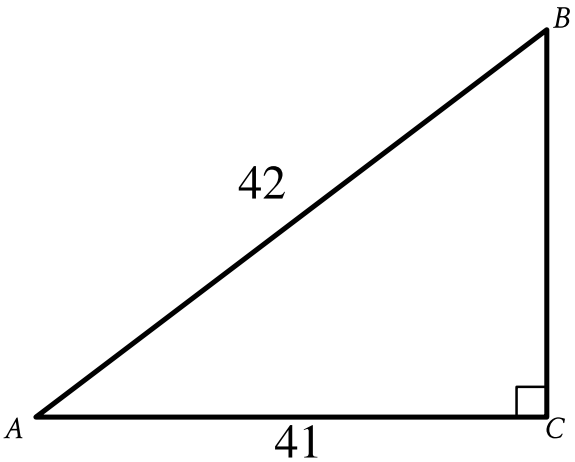
Choice A is incorrect. This is the length of an arc consisting of exactly half of the circle, but arc $\overset{\frown}{ABC}$ is greater than half of the circle. Choice C is incorrect. This is the total circumference of the circle. Choice D is incorrect. This is half the length of arc $\overset{\frown}{ABC}$, not its full length.

Question Difficulty: Hard

Question ID 2bddbc1b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: 2bddbc1b



Note: Figure not drawn to scale.

What is the value of $\cos A$ in the triangle shown?

A. $\frac{42}{41}$

B. $\frac{41}{42}$

C. $\frac{1}{42}$

D. $\frac{1}{41}$

ID: 2bddbc1b Answer

Correct Answer: B

Rationale

Choice B is correct. The cosine of an acute angle in a right triangle is defined as the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse. In the triangle shown, the length of the leg adjacent to angle A is 41, and the length of the hypotenuse is 42. Therefore, $\cos A = \frac{41}{42}$.

Choice A is incorrect. This is the value of $\frac{1}{\cos A}$.

Choice C is incorrect and may result from conceptual or calculation errors.

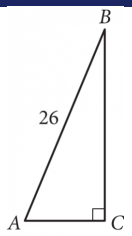
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID bd87bc09

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: bd87bc09



Triangle ABC above is a right triangle, and $\sin(B) = \frac{5}{13}$.

What is the length of side $\overline{BC}$?

ID: bd87bc09 Answer

Rationale

The correct answer is 24. The sine of an acute angle in a right triangle is equal to the ratio of the length of the side opposite the angle to the length of the hypotenuse. In the triangle shown, the sine of angle B, or $\sin(B)$, is equal to the ratio of the length of side $\overline{AC}$ to the length of side $\overline{AB}$. It's given that the length of side $\overline{AB}$ is 26 and that $\sin(B) = \frac{5}{13}$. Therefore, $\frac{5}{13} = \frac{AB}{26}$. Multiplying both sides of this equation by 26 yields $AC = 10$.

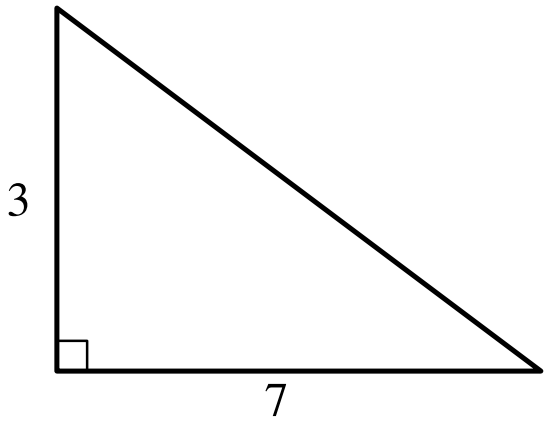
By the Pythagorean Theorem, the relationship between the lengths of the sides of triangle ABC is as follows: $26^2 = 10^2 + BC^2$, or $676 = 100 + BC^2$. Subtracting 100 from both sides of $676 = 100 + BC^2$ yields $576 = BC^2$. Taking the square root of both sides of $576 = BC^2$ yields $24 = BC$.

Question Difficulty: Hard

Question ID e6f2ace7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■□□

ID: e6f2ace7



Note: Figure not drawn to scale.

The lengths of the legs of a right triangle are shown. Which of the following is closest to the length of the triangle's hypotenuse?

A. 3.2

B. 5

C. 7.6

D. 20

ID: e6f2ace7 Answer

Correct Answer: C

Rationale

Choice C is correct. The Pythagorean theorem states that for a right triangle, $a^2 + b^2 = c^2$, where a and b represent the lengths of the legs of the triangle and c represents the length of its hypotenuse. In the triangle shown, the legs have lengths of 3 and 7. Substituting 3 for a and 7 for b in the equation $a^2 + b^2 = c^2$ yields $3^2 + 7^2 = c^2$, which is equivalent to $9 + 49 = c^2$, or $58 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{58} = c$. Thus, the value of c is approximately 7.6. Therefore, of the given choices, 7.6 is the closest to the length of the triangle's hypotenuse.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

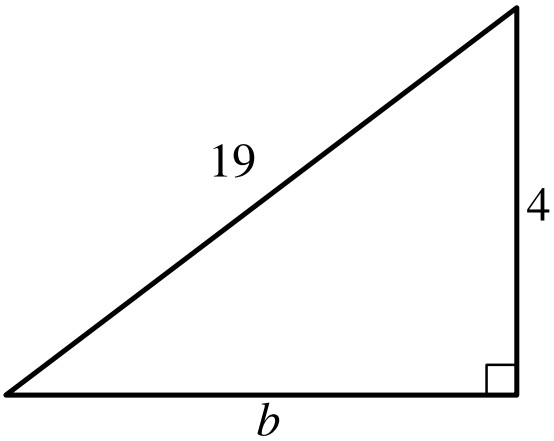
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID b0c5ece5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■□□

ID: b0c5ece5



Note: Figure not drawn to scale.

Which equation shows the relationship between the side lengths of the given triangle?

A. $4b = 19$

B. $4 + b = 19$

C. $4^2 + b^2 = 19^2$

D. $4^2 - b^2 = 19^2$

ID: b0c5ece5 Answer

Correct Answer: C

Rationale

Choice C is correct. The Pythagorean theorem states that in a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. Therefore, $a^2 + b^2 = c^2$, where a and b are the lengths of the legs and c is the length of the hypotenuse. For the given right triangle, the lengths of the legs are 4 and b, and the length of the hypotenuse is 19. Substituting 4 for a and 19 for c in the equation $a^2 + b^2 = c^2$ yields $4^2 + b^2 = 19^2$. Thus, the relationship between the side lengths of the given triangle is $4^2 + b^2 = 19^2$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID 76c73dbf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 76c73dbf

The graph of $x^2 + x + y^2 + y = \frac{199}{2}$ in the *xy*-plane is a circle. What is the length of the circle's radius?

ID: 76c73dbf Answer

Correct Answer: 10

Rationale

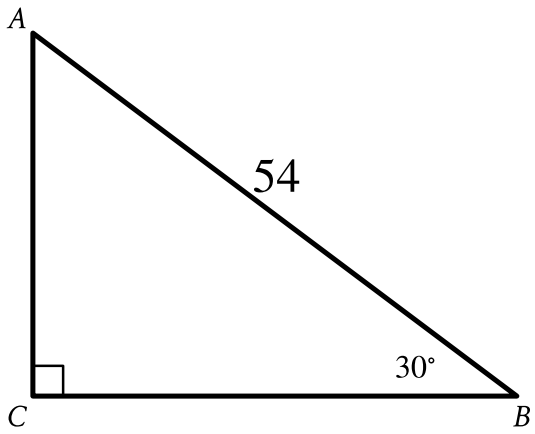
The correct answer is 10. It's given that the graph of $x^2 + x + y^2 + y = \frac{199}{2}$ in the *xy*-plane is a circle. The equation of a circle in the *xy*-plane can be written in the form $(x - h)^2 + (y - k)^2 = r^2$, where the coordinates of the center of the circle are (h, k) and the length of the radius of the circle is r. The term $(x - h)^2$ in this equation can be obtained by adding the square of half the coefficient of x to both sides of the given equation to complete the square. The coefficient of x is 1. Half the coefficient of x is $\frac{1}{2}$. The square of half the coefficient of x is $\frac{1}{4}$. Adding $\frac{1}{4}$ to each side of $(x^2 + x) + (y^2 + y) = \frac{199}{2}$ yields $(x^2 + x + \frac{1}{4}) + (y^2 + y) = \frac{199}{2} + \frac{1}{4}$, or $(x + \frac{1}{2})^2 + (y^2 + y) = \frac{199}{2} + \frac{1}{4}$. Similarly, the term $(y - k)^2$ can be obtained by adding the square of half the coefficient of y to both sides of this equation, which yields $(x + \frac{1}{2})^2 + (y^2 + y + \frac{1}{4}) = \frac{199}{2} + \frac{1}{4} + \frac{1}{4}$, or $(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = \frac{199}{2} + \frac{1}{4} + \frac{1}{4}$. This equation is equivalent to $(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = 100$, or $(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = 10^2$. Therefore, the length of the circle's radius is 10.

Question Difficulty: Hard

Question ID 52f7b898

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 52f7b898



Note: Figure not drawn to scale.

Right triangle ABC is shown. What is the value of $\tan A$?

A. $\frac{\sqrt{3}}{54}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. $27\sqrt{3}$

ID: 52f7b898 Answer

Correct Answer: C

Rationale

Choice C is correct. In the triangle shown, the measure of angle B is 30° and angle C is a right angle, which means that it has a measure of 90°. Since the sum of the angles in a triangle is equal to 180°, the measure of angle A is equal to $180^\circ - (30 + 90)^\circ$, or 60°. In a right triangle whose acute angles have measures 30° and 60°, the lengths of the legs can be represented by the expressions x, $x\sqrt{3}$, and $2x$, where x is the length of the leg opposite the angle with measure 30°, $x\sqrt{3}$ is the length of the leg opposite the angle with measure 60°, and $2x$ is the length of the hypotenuse. In the triangle shown, the hypotenuse has a length of 54. It follows that $2x = 54$, or $x = 27$. Therefore, the length of the leg opposite angle B is 27 and the length of the leg opposite angle A is $27\sqrt{3}$. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. The length of the leg opposite angle A is $27\sqrt{3}$ and the length of the leg adjacent to angle A is 27. Therefore, the value of $\tan A$ is $\frac{27\sqrt{3}}{27}$, or $\sqrt{3}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of $\frac{1}{\tan A}$, not the value of $\tan A$.

Choice D is incorrect. This is the length of the leg opposite angle A, not the value of $\tan A$.

Question Difficulty: Hard

Question ID e50afdd3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: e50afdd3

$(x+4)^2+(y-19)^2=121$

The graph of the given equation is a circle in the *xy*-plane. The point (a, b) lies on the circle. Which of the following is a possible value for a?

A. -16

B. -14

C. 11

D. 19

ID: e50afdd3 Answer

Correct Answer: B

Rationale

Choice B is correct. An equation of the form $(x-h)^2+(y-k)^2=r^2$, where h, k, and r are constants, represents a circle in the *xy*-plane with center (h, k) and radius r. Therefore, the circle represented by the given equation has center $(-4, 19)$ and radius 11. Since the center of the circle has an *x*-coordinate of -4 and the radius of the circle is 11, the least possible *x*-coordinate for any point on the circle is $-4-11$, or -15. Similarly, the greatest possible *x*-coordinate for any point on the circle is $-4+11$, or 7. Therefore, if the point (a, b) lies on the circle, it must be true that $-15 \leq a \leq 7$. Of the given choices, only -14 satisfies this inequality.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2266984b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 2266984b

$x^2+20x+y^2+16y=-20$

The equation above defines a circle in the *xy*-plane. What are the coordinates of the center of the circle?

A. $(-20,-16)$

B. $(-10,-8)$

C. $(10,8)$

D. $(20,16)$

ID: 2266984b Answer

Correct Answer: B

Rationale

Choice B is correct. The standard equation of a circle in the xy-plane is of the form $(x-h)^2+(y-k)^2=r^2$, where (h, k) are the coordinates of the center of the circle and r is the radius. The given equation can be rewritten in standard form by completing the squares. So the sum of the first two terms, x^2+20x, needs a 100 to complete the square, and the sum of the second two terms, y^2+16y, needs a 64 to complete the square. Adding 100 and 64 to both sides of the given equation yields $(x^2+20x+100)+(y^2+16y+64)=-20+100+64$, which is equivalent to $(x+10)^2+(y+8)^2=144$. Therefore, the coordinates of the center of the circle are $(-10, -8)$.

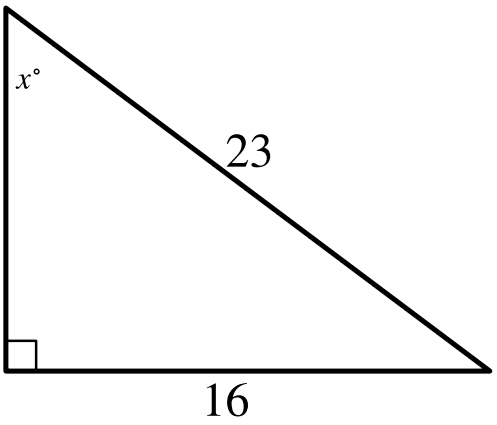
Choices A, C, and D are incorrect and may result from computational errors made when attempting to complete the squares or when identifying the coordinates of the center.

Question Difficulty: Hard

Question ID 1429dcdf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 1429dcdf



Note: Figure not drawn to scale.

In the triangle shown, what is the value of $\sin x^\circ$?

ID: 1429dcdf Answer

Correct Answer: .6956, .6957, 16/23

Rationale

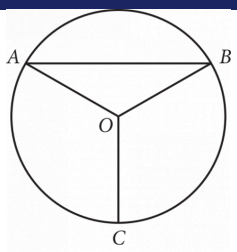
The correct answer is $\frac{16}{23}$. In a right triangle, the sine of an acute angle is defined as the ratio of the length of the side opposite the angle to the length of the hypotenuse. In the triangle shown, the length of the side opposite the angle with measure x° is 16 units and the length of the hypotenuse is 23 units. Therefore, the value of $\sin x^\circ$ is $\frac{16}{23}$. Note that 16/23, .6956, .6957, 0.695, and 0.696 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 69b0d79d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 69b0d79d



Point O is the center of the circle above, and the measure of $\angle OAB$ is $30°$. If the length of $\overline{OC}$ is 18, what is the length of arc $\overset{\frown}{AB}$?

A. 9π

B. 12π

C. 15π

D. 18π

ID: 69b0d79d Answer

Correct Answer: B

Rationale

Choice B is correct. Because segments OA and OB are radii of the circle centered at point O, these segments have equal lengths. Therefore, triangle AOB is an isosceles triangle, where angles OAB and OBA are congruent base angles of the triangle. It's given that angle OAB measures $30°$. Therefore, angle OBA also measures $30°$. Let $x°$ represent the measure of angle AOB. Since the sum of the measures of the three angles of any triangle is $180°$, it follows that $30° + 30° + x° = 180°$, or $60° + x° = 180°$. Subtracting $60°$ from both sides of this equation yields $x° = 120°$, or $\frac{2\pi}{3}$ radians. Therefore, the measure of angle AOB, and thus the measure of arc $\overset{\frown}{AB}$, is $\frac{2\pi}{3}$ radians. Since $\overline{OC}$ is a radius of the given circle and its length is 18, the length of the radius of the circle is 18. Therefore, the length of arc $\overset{\frown}{AB}$ can be calculated as $\left(\frac{2\pi}{3}\right)(18)$, or 12π.

Choices A, C, and D are incorrect and may result from conceptual or computational errors.

Question Difficulty: Hard

Question ID ebbf23ae

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: ebbf23ae

A circle in the *xy*-plane has a diameter with endpoints $(2, 4)$ and $(2, 14)$. An equation of this circle is $(x - 2)^2 + (y - 9)^2 = r^2$, where r is a positive constant. What is the value of r?

ID: ebbf23ae Answer

Correct Answer: 5

Rationale

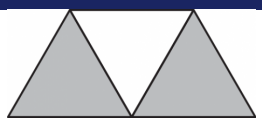
The correct answer is 5. The standard form of an equation of a circle in the *xy*-plane is $(x - h)^2 + (y - k)^2 = r^2$, where h, k, and r are constants, the coordinates of the center of the circle are (h, k), and the length of the radius of the circle is r. It's given that an equation of the circle is $(x - 2)^2 + (y - 9)^2 = r^2$. Therefore, the center of this circle is $(2, 9)$. It's given that the endpoints of a diameter of the circle are $(2, 4)$ and $(2, 14)$. The length of the radius is the distance from the center of the circle to an endpoint of a diameter of the circle, which can be found using the distance formula, $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. Substituting the center of the circle $(2, 9)$ and one endpoint of the diameter $(2, 4)$ in this formula gives a distance of $\sqrt{(2 - 2)^2 + (9 - 4)^2}$, or $\sqrt{0^2 + 5^2}$, which is equivalent to 5. Since the distance from the center of the circle to an endpoint of a diameter is 5, the value of r is 5.

Question Difficulty: Hard

Question ID 4c95c7d4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 4c95c7d4



A graphic designer is creating a logo for a company. The logo is shown in the figure above. The logo is in the shape of a trapezoid and consists of three congruent equilateral triangles. If the perimeter of the logo is 20 centimeters, what is the combined area of the shaded regions, in square centimeters, of the logo?

A. $2\sqrt{3}$

B. $4\sqrt{3}$

C. $8\sqrt{3}$

D. 16

ID: 4c95c7d4 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the logo is in the shape of a trapezoid that consists of three congruent equilateral triangles, and that the perimeter of the trapezoid is 20 centimeters (cm). Since the perimeter of the trapezoid is the sum of the lengths of 5 of the sides of the triangles, the length of each side of an equilateral triangle is $\frac{20}{5} = 4$ cm. Dividing up one equilateral triangle into two right triangles yields a pair of congruent 30°-60°-90° triangles. The shorter leg of each right triangle is half the length of the side of an equilateral triangle, or 2 cm. Using the Pythagorean Theorem, $a^2 + b^2 = c^2$, the height of the equilateral triangle can be found. Substituting $a = 2$ and $c = 4$ and solving for b yields $\sqrt{4^2 - 2^2} = \sqrt{12} = 2\sqrt{3}$ cm. The area of one equilateral triangle is $\frac{1}{2}bh$, where $b = 2$ and $h = 2\sqrt{3}$. Therefore, the area of one equilateral triangle is $\frac{1}{2}(4)(2\sqrt{3}) = 4\sqrt{3}$ cm^2. The shaded area consists of two such triangles, so its area is $(2)(4)\sqrt{3} = 8\sqrt{3}$ cm^2.

Alternate approach: The area of a trapezoid can be found by evaluating the expression $\frac{1}{2}(b_1 + b_2)h$, where b_1 is the length of one base, b_2 is the length of the other base, and h is the height of the trapezoid. Substituting $b_1 = 8$, $b_2 = 4$, and $h = 2\sqrt{3}$ yields the expression $\frac{1}{2}(8+4)(2\sqrt{3})$, or $\frac{1}{2}(12)(2\sqrt{3})$, which gives an area of $12\sqrt{3}$ cm^2 for the trapezoid. Since two-thirds of the trapezoid is shaded, the area of the shaded region is $\frac{2}{3} \times 12\sqrt{3} = 8\sqrt{3}$.

Choice A is incorrect. This is the height of the trapezoid. Choice B is incorrect. This is the area of one of the equilateral triangles, not two. Choice D is incorrect and may result from using a height of 4 for each triangle rather than the height of $2\sqrt{3}$.

Question Difficulty: Hard

Question ID b8a225ff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: b8a225ff

Circle A in the *xy*-plane has the equation $(x+5)^2+(y-5)^2=4$. Circle B has the same center as circle A. The radius of circle B is two times the radius of circle A. The equation defining circle B in the *xy*-plane is $(x+5)^2+(y-5)^2=k$, where k is a constant. What is the value of k?

ID: b8a225ff Answer

Correct Answer: 16

Rationale

The correct answer is 16. An equation of a circle in the *xy*-plane can be written as $(x-t)^2+(y-u)^2=r^2$, where the center of the circle is (t, u), the radius of the circle is r, and where t, u, and r are constants. It's given that the equation of circle A is $(x+5)^2+(y-5)^2=4$, which is equivalent to $(x+5)^2+(y-5)^2=2^2$. Therefore, the center of circle A is $(-5, 5)$ and the radius of circle A is 2. It's given that circle B has the same center as circle A and that the radius of circle B is two times the radius of circle A. Therefore, the center of circle B is $(-5, 5)$ and the radius of circle B is $2(2)$, or 4. Substituting -5 for t, 5 for u, and 4 for r into the equation $(x-t)^2+(y-u)^2=r^2$ yields $(x+5)^2+(y-5)^2=4^2$, which is equivalent to $(x+5)^2+(y-5)^2=16$. It follows that the equation of circle B in the *xy*-plane is $(x+5)^2+(y-5)^2=16$. Therefore, the value of k is 16.

Question Difficulty: Hard

Question ID b0a72bdc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: b0a72bdc

What is the diameter of the circle in the *xy*-plane with equation $(x-5)^2+(y-3)^2=16$?

A. 4

B. 8

C. 16

D. 32

ID: b0a72bdc Answer

Correct Answer: B

Rationale

Choice B is correct. The standard form of an equation of a circle in the *xy*-plane is $(x-h)^2+(y-k)^2=r^2$, where the coordinates of the center of the circle are (h, k) and the length of the radius of the circle is r. For the circle in the *xy*-plane with equation $(x-5)^2+(y-3)^2=16$, it follows that $r^2=16$. Taking the square root of both sides of this equation yields $r=4$ or $r=-4$. Because r represents the length of the radius of the circle and this length must be positive, $r=4$. Therefore, the radius of the circle is 4. The diameter of a circle is twice the length of the radius of the circle. Thus, $2(4)$ yields 8. Therefore, the diameter of the circle is 8.

Choice A is incorrect. This is the radius of the circle. Choice C is incorrect. This is the square of the radius of the circle.

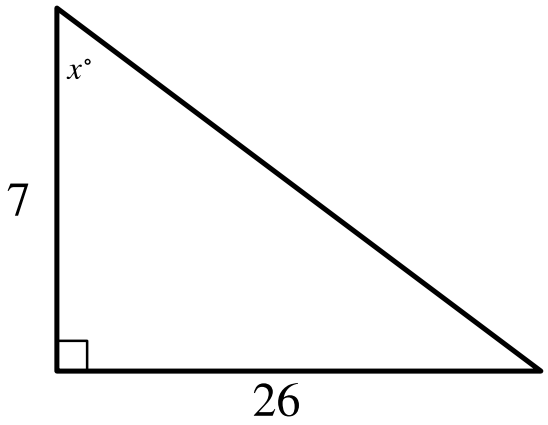
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 64c1f044

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■□□

ID: 64c1f044



Note: Figure not drawn to scale.

In the triangle shown, what is the value of $\tan x^\circ$?

A. $\frac{1}{26}$

B. $\frac{19}{26}$

C. $\frac{26}{7}$

D. $\frac{33}{7}$

ID: 64c1f044 Answer

Correct Answer: C

Rationale

Choice C is correct. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the side opposite the angle to the length of the shorter side adjacent to the angle. In the triangle shown, the length of the side opposite the angle with measure x° is 26 units and the length of the side adjacent to the angle with measure x° is 7 units. Therefore, the value of $\tan x^\circ$ is $\frac{26}{7}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a4bd60a3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: a4bd60a3

The perimeter of an equilateral triangle is 624 centimeters. The height of this triangle is $k\sqrt{3}$ centimeters, where k is a constant. What is the value of k?

ID: a4bd60a3 Answer

Correct Answer: 104

Rationale

The correct answer is 104. An equilateral triangle is a triangle in which all three sides have the same length and all three angles have a measure of 60°. The height of the triangle, $k\sqrt{3}$, is the length of the altitude from one vertex. The altitude divides the equilateral triangle into two congruent 30-60-90 right triangles, where the altitude is the side across from the 60° angle in each 30-60-90 right triangle. Since the altitude has a length of $k\sqrt{3}$, it follows from the properties of 30-60-90 right triangles that the side across from each 30° angle has a length of k and each hypotenuse has a length of $2k$. In this case, the hypotenuse of each 30-60-90 right triangle is a side of the equilateral triangle; therefore, each side length of the equilateral triangle is $2k$. The perimeter of a triangle is the sum of the lengths of each side. It's given that the perimeter of the equilateral triangle is 624; therefore, $2k + 2k + 2k = 624$, or $6k = 624$. Dividing both sides of this equation by 6 yields $k = 104$.

Question Difficulty: Hard

Question ID 498d6795

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 498d6795

In triangle ABC, angle B is a right angle. The length of side AB is $10\sqrt{37}$ and the length of side BC is $24\sqrt{37}$. What is the length of side AC?

A. $14\sqrt{37}$

B. $26\sqrt{37}$

C. $34\sqrt{37}$

D. $\sqrt{34 \cdot 37}$

ID: 498d6795 Answer

Correct Answer: B

Rationale

Choice B is correct. The Pythagorean theorem states that for a right triangle, $c^2 = a^2 + b^2$, where c represents the length of the hypotenuse and a and b represent the lengths of the legs. It's given that in triangle ABC, angle B is a right angle. Therefore, triangle ABC is a right triangle, where the hypotenuse is side AC and the legs are sides AB and BC. It's given that the lengths of sides AB and BC are $10\sqrt{37}$ and $24\sqrt{37}$, respectively. Substituting these values for a and b in the formula $c^2 = a^2 + b^2$ yields $c^2 = \left(10\sqrt{37}\right)^2 + \left(24\sqrt{37}\right)^2$, which is equivalent to $c^2 = 100(37) + 576(37)$, or $c^2 = 676(37)$. Taking the square root of both sides of this equation yields $c = \pm 26\sqrt{37}$. Since c represents the length of the hypotenuse, side AC, c must be positive. Therefore, the length of side AC is $26\sqrt{37}$.

Choice A is incorrect. This is the result of solving the equation $c = 24\sqrt{37} - 10\sqrt{37}$, not $c^2 = \left(10\sqrt{37}\right)^2 + \left(24\sqrt{37}\right)^2$.

Choice C is incorrect. This is the result of solving the equation $c = 10\sqrt{37} + 24\sqrt{37}$, not $c^2 = \left(10\sqrt{37}\right)^2 + \left(24\sqrt{37}\right)^2$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 249d3f80

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 249d3f80

Point O is the center of a circle. The measure of arc RS on this circle is 100°. What is the measure, in degrees, of its associated angle ROS?

ID: 249d3f80 Answer

Correct Answer: 100

Rationale

The correct answer is 100. It's given that point O is the center of a circle and the measure of arc RS on the circle is 100°. It follows that points R and S lie on the circle. Therefore, $\overline{OR}$ and $\overline{OS}$ are radii of the circle. A central angle is an angle formed by two radii of a circle, with its vertex at the center of the circle. Therefore, $\angle ROS$ is a central angle. Because the degree measure of an arc is equal to the measure of its associated central angle, it follows that the measure, in degrees, of $\angle ROS$ is 100.

Question Difficulty: Hard

Question ID ab176ad6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: ab176ad6

The equation $(x+6)^2+(y+3)^2=121$ defines a circle in the *xy*-plane. What is the radius of the circle?

ID: ab176ad6 Answer

Rationale

The correct answer is 11. A circle with equation $(x-a)^2+(y-b)^2=r^2$, where a, b, and r are constants, has center (a,b) and radius r. Therefore, the radius of the given circle is $\sqrt{121}$, or 11.

Question Difficulty: Hard

Question ID 3e577e4a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 3e577e4a

A circle in the *xy*-plane has its center at $(-4, -6)$. Line k is tangent to this circle at the point $(-7, -7)$. What is the slope of line k?

A. -3

B. $-\frac{1}{3}$

C. $\frac{1}{3}$

D. 3

ID: 3e577e4a Answer

Correct Answer: A

Rationale

Choice A is correct. A line that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. It's given that the circle has its center at $(-4, -6)$ and line k is tangent to the circle at the point $(-7, -7)$. The slope of a radius defined by the points (q, r) and (s, t) can be calculated as $\frac{t-r}{s-q}$. The points $(-7, -7)$ and $(-4, -6)$ define the radius of the circle at the point of tangency. Therefore, the slope of this radius can be calculated as $\frac{(-6)-(-7)}{(-4)-(-7)}$, or $\frac{1}{3}$. If a line and a radius are perpendicular, the slope of the line must be the negative reciprocal of the slope of the radius. The negative reciprocal of $\frac{1}{3}$ is -3. Thus, the slope of line k is -3.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the slope of the radius of the circle at the point of tangency, not the slope of line k.

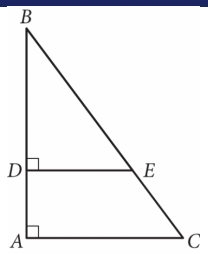
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 55bb437a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 55bb437a



In the figure above, $\tan B = \frac{3}{4}$. If $BC = 15$ and $DA = 4$, what is the length of $\overline{DE}$?

ID: 55bb437a Answer

Rationale

The correct answer is 6. Since $\tan B = \frac{3}{4}$, $\triangle ABC$ and $\triangle DBE$ are both similar to 3-4-5 triangles. This means that they are both similar to the right triangle with sides of lengths 3, 4, and 5. Since $BC = 15$, which is 3 times as long as the hypotenuse of the 3-4-5 triangle, the similarity ratio of $\triangle ABC$ to the 3-4-5 triangle is 3:1. Therefore, the length of $\overline{AC}$ (the side opposite to $\angle B$) is $3 \times 3 = 9$, and the length of $\overline{AB}$ (the side adjacent to $\angle B$) is $4 \times 3 = 12$. It is also given that $DA = 4$. Since $AB = DA + DB$ and $AB = 12$, it follows that $DB = 8$, which means that the similarity ratio of $\triangle DBE$ to the 3-4-5 triangle is 2:1 ($\overline{DB}$ is the side adjacent to $\angle B$). Therefore, the length of $\overline{DE}$, which is the side opposite to $\angle B$, is $3 \times 2 = 6$.

Question Difficulty: Hard

Question ID 8e7689e0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 8e7689e0

The number of radians in a 720-degree angle can be written as $a\pi$, where a is a constant. What is the value of a ?

ID: 8e7689e0 Answer

Rationale

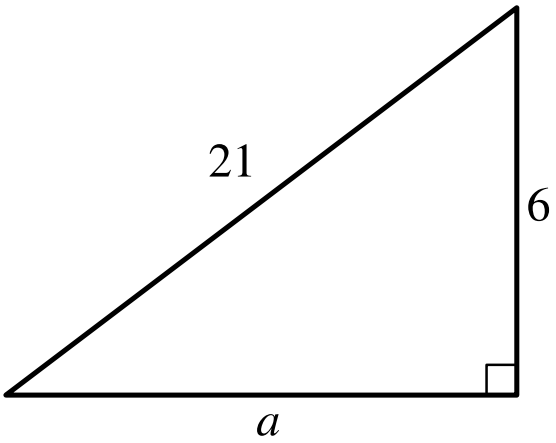
The correct answer is 4. There are π radians in a $180°$ angle. An angle measure of $720°$ is 4 times greater than an angle measure of $180°$. Therefore, the number of radians in a $720°$ angle is 4π.

Question Difficulty: Medium

Question ID de550be0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: de550be0



Note: Figure not drawn to scale.

For the triangle shown, which expression represents the value of a?

A. $\sqrt{21^2 - 6^2}$

B. $21^2 - 6^2$

C. $\sqrt{21 - 6}$

D. $21 - 6$

ID: de550be0 Answer

Correct Answer: A

Rationale

Choice A is correct. For the right triangle shown, the lengths of the legs are a units and 6 units, and the length of the hypotenuse is 21 units. The Pythagorean theorem states that in a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. Therefore, $a^2 + 6^2 = 21^2$. Subtracting 6^2 from both sides of this equation yields $a^2 = 21^2 - 6^2$. Taking the square root of both sides of this equation yields $a = \pm\sqrt{21^2 - 6^2}$. Since a is a length, a must be positive. Therefore, $a = \sqrt{21^2 - 6^2}$. Thus, for the triangle shown, $\sqrt{21^2 - 6^2}$ represents the value of a.

Choice B is incorrect. For the triangle shown, this expression represents the value of a^2, not a.

Choice C is incorrect and may result from conceptual errors. Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID ffe862a3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: ffe862a3

An isosceles right triangle has a hypotenuse of length 58 inches. What is the perimeter, in inches, of this triangle?

A. $29\sqrt{2}$

B. $58\sqrt{2}$

C. $58 + 58\sqrt{2}$

D. $58 + 116\sqrt{2}$

ID: ffe862a3 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the triangle is an isosceles right triangle, the two sides that form the right angle must be the same length. Let x be the length, in inches, of each of those sides. The Pythagorean theorem states that in a right triangle, $a^2 + b^2 = c^2$, where c is the length of the hypotenuse and a and b are the lengths of the other two sides. Substituting x for a, x for b, and 58 for c in this equation yields $x^2 + x^2 = 58^2$, or $2x^2 = 58^2$. Dividing each side of this equation by 2 yields $x^2 = \frac{58^2}{2}$, or $x^2 = \frac{2 \cdot 58^2}{4}$. Taking the square root of each side of this equation yields two solutions: $x = \frac{58\sqrt{2}}{2}$ and $x = -\frac{58\sqrt{2}}{2}$. The value of x must be positive because it represents a side length. Therefore, $x = \frac{58\sqrt{2}}{2}$, or $x = 29\sqrt{2}$. The perimeter, in inches, of the triangle is $58 + x + x$, or $58 + 2x$. Substituting $29\sqrt{2}$ for x in this expression gives a perimeter, in inches, of $58 + 2\left(29\sqrt{2}\right)$, or $58 + 58\sqrt{2}$.

Choice A is incorrect. This is the length, in inches, of each of the congruent sides of the triangle, not the perimeter, in inches, of the triangle.

Choice B is incorrect. This is the sum of the lengths, in inches, of the congruent sides of the triangle, not the perimeter, in inches, of the triangle.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 24cec8d1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 24cec8d1

A circle has center O, and points R and S lie on the circle. In triangle ORS, the measure of $\angle ROS$ is 88°. What is the measure of $\angle RSO$, in degrees? (Disregard the degree symbol when entering your answer.)

ID: 24cec8d1 Answer

Correct Answer: 46

Rationale

The correct answer is 46. It's given that O is the center of a circle and that points R and S lie on the circle. Therefore, $\overline{OR}$ and $\overline{OS}$ are radii of the circle. It follows that $OR = OS$. If two sides of a triangle are congruent, then the angles opposite them are congruent. It follows that the angles $\angle RSO$ and $\angle ORS$, which are across from the sides of equal length, are congruent. Let x° represent the measure of $\angle RSO$. It follows that the measure of $\angle ORS$ is also x°. It's given that the measure of $\angle ROS$ is 88°. Because the sum of the measures of the interior angles of a triangle is 180°, the equation $x^\circ + x^\circ + 88^\circ = 180^\circ$, or $2x + 88 = 180$, can be used to find the measure of $\angle RSO$. Subtracting 88 from both sides of this equation yields $2x = 92$. Dividing both sides of this equation by 2 yields $x = 46$. Therefore, the measure of $\angle RSO$, in degrees, is 46.

Question Difficulty: Hard

Question ID 44b2b894

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 44b2b894

A rectangle is inscribed in a circle, such that each vertex of the rectangle lies on the circumference of the circle. The diagonal of the rectangle is twice the length of the shortest side of the rectangle. The area of the rectangle is $1{,}089\sqrt{3}$ square units. What is the length, in units, of the diameter of the circle?

ID: 44b2b894 Answer

Correct Answer: 66

Rationale

The correct answer is 66. It's given that each vertex of the rectangle lies on the circumference of the circle. Therefore, the length of the diameter of the circle is equal to the length of the diagonal of the rectangle. The diagonal of a rectangle forms a right triangle with the shortest and longest sides of the rectangle, where the shortest side and the longest side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. Let s represent the length, in units, of the shortest side of the rectangle. Since it's given that the diagonal is twice the length of the shortest side, $2s$ represents the length, in units, of the diagonal of the rectangle. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2 + b^2 = c^2$. Substituting s for a and $2s$ for c in this equation yields $s^2 + b^2 = (2s)^2$, or $s^2 + b^2 = 4s^2$. Subtracting s^2 from both sides of this equation yields $b^2 = 3s^2$. Taking the positive square root of both sides of this equation yields $b = s\sqrt{3}$. Therefore, the length, in units, of the rectangle's longest side is $s\sqrt{3}$. The area of a rectangle is the product of the length of the shortest side and the length of the longest side. The lengths, in units, of the shortest and longest sides of the rectangle are represented by s and $s\sqrt{3}$, and it's given that the area of the rectangle is $1{,}089\sqrt{3}$ square units. It follows that $1{,}089\sqrt{3} = s\left(s\sqrt{3}\right)$, or $1{,}089\sqrt{3} = s^2\sqrt{3}$. Dividing both sides of this equation by $\sqrt{3}$ yields $1{,}089 = s^2$. Taking the positive square root of both sides of this equation yields $33 = s$. Since the length, in units, of the diagonal is represented by $2s$, it follows that the length, in units, of the diagonal is $2(33)$, or 66. Since the length of the diameter of the circle is equal to the length of the diagonal of the rectangle, the length, in units, of the diameter of the circle is 66.

Question Difficulty: Hard

Question ID 9e44284b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 9e44284b

In the *xy*-plane, the graph of $2x^2-6x+2y^2+2y=45$ is a circle. What is the radius of the circle?

A. 5

B. 6.5

C. $\sqrt{40}$

D. $\sqrt{50}$

ID: 9e44284b Answer

Correct Answer: A

Rationale

Choice A is correct. One way to find the radius of the circle is to rewrite the given equation in standard form, $(x-h)^2+(y-k)^2=r^2$, where (h,k) is the center of the circle and the radius of the circle is r. To do this, divide the original equation, $2x^2-6x+2y^2+2y=45$, by 2 to make the leading coefficients of x^2 and y^2 each equal to 1: $x^2-3x+y^2+y=22.5$. Then complete the square to put the equation in standard form. To do so, first rewrite $x^2-3x+y^2+y=22.5$ as $(x^2-3x+2.25)-2.25+(y^2+y+0.25)-0.25=22.5$. Second, add 2.25 and 0.25 to both sides of the equation: $(x^2-3x+2.25)+(y^2+y+0.25)=25$. Since $x^2-3x+2.25=(x-1.5)^2$, $y^2+y+0.25=(y+0.5)^2$, and $25=5^2$, it follows that $(x-1.5)^2+(y+0.5)^2=5^2$. Therefore, the radius of the circle is 5.

Choices B, C, and D are incorrect and may be the result of errors in manipulating the equation or of a misconception about the standard form of the equation of a circle in the xy-plane.

Question Difficulty: Hard

Question ID 568d66a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 568d66a7

An isosceles right triangle has a perimeter of $94 + 94\sqrt{2}$ inches. What is the length, in inches, of one leg of this triangle?

A. 47

B. $47\sqrt{2}$

C. 94

D. $94\sqrt{2}$

ID: 568d66a7 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the right triangle is isosceles. In an isosceles right triangle, the two legs have equal lengths, and the length of the hypotenuse is $\sqrt{2}$ times the length of one of the legs. Let ℓ represent the length, in inches, of each leg of the isosceles right triangle. It follows that the length of the hypotenuse is $\ell\sqrt{2}$ inches. The perimeter of a figure is the sum of the lengths of the sides of the figure. Therefore, the perimeter of the isosceles right triangle is $\ell + \ell + \ell\sqrt{2}$ inches. It's given that the perimeter of the triangle is $94 + 94\sqrt{2}$ inches. It follows that $\ell + \ell + \ell\sqrt{2} = 94 + 94\sqrt{2}$. Factoring the left-hand side of this equation yields $\left(1 + 1 + \sqrt{2}\right)\ell = 94 + 94\sqrt{2}$, or $\left(2 + \sqrt{2}\right)\ell = 94 + 94\sqrt{2}$. Dividing both sides of this equation by $2 + \sqrt{2}$ yields $\ell = \frac{94+94\sqrt{2}}{2+\sqrt{2}}$. Rationalizing the denominator of the right-hand side of this equation by multiplying the right-hand side of the equation by $\frac{2-\sqrt{2}}{2-\sqrt{2}}$ yields $\ell = \frac{\left(94+94\sqrt{2}\right)\left(2-\sqrt{2}\right)}{\left(2+\sqrt{2}\right)\left(2-\sqrt{2}\right)}$. Applying the distributive property to the numerator and to the denominator of the right-hand side of this equation yields $\ell = \frac{188-94\sqrt{2}+188\sqrt{2}-94\sqrt{4}}{4-2\sqrt{2}+2\sqrt{2}-\sqrt{4}}$. This is equivalent to $\ell = \frac{94\sqrt{2}}{2}$, or $\ell = 47\sqrt{2}$. Therefore, the length, in inches, of one leg of the isosceles right triangle is $47\sqrt{2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the length, in inches, of the hypotenuse.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 0e709a29

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 0e709a29

$RS = 440$ $ST = 384$ $TR = 584$

The side lengths of right triangle RST are given. Triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. What is the value of $\tan W$?

A. $\frac{48}{73}$

B. $\frac{55}{73}$

C. $\frac{48}{55}$

D. $\frac{55}{48}$

ID: 0e709a29 Answer

Correct Answer: D

Rationale

Choice D is correct. The hypotenuse of triangle RST is the longest side and is across from the right angle. The longest side length given is 584, which is the length of side TR. Therefore, the hypotenuse of triangle RST is side TR, so the right angle is angle S. The tangent of an acute angle in a right triangle is the ratio of the length of the opposite side, which is the side across from the angle, to the length of the adjacent side, which is the side closest to the angle that is not the hypotenuse. It follows that the opposite side of angle T is side RS and the adjacent side of angle T is side ST. Therefore, $\tan T = \frac{RS}{ST}$. Substituting 440 for RS and 384 for ST in this equation yields $\tan T = \frac{440}{384}$. This is equivalent to $\tan T = \frac{55}{48}$. It's given that triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. It follows that R corresponds to U. Therefore, the hypotenuse of triangle UVW is side WU, which means $\tan W = \frac{UV}{VW}$. Since the lengths of corresponding sides of similar triangles are proportional, $\frac{RS}{ST} = \frac{UV}{VW}$. Therefore, $\tan W = \frac{UV}{VW}$ is equivalent to $\tan W = \frac{RS}{ST}$, or $\tan W = \tan T$. Thus, $\tan W = \frac{55}{48}$.

Choice A is incorrect. This is the value of $\cos W$, not $\tan W$.

Choice B is incorrect. This is the value of $\sin W$, not $\tan W$. Choice C is incorrect. This is the value of $\frac{1}{\tan W}$, not $\tan W$.

Question Difficulty: Hard

Question ID 74d8b897

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 74d8b897

An angle has a measure of $\frac{9\pi}{20}$ radians. What is the measure of the angle in degrees?

ID: 74d8b897 Answer

Correct Answer: 81

Rationale

The correct answer is 81. The measure of an angle, in degrees, can be found by multiplying its measure, in radians, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$. Multiplying the given angle measure, $\frac{9\pi}{20}$ radians, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$ yields $\left(\frac{9\pi}{20} \text{ radians}\right)\left(\frac{180 \text{ degrees}}{\pi \text{ radians}}\right)$, which is equivalent to 81 degrees.

Question Difficulty: Medium

Question ID a0cacec1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: a0cacec1

An angle has a measure of $\frac{16\pi}{15}$ radians. What is the measure of the angle, in degrees?

ID: a0cacec1 Answer

Correct Answer: 192

Rationale

The correct answer is 192. The measure of an angle, in degrees, can be found by multiplying its measure, in radians, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$. Multiplying the given angle measure, $\frac{16\pi}{15}\text{radians}$, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$ yields $\left(\frac{16\pi}{15}\text{radians}\right)\left(\frac{180 \text{ degrees}}{\pi \text{ radians}}\right)$, which simplifies to 192 degrees.

Question Difficulty: Medium

Question ID f811d345

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: f811d345

A right triangle has legs with lengths of 24 centimeters and 21 centimeters. If the length of this triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$, where d is an integer, what is the value of d?

ID: f811d345 Answer

Correct Answer: 113

Rationale

The correct answer is 113. It's given that the legs of a right triangle have lengths 24 centimeters and 21 centimeters. In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the two legs. It follows that if h represents the length, in centimeters, of the hypotenuse of the right triangle, $h^2 = 24^2 + 21^2$. This equation is equivalent to $h^2 = 1{,}017$. Taking the square root of each side of this equation yields $h = \sqrt{1{,}017}$. This equation can be rewritten as $h = \sqrt{9 \cdot 113}$, or $h = \sqrt{9} \cdot \sqrt{113}$. This equation is equivalent to $h = 3\sqrt{113}$. It's given that the length of the triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$. It follows that the value of d is 113.

Question Difficulty: Hard

Question ID c9931030

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: c9931030

$RS = 20$ $ST = 48$ $TR = 52$

The side lengths of right triangle RST are given. Triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. What is the value of $\tan W$?

A. $\frac{5}{13}$

B. $\frac{5}{12}$

C. $\frac{12}{13}$

D. $\frac{12}{5}$

ID: c9931030 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that right triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. It's given that the side lengths of the right triangle RST are $RS = 20$, $ST = 48$, and $TR = 52$. Corresponding angles in similar triangles are equal. It follows that the measure of angle T is equal to the measure of angle W. The hypotenuse of a right triangle is the longest side. It follows that the hypotenuse of triangle RST is side TR. The hypotenuse of a right triangle is the side opposite the right angle. Therefore, angle S is a right angle. The adjacent side of an acute angle in a right triangle is the side closest to the angle that is not the hypotenuse. It follows that the adjacent side of angle T is side ST. The opposite side of an acute angle in a right triangle is the side across from the acute angle. It follows that the opposite side of angle T is side RS. The tangent of an acute angle in a right triangle is the ratio of the length of the opposite side to the length of the adjacent side. Therefore, $\tan T = \frac{RS}{ST}$. Substituting 20 for RS and 48 for ST in this equation yields $\tan T = \frac{20}{48}$, or $\tan T = \frac{5}{12}$. The tangents of two acute angles with equal measures are equal. Since the measure of angle T is equal to the measure of angle W, it follows that $\tan T = \tan W$. Substituting $\frac{5}{12}$ for $\tan T$ in this equation yields $\frac{5}{12} = \tan W$. Therefore, the value of $\tan W$ is $\frac{5}{12}$.

Choice A is incorrect. This is the value of $\sin W$. Choice C is incorrect. This is the value of $\cos W$.

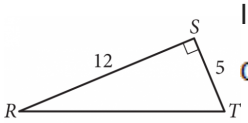
Choice D is incorrect. This is the value of $\frac{1}{\tan W}$.

Question Difficulty: Hard

Question ID 6933b3d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 6933b3d9



In triangle *RST* above, point *W* (not shown) lies on $\overline{RT}$. What is the value of $\cos(\angle RSW) - \sin(\angle WST)$?

ID: 6933b3d9 Answer

Rationale

The correct answer is 0. Note that no matter where point W is on $\overline{RT}$, the sum of the measures of $\angle RSW$ and $\angle WST$ is equal to the measure of $\angle RST$, which is $90°$. Thus, $\angle RSW$ and $\angle WST$ are complementary angles. Since the cosine of an angle is equal to the sine of its complementary angle, $\cos(\angle RSW) = \sin(\angle WST)$. Therefore, $\cos(\angle RSW) - \sin(\angle WST) = 0$.

Question Difficulty: Hard

Question ID 9ec76b54

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: 9ec76b54

A right triangle has legs with lengths of 28 centimeters and 20 centimeters. What is the length of this triangle's hypotenuse, in centimeters?

A. $8\sqrt{6}$

B. $4\sqrt{74}$

C. 48

D. $1{,}184$

ID: 9ec76b54 Answer

Correct Answer: B

Rationale

Choice B is correct. The Pythagorean theorem states that in a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. It's given that the right triangle has legs with lengths of 28 centimeters and 20 centimeters. Let c represent the length of this triangle's hypotenuse, in centimeters. Therefore, by the Pythagorean theorem, $28^2 + 20^2 = c^2$, or $1{,}184 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{1{,}184} = c$, or $4\sqrt{74} = c$. Therefore, the length of this triangle's hypotenuse, in centimeters, is $4\sqrt{74}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

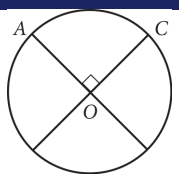
Choice D is incorrect. This is the square of the length of the triangle's hypotenuse.

Question Difficulty: Medium

Question ID 23c5fcce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■□□

ID: 23c5fcce



The circle above with center O has a circumference of 36.
What is the length of minor arc $\overset{\frown}{AC}$?

A. 9

B. 12

C. 18

D. 36

ID: 23c5fcce Answer

Correct Answer: A

Rationale

Choice A is correct. A circle has 360 degrees of arc. In the circle shown, O is the center of the circle and $\angle AOC$ is a central angle of the circle. From the figure, the two diameters that meet to form $\angle AOC$ are perpendicular, so the measure of $\angle AOC$ is $90°$. Therefore, the length of minor arc $\overset{\frown}{AC}$ is $\frac{90}{360}$ of the circumference of the circle. Since the circumference of the circle is 36, the length of minor arc $\overset{\frown}{AC}$ is $\frac{90}{360} \times 36 = 9$.

Choices B, C, and D are incorrect. The perpendicular diameters divide the circumference of the circle into four equal arcs; therefore, minor arc $\overset{\frown}{AC}$ is $\frac{1}{4}$ of the circumference. However, the lengths in choices B and C are, respectively, $\frac{1}{3}$ and $\frac{1}{2}$ the circumference of the circle, and the length in choice D is the length of the entire circumference. None of these lengths is $\frac{1}{4}$ the circumference.

Question Difficulty: Easy

Question ID f1c1e971

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: f1c1e971

The measure of angle R is $\frac{2\pi}{3}$ radians. The measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R. What is the measure of angle T, in degrees?

A. 75

B. 120

C. 195

D. 390

ID: f1c1e971 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the measure of angle R is $\frac{2\pi}{3}$ radians, and the measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R. Therefore, the measure of angle T is equal to $\frac{2\pi}{3} + \frac{5\pi}{12}$ radians. Multiplying $\frac{2\pi}{3}$ by $\frac{4}{4}$ to get a common denominator with $\frac{5\pi}{12}$ yields $\frac{8\pi}{12}$. Therefore, $\frac{2\pi}{3} + \frac{5\pi}{12}$ is equivalent to $\frac{8\pi}{12} + \frac{5\pi}{12}$, or $\frac{13\pi}{12}$. Therefore, the measure of angle T is $\frac{13\pi}{12}$ radians. The measure of angle T, in degrees, can be found by multiplying its measure, in radians, by $\frac{180}{\pi}$. This yields $\frac{13\pi}{12} \times \frac{180}{\pi}$, which is equivalent to 195 degrees. Therefore, the measure of angle T is 195 degrees.

Choice A is incorrect. This is the number of degrees that the measure of angle T is greater than the measure of angle R.

Choice B is incorrect. This is the measure of angle R, in degrees.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 6ab30ce3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 6ab30ce3

Triangle ABC is similar to triangle DEF, where A corresponds to D and C corresponds to F. Angles C and F are right angles. If $\tan(A) = \sqrt{3}$ and $DF = 125$, what is the length of $\overline{DE}$?

A. $125\frac{\sqrt{3}}{3}$

B. $125\frac{\sqrt{3}}{2}$

C. $125\sqrt{3}$

D. 250

ID: 6ab30ce3 Answer

Correct Answer: D

Rationale

Choice D is correct. Corresponding angles in similar triangles have equal measures. It's given that triangle ABC is similar to triangle DEF, where A corresponds to D, so the measure of angle A is equal to the measure of angle D. Therefore, if $\tan(A) = \sqrt{3}$, then $\tan(D) = \sqrt{3}$. It's given that angles C and F are right angles, so triangles ABC and DEF are right triangles. The adjacent side of an acute angle in a right triangle is the side closest to the angle that is not the hypotenuse. It follows that the adjacent side of angle D is side DF. The opposite side of an acute angle in a right triangle is the side across from the acute angle. It follows that the opposite side of angle D is side EF. The tangent of an acute angle in a right triangle is the ratio of the length of the opposite side to the length of the adjacent side. Therefore, $\tan(D) = \frac{EF}{DF}$. If $DF = 125$, the length of side EF can be found by substituting $\sqrt{3}$ for $\tan(D)$ and 125 for DF in the equation $\tan(D) = \frac{EF}{DF}$, which yields $\sqrt{3} = \frac{EF}{125}$. Multiplying both sides of this equation by 125 yields $125\sqrt{3} = EF$. Since the length of side EF is $\sqrt{3}$ times the length of side DF, it follows that triangle DEF is a special right triangle with angle measures 30°, 60°, and 90°. Therefore, the length of the hypotenuse, $\overline{DE}$, is 2 times the length of side DF, or $DE = 2(DF)$. Substituting 125 for DF in this equation yields $DE = 2(125)$, or $DE = 250$. Thus, if $\tan(A) = \sqrt{3}$ and $DF = 125$, the length of $\overline{DE}$ is 250.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the length of $\overline{EF}$, not $\overline{DE}$.

Question Difficulty: Hard

Question ID 9acd101f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 9acd101f

The equation $x^2 + (y-1)^2 = 49$ represents circle A. Circle B is obtained by shifting circle A down 2 units in the *xy*-plane. Which of the following equations represents circle B?

A. msup $+ (y-1)^2 = 49$

B. $x^2 +$ msup $= 49$

C. msup $+ (y-1)^2 = 49$

D. $x^2 +$ msup $= 49$

ID: 9acd101f Answer

Correct Answer: D

Rationale

Choice D is correct. The graph in the *xy*-plane of an equation of the form $(x-h)^2 + (y-k)^2 = r^2$ is a circle with center (h, k) and a radius of length r. It's given that circle A is represented by $x^2 + (y-1)^2 = 49$, which can be rewritten as $x^2 + (y-1)^2 = 7^2$. Therefore, circle A has center $(0, 1)$ and a radius of length 7. Shifting circle A down two units is a rigid vertical translation of circle A that does not change its size or shape. Since circle B is obtained by shifting circle A down two units, it follows that circle B has the same radius as circle A, and for each point (x, y) on circle A, the point $(x, y-2)$ lies on circle B. Moreover, if (h, k) is the center of circle A, then $(h, k-2)$ is the center of circle B. Therefore, circle B has a radius of 7 and the center of circle B is $(0, 1-2)$, or $(0, -1)$. Thus, circle B can be represented by the equation $x^2 + (y+1)^2 = 7^2$, or $x^2 + (y+1)^2 = 49$.

Choice A is incorrect. This is the equation of a circle obtained by shifting circle A right 2 units.

Choice B is incorrect. This is the equation of a circle obtained by shifting circle A up 2 units.

Choice C is incorrect. This is the equation of a circle obtained by shifting circle A left 2 units.

Question Difficulty: Hard

Question ID 244ff6c4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 244ff6c4

What is the value of $\tan \frac{92\pi}{3}$?

A. $-\sqrt{3}$

B. $-\frac{\sqrt{3}}{3}$

C. $\frac{\sqrt{3}}{3}$

D. $\sqrt{3}$

ID: 244ff6c4 Answer

Correct Answer: A

Rationale

Choice A is correct. A trigonometric ratio can be found using the unit circle, that is, a circle with radius 1 unit. If a central angle of a unit circle in the *xy*-plane centered at the origin has its starting side on the positive *x*-axis and its terminal side intersects the circle at a point (x, y), then the value of the tangent of the central angle is equal to the *y*-coordinate divided by the *x*-coordinate. There are 2π radians in a circle. Dividing $\frac{92\pi}{3}$ by 2π yields $\frac{92}{6}$, which is equivalent to $15 + \frac{2}{3}$. It follows that on the unit circle centered at the origin in the *xy*-plane, the angle $\frac{92\pi}{3}$ is the result of 15 revolutions from its starting side on the positive *x*-axis followed by a rotation through $\frac{2\pi}{3}$ radians. Therefore, the angles $\frac{92\pi}{3}$ and $\frac{2\pi}{3}$ are coterminal angles and $\tan\left(\frac{92\pi}{3}\right)$ is equal to $\tan\left(\frac{2\pi}{3}\right)$. Since $\frac{2\pi}{3}$ is greater than $\frac{\pi}{2}$ and less than π, it follows that the terminal side of the angle is in quadrant II and forms an angle of $\frac{\pi}{3}$, or 60°, with the negative *x*-axis. Therefore, the terminal side of the angle intersects the unit circle at the point $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$. It follows that the value of $\tan\left(\frac{2\pi}{3}\right)$ is $\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}$, which is equivalent to $-\sqrt{3}$. Therefore, the value of $\tan\left(\frac{92\pi}{3}\right)$ is $-\sqrt{3}$.

Choice B is incorrect. This is the value of $\frac{1}{\tan\left(\frac{92\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$.

Choice C is incorrect. This is the value of $\frac{1}{\tan\left(\frac{\pi}{3}\right)}$, not $\tan\left(\frac{92\pi}{3}\right)$.

Choice D is incorrect. This is the value of $\tan\left(\frac{\pi}{3}\right)$, not $\tan\left(\frac{92\pi}{3}\right)$.

Question Difficulty: Hard

Question ID 0acfddb5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 0acfddb5

A circle has center G, and points M and N lie on the circle. Line segments MH and NH are tangent to the circle at points M and N, respectively. If the radius of the circle is 168 millimeters and the perimeter of quadrilateral $GMHN$ is $3{,}856$ millimeters, what is the distance, in millimeters, between points G and H?

A. 168

B. $1{,}752$

C. $1{,}760$

D. $1{,}768$

ID: 0acfddb5 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the radius of the circle is 168 millimeters. Since points M and N both lie on the circle, segments GM and GN are both radii. Therefore, segments GM and GN each have length 168 millimeters. Two segments that are tangent to a circle and have a common exterior endpoint have equal length. Therefore, segment MH and segment NH have equal length. Let x represent the length of segment MH. Then x also represents the length of segment NH. It's given that the perimeter of quadrilateral $GMHN$ is $3{,}856$ millimeters. Since the perimeter of a quadrilateral is equal to the sum of the lengths of the sides of the quadrilateral, $3{,}856 = 168 + 168 + x + x$, or $3{,}856 = 336 + 2x$. Subtracting 336 from both sides of this equation yields $3{,}520 = 2x$, and dividing both sides of this equation by 2 yields $1{,}760 = x$. Therefore, the length of segment MH is $1{,}760$ millimeters. A line segment that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. Therefore, segment GM is perpendicular to segment MH. Since perpendicular segments form right angles, angle GMH is a right angle. Therefore, triangle GMH is a right triangle with legs of length $1{,}760$ millimeters and 168 millimeters, and hypotenuse GH. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2 + b^2 = c^2$. Substituting $1{,}760$ for a and 168 for b in this equation yields $1{,}760^2 + 168^2 = c^2$, or $3{,}125{,}824 = c^2$. Taking the square root of both sides of this equation yields $\pm 1{,}768 = c$. Since c represents a length, which must be positive, the value of c is $1{,}768$. Therefore, the length of segment GH is $1{,}768$ millimeters, so the distance between points G and H is $1{,}768$ millimeters.

Choice A is incorrect. This is the distance between points G and M and between points G and N, not the distance between points G and H.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the distance between points M and H and between points N and H, not the distance between points G and H.

Question Difficulty: Hard

Question ID ca2235f6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: ca2235f6

A circle has center O, and points A and B lie on the circle. The measure of arc AB is $45°$ and the length of arc AB is 3 inches. What is the circumference, in inches, of the circle?

A. 3

B. 6

C. 9

D. 24

ID: ca2235f6 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the measure of arc AB is 45° and the length of arc AB is 3 inches. The arc measure of the full circle is 360°. If x represents the circumference, in inches, of the circle, it follows that $\frac{45^\circ}{360^\circ} = \frac{3 \text{ inches}}{x \text{ inches}}$. This equation is equivalent to $\frac{45}{360} = \frac{3}{x}$, or $\frac{1}{8} = \frac{3}{x}$. Multiplying both sides of this equation by $8x$ yields $1(x) = 3(8)$, or $x = 24$. Therefore, the circumference of the circle is 24 inches.

Choice A is incorrect. This is the length of arc AB.

Choice B is incorrect and may result from multiplying the length of arc AB by 2.

Choice C is incorrect and may result from squaring the length of arc AB.

Question Difficulty: Hard

Question ID 856372ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 856372ca

In the *xy*-plane, a circle with radius 5 has center $(-8,6)$. Which of the following is an equation of the circle?

A. $(x-8)^2+(y+6)^2=25$

B. $(x+8)^2+(y-6)^2=25$

C. $(x-8)^2+(y+6)^2=5$

D. $(x+8)^2+(y-6)^2=5$

ID: 856372ca Answer

Correct Answer: B

Rationale

Choice B is correct. An equation of a circle is $(x-h)^2+(y-k)^2=r^2$, where the center of the circle is (h,k) and the radius is r. It's given that the center of this circle is $(-8,6)$ and the radius is 5. Substituting these values into the equation gives $(x-(-8))^2+(y-6)^2=5^2$, or $(x+8)^2+(y-6)^2=25$.

Choice A is incorrect. This is an equation of a circle that has center $(8,-6)$. Choice C is incorrect. This is an equation of a circle that has center $(8,-6)$ and radius $\sqrt{5}$. Choice D is incorrect. This is an equation of a circle that has radius $\sqrt{5}$.

Question Difficulty: Medium

Question ID 9d159400

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 9d159400

Which of the following equations represents a circle in the *xy*-plane that intersects the *y*-axis at exactly one point?

A. msup $+ (y-8)^2 = 16$

B. msup $+ (y-4)^2 = 16$

C. msup $+ (y-9)^2 = 16$

D. $x^2 +$ msup $= 16$

ID: 9d159400 Answer

Correct Answer: C

Rationale

Choice C is correct. The graph of the equation $(x-h)^2 + (y-k)^2 = r^2$ in the *xy*-plane is a circle with center (h, k) and a radius of length r. The radius of a circle is the distance from the center of the circle to any point on the circle. If a circle in the *xy*-plane intersects the *y*-axis at exactly one point, then the perpendicular distance from the center of the circle to this point on the *y*-axis must be equal to the length of the circle's radius. It follows that the *x*-coordinate of the circle's center must be equivalent to the length of the circle's radius. In other words, if the graph of $(x-h)^2 + (y-k)^2 = r^2$ is a circle that intersects the *y*-axis at exactly one point, then $r = |h|$ must be true. The equation in choice C is $(x-4)^2 + (y-9)^2 = 16$, or $(x-4)^2 + (y-9)^2 = 4^2$. This equation is in the form $(x-h)^2 + (y-k)^2 = r^2$, where $h = 4$, $k = 9$, and $r = 4$, and represents a circle in the *xy*-plane with center $(4, 9)$ and radius of length 4. Substituting 4 for r and 4 for h in the equation $r = |h|$ yields $4 = |4|$, or $4 = 4$, which is true. Therefore, the equation in choice C represents a circle in the *xy*-plane that intersects the *y*-axis at exactly one point.

Choice A is incorrect. This is the equation of a circle that does not intersect the *y*-axis at any point.

Choice B is incorrect. This is an equation of a circle that intersects the *x*-axis, not the *y*-axis, at exactly one point.

Choice D is incorrect. This is the equation of a circle with the center located on the *y*-axis and thus intersects the *y*-axis at exactly two points, not exactly one point.

Question Difficulty: Hard

Question ID 379ffefb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■□□

ID: 379ffefb

A right triangle has legs with lengths of 11 centimeters and 9 centimeters. What is the length of this triangle's hypotenuse, in centimeters?

A. $\sqrt{40}$

B. $\sqrt{202}$

C. 20

D. 202

ID: 379ffefb Answer

Correct Answer: B

Rationale

Choice B is correct. The Pythagorean theorem states that for a right triangle, $c^2 = a^2 + b^2$, where c represents the length of the hypotenuse and a and b represent the lengths of the legs. It's given that a right triangle has legs with lengths of 11 centimeters and 9 centimeters. Substituting 11 for a and 9 for b in the formula $c^2 = a^2 + b^2$ yields $c^2 = 11^2 + 9^2$, which is equivalent to $c^2 = 121 + 81$, or $c^2 = 202$. Taking the square root of each side of this equation yields $c = \pm\sqrt{202}$. Since c represents a length, c must be positive. Therefore, the length of the triangle's hypotenuse, in centimeters, is $\sqrt{202}$.

Choice A is incorrect. This is the result of solving the equation $c^2 = 11(2) + 9(2)$, not $c^2 = 11^2 + 9^2$.

Choice C is incorrect. This is the result of solving the equation $c(2) = 11(2) + 9(2)$, not $c^2 = 11^2 + 9^2$.

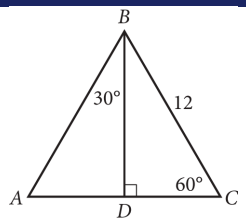
Choice D is incorrect. This is the result of solving the equation $c = 11^2 + 9^2$, not $c^2 = 11^2 + 9^2$.

Question Difficulty: Easy

Question ID bf8d843e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: bf8d843e



In ΔABC above, what is the length of $\overline{AD}$?

A. 4

B. 6

C. $6\sqrt{2}$

D. $6\sqrt{3}$

ID: bf8d843e Answer

Correct Answer: B

Rationale

Choice B is correct. Triangles ADB and CDB are both $30°-60°-90°$ triangles and share $\overline{BD}$. Therefore, triangles ADB and CDB are congruent by the angle-side-angle postulate. Using the properties of $30°-60°-90°$ triangles, the length of $\overline{AD}$ is half the length of hypotenuse $\overline{AB}$. Since the triangles are congruent, $AB = BC = 12$. So the length of $\overline{AD}$ is $\frac{12}{2} = 6$.

Alternate approach: Since angle CBD has a measure of $30°$, angle ABC must have a measure of $60°$. It follows that triangle ABC is equilateral, so side AC also has length 12. It also follows that the altitude BD is also a median, and therefore the length of AD is half of the length of AC, which is 6.

Choice A is incorrect. If the length of $\overline{AD}$ were 4, then the length of $\overline{AB}$ would be 8. However, this is incorrect because $\overline{AB}$ is congruent to $\overline{BC}$, which has a length of 12. Choices C and D are also incorrect. Following the same procedures as used to test choice A gives $\overline{AB}$ a length of $12\sqrt{2}$ for choice C and $12\sqrt{3}$ for choice D. However, these results cannot be true because $\overline{AB}$ is congruent to $\overline{BC}$, which has a length of 12.

Question Difficulty: Medium

Question ID 981275d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 981275d2

$(x-6)^2+(y+5)^2=16$

In the *xy*-plane, the graph of the equation above is a circle. Point *P* is on the circle and has coordinates $(10,-5)$. If $\overline{PQ}$ is a diameter of the circle, what are the coordinates of point *Q* ?

A. $(2,-5)$

B. $(6,-1)$

C. $(6,-5)$

D. $(6,-9)$

ID: 981275d2 Answer

Correct Answer: A

Rationale

Choice A is correct. The standard form for the equation of a circle is $(x-h)^2+(y-k)^2=r^2$, where (h,k) are the coordinates of the center and r is the length of the radius. According to the given equation, the center of the circle is $(6,-5)$. Let (x_1,y_1) represent the coordinates of point Q. Since point P $(10,-5)$ and point Q (x_1,y_1) are the endpoints of a diameter of the circle, the center $(6,-5)$ lies on the diameter, halfway between P and Q. Therefore, the following relationships hold: $\frac{x_1+10}{2}=6$ and $\frac{y_1+(-5)}{2}=-5$. Solving the equations for x_1 and y_1, respectively, yields $x_1=2$ and $y_1=-5$. Therefore, the coordinates of point Q are $(2,-5)$.

Alternate approach: Since point P $(10,-5)$ on the circle and the center of the circle $(6,-5)$ have the same y-coordinate, it follows that the radius of the circle is $10-6=4$. In addition, the opposite end of the diameter $\overline{PQ}$ must have the same y-coordinate as P and be 4 units away from the center. Hence, the coordinates of point Q must be $(2,-5)$.

Choices B and D are incorrect because the points given in these choices lie on a diameter that is perpendicular to the diameter $\overline{PQ}$. If either of these points were point Q, then $\overline{PQ}$ would not be the diameter of the circle. Choice C is incorrect because $(6,-5)$ is the center of the circle and does not lie on the circle.

Question Difficulty: Hard

Question ID 89661424

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 89661424

A circle in the *xy*-plane has its center at $(-5, 2)$ and has a radius of 9. An equation of this circle is $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. What is the value of c?

ID: 89661424 Answer

Correct Answer: -52

Rationale

The correct answer is -52. The equation of a circle in the *xy*-plane with its center at (h, k) and a radius of r can be written in the form $(x - h)^2 + (y - k)^2 = r^2$. It's given that a circle in the *xy*-plane has its center at $(-5, 2)$ and has a radius of 9. Substituting -5 for h, 2 for k, and 9 for r in the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x - (-5))^2 + (y - 2)^2 = 9^2$, or $(x + 5)^2 + (y - 2)^2 = 81$. It's also given that an equation of this circle is $x^2 + y^2 + ax + by + c = 0$, where a, b, and c are constants. Therefore, $(x + 5)^2 + (y - 2)^2 = 81$ can be rewritten in the form $x^2 + y^2 + ax + by + c = 0$. The equation $(x + 5)^2 + (y - 2)^2 = 81$, or $(x + 5)(x + 5) + (y - 2)(y - 2) = 81$, can be rewritten as $x^2 + 5x + 5x + 25 + y^2 - 2y - 2y + 4 = 81$. Combining like terms on the left-hand side of this equation yields $x^2 + y^2 + 10x - 4y + 29 = 81$. Subtracting 81 from both sides of this equation yields $x^2 + y^2 + 10x - 4y - 52 = 0$, which is equivalent to $x^2 + y^2 + 10x + (-4)y + (-52) = 0$. This equation is in the form $x^2 + y^2 + ax + by + c = 0$. Therefore, the value of c is -52.

Question Difficulty: Hard

Question ID 196e8e6e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: 196e8e6e

In the *xy*-plane, a circle has center C with coordinates (h, k). Points A and B lie on the circle. Point A has coordinates $\left(h+1, k+\sqrt{102}\right)$, and $\angle ACB$ is a right angle. What is the length of $\overline{AB}$?

A. $\sqrt{206}$

B. $2\sqrt{102}$

C. $103\sqrt{2}$

D. $103\sqrt{3}$

ID: 196e8e6e Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that points A and B lie on the circle with center C. Therefore, $\overline{AC}$ and $\overline{BC}$ are both radii of the circle. Since all radii of a circle are congruent, $\overline{AC}$ is congruent to $\overline{BC}$. The length of $\overline{AC}$, or the distance from point A to point C, can be found using the distance formula, which gives the distance between two points, (x_1, y_1) and (x_2, y_2), as $\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$. Substituting the given coordinates of point A, $\left(h+1, k+\sqrt{102}\right)$, for (x_1, y_1) and the given coordinates of point C, (h, k), for (x_2, y_2) in the distance formula yields $\sqrt{(h+1-h)^2+\left(k+\sqrt{102}-k\right)^2}$, or $\sqrt{1^2+\left(\sqrt{102}\right)^2}$, which is equivalent to $\sqrt{1+102}$, or $\sqrt{103}$. Therefore, the length of $\overline{AC}$ is $\sqrt{103}$ and the length of $\overline{BC}$ is $\sqrt{103}$. It's given that angle ACB is a right angle. Therefore, triangle ACB is a right triangle with legs $\overline{AC}$ and $\overline{BC}$ and hypotenuse $\overline{AB}$. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2+b^2=c^2$. Substituting $\sqrt{103}$ for a and b in this equation yields $\left(\sqrt{103}\right)^2+\left(\sqrt{103}\right)^2=c^2$, or $103+103=c^2$, which is equivalent to $206=c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{206}=c$. Therefore, the length of $\overline{AB}$ is $\sqrt{206}$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This would be the length of $\overline{AB}$ if the length of $\overline{AC}$ were 103, not $\sqrt{103}$.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 7c25b0dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 7c25b0dc

The length of a rectangle's diagonal is $3\sqrt{17}$, and the length of the rectangle's shorter side is 3. What is the length of the rectangle's longer side?

ID: 7c25b0dc Answer

Correct Answer: 12

Rationale

The correct answer is 12. The diagonal of a rectangle forms a right triangle, where the shorter side and the longer side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. It's given that the length of the rectangle's diagonal is $3\sqrt{17}$ and the length of the rectangle's shorter side is 3. Thus, the length of the hypotenuse of the right triangle formed by the diagonal is $3\sqrt{17}$ and the length of one of the legs is 3. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2 + b^2 = c^2$. Substituting $3\sqrt{17}$ for c and 3 for b in this equation yields $a^2 + (3)^2 = \left(3\sqrt{17}\right)^2$, or $a^2 + 9 = 153$. Subtracting 9 from both sides of this equation yields $a^2 = 144$. Taking the square root of both sides of this equation yields $a = \pm\sqrt{144}$, or $a = \pm 12$. Since a represents a length, which must be positive, the value of a is 12. Thus, the length of the rectangle's longer side is 12.

Question Difficulty: Hard

Question ID e80d62c6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: e80d62c6

The equation $x^2 + (y - 2)^2 = 36$ represents circle A. Circle B is obtained by shifting circle A down 4 units in the *xy*-plane. Which of the following equations represents circle B?

A. $x^2 +$ msup $= 36$

B. $x^2 +$ msup $= 36$

C. msup $+ (y - 2)^2 = 36$

D. msup $+ (y - 2)^2 = 36$

ID: e80d62c6 Answer

Correct Answer: A

Rationale

Choice A is correct. The standard form of an equation of a circle in the *xy*-plane is $(x - h)^2 + (y - k)^2 = r^2$, where the coordinates of the center of the circle are (h, k) and the length of the radius of the circle is r. The equation of circle A, $x^2 + (y - 2)^2 = 36$, can be rewritten as $(x - 0)^2 + (y - 2)^2 = 6^2$. Therefore, the center of circle A is at $(0, 2)$ and the length of the radius of circle A is 6. If circle A is shifted down 4 units, the *y*-coordinate of its center will decrease by 4; the radius of the circle and the *x*-coordinate of its center will not change. Therefore, the center of circle B is at $(0, 2 - 4)$, or $(0, -2)$, and its radius is 6. Substituting 0 for h, -2 for k, and 6 for r in the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x - 0)^2 + (y - (-2))^2 = (6)^2$, or $x^2 + (y + 2)^2 = 36$. Therefore, the equation $x^2 + (y + 2)^2 = 36$ represents circle B.

Choice B is incorrect. This equation represents a circle obtained by shifting circle A up, rather than down, 4 units.

Choice C is incorrect. This equation represents a circle obtained by shifting circle A right, rather than down, 4 units.

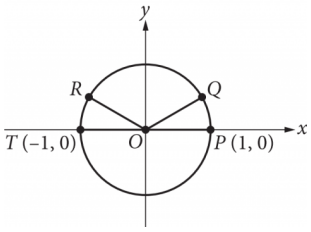
Choice D is incorrect. This equation represents a circle obtained by shifting circle A left, rather than down, 4 units.

Question Difficulty: Hard

Question ID 95ba2d09

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 95ba2d09



In the *xy*-plane above, points *P*, *Q*, *R*, and *T* lie on the circle with center *O*. The degree measures of angles POQ and ROT are each 30°. What is the radian measure of angle QOR?

A. $\frac{5}{6}\pi$

B. $\frac{3}{4}\pi$

C. $\frac{2}{3}\pi$

D. $\frac{1}{3}\pi$

ID: 95ba2d09 Answer

Correct Answer: C

Rationale

Choice C is correct. Because points T, O, and P all lie on the x-axis, they form a line. Since the angles on a line add up to $180°$, and it's given that angles POQ and ROT each measure $30°$, it follows that the measure of angle *QOR* is $180° - 30° - 30° = 120°$. Since the arc of a complete circle is $360°$ or 2π radians, a proportion can be set up to convert the measure of angle QOR from degrees to radians: $\frac{360 \text{ degrees}}{2\pi \text{ radians}} = \frac{120 \text{ degrees}}{x \text{ radians}}$, where x is the radian measure of angle QOR. Multiplying each side of the proportion by $2\pi x$ gives $360x = 240\pi$. Solving for x gives $\frac{240}{360}\pi$, or $\frac{2}{3}\pi$.

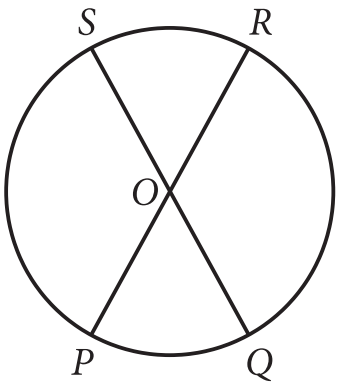
Choice A is incorrect and may result from subtracting only angle POQ from $180°$ to get a value of $150°$ and then finding the radian measure equivalent to that value. Choice B is incorrect and may result from a calculation error. Choice D is incorrect and may result from calculating the sum of the angle measures, in radians, of angles POQ and ROT.

Question Difficulty: Medium

Question ID 0815a5af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 0815a5af



Note: Figure not drawn to scale.

The circle shown has center O, circumference 144π, and diameters $\overline{PR}$ and $\overline{QS}$. The length of arc PS is twice the length of arc PQ. What is the length of arc QR?

A. 24π

B. 48π

C. 72π

D. 96π

ID: 0815a5af Answer

Correct Answer: B

Rationale

Choice B is correct. Since $\overline{PR}$ and $\overline{QS}$ are diameters of the circle shown, $\overline{OS}$, $\overline{OR}$, $\overline{OP}$, and $\overline{OQ}$ are radii of the circle and are therefore congruent. Since $\angle SOP$ and $\angle ROQ$ are vertical angles, they are congruent. Therefore, arc PS and arc QR are formed by congruent radii and have the same angle measure, so they are congruent arcs. Similarly, $\angle SOR$ and $\angle POQ$ are vertical angles, so they are congruent. Therefore, arc SR and arc PQ are formed by congruent radii and have the same angle measure, so they are congruent arcs. Let x represent the length of arc SR. Since arc SR and arc PQ are congruent arcs, the length of arc PQ can also be represented by x. It's given that the length of arc PS is twice the length of arc PQ. Therefore, the length of arc PS can be represented by the expression $2x$. Since arc PS and arc QR are congruent arcs, the length of arc QR can also be represented by $2x$. This gives the expression $x + x + 2x + 2x$. Since it's given that the circumference is 144π, the expression $x + x + 2x + 2x$ is equal to 144π. Thus $x + x + 2x + 2x = 144\pi$, or $6x = 144\pi$. Dividing both sides of this equation by 6 yields $x = 24\pi$. Therefore, the length of arc QR is $2(24\pi)$, or 48π.

Choice A is incorrect. This is the length of arc PQ, not arc QR.

Choice C is incorrect and may result from conceptual or calculation errors.

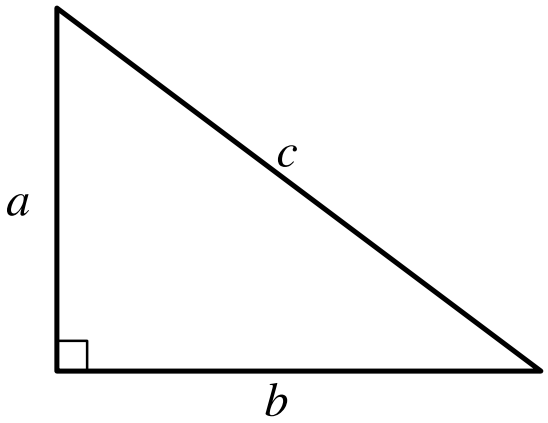
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID c9f8d1e9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■□□

ID: c9f8d1e9



Note: Figure not drawn to scale.

For the right triangle shown, $a = 4$ and $b = 5$. Which expression represents the value of c?

A. $4 + 5$

B. $\sqrt{(4)(5)}$

C. $\sqrt{4 + 5}$

D. $\sqrt{4^2 + 5^2}$

ID: c9f8d1e9 Answer

Correct Answer: D

Rationale

Choice D is correct. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $c^2 = a^2 + b^2$. In the right triangle shown, the hypotenuse has length c and the legs have lengths a and b. It's given that $a = 4$ and $b = 5$. Substituting 4 for a and 5 for b in the Pythagorean theorem yields $c^2 = 4^2 + 5^2$. Taking the square root of both sides of this equation yields $c = \pm\sqrt{4^2 + 5^2}$. Since the length of a side of a triangle must be positive, the value of c is $\sqrt{4^2 + 5^2}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy

Question ID a5aee181

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: a5aee181

The length of a rectangle's diagonal is $5\sqrt{17}$, and the length of the rectangle's shorter side is 5. What is the length of the rectangle's longer side?

A. $\sqrt{17}$

B. 20

C. $15\sqrt{2}$

D. 400

ID: a5aee181 Answer

Correct Answer: B

Rationale

Choice B is correct. A rectangle's diagonal divides a rectangle into two congruent right triangles, where the diagonal is the hypotenuse of both triangles. It's given that the length of the diagonal is $5\sqrt{17}$ and the length of the rectangle's shorter side is 5. Therefore, each of the two right triangles formed by the rectangle's diagonal has a hypotenuse with length $5\sqrt{17}$, and a shorter leg with length 5. To calculate the length of the longer leg of each right triangle, the Pythagorean theorem, $a^2 + b^2 = c^2$, can be used, where a and b are the lengths of the legs and c is the length of the hypotenuse of the triangle. Substituting 5 for a and $5\sqrt{17}$ for c in the equation $a^2 + b^2 = c^2$ yields $5^2 + b^2 = \left(5\sqrt{17}\right)^2$, which is equivalent to $25 + b^2 = 25(17)$, or $25 + b^2 = 425$. Subtracting 25 from each side of this equation yields $b^2 = 400$. Taking the positive square root of each side of this equation yields $b = 20$. Therefore, the length of the longer leg of each right triangle formed by the diagonal of the rectangle is 20. It follows that the length of the rectangle's longer side is 20.

Choice A is incorrect and may result from dividing the length of the rectangle's diagonal by the length of the rectangle's shorter side, rather than substituting these values into the Pythagorean theorem.

Choice C is incorrect and may result from using the length of the rectangle's diagonal as the length of a leg of the right triangle, rather than the length of the hypotenuse.

Choice D is incorrect. This is the square of the length of the rectangle's longer side.

Question Difficulty: Medium

Question ID fb58c0db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: fb58c0db

Points *A* and *B* lie on a circle with radius 1, and arc $\overset{\frown}{AB}$ has length $\frac{\pi}{3}$. What fraction of the circumference of the circle is the length of arc $\overset{\frown}{AB}$?

ID: fb58c0db Answer

Rationale

The correct answer is $\frac{1}{6}$. The circumference, C, of a circle is $C = 2\pi r$, where r is the length of the radius of the circle. For the given circle with a radius of 1, the circumference is $C = 2(\pi)(1)$, or $C = 2\pi$. To find what fraction of the circumference the length of arc $\overset{\frown}{AB}$ is, divide the length of the arc by the circumference, which gives $\frac{\pi}{3} \div 2\pi$. This division can be represented by $\frac{\pi}{3} \cdot \frac{1}{2\pi} = \frac{1}{6}$. Note that 1/6, .1666, .1667, 0.166, and 0.167 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ae041e52

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: ae041e52

A square is inscribed in a circle. The radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. What is the side length, in inches, of the square?

A. 20

B. $\frac{20\sqrt{2}}{2}$

C. $20\sqrt{2}$

D. 40

ID: ae041e52 Answer

Correct Answer: A

Rationale

Choice A is correct. When a square is inscribed in a circle, a diagonal of the square is a diameter of the circle. It's given that a square is inscribed in a circle and the length of a radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. Therefore, the length of a diameter of the circle is $2\left(\frac{20\sqrt{2}}{2}\right)$ inches, or $20\sqrt{2}$ inches. It follows that the length of a diagonal of the square is $20\sqrt{2}$ inches. A diagonal of a square separates the square into two right triangles in which the legs are the sides of the square and the hypotenuse is a diagonal. Since a square has 4 congruent sides, each of these two right triangles has congruent legs and a hypotenuse of length $20\sqrt{2}$ inches. Since each of these two right triangles has congruent legs, they are both 45-45-90 triangles. In a 45-45-90 triangle, the length of the hypotenuse is $\sqrt{2}$ times the length of a leg. Let s represent the length of a leg of one of these 45-45-90 triangles. It follows that $20\sqrt{2} = \sqrt{2}(s)$. Dividing both sides of this equation by $\sqrt{2}$ yields $20 = s$. Therefore, the length of a leg of one of these 45-45-90 triangles is 20 inches. Since the legs of these two 45-45-90 triangles are the sides of the square, it follows that the side length of the square is 20 inches.

Choice B is incorrect. This is the length of a radius, in inches, of the circle.

Choice C is incorrect. This is the length of a diameter, in inches, of the circle.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c6dff223

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: c6dff223

Triangle ABC is similar to triangle DEF, where angle A corresponds to angle D and angles C and F are right angles. The length of $\overline{AB}$ is 2.9 times the length of $\overline{DE}$. If $\tan A = \frac{21}{20}$, what is the value of $\sin D$?

ID: c6dff223 Answer

Correct Answer: .7241, 21/29

Rationale

The correct answer is $\frac{21}{29}$. It's given that triangle ABC is similar to triangle DEF, where angle A corresponds to angle D and angles C and F are right angles. In similar triangles, the tangents of corresponding angles are equal. Therefore, if $\tan A = \frac{21}{20}$, then $\tan D = \frac{21}{20}$. In a right triangle, the tangent of an acute angle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. Therefore, in triangle DEF, if $\tan D = \frac{21}{20}$, the ratio of the length of $\overline{EF}$ to the length of $\overline{DF}$ is $\frac{21}{20}$. If the lengths of $\overline{EF}$ and $\overline{DF}$ are 21 and 20, respectively, then the ratio of the length of $\overline{EF}$ to the length of $\overline{DF}$ is $\frac{21}{20}$. In a right triangle, the sine of an acute angle is the ratio of the length of the leg opposite the angle to the length of the hypotenuse. Therefore, the value of $\sin D$ is the ratio of the length of $\overline{EF}$ to the length of $\overline{DE}$. The length of $\overline{DE}$ can be calculated using the Pythagorean theorem, which states that if the lengths of the legs of a right triangle are a and b and the length of the hypotenuse is c, then $a^2 + b^2 = c^2$. Therefore, if the lengths of $\overline{EF}$ and $\overline{DF}$ are 21 and 20, respectively, then $(21)^2 + (20)^2 = (DE)^2$, or $841 = (DE)^2$. Taking the positive square root of both sides of this equation yields $29 = DE$. Therefore, if the lengths of $\overline{EF}$ and $\overline{DF}$ are 21 and 20, respectively, then the length of $\overline{DE}$ is 29 and the ratio of the length of $\overline{EF}$ to the length of $\overline{DE}$ is $\frac{21}{29}$. Thus, if $\tan A = \frac{21}{20}$, the value of $\sin D$ is $\frac{21}{29}$. Note that 21/29, .7241, and 0.724 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 92eb236a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 92eb236a

In a right triangle, the tangent of one of the two acute angles is $\frac{\sqrt{3}}{3}$. What is the tangent of the other acute angle?

A. $-\frac{\sqrt{3}}{3}$

B. $-\frac{3}{\sqrt{3}}$

C. $\frac{\sqrt{3}}{3}$

D. $\frac{3}{\sqrt{3}}$

ID: 92eb236a Answer

Correct Answer: D

Rationale

Choice D is correct. The tangent of a nonright angle in a right triangle is defined as the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. Using that definition for tangent, in a right triangle with legs that have lengths a and b, the tangent of one acute angle is $\frac{a}{b}$ and the tangent for the other acute angle is $\frac{b}{a}$. It follows that the tangents of the acute angles in a right triangle are reciprocals of each other. Therefore, the tangent of the other acute angle in the given triangle is the reciprocal of $\frac{\sqrt{3}}{3}$ or $\frac{3}{\sqrt{3}}$.

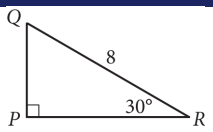
Choice A is incorrect and may result from assuming that the tangent of the other acute angle is the negative of the tangent of the angle described. Choice B is incorrect and may result from assuming that the tangent of the other acute angle is the negative of the reciprocal of the tangent of the angle described. Choice C is incorrect and may result from interpreting the tangent of the other acute angle as equal to the tangent of the angle described.

Question Difficulty: Hard

Question ID 13d9a1c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■□

ID: 13d9a1c3



In the right triangle shown above, what is the length of $\overline{PQ}$?

ID: 13d9a1c3 Answer

Rationale

The correct answer is 4. Triangle PQR has given angle measures of 30° and 90°, so the third angle must be 60° because the measures of the angles of a triangle sum to 180°. For any special right triangle with angles measuring 30°, 60°, and 90°, the length of the hypotenuse (the side opposite the right angle) is 2x, where x is the length of the side opposite the 30° angle. Segment PQ is opposite the 30° angle. Therefore, 2(PQ) = 8 and PQ = 4.

Question Difficulty: Medium

Question ID 2be01bd9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 2be01bd9

Triangle ABC is similar to triangle DEF, where angle A corresponds to angle D and angle C corresponds to angle F. Angles C and F are right angles. If $\tan(A) = \frac{50}{7}$, what is the value of $\tan(E)$?

ID: 2be01bd9 Answer

Correct Answer: .14, 7/50

Rationale

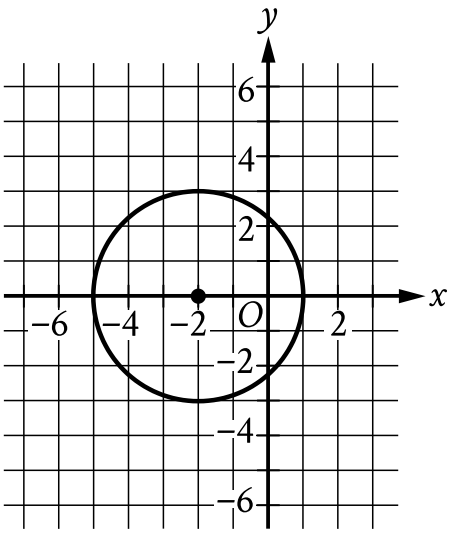
The correct answer is $\frac{7}{50}$. It's given that triangle ABC is similar to triangle DEF, where angle A corresponds to angle D and angle C corresponds to angle F. In similar triangles, the tangents of corresponding angles are equal. Since angle A and angle D are corresponding angles, if $\tan(A) = \frac{50}{7}$, then $\tan(D) = \frac{50}{7}$. It's also given that angles C and F are right angles. It follows that triangle DEF is a right triangle with acute angles D and E. The tangent of one acute angle in a right triangle is the inverse of the tangent of the other acute angle in the triangle. Therefore, $\tan(E) = \frac{1}{\tan(D)}$. Substituting $\frac{50}{7}$ for $\tan(D)$ in this equation yields $\tan(E) = \frac{1}{\frac{50}{7}}$, or $\tan(E) = \frac{7}{50}$. Thus, if $\tan(A) = \frac{50}{7}$, the value of $\tan(E)$ is $\frac{7}{50}$. Note that 7/50 and .14 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID a38c0183

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: a38c0183



Circle *A* (shown) is defined by the equation $(x+2)^2+y^2=9$. Circle *B* (not shown) is the result of shifting circle *A* down 6 units and increasing the radius so that the radius of circle *B* is 2 times the radius of circle *A*. Which equation defines circle *B*?

A. msup $+(y+6)^2=(4)(9)$

B. 2msup $+2(y+6)^2=9$

C. msup $+(y-6)^2=(4)(9)$

D. 2msup $+2(y-6)^2=9$

ID: a38c0183 Answer

Correct Answer: A

Rationale

Choice A is correct. According to the graph, the center of circle *A* has coordinates $(-2, 0)$, and the radius of circle *A* is 3. It's given that circle *B* is the result of shifting circle *A* down 6 units and increasing the radius so that the radius of circle *B* is 2 times the radius of circle *A*. It follows that the center of circle *B* is 6 units below the center of circle *A*. The point that's 6 units below $(-2, 0)$ has the same *x*-coordinate as $(-2, 0)$ and has a *y*-coordinate that is 6 less than the *y*-coordinate of $(-2, 0)$. Therefore, the coordinates of the center of circle *B* are $(-2, 0 - 6)$, or $(-2, -6)$. Since the radius of circle *B* is 2 times the radius of circle *A*, the radius of circle *B* is $(2)(3)$. A circle in the *xy*-plane can be defined by an equation of the form $(x - h)^2 + (y - k)^2 = r^2$, where the coordinates of the center of the circle are (h, k) and the radius of the circle is r. Substituting -2 for h, -6 for k, and $(2)(3)$ for r in this equation yields $(x - (-2))^2 + (y - (-6))^2 = ((2)(3))^2$, which is equivalent to $(x + 2)^2 + (y + 6)^2 = (2)^2(3)^2$, or $(x + 2)^2 + (y + 6)^2 = (4)(9)$. Therefore, the equation $(x + 2)^2 + (y + 6)^2 = (4)(9)$ defines circle *B*.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This equation defines a circle that's the result of shifting circle *A* up, not down, by 6 units and increasing the radius.

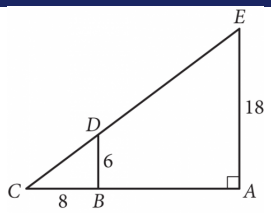
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID dba6a25a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: dba6a25a



In the figure above, $\overline{BD}$ is parallel to $\overline{AE}$.

What is the length of $\overline{CE}$?

ID: dba6a25a Answer

Rationale

The correct answer is 30. In the figure given, since $\overline{BD}$ is parallel to $\overline{AE}$ and both segments are intersected by $\overline{CE}$, then angle BDC and angle AEC are corresponding angles and therefore congruent. Angle BCD and angle ACE are also congruent because they are the same angle. Triangle BCD and triangle ACE are similar because if two angles of one triangle are congruent to two angles of another triangle, the triangles are similar. Since triangle BCD and triangle ACE are similar, their corresponding sides are proportional. So in triangle BCD and triangle ACE, $\overline{BD}$ corresponds to $\overline{AE}$ and $\overline{CD}$ corresponds to $\overline{CE}$. Therefore, $\frac{BD}{CD} = \frac{AE}{CE}$. Since triangle BCD is a right triangle, the Pythagorean theorem can be used to give the value of CD: $6^2 + 8^2 = CD^2$. Taking the square root of each side gives $CD = 10$. Substituting the values in the proportion $\frac{BD}{CD} = \frac{AE}{CE}$ yields $\frac{6}{10} = \frac{18}{CE}$. Multiplying each side by CE, and then multiplying by $\frac{10}{6}$ yields $CE = 30$. Therefore, the length of $\overline{CE}$ is 30.

Question Difficulty: Hard

Question ID acd30391

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■■

ID: acd30391

A circle in the *xy*-plane has equation $(x+3)^2+(y-1)^2=25$. Which of the following points does NOT lie in the interior of the circle?

A. $(-7, 3)$

B. $(-3, 1)$

C. $(0, 0)$

D. $(3, 2)$

ID: acd30391 Answer

Correct Answer: D

Rationale

Choice D is correct. The circle with equation $(x+3)^2+(y-1)^2=25$ has center $(-3,1)$ and radius 5. For a point to be inside of the circle, the distance from that point to the center must be less than the radius, 5. The distance between $(3,2)$ and $(-3,1)$ is $\sqrt{(-3-3)^2+(1-2)^2}=\sqrt{(-6)^2+(-1)^2}=\sqrt{37}$, which is greater than 5. Therefore, $(3,2)$ does NOT lie in the interior of the circle.

Choice A is incorrect. The distance between $(-7,3)$ and $(-3,1)$ is $\sqrt{(-7+3)^2+(3-1)^2}=\sqrt{(-4)^2+(2)^2}=\sqrt{20}$, which is less than 5, and therefore $(-7,3)$ lies in the interior of the circle. Choice B is incorrect because it is the center of the circle. Choice C is incorrect because the distance between $(0,0)$ and $(-3,1)$ is $\sqrt{(0+3)^2+(0-1)^2}=\sqrt{(3)^2+(1)^2}=\sqrt{8}$, which is less than 5, and therefore $(0,0)$ in the interior of the circle.

Question Difficulty: Hard

Question ID 8027db3f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 8027db3f

In triangle JKL, $\cos(K) = \frac{24}{51}$ and angle J is a right angle. What is the value of $\cos(L)$?

ID: 8027db3f Answer

Correct Answer: .8823, .8824, 15/17

Rationale

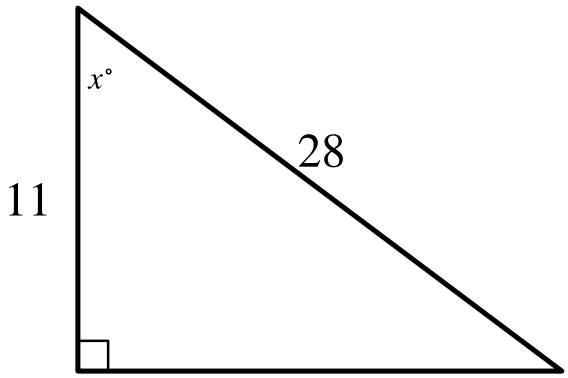
The correct answer is $\frac{15}{17}$. It's given that angle J is the right angle in triangle JKL. Therefore, the acute angles of triangle JKL are angle K and angle L. The hypotenuse of a right triangle is the side opposite its right angle. Therefore, the hypotenuse of triangle JKL is side KL. The cosine of an acute angle in a right triangle is the ratio of the length of the side adjacent to the angle to the length of the hypotenuse. It's given that $\cos(K) = \frac{24}{51}$. This can be written as $\cos(K) = \frac{8}{17}$. Since the cosine of angle K is a ratio, it follows that the length of the side adjacent to angle K is $8n$ and the length of the hypotenuse is $17n$, where n is a constant. Therefore, $JK = 8n$ and $KL = 17n$. The Pythagorean theorem states that in a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other two sides. For triangle JKL, it follows that $(JK)^2 + (JL)^2 = (KL)^2$. Substituting $8n$ for JK and $17n$ for KL yields $(8n)^2 + (JL)^2 = (17n)^2$. This is equivalent to $64n^2 + (JL)^2 = 289n^2$. Subtracting $64n^2$ from each side of this equation yields $(JL)^2 = 225n^2$. Taking the square root of each side of this equation yields $JL = 15n$. Since $\cos(L) = \frac{JL}{KL}$, it follows that $\cos(L) = \frac{15n}{17n}$, which can be rewritten as $\cos(L) = \frac{15}{17}$. Note that 15/17, .8824, .8823, and 0.882 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 1bf809b5

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 1bf809b5



Note: Figure not drawn to scale.

In the triangle shown, what is the value of $\cos x^\circ$?

ID: 1bf809b5 Answer

Correct Answer: .3928, .3929, 11/28

Rationale

The correct answer is $\frac{11}{28}$. The cosine of an acute angle in a right triangle is defined as the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse. In the triangle shown, the length of the leg adjacent to the angle with measure x° is 11 units and the length of the hypotenuse is 28 units. Therefore, the value of $\cos x^\circ$ is $\frac{11}{28}$. Note that 11/28, .3928, .3929, 0.392, and 0.393 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 82c8325f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	■■□

ID: 82c8325f

A circle in the *xy*-plane has its center at $(-4, 5)$ and the point $(-8, 8)$ lies on the circle. Which equation represents this circle?

A. msup $+ (y + 5)^2 = 5$

B. msup $+ (y - 5)^2 = 5$

C. msup $+ (y + 5)^2 = 25$

D. msup $+ (y - 5)^2 = 25$

ID: 82c8325f Answer

Correct Answer: D

Rationale

Choice D is correct. A circle in the *xy*-plane can be represented by an equation of the form $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and r is the length of a radius of the circle. It's given that the circle has its center at $(-4, 5)$. Therefore, $h = -4$ and $k = 5$. Substituting -4 for h and 5 for k in the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x - (-4))^2 + (y - 5)^2 = r^2$, or $(x + 4)^2 + (y - 5)^2 = r^2$. It's also given that the point $(-8, 8)$ lies on the circle. Substituting -8 for x and 8 for y in the equation $(x + 4)^2 + (y - 5)^2 = r^2$ yields $(-8 + 4)^2 + (8 - 5)^2 = r^2$, or $(-4)^2 + (3)^2 = r^2$, which is equivalent to $16 + 9 = r^2$, or $25 = r^2$. Substituting 25 for r^2 in the equation $(x + 4)^2 + (y - 5)^2 = r^2$ yields $(x + 4)^2 + (y - 5)^2 = 25$. Thus, the equation $(x + 4)^2 + (y - 5)^2 = 25$ represents the circle.

Choice A is incorrect. The circle represented by this equation has its center at $(4, -5)$, not $(-4, 5)$, and the point $(-8, 8)$ doesn't lie on the circle.

Choice B is incorrect. The point $(-8, 8)$ doesn't lie on the circle represented by this equation.

Choice C is incorrect. The circle represented by this equation has its center at $(4, -5)$, not $(-4, 5)$, and the point $(-8, 8)$ doesn't lie on the circle.

Question Difficulty: Medium

Question ID 25da87f8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	■■■

ID: 25da87f8

A triangle with angle measures 30°, 60°, and 90° has a perimeter of $18+6\sqrt{3}$.

What is the length of the longest side of the triangle?

ID: 25da87f8 Answer

Rationale

The correct answer is 12. It is given that the triangle has angle measures of 30°, 60°, and 90°, and so the triangle is a special right triangle. The side measures of this type of special triangle are in the ratio $2:1:\sqrt{3}$. If x is the measure of the shortest leg, then the measure of the other leg is $\sqrt{3}x$ and the measure of the hypotenuse is 2x. The perimeter of the triangle is given to be $18+6\sqrt{3}$, and so the equation for the perimeter can be written as $2x+x+\sqrt{3}x=18+6\sqrt{3}$. Combining like terms and factoring out a common factor of x on the left-hand side of the equation gives $(3+\sqrt{3})x=18+6\sqrt{3}$. Rewriting the right-hand side of the equation by factoring out 6 gives $(3+\sqrt{3})x=6(3+\sqrt{3})$. Dividing both sides of the equation by the common factor $(3+\sqrt{3})$ gives x = 6. The longest side of the right triangle, the hypotenuse, has a length of 2x, or 2(6), which is 12.

Question Difficulty: Hard