Question ID 6ee5222e

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

ID: 6ee5222e

$$\frac{3}{5}x + \frac{3}{4}y = 7$$

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

A.

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

B.

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

C.

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

D.

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

ID: 6ee5222e Answer

Correct Answer: D

Rationale

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

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

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

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

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

Question Difficulty: Hard

Question ID 252d6b8a

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

ID: 252d6b8a

$$5x + 7y = 1$$
$$ax + by = 1$$

In the given pair of equations, a and b are constants. The graph of this pair of equations in the *xy*-plane is a pair of perpendicular lines. Which of the following pairs of equations also represents a pair of perpendicular lines?

A. $10x + 7y = 1$
$ax - 2by = 1$

B. $10x + 7y = 1$
$ax + 2by = 1$

C. $10x + 7y = 1$
$2ax + by = 1$

D. $5x - 7y = 1$
$ax + by = 1$

ID: 252d6b8a Answer

Correct Answer: B

Rationale

Choice B is correct. Two lines are perpendicular if their slopes are negative reciprocals, meaning that the slope of the first line is equal to -1 divided by the slope of the second line. Each equation in the given pair of equations can be written in slope-intercept form, $y = mx + b$, where m is the slope of the graph of the equation in the *xy*-plane and $(0, b)$ is the *y*-intercept. For the first equation, $5x + 7y = 1$, subtracting $5x$ from both sides gives $7y = -5x + 1$, and dividing both sides of this equation by 7 gives $y = -\frac{5}{7}x + \frac{1}{7}$. Therefore, the slope of the graph of this equation is $-\frac{5}{7}$. For the second equation, $ax + by = 1$, subtracting ax from both sides gives $by = -ax + 1$, and dividing both sides of this equation by b gives $y = -\frac{a}{b}x + \frac{1}{b}$. Therefore, the slope of the graph of this equation is $-\frac{a}{b}$. Since the graph of the given pair of equations is a pair of perpendicular lines, the slope of the graph of the second equation, $-\frac{a}{b}$, must be the negative reciprocal of the slope of the graph of the first equation, $-\frac{5}{7}$. The negative reciprocal of $-\frac{5}{7}$ is $\frac{-1}{\left(-\frac{5}{7}\right)}$, or $\frac{7}{5}$. Therefore, $-\frac{a}{b} = \frac{7}{5}$, or $\frac{a}{b} = -\frac{7}{5}$. Similarly, rewriting the equations in choice B in slope-intercept form yields $y = -\frac{10}{7}x + \frac{1}{7}$ and $y = -\frac{a}{2b}x + \frac{1}{2b}$. It follows that the slope of the graph of the first equation in choice B is $-\frac{10}{7}$ and the slope of the graph of the second equation in choice B is $-\frac{a}{2b}$. Since $\frac{a}{b} = -\frac{7}{5}$, $-\frac{a}{2b}$ is equal to $-\left(\frac{1}{2}\right)\left(-\frac{7}{5}\right)$, or $\frac{7}{10}$. Since $\frac{7}{10}$ is the negative reciprocal of $-\frac{10}{7}$, the pair of equations in choice B represents a pair of perpendicular lines.

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

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

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

Question Difficulty: Hard

Question ID 900234f1

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

ID: 900234f1

$$5G + 45R = 380$$

At a school fair, students can win colored tokens that are worth a different number of points depending on the color. One student won G green tokens and R red tokens worth a total of 380 points. The given equation represents this situation. How many more points is a red token worth than a green token?

ID: 900234f1 Answer

Correct Answer: 40

Rationale

The correct answer is 40. It's given that $5G + 45R = 380$, where G is the number of green tokens and R is the number of red tokens won by one student and these tokens are worth a total of 380 points. Since the equation represents the situation where the student won points with green tokens and red tokens for a total of 380 points, each term on the left-hand side of the equation represents the number of points won for one of the colors. Since the coefficient of G in the given equation is 5, a green token must be worth 5 points. Similarly, since the coefficient of R in the given equation is 45, a red token must be worth 45 points. Therefore, a red token is worth $45 - 5$ points, or 40 points, more than a green token.

Question Difficulty: Hard

Question ID e40b7bdc

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

ID: e40b7bdc

Keenan made 32 cups of vegetable broth. Keenan then filled x small jars and y large jars with all the vegetable broth he made. The equation $3x + 5y = 32$ represents this situation. Which is the best interpretation of $5y$ in this context?

A. The number of large jars Keenan filled

B. The number of small jars Keenan filled

C. The total number of cups of vegetable broth in the large jars

D. The total number of cups of vegetable broth in the small jars

ID: e40b7bdc Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the equation $3x + 5y = 32$ represents the situation where Keenan filled x small jars and y large jars with all the vegetable broth he made, which was 32 cups. Therefore, $3x$ represents the total number of cups of vegetable broth in the small jars and $5y$ represents the total number of cups of vegetable broth in the large jars.

Choice A is incorrect. The number of large jars Keenan filled is represented by y, not $5y$.

Choice B is incorrect. The number of small jars Keenan filled is represented by x, not $5y$.

Choice D is incorrect. The total number of cups of vegetable broth in the small jars is represented by $3x$, not $5y$.

Question Difficulty: Hard

Question ID dcdceeae

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

ID: dcdceeae

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

ID: dcdceeae Answer

Correct Answer: -10

Rationale

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

Question Difficulty: Hard

Question ID 1cc52a1f

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

ID: 1cc52a1f

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

ID: 1cc52a1f Answer

Correct Answer: 5

Rationale

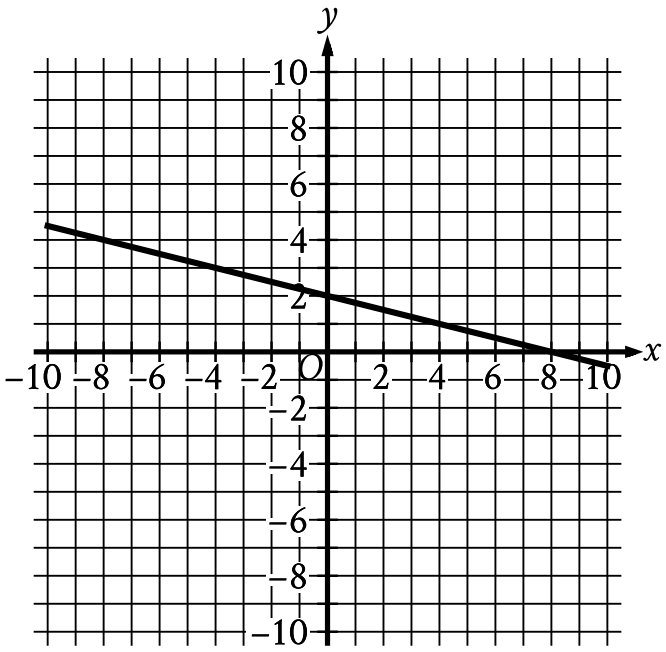
The correct answer is 5. It's given that the equation $10x + 15y = 85$ represents the situation, where x is the number of on-site training courses, y is the number of online training courses, and 85 is the total number of hours of training courses the apprentice has enrolled in. Therefore, $10x$ represents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

Question Difficulty: Hard

Question ID a8e43ae3

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

ID: a8e43ae3



The graph of $y = f(x) + 14$ is shown. Which equation defines function f?

A. $f(x) = -\frac{1}{4}x - 12$

B. $f(x) = -\frac{1}{4}x + 16$

C. $f(x) = -\frac{1}{4}x + 2$

D. $f(x) = -\frac{1}{4}x - 14$

ID: a8e43ae3 Answer

Correct Answer: A

Rationale

Choice A is correct. An equation for the graph shown can be written in slope-intercept form $y = mx + b$, where m is the slope of the graph and its y-intercept is $(0, b)$. Since the y-intercept of the graph shown is $(0, 2)$, the value of b is 2. Since the graph also passes through the point $(4, 1)$, the slope can be calculated as $\frac{1-2}{4-0}$, or $-\frac{1}{4}$. Therefore, the value of m is $-\frac{1}{4}$. Substituting $-\frac{1}{4}$ for m and 2 for b in the equation $y = mx + b$ yields $y = -\frac{1}{4}x + 2$. It's given that an equation for the graph shown is $y = f(x) + 14$. Substituting $f(x) + 14$ for y in the equation $y = -\frac{1}{4}x + 2$ yields $f(x) + 14 = -\frac{1}{4}x + 2$. Subtracting 14 from both sides of this equation yields $f(x) = -\frac{1}{4}x - 12$.

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

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

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

Question Difficulty: Hard

Question ID beb54560

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

ID: beb54560

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

ID: beb54560 Answer

Correct Answer: .5, 1/2

Rationale

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

Question Difficulty: Hard

Question ID c73c84cc

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

ID: c73c84cc

The graph of $9x - 10y = 19$ is translated down 4 units in the *xy*-plane. What is the *x*-coordinate of the *x*-intercept of the resulting graph?

ID: c73c84cc Answer

Correct Answer: 59/9, 6.555, 6.556

Rationale

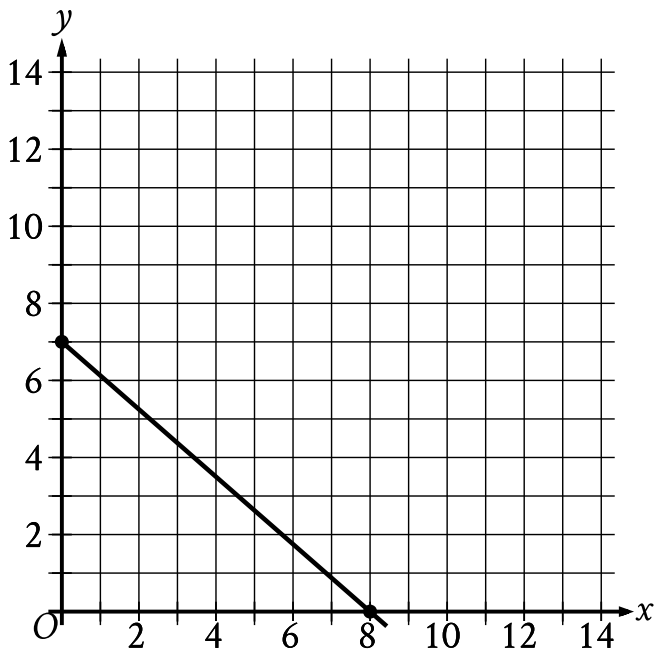
The correct answer is $\frac{59}{9}$. When the graph of an equation in the form $Ax + By = C$, where A, B, and C are constants, is translated down k units in the *xy*-plane, the resulting graph can be represented by the equation $Ax + B(y + k) = C$. It's given that the graph of $9x - 10y = 19$ is translated down 4 units in the *xy*-plane. Therefore, the resulting graph can be represented by the equation $9x - 10(y + 4) = 19$, or $9x - 10y - 40 = 19$. Adding 40 to both sides of this equation yields $9x - 10y = 59$. The *x*-coordinate of the *x*-intercept of the graph of an equation in the *xy*-plane is the value of x in the equation when $y = 0$. Substituting 0 for y in the equation $9x - 10y = 59$ yields $9x - 10(0) = 59$, or $9x = 59$. Dividing both sides of this equation by 9 yields $x = \frac{59}{9}$. Therefore, the *x*-coordinate of the *x*-intercept of the resulting graph is $\frac{59}{9}$. Note that 59/9, 6.555, and 6.556 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 35978b89

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

ID: 35978b89



The point with coordinates $(d, 4)$ lies on the line shown. What is the value of d?

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

B. $\frac{26}{7}$

C. $\frac{24}{7}$

D. $\frac{27}{8}$

ID: 35978b89 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given from the graph that the points $(0, 7)$ and $(8, 0)$ lie on the line. For two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(0, 7)$ for (x_1, y_1) and $(8, 0)$ for (x_2, y_2) in this formula, the slope of the line can be calculated as $m = \frac{0-7}{8-0}$, or $m = -\frac{7}{8}$. It's also given that the point $(d, 4)$ lies on the line. Substituting $(d, 4)$ for (x_1, y_1), $(8, 0)$ for (x_2, y_2), and $-\frac{7}{8}$ for m in the slope formula yields $-\frac{7}{8} = \frac{0-4}{8-d}$, or $-\frac{7}{8} = \frac{-4}{8-d}$. Multiplying both sides of this equation by $8 - d$ yields $-\frac{7}{8}(8 - d) = -4$. Expanding the left-hand side of this equation yields $-7 + \frac{7}{8}d = -4$. Adding 7 to both sides of this equation yields $\frac{7}{8}d = 3$. Multiplying both sides of this equation by $\frac{8}{7}$ yields $d = \frac{24}{7}$. Thus, the value of d is $\frac{24}{7}$.

Choice A is incorrect. This is the value of y when $x = 4$.

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

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

Question Difficulty: Hard

Question ID 9a67367f

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

ID: 9a67367f

x	y
k	13
$k+7$	-15

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

ID: 9a67367f Answer

Correct Answer: 33

Rationale

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

Question Difficulty: Hard

Question ID 95cc0b50

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

ID: 95cc0b50

The graph of $7x + 2y = -31$ in the xy-plane has an x-intercept at $(a, 0)$ and a y-intercept at $(0, b)$, where a and b are constants. What is the value of $\frac{b}{a}$?

A. $-\frac{7}{2}$

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

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

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

ID: 95cc0b50 Answer

Correct Answer: D

Rationale

Choice D is correct. The *x*-coordinate a of the *x*-intercept $(a, 0)$ can be found by substituting 0 for y in the given equation, which gives $7x + 2(0) = -31$, or $7x = -31$. Dividing both sides of this equation by 7 yields $x = -\frac{31}{7}$. Therefore, the value of a is $-\frac{31}{7}$. The *y*-coordinate b of the *y*-intercept $(0, b)$ can be found by substituting 0 for x in the given equation, which gives $7(0) + 2y = -31$, or $2y = -31$. Dividing both sides of this equation by 2 yields $y = -\frac{31}{2}$. Therefore, the value of b is $-\frac{31}{2}$. It follows that the value of $\frac{b}{a}$ is $\frac{-\frac{31}{2}}{-\frac{31}{7}}$, which is equivalent to $\left(\frac{31}{2}\right)\left(\frac{7}{31}\right)$, or $\frac{7}{2}$.

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

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

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

Question Difficulty: Hard

Question ID e4db4454

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

ID: e4db4454

Line h is defined by $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$. Line j is perpendicular to line h in the *xy*-plane. What is the slope of line j?

A. $-\frac{7}{5}$

B. $-\frac{5}{7}$

C. $\frac{7}{5}$

D. $\frac{5}{7}$

ID: e4db4454 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that line h is defined by $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$. This equation can be written in slope-intercept form $y = mx + b$, where m is the slope of line h and b is the *y*-coordinate of the *y*-intercept of line h. Adding 70 to both sides of $\frac{1}{5}x + \frac{1}{7}y - 70 = 0$ yields $\frac{1}{5}x + \frac{1}{7}y = 70$. Subtracting $\frac{1}{5}x$ from both sides of this equation yields $\frac{1}{7}y = -\frac{1}{5}x + 70$. Multiplying both sides of this equation by 7 yields $y = -\frac{7}{5}x + 490$. Therefore, the slope of line h is $-\frac{7}{5}$. It's given that line j is perpendicular to line h in the *xy*-plane. Two lines are perpendicular if their slopes are negative reciprocals, meaning that the slope of the first line is equal to -1 divided by the slope of the second line. Therefore, the slope of line j is the negative reciprocal of the slope of line h. The negative reciprocal of $-\frac{7}{5}$ is $\frac{-1}{\left(-\frac{7}{5}\right)}$, or $\frac{5}{7}$. Therefore, the slope of line j is $\frac{5}{7}$.

Choice A is incorrect. This is the slope of a line in the *xy*-plane that is parallel, not perpendicular, to line h.

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of $-\frac{7}{5}$.

Choice C is incorrect. This is the negative, not the negative reciprocal, of $-\frac{7}{5}$.

Question Difficulty: Hard

Question ID 0e1dbc1d

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

ID: 0e1dbc1d

Line ℓ is defined by $3y + 12x = 5$. Line n is perpendicular to line ℓ in the *xy*-plane. What is the slope of line n?

ID: 0e1dbc1d Answer

Correct Answer: 0.25, 1/4

Rationale

The correct answer is $\frac{1}{4}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line in the *xy*-plane defined by this equation. It's given that line ℓ is defined by $3y + 12x = 5$. Subtracting $12x$ from both sides of this equation yields $3y = -12x + 5$. Dividing both sides of this equation by 3 yields $y = -\frac{12}{3}x + \frac{5}{3}$, or $y = -4x + \frac{5}{3}$. Thus, the slope of line ℓ in the *xy*-plane is -4. Since line n is perpendicular to line ℓ in the *xy*-plane, the slope of line n is the negative reciprocal of the slope of line ℓ. The negative reciprocal of -4 is $-\frac{1}{(-4)} = \frac{1}{4}$. Note that 1/4 and .25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 1ad71c23

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

ID: 1ad71c23

x	y
-18	-48
7	52

The table shows two values of x and their corresponding values of y. In the *xy*-plane, the graph of the linear equation representing this relationship passes through the point $\left(\frac{1}{7},\ a\right)$. What is the value of a?

A. $-\frac{4}{11}$

B. $-\frac{4}{77}$

C. $\frac{4}{7}$

D. $\frac{172}{7}$

ID: 1ad71c23 Answer

Correct Answer: D

Rationale

Choice D is correct. The linear relationship between x and y can be represented by the equation $y = mx + b$, where m is the slope of the graph of this equation in the *xy*-plane and b is the *y*-coordinate of the *y*-intercept. The slope of a line between any two points (x_1, y_1) and (x_2, y_2) on the line can be calculated using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Based on the table, the graph contains the points $(-18, -48)$ and $(7, 52)$. Substituting $(-18, -48)$ and $(7, 52)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{52 - (-48)}{7 - (-18)}$, which is equivalent to $m = \frac{100}{25}$, or $m = 4$. Substituting 4 for m, -18 for x, and -48 for y in the equation $y = mx + b$ yields $-48 = 4(-18) + b$, or $-48 = -72 + b$. Adding 72 to both sides of this equation yields $24 = b$. Therefore, $m = 4$ and $b = 24$. Substituting 4 for m and 24 for b in the equation $y = mx + b$ yields $y = 4x + 24$. Thus, the equation $y = 4x + 24$ represents the linear relationship between x and y. It's also given that the graph of the linear equation representing this relationship in the *xy*-plane passes through the point $\left(\frac{1}{7}, a\right)$. Substituting $\frac{1}{7}$ for x and a for y in the equation $y = 4x + 24$ yields $a = 4\left(\frac{1}{7}\right) + 24$, which is equivalent to $a = \frac{4}{7} + \frac{168}{7}$, or $a = \frac{172}{7}$.

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

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

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

Question Difficulty: Hard

Question ID 8d7fb037

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

ID: 8d7fb037

x	y
18	130
23	160
26	178

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

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

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

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

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

ID: 8d7fb037 Answer

Correct Answer: D

Rationale

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

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

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

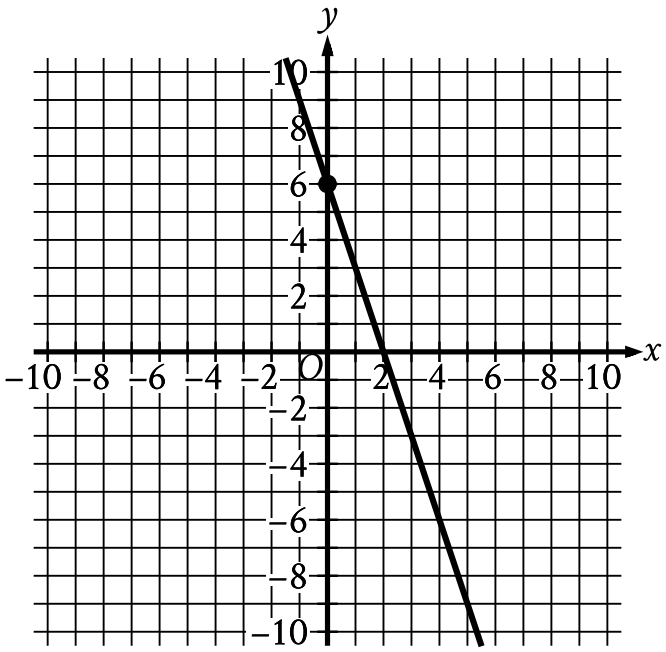
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 8a1fb433

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

ID: 8a1fb433



The graph shows a linear relationship between x and y. Which equation represents this relationship, where R is a positive constant?

A. $Rx + 18y = 36$

B. $Rx - 18y = -36$

C. $18x + Ry = 36$

D. $18x - Ry = -36$

ID: 8a1fb433 Answer

Correct Answer: C

Rationale

Choice C is correct. The equation representing the linear relationship shown can be written in slope-intercept form $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the line. The line shown passes through the points $(0, 6)$ and $(2, 0)$. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope of the line can be calculated using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(0, 6)$ and $(2, 0)$ for (x_1, y_1) and (x_2, y_2), respectively, in this equation yields $m = \frac{0-6}{2-0}$, which is equivalent to $m = -\frac{6}{2}$, or $m = -3$. Since $(0, 6)$ is the *y*-intercept, it follows that $b = 6$. Substituting -3 for m and 6 for b in the equation $y = mx + b$ yields $y = -3x + 6$. Adding $3x$ to both sides of this equation yields $3x + y = 6$. Multiplying this equation by 6 yields $18x + 6y = 36$. It follows that the equation $18x + Ry = 36$, where R is a positive constant, represents this relationship.

Choice A is incorrect. The graph of this relationship passes through the point $(0, 2)$, not $(0, 6)$.

Choice B is incorrect. The graph of this relationship passes through the point $(0, 2)$, not $(0, 6)$.

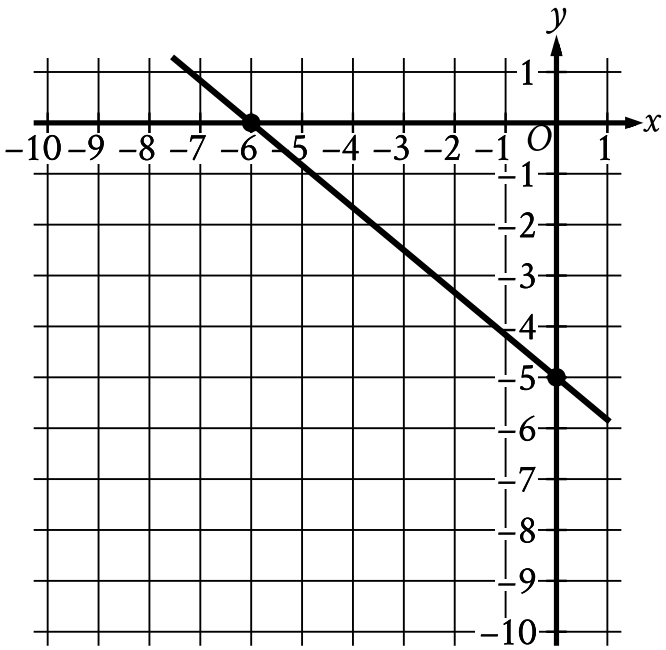
Choice D is incorrect. The graph of this relationship passes through the point $(-2, 0)$, not $(2, 0)$.

Question Difficulty: Hard

Question ID 3dcde9ed

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

ID: 3dcde9ed



Line k is shown in the *xy*-plane. Line j (not shown) is perpendicular to line k. What is the slope of line j?

ID: 3dcde9ed Answer

Correct Answer: 1.2, 6/5

Rationale

The correct answer is $\frac{6}{5}$. It's given that line j is perpendicular to line k in the *xy*-plane. This means that the slope of line j is the opposite reciprocal of the slope of line k. 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 as $\frac{y_2-y_1}{x_2-x_1}$. It's shown that line k passes through the points $(-6, 0)$ and $(0, -5)$ in the *xy*-plane. Substituting -6 for x_1, 0 for y_1, 0 for x_2, and -5 for y_2 in $\frac{y_2-y_1}{x_2-x_1}$ yields $\frac{-5-0}{0-(-6)}$, or $-\frac{5}{6}$. The opposite reciprocal of $-\frac{5}{6}$ is $\frac{6}{5}$. Therefore, the slope of line j is $\frac{6}{5}$. Note that 6/5 and 1.2 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ec0fe2b2

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

ID: ec0fe2b2

In the *xy*-plane, line ℓ passes through the point $(0, 0)$ and is parallel to the line represented by the equation $y = 8x + 2$. If line ℓ also passes through the point $(3, d)$, what is the value of d?

ID: ec0fe2b2 Answer

Correct Answer: 24

Rationale

The correct answer is 24. A line in the *xy*-plane can be defined by the equation $y = mx + b$, where m is the slope of the line and b is the *y*-coordinate of the *y*-intercept of the line. It's given that line ℓ passes through the point $(0, 0)$. Therefore, the *y*-coordinate of the *y*-intercept of line ℓ is 0. It's given that line ℓ is parallel to the line represented by the equation $y = 8x + 2$. Since parallel lines have the same slope, it follows that the slope of line ℓ is 8. Therefore, line ℓ can be defined by an equation in the form $y = mx + b$, where $m = 8$ and $b = 0$. Substituting 8 for m and 0 for b in $y = mx + b$ yields the equation $y = 8x + 0$, or $y = 8x$. If line ℓ passes through the point $(3, d)$, then when $x = 3$, $y = d$ for the equation $y = 8x$. Substituting 3 for x and d for y in the equation $y = 8x$ yields $d = 8(3)$, or $d = 24$.

Question Difficulty: Hard

Question ID 228bd68a

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

ID: 228bd68a

What is the *y*-coordinate of the *y*-intercept of the graph of $\frac{3x}{7} = -\frac{5y}{9} + 21$ in the *xy*-plane?

ID: 228bd68a Answer

Correct Answer: 189/5, 37.8

Rationale

The correct answer is $\frac{189}{5}$. A *y*-intercept of a graph in the *xy*-plane is a point where the graph intersects the *y*-axis, which is a point with an *x*-coordinate of 0. Substituting 0 for x in the given equation yields $\frac{3(0)}{7} = -\frac{5y}{9} + 21$, or $0 = -\frac{5y}{9} + 21$. Subtracting 21 from both sides of this equation yields $-21 = -\frac{5y}{9}$. Multiplying both sides of this equation by -9 yields $189 = 5y$. Dividing both sides of this equation by 5 yields $\frac{189}{5} = y$. Therefore, the *y*-coordinate of the *y*-intercept of the graph of the given equation in the *xy*-plane is $\frac{189}{5}$. Note that 189/5 and 37.8 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID a83cf688

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

ID: a83cf688

x	y
$-2s$	24
$-s$	21
s	15

The table shows three values of x and their corresponding values of y, where s is a constant. There is a linear relationship between x and y. Which of the following equations represents this relationship?

A. $sx + 3y = 18s$

B. $3x + sy = 18s$

C. $3x + sy = 18$

D. $sx + 3y = 18$

ID: a83cf688 Answer

Correct Answer: B

Rationale

Choice B is correct. The linear relationship between x and y can be represented by an equation of the form $y - y_1 = m(x - x_1)$, where m is the slope of the graph of the equation in the *xy*-plane and (x_1, y_1) is a point on the graph. The slope of a line can be found using two points on the line and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Each value of x and its corresponding value of y in the table can be represented by a point (x, y). Substituting the points $(-s, 21)$ and $(s, 15)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m = \frac{15 - 21}{s - (-s)}$, which gives $m = \frac{-6}{2s}$, or $m = -\frac{3}{s}$. Substituting $-\frac{3}{s}$ for m and the point $(s, 15)$ for (x_1, y_1) in the equation $y - y_1 = m(x - x_1)$ yields $y - 15 = -\frac{3}{s}(x - s)$. Distributing $-\frac{3}{s}$ on the right-hand side of this equation yields $y - 15 = -\frac{3x}{s} + 3$. Adding 15 to each side of this equation yields $y = -\frac{3x}{s} + 18$. Multiplying each side of this equation by s yields $sy = -3x + 18s$. Adding $3x$ to each side of this equation yields $3x + sy = 18s$. Therefore, the equation $3x + sy = 18s$ represents this relationship.

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