Question ID e53870b6

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

$$6x + k = 6x + 5$$

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

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 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 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 $y = -40 + 40$, 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 $y = -41 + 40$, or $y = 36$. Therefore, when $x = 1$, the corresponding value of y for the given

Question ID dba8d38a

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

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. $s + p = 250$
$5s + 12p = 2{,}300$

B. $s + p = 250$
$12s + 5p = 2{,}300$

C. $5s + 12p = 250$
$s + p = 2{,}300$

D. $12s + 5p = 250$
$s + p = 2{,}300$

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 ID 2c121b25

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

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

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

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 ≥ 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 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 $f0 = \frac{1}{10}0$ - 2, or $f0 = $ - 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 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 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 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 $44x + 2 = 412$, 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 06fc1726

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

ID: 06fc1726

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

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

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

C. 3

D. 9

ID: 06fc1726 Answer

Correct Answer: C

Rationale

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

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 bf883fde

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

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 $fx = mx + b$, where m and b are constants, m is the slope of the graph of $y = fx$ 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 $y = fx$ 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 $fx = mx + b$ yields $fx = 3x - 8$. Thus, the equation that defines f is $fx = 3x - 8$.

Choice A is incorrect. For this function, the graph of $y = fx$ in the xy-plane passes through the point $0, 0$, not $0, -8$.

Choice C is incorrect. For this function, the graph of $y = fx$ in the xy-plane passes through the point $0, 5$, not $0, -8$.

Choice D is incorrect. For this function, the graph of $y = fx$ in the xy-plane passes through the point $0, 11$, not $0, -8$.

Question Difficulty: Easy

Question ID 12983c1e

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

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. $f(x) = 5x$

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 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 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 5ad6bc97

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

$$f(x) = 7x + 1$$

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?

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 $f7 = 77 + 1$, or $f7 = 50$. Therefore, there are a total of 50 people on a company retreat with 7 managers.

Question Difficulty: Easy

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 $82 + x = 860$, or $16 + 8x = 480$. Therefore, if $2 + x = 60$, the value of $16 + 8x$ is 480.

Question Difficulty: Easy

Question ID dd797fe2

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

$$4x + 3y = 24$$

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

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 12255364

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

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

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.
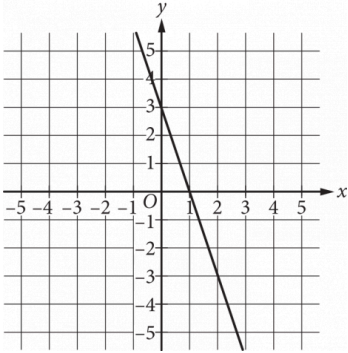
Choice D is incorrect. A member will have been charged a total of $36 + 19 \times 10$, or $226, after 10 months at the gym.

Question Difficulty: Easy

Question ID 8a1544f1

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

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 5ad9eff0

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

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. $w^2 + 6w$

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 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 $120a + 100b \leq 1,100$ represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality $a + b \geq 10$ 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 $b \geq 10 - a$, so the minimum value of b is equal to $10 - a$. Substituting $10 - a$ for b in the first inequality results in $120a + 100(10 - a) \leq 1,100$. Using the distributive property to rewrite this inequality yields $120a + 1,000 - 100a \leq 1,100$, or $20a + 1,000 \leq 1,100$. Subtracting 1,000 from both sides of this inequality yields $20a \leq 100$. Dividing both sides of this inequality by 20 results in $a \leq 5$. 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 c8fb6bcb

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

$$f(x) = 2x + 244$$

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

Correct Answer: B

Rationale

Choice B is correct. It's given that $fx = 2x + 244$ 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 $fx = 2x + 2w$. 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

Choice C is incorrect. The point $0, 40$ is not on the graph of this equation, since $40 = 120 + 8$, or $40 = 8$, is not true.

Choice D is incorrect. The point $0, 40$ is not on the graph of this equation, since $120 + 840 = 480$, or $320 = 480$, is not true.
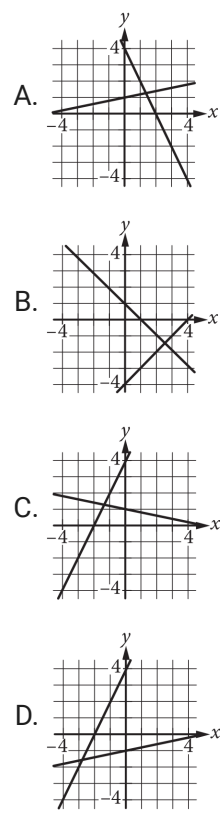
Question Difficulty: Medium

Question ID 6e6a3241

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

$$x + 5y = 5$$
$$2x - y = -4$$

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

A.

B.

C.

D.

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 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 d02193fb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	■■□
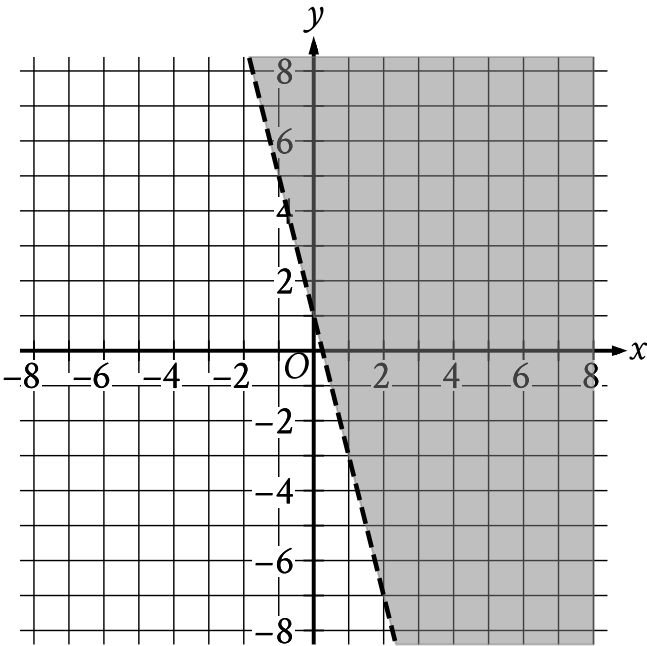
The shaded region shown represents the solutions to which inequality?

A. $y < 1 + 4x$

B. $y < 1 - 4x$

C. $y > 1 + 4x$

D. $y > 1 - 4x$

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 $y > 1 - 4x$.

Question ID e9ef0e6b

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

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. $72 \leq 16x \leq 77$

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 7216 miles total. If one of these whales travels 77 miles each day for 16 days, then the whale travels 7716 miles total. Therefore, the model estimates that in 16 days of its migration, a whale from the genus *Eschrichtius* could travel at least 7216 and at most 7716 miles total. Thus, the inequality $7216 \leq x \leq 7716$ 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 90bd9ef8

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

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. $25,000 > \dfrac{4,332}{2,712}t$

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 $\dfrac{4,332}{2,712}$ 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 3ce92ce8

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

$$f(x) = 2x + 3$$

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?

Correct Answer: 2

Rationale

The correct answer is 2. It's given that function f is defined by $fx = 2x + 3$. Therefore, the equation representing the graph of $y = fx$ 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 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 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 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

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 5cf1bbc9

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

ID: 5cf1bbc9
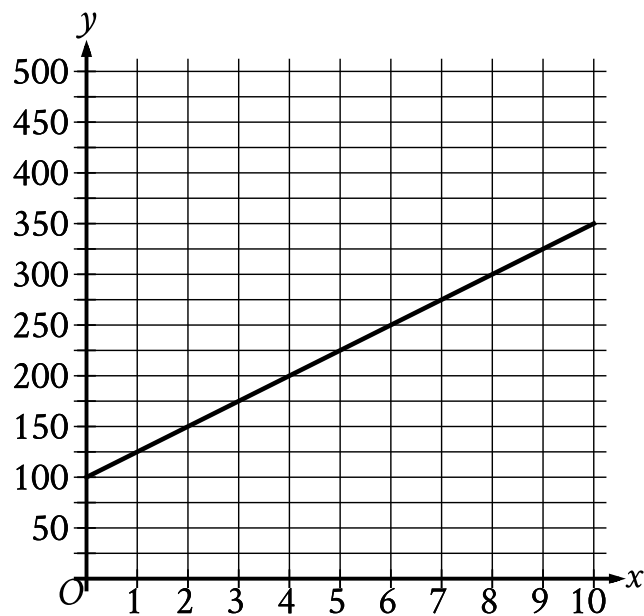
The graph of the function f, where $y = f(x)$, gives the total cost y, in dollars, for a certain video game system and x games. What is the best interpretation of the slope of the graph in this context?

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.

Question ID 7efe5495

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

$$y = 3x$$
$$2x + y = 12$$

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

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 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 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 431c3038

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

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 <u>hours</u> the adult should hike.

Question Difficulty: Medium

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 $0, \frac{86}{3}$. 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 $0, \frac{86}{3}$ 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 $\frac{86}{3}, 0$ and a y-intercept of $0, -4$.

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

Question Difficulty: Medium

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 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 $x = \dfrac{8}{(b-2)}$. 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 2e0290c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	■■☐
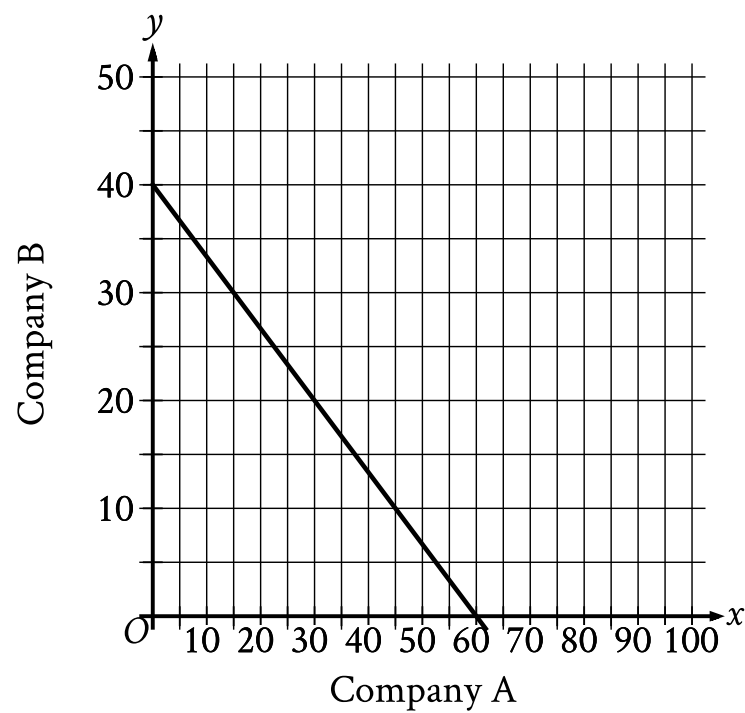
The graph shows the relationship between the number of shares of stock from Company A, x, and the number of shares of stock from Company B, y, that Simone can purchase. Which equation could represent this relationship?

A. $y = 8x + 12$

B. $8x + 12y = 480$

C. $y = 12x + 8$

D. $12x + 8y = 480$

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 $80 + 1240 = 480$, or $480 = 480$, which is true. Substituting 60 for x and 0 for y in the equation $8x + 12y = 480$ yields $860 + 120 = 480$, 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 $40 = 80 + 12$, or $40 = 12$, is not true.

Question ID 45bba652

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

If $2(x-5)+3(x-5)=10$, what is the value of $x-5$?

A. 2

B. 5

C. 7

D. 12

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 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 $44x + 1 = 15x$ - 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 cc3e9528

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

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?

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 $Ax + By + k = C$. 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 $9x$ - $10y + 4 = 19$, 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 $9x$ - $100 = 59$, 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 ee2f611f

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

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?

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 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:

$$12a + 8c = 300$$
$$\underline{-8a - 8c = -240}$$
$$4a + 0c = 60$$

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 e1248a5c

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

ID: e1248a5c

In the system of equations below, *a* and *c* are constants.

$$\frac{1}{2}x + \frac{1}{3}y = \frac{1}{6}$$
$$ax + y = c$$

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 ID 70feb725

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

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

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 af2ba762

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

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

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 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 153ee763

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

$$-3x + 21px = 84$$

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

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 $-3x1 - 7p = 84$. Dividing both sides of this equation by -3 yields $x1 - 7p = -28$. 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 ff501705

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

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

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

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 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 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. $y > \dfrac{5}{2}$

D. $y > \dfrac{3}{2}$

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 $y > \dfrac{3}{2}$; however, if 2 is substituted into the first inequality for y, the result is $x < \dfrac{3}{2}$. This cannot be true because the second inequality gives $x > \dfrac{5}{2}$.

Question Difficulty: Hard

Question ID a04050d8

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

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. $f = 20 + \dfrac{4}{9}(p + c)$

B. $f = 20 - \dfrac{4}{9}(p + c)$

C. $f = 20 - \dfrac{4}{9}(p - c)$

D. $f = 20 + \dfrac{9}{4}(p + c)$

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 $f = 20 - \dfrac{4}{9}(p + c)$.

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 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 e8f9e117

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

$$I = \frac{V}{R}$$

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?

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