Question ID 002dba45

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

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

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

Rationale

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

Question Difficulty: Medium

Question ID f224df07

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

ID: f224df07

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

A. 2

B. 4

C. 5

D. 6

ID: f224df07 Answer

Correct Answer: C

Rationale

Choice C is correct. Let a equal the number of 120-pound packages, and let b equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality $120a + 100b \leq 1,100$ 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 3008cfc3

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

ID: 3008cfc3

x	y
k	13
$k+7$	-15

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

ID: 3008cfc3 Answer

Correct Answer: 33

Rationale

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

Question Difficulty: Hard

Question ID d1b66ae6

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

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

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

Rationale

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

Question Difficulty: Hard

Question ID cb8f449f

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

ID: cb8f449f

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

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

A. 3

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

C. 4

D. 6

ID: cb8f449f Answer

Correct Answer: D

Rationale

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

$$\frac{1}{2}y = 4$$
$$x - \frac{1}{2}y = 2$$
$$\overline{x + 0 = 6}$$

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

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

Question Difficulty: Medium