Question ID f79fffba

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

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

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 $hx = 3x$ - 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 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 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. $\begin{aligned} x+y &\geq 20 \\ 3x+4y &\leq 80 \end{aligned}$

B. $\begin{aligned} x+y &\geq 20 \\ 3x+4y &\geq 80 \end{aligned}$

C. $\begin{aligned} 3x+4y &\leq 20 \\ x+y &\geq 80 \end{aligned}$

D. $\begin{aligned} x+y &\leq 20 \\ 3x+4y &\geq 80 \end{aligned}$

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 aff28230

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

$$x = 10$$
$$y = x + 21$$

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

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

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 7a987ae4

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

ID: 7a987ae4

If $\dfrac{2n}{5} = 10$, 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 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 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 7d6928bd

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

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. $f - h \geq 14$

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 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 74c03c21

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

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 $55 \text{ miles per hour (mph)}$ 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. $25x + 55y = 160$
   $x + y = 4$

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 41fdc0b8

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

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. $P(t) = 862 - 1.6(t - 2{,}000)$

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 $m = \dfrac{P(10) - P(0)}{10 - 0} = \dfrac{846 - 862}{10 - 0} = \dfrac{-16}{10} = -1.6$. 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 70e29454

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

$$a(3-x)-b=-1-2x$$

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 $b=-5$

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 968e9e51

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

$$y \leq x$$
$$y \leq -x$$

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. $(0,-1)$

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 7e1bff94

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

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. $f(h) = 90h + 65$

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 fh, in dollars. It follows that the relationship can be represented by an equation of the form $fh = mh + b$, 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 fh 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 $fh = mh + b$ yields $fh = 65h + b$. The value of b can be found by substituting any value of h and its corresponding value of fh for h and fh, respectively, in this equation. Substituting 1 for h and 155 for fh yields $155 = 651 + b$, or $155 = 65 + b$. Subtracting 65 from both sides of this equation yields $90 = b$. Substituting 90 for b in the equation $fh = 65h + b$ 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.
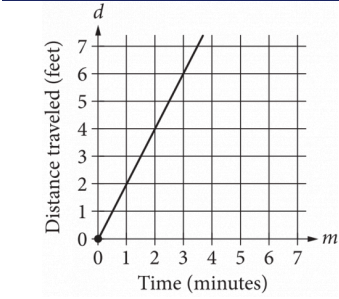
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 11e1ab81

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

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. $d = \dfrac{1}{2}m$

C. $d = m + 2$

D. $d = 2m + 2$

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 c01f4a95

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

$$j(x) = mx + 144$$

For the linear function j, m is a constant and $j(12) = 18$. What is the value of $j(10)$?

Correct Answer: 39

Rationale

The correct answer is 39. It's given that for the linear function j, m is a constant and $j12 = 18$. Substituting 12 for x and 18 for jx in the given equation yields $18 = m12 + 144$. Subtracting 144 from both sides of this equation yields $-126 = m12$. Dividing both sides of this equation by 12 yields $-10.5 = m$. Substituting -10.5 for m in the given equation, $jx = mx + 144$, yields $jx = -10.5x + 144$. Substituting 10 for x in this equation yields $j10 = -10.510 + 144$, or $j10 = 39$. Therefore, the value of $j10$ is 39.

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.

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 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 28c2253f

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

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

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

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 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 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 $y = 0.6758 + 2.6$, 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 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 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 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. $\dfrac{23}{2}$

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

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

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

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 $x-3=\dfrac{17}{2}$.

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 $x=\dfrac{23}{2}$. Therefore, the value of $x-3$ is $\dfrac{23}{2}-3$, or $\dfrac{17}{2}$.

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 $\dfrac{15}{2}$ or $-\dfrac{15}{2}$, it follows that the value of x is $\dfrac{21}{2}$ or $-\dfrac{9}{2}$, respectively. However, solving the given equation for x yields $x=\dfrac{23}{2}$.

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 $p=\dfrac{6}{5}$, 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 d62ad380

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

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. $P = \dfrac{10}{3}s + 8$

C. $P = \dfrac{10}{3}s - 2$

D. $P = \dfrac{3}{10}s - \dfrac{1}{10}$

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 = $\dfrac{10}{3}$. To solve for a, substitute one of the given pairs of values for s and P: when s = 3, P = 8, so $8 = \dfrac{10}{3}(3) + a$, which yields a = −2. The solution is therefore $P = \dfrac{10}{3}s - 2$.

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 ID 1035faea

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

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 52cb8ea4

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

$$7x - 5y = 4$$
$$4x - 8y = 9$$

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

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.
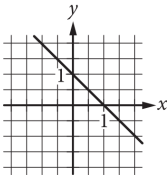
Question Difficulty: Hard

Question ID 0b46bad5

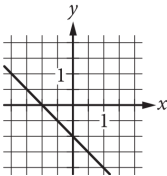| Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■■

$$ax + by = b$$

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?
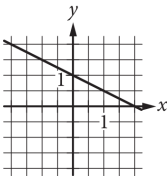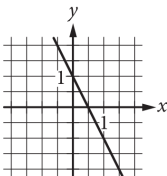
A.

B.

C.

D.

Correct Answer: C

Rationale

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. $-\dfrac{1}{2}$

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 $-\dfrac{1}{2}$ 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 $\dfrac{1}{2}$. However, the line with equation x = 2 has undefined slope (not slope of $\dfrac{1}{2}$). 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 3f8a701b

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

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. $b \neq \dfrac{5}{9}$

A. None

B. I only

C. I and II only

D. I and III only

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 $\dfrac{5}{9}$. Therefore, statement III must be true.

Since b can have any value other than $\dfrac{5}{9}$, statement II may or may not be true.

Choice A is incorrect. For the given equation to have no solution, both $a = 9$ and $b \neq \dfrac{5}{9}$ must be true. Choice B is incorrect because it must also be true that $b \neq \dfrac{5}{9}$. 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 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 $-2t + 3 = 38$. 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 0cb57740

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

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. $8(5n) + 3n + 4(6) = 30$

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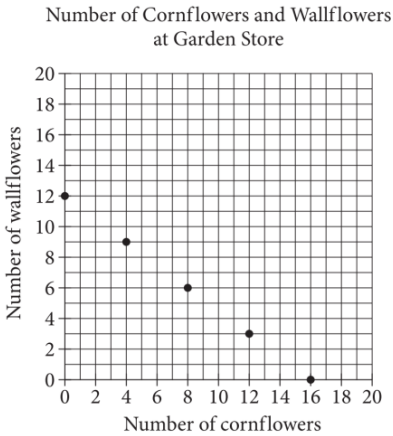
Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c362c210

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

Number of Cornflowers and Wallflowers
at Garden Store

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?

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

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 2937ef4f

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

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

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 $\dfrac{4,650}{5} = 930$ 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 2b15d65f

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

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

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 0366d965

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

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 $k+n$?

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 c4ea43ef

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

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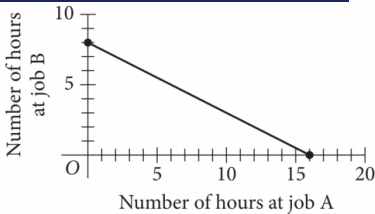
To earn money for college, Avery works two part-time jobs: A and B. She earns $10 per hour working at job A and $20 per hour working at job B. In one week, Avery earned a total of s dollars for working at the two part-time jobs. The graph above represents all possible combinations of numbers of hours 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 $10a + 20b = s$

Question ID 628300a9

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

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. $10x + 20$

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 90095507

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

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

Correct Answer: B

Rationale

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, $\$135x$ - 1. It follows that $y = 270 + 135x$ - 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 a7a14e87

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

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. $x - y = -3$

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 e6cb2402

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

$$3(kx + 13) = \tfrac{48}{17}x + 36$$

In the given equation, k is a constant. The equation has no solution. What is the value of k?

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

Rationale

The correct answer is $\frac{16}{17}$. It's given that the equation $3kx + 13 = \frac{48}{17}x + 36$ 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 aee9fd2d

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

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

Correct Answer: B

Rationale

Choice B is correct. Multiplying both sides of the given equation by 313, or 39, yields $39\frac{x+6}{3} = 39\frac{x+6}{13}$, or $13x + 6 = 3x + 6$. Subtracting $3x + 6$ from both sides of this equation yields $10x + 6 = 0$. 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 5bf5136d

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

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 $x > 18$

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

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 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 $10x + 73 = 27$, 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 $\frac{3}{5}3$, or $\frac{9}{5}$. Note that 9/5 and 1.8 are examples of ways to enter a correct answer.

Question Difficulty: Hard

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

Question Difficulty: Hard

Question ID 45cfb9de

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

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. $w + 5 > 20$

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 daad7c32

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

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

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 b988eeec

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

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?

Correct Answer: -12

Rationale

The correct answer is -12. It's given that the functions f and g are defined as $fx = \frac{1}{4}x$ - 9 and $gx = \frac{3}{4}x + 21$. If the function h is defined as $hx = fx + gx$, then substituting $\frac{1}{4}x$ - 9 for fx and $\frac{3}{4}x + 21$ for gx in this function yields $hx = \frac{1}{4}x$ - 9 + $\frac{3}{4}x + 21$. This can be rewritten as $hx = \frac{4}{4}x + 12$, or $hx = x + 12$. 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 $y = hx$ 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 $y = hx$ in the xy-plane is -12.

Question Difficulty: Hard

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, $m = \dfrac{y_2 - y_1}{x_2 - x_1}$. 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 $m = \dfrac{18 - 21}{-10 + 11}$, 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 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 $x \leq 3 \cdot 4$ - 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 a1fd2304

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

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?

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