Question ID 7d5a0f4e

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

ID: 7d5a0f4e

In August, a car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. In August and September, the car dealer completed 363 sales. How many sales did the car dealer complete in September?

ID: 7d5a0f4e Answer

Correct Answer: 87

Rationale

The correct answer is 87. It’s given that in August, the car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. Let x represent the number of sales the car dealer completed in September. It follows that $3x+15$ represents the number of sales the car dealer completed in August. It’s also given that in August and September, the car dealer completed 363 sales. It follows that $x+(3x+15)=363$, or $4x+15=363$. Subtracting 15 from each side of this equation yields $4x=348$. Dividing each side of this equation by 4 yields $x=87$. Therefore, the car dealer completed 87 sales in September.

Question Difficulty: Hard

Question ID b0e72232

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

ID: b0e72232

$$3x = 36y - 45$$

One of the two equations in a system of linear equations is given. The system has no solution. Which equation could be the second equation in this system?

A. $x = 4y$

B. $\frac{1}{3}x = 4y$

C. $x = 12y - 15$

D. $\frac{1}{3}x = 12y - 15$

ID: b0e72232 Answer

Correct Answer: B

Rationale

Choice B is correct. A system of two linear equations in two variables, x and y, has no solution when the lines in the *xy*-plane representing the equations are parallel and distinct. Two lines are parallel and distinct if their slopes are the same and their *y*-intercepts are different. The slope of the graph of the given equation, $3x = 36y - 45$, in the *xy*-plane can be found by rewriting the equation in the form $y = mx + b$, where m is the slope of the graph and $(0, b)$ is the *y*-intercept. Adding 45 to each side of the given equation yields $3x + 45 = 36y$. Dividing each side of this equation by 36 yields $\frac{1}{12}x + \frac{5}{4} = y$, or $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the slope of the graph of the given equation is $\frac{1}{12}$ and the *y*-intercept is $\left(0, \frac{5}{4}\right)$. Therefore, the graph of the second equation in the system must also have a slope of $\frac{1}{12}$, but must not have a *y*-intercept of $\left(0, \frac{5}{4}\right)$. Multiplying each side of the equation given in choice B by $\frac{1}{4}$ yields $\frac{1}{12}x = y$, or $y = \frac{1}{12}x$. It follows that the graph representing the equation in choice B has a slope of $\frac{1}{12}$ and a *y*-intercept of $(0, 0)$. Since the slopes of the graphs of the two equations are equal and the *y*-intercepts of the graphs of the two equations are different, the equation in choice B could be the second equation in the system.

Choice A is incorrect. This equation can be rewritten as $y = \frac{1}{4}x$. It follows that the graph of this equation has a slope of $\frac{1}{4}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Choice C is incorrect. This equation can be rewritten as $y = \frac{1}{12}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{12}$ and a *y*-intercept of $\left(0, \frac{5}{4}\right)$, so the system consisting of this equation and the given equation has infinitely many solutions, rather than no solution.

Choice D is incorrect. This equation can be rewritten as $y = \frac{1}{36}x + \frac{5}{4}$. It follows that the graph of this equation has a slope of $\frac{1}{36}$, so the system consisting of this equation and the given equation has exactly one solution, rather than no solution.

Question Difficulty: Hard

Question ID 9609a243

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

ID: 9609a243

$$4x - 9y = 9y + 5$$
$$hy = 2 + 4x$$

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

A. -9

B. 0

C. 9

D. 18

ID: 9609a243 Answer

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. The graphs of two lines in the *xy*-plane represented by equations in the form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system can be written in the form $Ax + By = C$ by subtracting $9y$ from both sides of the equation to yield $4x - 18y = 5$. The second equation in the given system can be written in the form $Ax + By = C$ by subtracting $4x$ from both sides of the equation to yield $-4x + hy = 2$. The coefficient of x in this second equation, -4, is -1 times the coefficient of x in the first equation, 4. For the lines to be parallel, the coefficient of y in the second equation, h, must also be -1 times the coefficient of y in the first equation, -18. Thus, $h = -1(-18)$, or $h = 18$. Therefore, if the given system has no solution, the value of h is 18.

Choice A is incorrect. If the value of h is -9, then the given system would have one solution, rather than no solution.

Choice B is incorrect. If the value of h is 0, then the given system would have one solution, rather than no solution.

Choice C is incorrect. If the value of h is 9, then the given system would have one solution, rather than no solution.

Question Difficulty: Hard

Question ID 0876dbef

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

ID: 0876dbef

$$\frac{7}{8}y - \frac{5}{8}x = \frac{4}{7} - \frac{7}{8}y$$
$$\frac{5}{4}x + \frac{7}{4} = py + \frac{15}{4}$$

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

ID: 0876dbef Answer

Correct Answer: 3.5, 7/2

Rationale

The correct answer is $\frac{7}{2}$. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. Two lines represented by equations in standard form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system, $\frac{7}{8}y - \frac{5}{8}x = \frac{4}{7} - \frac{7}{8}y$, can be written in standard form by adding $\frac{7}{8}y$ to both sides of the equation, which yields $\frac{14}{8}y - \frac{5}{8}x = \frac{4}{7}$, or $-\frac{5}{8}x + \frac{14}{8}y = \frac{4}{7}$. Multiplying each term in this equation by -8 yields $5x - 14y = -\frac{32}{7}$. The second equation in the given system, $\frac{5}{4}x + \frac{7}{4} = py + \frac{15}{4}$, can be written in standard form by subtracting $\frac{7}{4}$ and py from both sides of the equation, which yields $\frac{5}{4}x - py = \frac{8}{4}$. Multiplying each term in this equation by 4 yields $5x - 4py = 8$. The coefficient of x in the first equation, $5x - 14y = -\frac{32}{7}$, is equal to the coefficient of x in the second equation, $5x - 4py = 8$. For the lines to be parallel, and for the coefficients for x and y in one equation to be proportional to the corresponding coefficients in the other equation, the coefficient of y in the second equation must also be equal to the coefficient of y in the first equation. Therefore, $-14 = -4p$. Dividing both sides of this equation by -4 yields $\frac{-14}{-4} = p$, or $p = \frac{7}{2}$. Therefore, if the given system of equations has no solution, the value of p is $\frac{7}{2}$. Note that 7/2 and 3.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 4a2f9ba8

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

ID: 4a2f9ba8

$$8x + 7y = 9$$
$$24x + 21y = 27$$

For each real number r, which of the following points lies on the graph of each equation in the *xy*-plane for the given system?

A. $\left(r, -\frac{8r}{7} + \frac{9}{7}\right)$

B. $\left(-\frac{8r}{7} + \frac{9}{7}, r\right)$

C. $\left(-\frac{8r}{7} + 9, \frac{8r}{7} + 27\right)$

D. $\left(\frac{r}{3} + 9, -\frac{r}{3} + 27\right)$

ID: 4a2f9ba8 Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing both sides of the second equation in the given system by 3 yields $8x + 7y = 9$, which is the first equation in the given system. Therefore, the first and second equations represent the same line in the *xy*-plane. If the *x*- and *y*-coordinates of a point satisfy an equation, the point lies on the graph of the equation in the *xy*-plane. Choice A is a point with *x*-coordinate r and *y*-coordinate $-\frac{8r}{7} + \frac{9}{7}$. Substituting r for x and $-\frac{8r}{7} + \frac{9}{7}$ for y in the equation $8x + 7y = 9$ yields $8r + 7\left(-\frac{8}{7}r + \frac{9}{7}\right) = 9$. Applying the distributive property to the left-hand side of this equation yields $8r - 8r + 9 = 9$. Combining like terms on the left-hand side of this equation yields $9 = 9$, so the coordinates of the point $\left(r, -\frac{8}{7}r + \frac{9}{7}\right)$ satisfy both equations in the given system. Therefore, for each real number r, the point $\left(r, -\frac{8}{7}r + \frac{9}{7}\right)$ lies on the graph of each equation in the *xy*-plane for the given system.

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

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

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

Question Difficulty: Hard

Question ID 52007f35

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

ID: 52007f35

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

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

ID: 52007f35 Answer

Correct Answer: 6

Rationale

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

Question Difficulty: Hard

Question ID b1047a54

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

ID: b1047a54

$$\frac{2}{5}x + \frac{7}{5}y = \frac{2}{7}$$
$$gx + ky = \frac{5}{2}$$

In the given system of equations, g and k are constants. The system has infinitely many solutions. What is the value of $\frac{g}{k}$?

ID: b1047a54 Answer

Correct Answer: .2857, 2/7

Rationale

The correct answer is $\frac{2}{7}$. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions if and only if the two linear equations are equivalent. Multiplying each side of the first equation in the system by $\frac{35}{4}$ yields $\frac{35}{4}\left(\frac{2}{5}x + \frac{7}{5}y\right) = \frac{35}{4}\left(\frac{2}{7}\right)$, or $\frac{7}{2}x + \frac{49}{4}y = \frac{5}{2}$. Since this equation is equivalent to the second equation and has the same right side as the second equation, the coefficients of x and y, respectively, should also be the same. It follows that $g = \frac{7}{2}$ and $k = \frac{49}{4}$. Therefore, the value of $\frac{g}{k}$ is $\frac{\frac{7}{2}}{\frac{49}{4}}$, or $\frac{2}{7}$. Note that 2/7, .2857, 0.285, and 0.286 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID c130b16c

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

ID: c130b16c

$$y = 6x + 18$$

One of the equations in a system of two linear equations is given. The system has no solution. Which equation could be the second equation in the system?

A. $-6x + y = 18$

B. $-6x + y = 22$

C. $-12x + y = 36$

D. $-12x + y = 18$

ID: c130b16c Answer

Correct Answer: B

Rationale

Choice B is correct. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning $\frac{D}{A} = \frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The given equation, $y = 6x + 18$, can be written in standard form by subtracting $6x$ from both sides of the equation to yield $-6x + y = 18$. Therefore, the given equation can be written in the form $Ax + By = C$, where $A = -6$, $B = 1$, and $C = 18$. The equation in choice B, $-6x + y = 22$, is written in the form $Dx + Ey = F$, where $D = -6$, $E = 1$, and $F = 22$. Therefore, $\frac{D}{A} = \frac{-6}{-6}$, which can be rewritten as $\frac{D}{A} = 1$; $\frac{E}{B} = \frac{1}{1}$, which can be rewritten as $\frac{E}{B} = 1$; and $\frac{F}{C} = \frac{22}{18}$, which can be rewritten as $\frac{F}{C} = \frac{11}{9}$. Since $\frac{D}{A} = 1$, $\frac{E}{B} = 1$, and $\frac{F}{C}$ is not equal to 1, it follows that the given equation and the equation $-6x + y = 22$ are parallel and distinct. Therefore, a system of two linear equations consisting of the given equation and the equation $-6x + y = 22$ has no solution. Thus, the equation in choice B could be the second equation in the system.

Choice A is incorrect. The equation $-6x + y = 18$ and the given equation represent the same line in the *xy*-plane. Therefore, a system of these linear equations would have infinitely many solutions, rather than no solution.

Choice C is incorrect. The equation $-12x + y = 36$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

Choice D is incorrect. The equation $-12x + y = 18$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

Question Difficulty: Hard

Question ID 5e7991d4

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

ID: 5e7991d4

$$(x-2)-4(y+7)=117$$
$$(x-2)+4(y+7)=442$$

The solution to the given system of equations is (x, y). What is the value of $6(x-2)$?

ID: 5e7991d4 Answer

Correct Answer: 1677

Rationale

The correct answer is $1{,}677$. Adding the first equation to the second equation in the given system yields $(x-2)+(x-2)+(-4)(y+7)+4(y+7)=117+442$, or $2(x-2)=559$. Multiplying both sides of this equation by 3 yields $6(x-2)=1{,}677$. Therefore, the value of $6(x-2)$ is $1{,}677$.

Question Difficulty: Hard

Question ID 2ebd5e5b

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

ID: 2ebd5e5b

$$24x + y = 48$$
$$6x + y = 72$$

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

ID: 2ebd5e5b Answer

Correct Answer: 80

Rationale

The correct answer is 80. Subtracting the second equation in the given system from the first equation yields $(24x + y) - (6x + y) = 48 - 72$, which is equivalent to $24x - 6x + y - y = -24$, or $18x = -24$. Dividing each side of this equation by 3 yields $6x = -8$. Substituting -8 for $6x$ in the second equation yields $-8 + y = 72$. Adding 8 to both sides of this equation yields $y = 80$.

Alternate approach: Multiplying each side of the second equation in the given system by 4 yields $24x + 4y = 288$. Subtracting the first equation in the given system from this equation yields $(24x + 4y) - (24x + y) = 288 - 48$, which is equivalent to $24x - 24x + 4y - y = 240$, or $3y = 240$. Dividing each side of this equation by 3 yields $y = 80$.

Question Difficulty: Hard

Question ID 90c618a3

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

ID: 90c618a3

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

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

ID: 90c618a3 Answer

Correct Answer: 8

Rationale

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

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

Question Difficulty: Hard

Question ID efaeaf88

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

ID: efaeaf88

$$5y = 10x + 11$$
$$-5y = 5x - 21$$

The solution to the given system of equations is (x, y). What is the value of $30x$?

ID: efaeaf88 Answer

Correct Answer: 20

Rationale

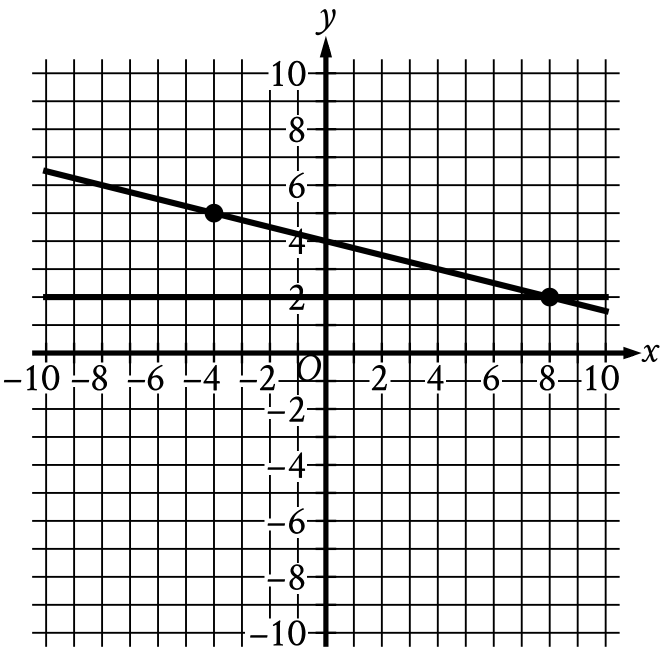
The correct answer is 20. Adding the first equation to the second equation in the given system yields $5y - 5y = 10x + 5x + 11 - 21$, or $0 = 15x - 10$. Adding 10 to both sides of this equation yields $10 = 15x$. Multiplying both sides of this equation by 2 yields $20 = 30x$. Therefore, the value of $30x$ is 20.

Question Difficulty: Hard

Question ID 0b28166c

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

ID: 0b28166c



If a new graph of three linear equations is created using the system of equations shown and the equation $x + 4y = -16$, how many solutions (x, y) will the resulting system of three equations have?

A. Zero

B. Exactly one

C. Exactly two

D. Infinitely many

ID: 0b28166c Answer

Correct Answer: A

Rationale

Choice A is correct. A solution to a system of equations must satisfy each equation in the system. It follows that if an ordered pair (x, y) is a solution to the system, the point (x, y) lies on the graph in the *xy*-plane of each equation in the system. The only point that lies on each graph of the system of two linear equations shown is their intersection point $(8, 2)$. It follows that if a new graph of three linear equations is created using the system of equations shown and the graph of $x + 4y = -16$, this system has either zero solutions or one solution, the point $(8, 2)$. Substituting 8 for x and 2 for y in the equation $x + 4y = -16$ yields $8 + 4(2) = -16$, or $16 = -16$. Since this equation is not true, the point $(8, 2)$ does not lie on the graph of $x + 4y = -16$. Therefore, $(8, 2)$ is not a solution to the system of three equations. It follows that there are zero solutions to this system.

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

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

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

Question Difficulty: Hard

Question ID 8f9ba995

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

ID: 8f9ba995

$$-12x + 14y = 36$$
$$-6x + 7y = -18$$

How many solutions does the given system of equations have?

A. Exactly one

B. Exactly two

C. Infinitely many

D. Zero

ID: 8f9ba995 Answer

Correct Answer: D

Rationale

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

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

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

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

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

Question Difficulty: Hard

Question ID 5cf2a640

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

ID: 5cf2a640

$$7x + 6y = 5$$
$$28x + 24y = 20$$

For each real number r, which of the following points lies on the graph of each equation in the *xy*-plane for the given system?

A. $\left(r, -\frac{6r}{7} + \frac{5}{7}\right)$

B. $\left(r, \frac{7r}{6} + \frac{5}{6}\right)$

C. $\left(\frac{r}{4} + 5, -\frac{r}{4} + 20\right)$

D. $\left(-\frac{6r}{7} + \frac{5}{7}, r\right)$

ID: 5cf2a640 Answer

Correct Answer: D

Rationale

Choice D is correct. Dividing each side of the second equation in the given system by 4 yields $7x + 6y = 5$. It follows that the two equations in the given system are equivalent and any point that lies on the graph of one equation will also lie on the graph of the other equation. Substituting r for y in the equation $7x + 6y = 5$ yields $7x + 6r = 5$. Subtracting $6r$ from each side of this equation yields $7x = -6r + 5$. Dividing each side of this equation by 7 yields $x = -\frac{6r}{7} + \frac{5}{7}$. Therefore, the point $\left(-\frac{6r}{7} + \frac{5}{7}, r\right)$ lies on the graph of each equation in the *xy*-plane for each real number r.

Choice A is incorrect. Substituting r for x in the equation $7x + 6y = 5$ yields $7r + 6y = 5$. Subtracting $7r$ from each side of this equation yields $6y = -7r + 5$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{6} + \frac{5}{6}$. Therefore, the point $\left(r, -\frac{7r}{6} + \frac{5}{6}\right)$, not the point $\left(r, -\frac{6r}{7} + \frac{5}{7}\right)$, lies on the graph of each equation.

Choice B is incorrect. Substituting r for x in the equation $7x + 6y = 5$ yields $7r + 6y = 5$. Subtracting $7r$ from each side of this equation yields $6y = -7r + 5$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{6} + \frac{5}{6}$. Therefore, the point $\left(r, -\frac{7r}{6} + \frac{5}{6}\right)$, not the point $\left(r, \frac{7r}{6} + \frac{5}{6}\right)$, lies on the graph of each equation.

Choice C is incorrect. Substituting $\frac{r}{4} + 5$ for x in the equation $7x + 6y = 5$ yields $7\left(\frac{r}{4} + 5\right) + 6y = 5$, or $\left(\frac{7r}{4} + 35\right) + 6y = 5$. Subtracting $\left(\frac{7r}{4} + 35\right)$ from each side of this equation yields $6y = -\frac{7r}{4} - 35 + 5$, or $6y = -\frac{7r}{4} - 30$. Dividing each side of this equation by 6 yields $y = -\frac{7r}{24} - 5$. Therefore, the point $\left(\frac{r}{4} + 5, -\frac{7r}{24} - 5\right)$, not the point $\left(\frac{r}{4} + 5, -\frac{r}{4} + 20\right)$, lies on the graph of each equation.

Question Difficulty: Hard

Question ID 4898aa47

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

ID: 4898aa47

$$\frac{7}{2}x + 6y = 25$$
$$\frac{5}{2}x + 6y = 23$$

The solution to the given system of equations is (x, y). What is the value of $\frac{17}{2}x + 18y$?

A. 2

B. 3

C. 48

D. 71

ID: 4898aa47 Answer

Correct Answer: D

Rationale

Choice D is correct. Multiplying the second equation in the given system by 2 yields $\frac{10}{2}x + 12y = 46$. Adding this equation to the first equation in the system yields $\left(\frac{7}{2}x + 6y\right) + \left(\frac{10}{2}x + 12y\right) = 25 + 46$, which is equivalent to $\left(\frac{7}{2}x + \frac{10}{2}x\right) + (6y + 12y) = 25 + 46$, or $\frac{17}{2}x + 18y = 71$. Therefore, the value of $\frac{17}{2}x + 18y$ is 71.

Choice A is incorrect. This is the value of x, not the value of $\frac{17}{2}x + 18y$.

Choice B is incorrect. This is the value of y, not the value of $\frac{17}{2}x + 18y$.

Choice C is incorrect. This the value of $\left(\frac{7}{2}x + 6y\right) + \left(\frac{5}{2}x + 6y\right)$, or $6x + 12y$, not the value of $\frac{17}{2}x + 18y$.

Question Difficulty: Hard

Question ID 3eb27778

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

ID: 3eb27778

Store A sells raspberries for $\$5.50$ per pint and blackberries for $\$3.00$ per pint. Store B sells raspberries for $\$6.50$ per pint and blackberries for $\$8.00$ per pint. A certain purchase of raspberries and blackberries would cost $\$37.00$ at Store A or $\$66.00$ at Store B. How many pints of blackberries are in this purchase?

A. 4

B. 5

C. 8

D. 12

ID: 3eb27778 Answer

Correct Answer: B

Rationale

Choice C is correct. It's given that store A sells raspberries for $\$5.50$ per pint and blackberries for $\$3.00$ per pint, and a certain purchase of raspberries and blackberries at store A would cost $\$37.00$. It's also given that store B sells raspberries for $\$6.50$ per pint and blackberries for $\$8.00$ per pint, and this purchase of raspberries and blackberries at store B would cost $\$66.00$. Let r represent the number of pints of raspberries and b represent the number of pints of blackberries in this purchase. The equation $5.50r + 3.00b = 37.00$ represents this purchase of raspberries and blackberries from store A and the equation $6.50r + 8.00b = 66.00$ represents this purchase of raspberries and blackberries from store B. Solving the system of equations by elimination gives the value of r and the value of b that make the system of equations true. Multiplying both sides of the equation for store A by 6.5 yields $(5.50r)(6.5) + (3.00b)(6.5) = (37.00)(6.5)$, or $35.75r + 19.5b = 240.5$. Multiplying both sides of the equation for store B by 5.5 yields $(6.50r)(5.5) + (8.00b)(5.5) = (66.00)(5.5)$, or $35.75r + 44b = 363$. Subtracting both sides of the equation for store A, $35.75r + 19.5b = 240.5$, from the corresponding sides of the equation for store B, $35.75r + 44b = 363$, yields $(35.75r - 35.75r) + (44b - 19.5b) = (363 - 240.5)$, or $24.5b = 122.5$. Dividing both sides of this equationby 24.5 yields $b = 5$. Thus, 5 pints of blackberries are in this purchase.

Choices A and B are incorrect and may result from conceptual or calculation errors. Choice D is incorrect. This is the number of pints of raspberries, not blackberries, in the purchase.

Question Difficulty: Hard

Question ID e5b53db0

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

ID: e5b53db0

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

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

A. 3

B. 4

C. 6

D. 14

ID: e5b53db0 Answer

Correct Answer: D

Rationale

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

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

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

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

Question Difficulty: Hard

Question ID 1c72d95e

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

ID: 1c72d95e

$$y = 4x + 1$$
$$4y = 15x - 8$$

The solution to the given system of equations is (x, y). What is the value of $x - y$?

ID: 1c72d95e Answer

Correct Answer: 35

Rationale

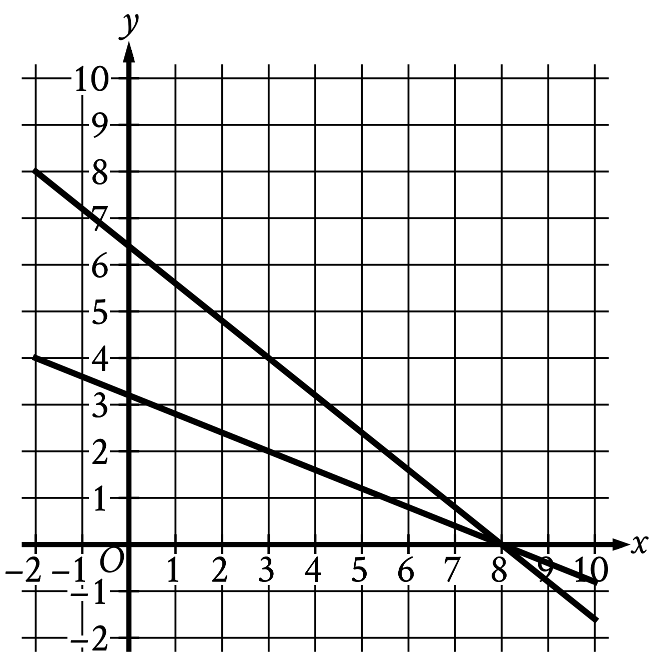
The correct answer is 35. The first equation in the given system of equations defines y as $4x + 1$. Substituting $4x + 1$ for y in the second equation in the given system of equations yields $4(4x + 1) = 15x - 8$. Applying the distributive property on the left-hand side of this equation yields $16x + 4 = 15x - 8$. Subtracting $15x$ from each side of this equation yields $x + 4 = -8$. Subtracting 4 from each side of this equation yields $x = -12$. Substituting -12 for x in the first equation of the given system of equations yields $y = 4(-12) + 1$, or $y = -47$. Substituting -12 for x and -47 for y into the expression $x - y$ yields $-12 - (-47)$, or 35.

Question Difficulty: Hard

Question ID 064ba59a

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

ID: 064ba59a



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

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

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

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

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

ID: 064ba59a Answer

Correct Answer: D

Rationale

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

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

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

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

Question Difficulty: Hard

Question ID 11f714b1

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

ID: 11f714b1

$$5x + 14y = 45$$
$$10x + 7y = 27$$

The solution to the given system of equations is (x, y). What is the value of xy?

ID: 11f714b1 Answer

Correct Answer: 1.8, 9/5

Rationale

The correct answer is $\frac{9}{5}$. Multiplying the first equation in the given system by 2 yields $10x + 28y = 90$. Subtracting the second equation in the given system, $10x + 7y = 27$, from $10x + 28y = 90$ yields $(10x + 28y) - (10x + 7y) = 90 - 27$, which is equivalent to $10x + 28y - 10x - 7y = 63$, or $21y = 63$. Dividing both sides of this equation by 21 yields $y = 3$. The value of x can be found by substituting 3 for y in either of the two given equations. Substituting 3 for y in the equation $10x + 7y = 27$ yields $10x + 7(3) = 27$, or $10x + 21 = 27$. Subtracting 21 from both sides of this equation yields $10x = 6$. Dividing both sides of this equation by 10 yields $x = \frac{6}{10}$, or $x = \frac{3}{5}$. Therefore, the value of xy is $\left(\frac{3}{5}\right)(3)$, or $\frac{9}{5}$. Note that 9/5 and 1.8 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID ac73d6d9

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

ID: ac73d6d9

A sample of a certain alloy has a total mass of 50.0 grams and is 50.0% silicon by mass. The sample was created by combining two pieces of different alloys. The first piece was 30.0% silicon by mass and the second piece was 80.0% silicon by mass. What was the mass, in grams, of the silicon in the second piece?

A. 9.0

B. 16.0

C. 20.0

D. 30.0

ID: ac73d6d9 Answer

Correct Answer: B

Rationale

Choice B is correct. Let x represent the total mass, in grams, of the first piece, and let y represent the total mass, in grams, of the second piece. It's given that the sample has a total mass of 50.0 grams. Therefore, the equation $x + y = 50.0$ represents this situation. It's also given that the sample is 50.0% silicon by mass. Therefore, the total mass of the silicon in the sample is $0.500(50.0)$, or 25.0, grams. It's also given that the first piece was 30.0% silicon by mass and the second piece was 80.0% silicon by mass. Therefore, the masses, in grams, of the silicon in the first and second pieces can be represented by the expressions $0.300x$ and $0.800y$, respectively. Since the sample was created by combining the first and second pieces, and the total mass of the silicon in the sample is 25.0 grams, the equation $0.300x + 0.800y = 25.0$ represents this situation. Subtracting y from both sides of the equation $x + y = 50.0$ yields $x = 50.0 - y$. Substituting $50.0 - y$ for x in the equation $0.300x + 0.800y = 25.0$ yields $0.300(50.0 - y) + 0.800y = 25.0$. Distributing 0.300 on the left-hand side of this equation yields $15.0 - 0.300y + 0.800y = 25.0$. Combining like terms on the left-hand side of this equation yields $15.0 + 0.500y = 25.0$. Subtracting 15.0 from both sides of this equation yields $0.500y = 10.0$. Dividing both sides of this equation by 0.500 yields $y = 20.0$. Substituting 20.0 for y in the expression representing the mass, in grams, of the silicon in the second piece, $0.800y$, yields $0.800(20.0)$, or 16.0. Therefore, the mass, in grams, of the silicon in the second piece is 16.0.

Choice A is incorrect. This is the mass, in grams, of the silicon in the first piece, not the second piece.

Choice C is incorrect. This is the total mass, in grams, of the second piece, not the mass, in grams, of the silicon in the second piece.

Choice D is incorrect. This is the total mass, in grams, of the first piece, not the mass, in grams, of the silicon in the second piece.

Question Difficulty: Hard

Question ID 5cc1eacc

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

ID: 5cc1eacc

$$2x + 3y = 7$$
$$10x + 15y = 35$$

For each real number r, which of the following points lies on the graph of each equation in the *xy*-plane for the given system?

A. $\left(\frac{r}{5} + 7, -\frac{r}{5} + 35\right)$

B. $\left(-\frac{3r}{2} + \frac{7}{2},\ r\right)$

C. $\left(r,\ \frac{2r}{3} + \frac{7}{3}\right)$

D. $\left(r, -\frac{3r}{2} + \frac{7}{2}\right)$

ID: 5cc1eacc Answer

Correct Answer: B

Rationale

Choice B is correct. The two given equations are equivalent because the second equation can be obtained from the first equation by multiplying each side of the equation by 5. Thus, the graphs of the equations are coincident, so if a point lies on the graph of one of the equations, it also lies on the graph of the other equation. A point (x, y) lies on the graph of an equation in the *xy*-plane if and only if this point represents a solution to the equation. It is sufficient, therefore, to find the point that represents a solution to the first given equation. Substituting the *x*- and *y*-coordinates of choice B, $-\frac{3r}{2} + \frac{7}{2}$ and r, for x and y, respectively, in the first equation yields $2\left(-\frac{3r}{2} + \frac{7}{2}\right) + 3r = 7$, which is equivalent to $-3r + 7 + 3r = 7$, or $7 = 7$. Therefore, the point $\left(-\frac{3r}{2} + \frac{7}{2}, r\right)$ represents a solution to the first equation and thus lies on the graph of each equation in the *xy*-plane for the given system.

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

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

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

Question Difficulty: Hard

Question ID a9053f97

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

ID: a9053f97

$$2(8x) + 4(7y) = 12$$
$$-2(8x) + 4(7y) = 12$$

The solution to the given system of equations is (x, y). What is the value of $8x + 7y$?

ID: a9053f97 Answer

Correct Answer: 3

Rationale

The correct answer is 3. Adding the second equation to the first equation in the given system of equations yields $(2(8x) - 2(8x)) + (4(7y) + 4(7y)) = 12 + 12$, or $8(7y) = 24$. Dividing both sides of this equation by 8 yields $7y = 3$. Substituting 3 for $7y$ in the first equation, $2(8x) + 4(7y) = 12$, yields $2(8x) + 4(3) = 12$, or $2(8x) + 12 = 12$. Subtracting 12 from both sides of this equation yields $2(8x) = 0$. Dividing both sides of this equation by 2 yields $8x = 0$. Substituting 0 for $8x$ and 3 for $7y$ in the expression $8x + 7y$ yields $0 + 3$, or 3. Therefore, the value of $8x + 7y$ is 3.

Question Difficulty: Hard

Question ID 1b19f9c0

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

ID: 1b19f9c0

$$48x - 72y = 30y + 24$$
$$ry = \frac{1}{6} - 16x$$

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

ID: 1b19f9c0 Answer

Correct Answer: -34

Rationale

The correct answer is -34. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the *xy*-plane are distinct and parallel. Two lines represented by equations in standard form $Ax + By = C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system can be written in standard form by subtracting $30y$ from both sides of the equation to yield $48x - 102y = 24$. The second equation in the given system can be written in standard form by adding $16x$ to both sides of the equation to yield $16x + ry = \frac{1}{6}$. The coefficient of x in this second equation, 16, is $\frac{1}{3}$ times the coefficient of x in the first equation, 48. For the lines to be parallel the coefficient of y in the second equation, r, must also be $\frac{1}{3}$ times the coefficient of y in the first equation, -102. Thus, $r = \frac{1}{3}(-102)$, or $r = -34$. Therefore, if the given system has no solution, the value of r is -34.

Question Difficulty: Hard

Question ID ec5b59f7

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

ID: ec5b59f7

A piece of wire with a length of 32 inches is cut into two parts. One part has a length of x inches, and the other part has a length of y inches. The value of x is 4 more than 3 times the value of y. What is the value of x?

ID: ec5b59f7 Answer

Correct Answer: 25

Rationale

The correct answer is 25. It's given that a piece of wire has a length of 32 inches and is cut into two parts. It's also given that one part has a length of x inches and the other part has a length of y inches. It follows that the equation $x + y = 32$ represents this situation. It's also given that the value of x is 4 more than 3 times the value of y, or $x = 3y + 4$. Substituting $3y + 4$ for x in the equation $x + y = 32$ yields $3y + 4 + y = 32$. Combining like terms on the left-hand side of this equation yields $4y + 4 = 32$. Subtracting 4 from both sides of this equation yields $4y = 28$. Dividing both sides of this equation by 4 yields $y = 7$. Substituting 7 for y in the equation $x = 3y + 4$ yields $x = 3(7) + 4$, or $x = 25$. Therefore, the value of x is 25.

Question Difficulty: Hard

Question ID a32041f6

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

ID: a32041f6

$$6 + 7r = pw$$
$$7r - 5w = 5w + 11$$

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

ID: a32041f6 Answer

Correct Answer: 10

Rationale

The correct answer is 10. Solving by substitution, the given system of equations, where p is a constant, can be written so that the left-hand side of each equation is equal to $7r$. Subtracting 6 from each side of the first equation in the given system, $6 + 7r = pw$, yields $7r = pw - 6$. Adding $5w$ to each side of the second equation in the given system, $7r - 5w = 5w + 11$, yields $7r = 10w + 11$. Since the left-hand side of each equation is equal to $7r$, setting the the right-hand side of the equations equal to each other yields $pw - 6 = 10w + 11$. A linear equation in one variable, w, has no solution if and only if the equation is false; that is, when there's no value of w that produces a true statement. For the equation $pw - 6 = 10w + 11$, there's no value of w that produces a true statement when $pw = 10w$. Therefore, for the equation $pw - 6 = 10w + 11$, there's no value of w that produces a true statement when the value of p is 10. It follows that in the given system of equations, the system has no solution when the value of p is 10.

Question Difficulty: Hard

Question ID 6d01548f

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

ID: 6d01548f

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

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

ID: 6d01548f Answer

Correct Answer: -28

Rationale

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

Question Difficulty: Hard