STRATEGY

Many Algebra questions such as this one will require you to perform the following steps:

1. Define one or more variables that represent quantities in the question.
2. Write one or more equations, expressions, inequalities, or functions that represent the relationships described in the question.
3. Solve the equation.
4. Interpret the solution in terms of what the question is asking.

Ample practice with each of these steps will help you develop the math skills and knowledge needed to successfully answer questions in the Algebra content domain.

REMINDER

There are several different ways you may be tested on the same underlying algebra concepts. Practicing a variety of questions with different contexts is a good way to ensure you'll be ready for the questions you'll come across in the Math section.

Algebra Sample Question 1

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, how many miles of paved road will County X have in 2030? (Assume that no paved roads go out of service.)

The first step in answering this question is to decide what variable or variables you need to define. Since the number of miles paved depends on the year, we can define a variable to represent the year. The number of years after 2014 can be represented using the variable n. Then, since the question says that County X had 783 miles of paved road in 2014 and has been building 8 miles of new paved roads each year, the expression $783 + 8n$ gives the number of miles of paved roads in County X in the year that is n years after 2014. The year 2030 is $2030 - 2014 = 16$ years after 2014; thus, the year 2030 corresponds to $n = 16$. Hence, to find the number of miles of paved roads in County X in 2030, substitute 16 for n in the expression $783 + 8n$, giving $783 + 8(16)$. This is equivalent to $783 + 128$, or 911. Therefore, at the given rate of building, County X will have 911 miles of paved roads in 2030.

Note that this example provides no answer choices. It's in the student-produced response format mentioned briefly above. To respond to this question, you would enter your answer in Bluebook. Directions for entering your answers to student-produced response questions are presented in chapter 29.

Note that the same context could have generated different sorts of questions, as in samples 2 and 3, below.

Algebra Sample Question 2

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, which of the following functions f gives the number of miles of paved road there will be in County X n years after 2014? (Assume that no paved roads go out of service.)

A) $f(n) = 8 + 783n$
B) $f(n) = 2{,}014 + 783n$
C) $f(n) = 738 + 8n$
D) $f(n) = 2{,}014 + 8n$

This question already defines the variable and asks you to identify a function that describes the context. The discussion for sample 1 shows that the correct answer is choice C.

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Algebra Sample Question 3

In 2014, County X had 783 miles of paved roads. Starting in 2015, the county has been building 8 miles of new paved roads each year. At this rate, in which year will County X first have at least 1,000 miles of paved roads? (Assume that no paved roads go out of service.)

In this question, you must create and solve an inequality. As in sample 1, let n be the number of years after 2014. Then the expression $783 + 8n$ gives the number of miles of paved roads in County X n years after 2014. The question is asking when there will first be at least 1,000 miles of paved roads in County X. This condition can be represented by the inequality $783 + 8n \geq 1{,}000$. To find the year in which there will first be at least 1,000 miles of paved roads, you solve this inequality for n. Subtracting 783 from each side of $783 + 8n \geq 1{,}000$ gives $8n \geq 217$. Then dividing each side of $8n \geq 217$ by 8 gives $n \geq 27.125$. Note that an important part of relating the inequality $783 + 8n \geq 1{,}000$ back to the context is to notice that n is counting calendar years, and so the value of n must be an integer. The least value of n that satisfies $783 + 8n \geq 1{,}000$ is 27.125, but the year $2014 + 27.125 = 2041.125$ does not make sense as an answer, and in 2041, there would be only $783 + 8(27) = 999$ miles of paved roads in the county. Therefore, the variable n needs to be rounded up to the next integer, and so the least possible value of n is 28. Therefore, the year that County X will first have at least 1,000 miles of paved roads is 28 years after 2014, which is 2042.

In sample 1, once the variable n was defined, you needed to find an expression that represents the number of miles of paved road in terms of n. In other questions, creating the correct expression, equation, or function may require a more insightful understanding of the context.

STRATEGY

Solving an equation or inequality is often only part of the problem-solving process. You'll also need to interpret the solution in the context of the question, so be sure to remind yourself of the question's context and the meaning of the variables you solved for before selecting your answer.

Algebra Sample Question 4

To edit a manuscript, Miguel charges \$50 for the first 2 hours and \$20 per hour after the first 2 hours. Which of the following expresses the amount, C, in dollars, Miguel charges if it takes him x hours to edit a manuscript, where $x > 2$?

A) $C = 20x$
B) $C = 20x + 10$
C) $C = 20x + 50$
D) $C = 20x + 90$

The question defines the variables C and x and asks you to express C in terms of x. To create the correct equation, you must note that since the \$50 that Miguel charges pays for his first 2 hours of editing, he charges \$20 per hour only *after* the first 2 hours. Thus, if it takes x hours for Miguel to edit a manuscript, he charges \$50 for the first 2 hours and \$20 per hour for the remaining time, which is $x - 2$ hours. Thus, his total charge, C, in dollars, can be written as $C = 50 + 20(x - 2)$, where $x > 2$.

STRATEGY

When the solution you arrive at doesn't match any of the answer choices provided in a given multiple-choice question, consider whether expanding, simplifying, or rearranging your solution will cause it to match an answer choice. Sometimes this extra step is needed to arrive at the correct answer.

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This doesn't match any of the provided answer choices. But when you apply the distributive property to the right-hand side of $C = 50 + 20(x - 2)$, you get $C = 50 + 20x - 40$, or $C = 20x + 10$, which is choice B.

As with samples 1 to 3, different questions could have been asked about this context. For example, you could be asked to find how long it took Miguel to edit a manuscript if he charged $370.

In some questions in the Math section, you'll be given a function that represents a context and be asked to find the value of the output of the function given an input or, as in sample 5, below, the value of the input that corresponds to a given output.

Algebra Sample Question 5

A builder uses the function g defined by $g(x) = 110x + 10{,}000$ to estimate the cost $g(x)$, in dollars, to build a one-story home of planned floor area of x square feet in Stillwater. If the builder estimates that the cost to build a certain one-story home in Stillwater is $142,000, what is the planned floor area, in square feet, of the home?

This question asks you to find the value of the input of a function when you're given the value of the output and the equation of the function. The estimated cost of the home, in dollars, is the output of the function g for a one-story home of planned floor area of x square feet. That is, the output of the function, $g(x)$, is 142,000, and you need to find the value of the input x that gives an output of 142,000. To do this, substitute 142,000 for $g(x)$ in the equation that defines g: $142{,}000 = 110x + 10{,}000$. Now solve for x: First, subtract 10,000 from each side of the equation $142{,}000 = 110x + 10{,}000$, which gives $132{,}000 = 110x$. Then, divide each side of $132{,}000 = 110x$ by 110, which gives $1{,}200 = x$. Therefore, a one-story home with an estimated cost of $142,000 to build in Stillwater has a planned floor area of 1,200 square feet.

Systems of Linear Equations and Inequalities in Context

You may need to define more than one variable and create more than one equation or inequality to represent a context and answer a question. Questions on the Math section may require you to create and solve a system of equations or create a system of inequalities.

Algebra Sample Question 6

Maizah bought pants and a briefcase at a department store. The sum of the prices of the pants and the briefcase before sales tax was $130.00. There was no sales tax on the pants and a 9% sales tax on the briefcase. The total Maizah paid, including the sales tax, was $136.75. What was the price, in dollars, of the pants?

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To answer the question, you first need to define the variables. The question discusses the prices of pants and a briefcase and asks you to find the price of the pants. So it's appropriate to let P be the price, in dollars, of the pants and to let B be the price, in dollars, of the briefcase. Since the sum of the prices before sales tax was \$130.00, the equation $P + B = 130$ represents the sum of the prices. A sales tax of 9% was added to the price of the briefcase. Since 9% is equal to 0.09, the price of the briefcase with tax was $B + 0.09B = 1.09B$. There was no sales tax on the pants, and the total Maizah paid, including tax, was \$136.75, so the equation $P + 1.09B = 136.75$ represents the total, in dollars, Maizah paid.

Now you need to solve the system

$$P + B = 130$$
$$P + 1.09B = 136.75$$

Subtracting the left- and right-hand sides of the first equation from the corresponding sides of the second equation gives you $(P + 1.09B) - (P + B) = 136.75 - 130$, which can be rewritten as $0.09B = 6.75$. Now you can divide each side of the equation $0.09B = 6.75$ by 0.09. This gives you $B = \frac{6.75}{0.09}$, or $B = 75$. Thus, the price, in dollars, of the briefcase is 75. The question asks for the price, in dollars, of the pants, which is P. You can substitute 75 for B in the equation $P + B = 130$, which gives you $P + 75 = 130$, or $P = 130 - 75$, or $P = 55$, so the price of the pants is \$55.

STRATEGY

You can use either of two approaches—combination or substitution—when solving a system of linear equations. One may get you to the answer more quickly than the other, depending on the equations you're working with and what you're solving for. Practice using both approaches to give you greater flexibility on test day.

STRATEGY

While this question may seem complex, as it involves numerous steps, solving it calls on the same underlying principles outlined earlier: defining variables, creating equations to represent relationships, solving equations, and interpreting the solution.

Algebra Sample Question 7

Each morning, John jogs at 6 miles per hour and rides a bike at 12 miles per hour. His goal is to jog and ride his bike a total of at least 9 miles in no more than 1 hour. If John jogs j miles and rides his bike b miles, which of the following systems of inequalities represents John's goal?

A) $\frac{j}{6} + \frac{b}{12} \leq 1$
$j + b \geq 9$

B) $\frac{j}{6} + \frac{b}{12} \geq 1$
$j + b \leq 9$

C) $6j + 12b \geq 9$
$j + b \leq 1$

D) $6j + 12b \leq 1$
$j + b \geq 9$

Distance = Time × Speed.

Distance / Speed

Jogging: $\frac{j}{6}$ ①

Riding: $\frac{b}{12}$ ②

① + ② ≤ 1 hr

$j + b \geq 9$

It's given that John jogs j miles and rides his bike b miles. It's also given that his goal is to jog and ride his bike a total of at least 9 miles. This goal is represented by the inequality $j + b \geq 9$. This eliminates choices B and C.

STRATEGY

In sample 7, the answer choices each contain two parts. Use this to your advantage by tackling one part at a time and eliminating answers that don't work.

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STRATEGY

You should be able to quickly rearrange equations such as rate × time = distance by solving for any of the variables. Sample 7 requires you to solve the equation for time.

Since rate × time = distance, it follows that time = $\frac{\text{distance}}{\text{rate}}$. John jogs j miles at 6 miles per hour, so the time he jogs is equal to $\frac{j \text{ miles}}{6 \text{ miles/hour}} = \frac{j}{6}$ hours. Similarly, since John rides his bike b miles at 12 miles per hour, the time he rides his bike is $\frac{b}{12}$ hours. Thus, John's goal to complete his jog and his bike ride in no more than 1 hour can be represented by the inequality $\frac{j}{6} + \frac{b}{12} \leq 1$. The system $j + b \geq 9$ and $\frac{j}{6} + \frac{b}{12} \leq 1$ is choice A.

Fluency in Solving Linear Equations, Linear Inequalities, and Systems of Linear Equations

Creating linear equations, linear inequalities, and systems of linear equations that represent a context are key skills for success in college and careers. It's also essential to be able to fluently solve these linear equations, linear inequalities, and systems of linear equations. Some of the Algebra questions in the Math section may also present equations, inequalities, or systems without a context and directly assess your fluency in solving them.

All such fluency questions in the Math section permit the use of a calculator, and some of them test your ability to solve equations, inequalities, and systems of equations. Even though a calculator is permitted for all Math section questions, you may be able to answer certain questions more quickly without using a calculator, such as in sample 9, below. Part of what the Math section assesses is your ability to decide whether using a calculator to answer a question offers efficiency or whether it's more efficient to solve by hand. Sample 8 is an example of a question that could be solved either by hand or by using a graphing calculator.

Algebra Sample Question 8

$3\left(\frac{1}{2} - x\right) = \frac{3}{5} + 15x$

What is the solution to the given equation?

Using the distributive property to rewrite the left-hand side of the equation gives $\frac{3}{2} - 3x = \frac{3}{5} + 15x$. Adding $3x$ to both sides of this equation and then subtracting $\frac{3}{5}$ from both sides of this equation gives $\frac{3}{2} - \frac{3}{5} = 18x$. The equation may be easier to solve if it's transformed

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into an equation without fractions; to do this, multiply each side of $\frac{3}{2} - \frac{3}{5} = 18x$ by 10, which is the least common multiple of the denominators 2 and 5. This gives $\frac{30}{2} - \frac{30}{5} = 180x$, which can be rewritten as $15 - 6 = 180x$, or $9 = 180x$. Dividing both sides of this equation by 180 gives $x = \frac{1}{20}$.

Alternatively, each side of the given equation can be set equal to y and entered in a graphing calculator. Then the problem can be solved by finding the intersection point of the two lines that each represent one side of the given equation. You would enter $y = 3\left(\frac{1}{2} - x\right)$ and $y = \frac{3}{5} + 15x$ in the graphing interface and draw the graphs. The intersection point is (0.05, 1.35), which means $x = 0.05$, which is equivalent to $x = \frac{1}{20}$. Note that .05 and 1/20 are examples of ways to enter a correct answer.

Algebra Sample Question 9

$$-2(3x + 2.4) = -3(3x + 2.4)$$

What is the solution to the given equation?

STRATEGY

While a calculator is permitted on all questions in the Math section, it's important to not rely too much on the tool. Some questions, such as sample 9, can be solved more efficiently without using a calculator. Your ability to choose when to use and when not to use a calculator is one of the things the Math section assesses, so be sure to practice this.

You could solve this in the same way as sample 8, by multiplying everything out and simplifying, or by graphing each side of the equation. But the structure of the equation reveals that −2 times a quantity, $3x + 2.4$, is equal to −3 times the same quantity. This is only possible if the quantity $3x + 2.4$ is equal to zero. Thus, $3x + 2.4 = 0$, or $3x = -2.4$. Therefore, the solution is $x = -0.8$.

Algebra Sample Question 10

$$-2x = 4y + 6$$

$$2(2y + 3) = 3x - 5$$

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

A) (1, 2)
B) (1, −2)
C) (−1, −1)
D) (−1, 1)

STRATEGY

In sample 6, the elimination method yields an efficient solution to the question. In sample 10, the substitution method turns out to be an efficient approach. These examples illustrate the benefits of knowing both approaches and thinking critically about which approach may be more efficient for a given question.

This is an example of a system you can solve more efficiently by substitution than by using the elimination method demonstrated in sample 6. Since $-2x = 4y + 6$, it follows that $-x = 2y + 3$. Now you can substitute $-x$ for $2y + 3$ in the second equation. This gives you $2(-x) = 3x - 5$, which is equivalent to $5x = 5$, or $x = 1$. Substituting 1 for x in the first equation gives you $-2 = 4y + 6$, which is equivalent to $4y = -8$, or $y = -2$. Therefore, the solution to the system is (1, −2).

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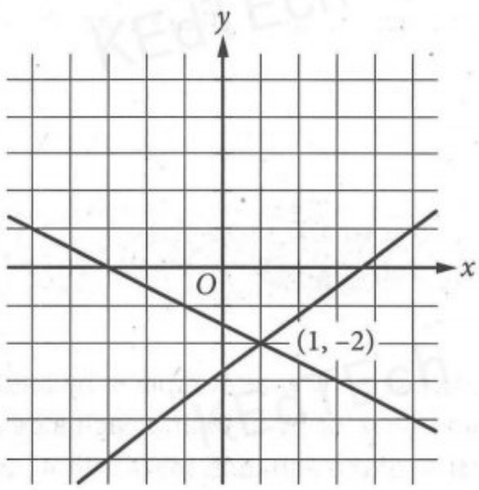
In the preceding examples, you found a unique solution to linear equations and to systems of two linear equations in two variables. But not all such equations and systems have solutions, and some have infinitely many solutions. Some questions in the Math section assess your ability to determine whether an equation or a system of linear equations has one solution, no solutions, or infinitely many solutions.

The Relationships Among Linear Equations, Lines in the Coordinate Plane, and the Contexts They Describe

STRATEGY

Graphing systems of two linear equations is another effective approach to solving them. Practice arranging linear equations into $y = mx + b$ form and graphing them in the coordinate plane.

A system of two linear equations in two variables can be solved by graphing the lines in the coordinate plane. For example, you can graph the equations of the system in the xy-plane in sample 10, above.



The point of intersection gives the solution to the system.

If the equations in a system of two linear equations in two variables are graphed, each graph will be a line. There are three possibilities:

1. The lines intersect at one point. In this case, the system has a unique solution.
2. The lines are parallel. In this case, the system has no solution.
3. The lines are identical. In this case, every point on the line is a solution, and so the system has infinitely many solutions.

One way that the second and third cases can be identified is by rewriting the equations of the system 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 when the system is graphed in the xy-plane. If the lines have the same slope and different y-coordinates of the y-intercepts, the lines are parallel; if both the slope and the y-coordinate of the y-intercept are the same, the lines are identical.

How are the second and third cases represented algebraically? Samples 11 and 12 answer this question.

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Algebra Sample Question 11

$$2y + 6x = 3$$
$$y + 3x = 2$$

How many solutions (x, y) does the given system of equations have?

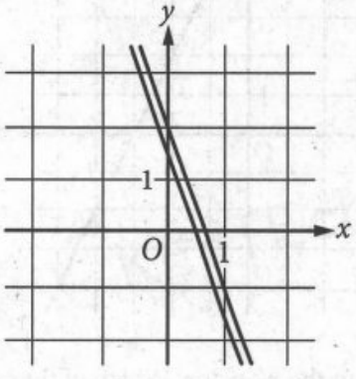
A) Zero
B) Exactly one
C) Exactly two
D) Infinitely many

To rewrite the second equation in slope-intercept form, subtract $3x$ from both sides of the equation, which gives $y = -3x + 2$. To rewrite the first equation in slope-intercept form, subtract $6x$ from both sides of the equation, which gives $2y = -6x + 3$. Next, divide both sides of this equation by 2, which gives $y = -3x + \frac{3}{2}$. Now that the two equations are written in slope-intercept form, you can identify that the slope of each line is -3 and that the y-coordinates of the y-intercepts are $\frac{3}{2}$ and 2.

Since the slopes are the same and the y-coordinates of the y-intercepts are different, the graphs of the lines will show distinct parallel lines. Because parallel lines never intersect, the system of equations has zero solutions.

Alternatively, if you multiply each side of $y + 3x = 2$ by 2, you get $2y + 6x = 4$. Then subtracting each side of $2y + 6x = 3$ from the corresponding side of $2y + 6x = 4$ gives $0 = 1$. This is a false statement. Therefore, the system has zero solutions (x, y).

You could also use graphing technology to graph the two equations. The graphs are parallel lines, so there are no points of intersection, and the system of equations has zero solutions.



STRATEGY

When the graphs of a system of two linear equations are distinct parallel lines, as in sample 11, the system has zero solutions. If the question states that a system of two linear equations has an infinite number of solutions, as in sample 12, the equations must be equivalent.

STRATEGY

The equations in the system in sample 11 are in a form that allows you to quickly find both the x-intercept and the y-intercept of the graph of the equation. For example, the graph of $y + 3x = 2$ has an x-intercept of $\left(\frac{2}{3}, 0\right)$ because if $y = 0$, then $3x = 2$ and $x = \frac{2}{3}$. Similarly, the graph has a y-intercept of $(0, 2)$ because if $x = 0$, then $y = 2$.

Algebra Sample Question 12

$$3s - 2t = a$$
$$-15s + bt = -7$$

In the given system of equations, a and b are constants. If the system has infinitely many solutions, what is the value of a?

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If a system of two linear equations in two variables has infinitely many solutions, the two equations in the system must be equivalent. Since the two equations are presented in the same form, the second equation must be equal to the first equation multiplied by a constant. Since the coefficient of s in the second equation is -5 times the coefficient of s in the first equation, multiply each side of the first equation by -5. This gives you the system

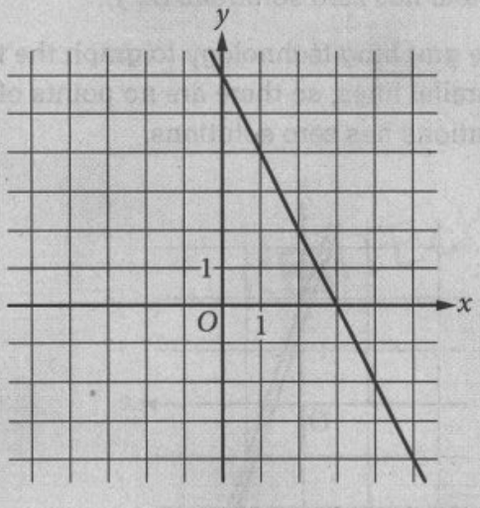
$$-15s + 10t = -5a$$
$$-15s + bt = -7$$

Since these two equations are equivalent and have the same coefficient of s, the coefficients of t and the constants on the right-hand side must also be the same. Thus, $b = 10$ and $-5a = -7$. Therefore, the value of a is $\frac{7}{5}$.

There may also be questions in the Math section that assess your knowledge of the relationship between the algebraic and the geometric representations of a line—that is, between an equation of a line and its graph. The key concepts are

- If the slopes of line ℓ and line k are each defined (that is, if neither line is a vertical line), then
  - Line ℓ and line k are parallel if and only if they have the same slope.
  - Line ℓ and line k are perpendicular if and only if the product of their slopes is -1.

Algebra Sample Question 13



The graph of line k is shown in the xy-plane. Which of the following is an equation of a line that is perpendicular to line k?

A) $y = -2x + 1$

B) $y = -\frac{1}{2}x + 2$

C) $y = \frac{1}{2}x + 3$

D) $y = 2x + 4$

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Note that the graph of line k passes through the points (0, 6) and (3, 0). Thus, the slope of line k is $\frac{0-6}{3-0} = -2$. Since the product of the slopes of perpendicular lines is −1, a line that is perpendicular to line k will have slope $\frac{1}{2}$. All the choices are in slope-intercept form, and so the coefficient of x is the slope of the line represented by the equation. Therefore, choice C, $y = \frac{1}{2}x + 3$, is an equation of a line with slope $\frac{1}{2}$, and thus this line is perpendicular to line k.

As we've noted, some contexts can be described with a linear equation. The graph of a linear equation is a line. A nonvertical line has geometric properties such as its slope and its y-intercept. These geometric properties can often be interpreted in terms of the context. The Math section may have questions that assess your ability to make these interpretations. For example, reconsider the contexts in samples 1 to 3. You created a linear function, $f(n) = 783 + 8n$, that describes the number of miles of paved road County X will have n years after 2014. This equation can be graphed in the coordinate plane, with n on the horizontal axis and $f(n)$ on the vertical axis. The points of this graph lie on a line with slope 8 and y-intercept of (0, 783). The slope, 8, gives the number of miles of new paved roads added each year, and the y-intercept gives the number of miles of paved roads in 2014, the year that corresponds to $n = 0$.

Algebra Sample Question 14

A voter registration drive was held in Town Y. The number of voters, V, registered T days after the drive began can be estimated by the equation $V = 3{,}450 + 65T$. What is the best interpretation of the number 65 in this context?

A) The estimated number of registered voters at the beginning of the registration drive

B) The estimated number of registered voters at the end of the registration drive

C) The total estimated number of voters registered during the drive

D) The estimated number of voters registered each day during the drive

The correct answer is choice D. For each day that passes, it's the next day of the registration drive, and so T increases by 1. In the given equation, when T, the number of days after the drive began, increases by 1, V, the estimated number of voters registered, becomes $V = 3{,}450 + 65(T + 1)$, or $V = 3{,}450 + 65T + 65$. That is, the estimated number of voters registered increases by 65 for each day of the drive. Therefore, 65 is the estimated number of voters registered each day during the drive.

You should note that choice A describes the number 3,450, and the numbers described by choices B and C can be found only if you know how many days the registration drive lasted; this information isn't given in the question.

REMINDER

The Math section will further assess your understanding of linear equations by, for instance, asking you to select a linear equation that describes a given graph, select a graph that describes a given linear equation, or determine how a graph may be affected by a change in its equation.

STRATEGY

Sample 13 requires a strong understanding of slope as well as the ability to calculate slope: slope is equal to rise over run, or the change in the y-value divided by the change in the x-value. Parallel lines have slopes that are equal. Perpendicular lines have slopes whose product is −1.

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Summary: Algebra Questions

Main purpose: To assess your understanding of linear relationships

Proportion of the test section: About 35 percent (thirteen to fifteen questions)

Question types

- Linear equations in one variable
- Linear equations in two variables
- Linear functions
- Systems of two linear equations in two variables
- Linear inequalities in one or two variables

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CHAPTER 22

Math: Questions—Algebra Drills

1

$$3a + 4b = 25$$

A shipping company charged a customer $25 to ship some small boxes and some large boxes. The given equation represents the relationship between a, the number of small boxes, and b, the number of large boxes, the customer had shipped. If the customer had 3 small boxes shipped, how many large boxes were shipped?

A) 3

B) 4

C) 5

D) 6

2

$$ax = 5$$

In the given equation, a is a constant. For which of the following values of a will the equation have no solution?

A) 0

B) 1

C) 5

D) 10

3

Tom scored 85, 78, and 98 on his first three exams in history class. Solving which inequality gives all the possible scores, G, that Tom could get on his fourth exam that will result in a mean score on all four exams of at least 90?

A) $90 - (85 + 78 + 98) \leq 4G$

B) $4G + 85 + 78 + 98 \geq 360$

C) $\frac{(G + 85 + 78 + 98)}{4} \geq 90$

D) $\frac{(85 + 78 + 98)}{4} \geq 90 - 4G$

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4

If $3(3x + 5) = 2x - 8$, what is the value of x?

A) $-\frac{23}{7}$

B) $-\frac{15}{7}$

C) $-\frac{13}{7}$

D) $\frac{7}{11}$

5

On Monday, Jao walked a total of 11,400 steps. On Tuesday, Jao has a goal to walk at least 1,500 more steps than he did on Monday. What is the least number of steps Jao could walk on Tuesday to meet his goal?

6

$$x - 3y = 7$$

$$3y = 9$$

If (x, y) is the solution to the given system of equations, what is the value of x?

A) -2

B) 10

C) 16

D) 34

7

$$P = 1.20x + 5.00$$

The given equation gives the total monthly price P, in dollars, for using an online gaming service. The total monthly price for the online service consists of a flat monthly fee and a charge for each game played during a month. Of the following, which is the best interpretation of the value of x in this context?

A) The number of games played during a month

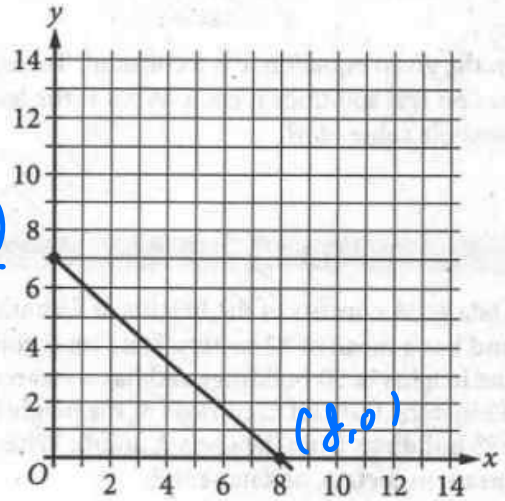
B) The charge, in dollars, for playing x games

C) The flat monthly fee, in dollars, for the gaming service

D) The number of months the gaming service was used

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4



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) $\frac{27}{8}$

5

x	$f(x)$
-1	10
0	14
1	20

For the quadratic function f, the table shows three values of x and their corresponding values of $f(x)$. Which equation defines f?

A) $f(x) = 3x^2 + 3x + 14$

B) $f(x) = 5x^2 + x + 14$

C) $f(x) = 9x^2 - x + 14$

D) $f(x) = x^2 + 5x + 14$

6

The function f is defined by $f(x) = \frac{x + 15}{5}$, and $f(a) = 10$, where a is a constant. What is the value of a?

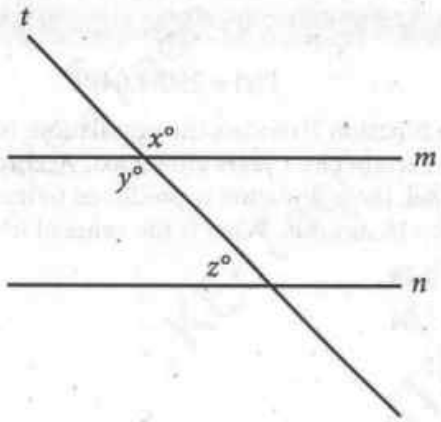
A) 5

B) 10

C) 35

D) 65

7



Note: Figure not drawn to scale.

In the figure, lines m and n are parallel. If $x = 6k + 13$ and $y = 8k - 29$, what is the value of z?

A) 3

B) 21

C) 41

D) 139

8

Line p is defined by $2y + 18x = 9$. Line r is perpendicular to line p in the xy-plane. What is the slope of line r?

A) -9

B) $-\frac{1}{9}$

C) $\frac{1}{9}$

D) 9

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9

A sample of oak has a density of 807 kilograms per cubic meter. The sample is in the shape of a cube, where each edge has a length of 0.90 meters. To the nearest whole number, what is the mass, in kilograms, of this sample?

A) 588
B) 726
C) 897
D) 1,107

10

$$P(t) = 290(1.04)^{(\frac{4}{6})t}$$

The function P models the population, in thousands, of a certain city t years after 2005. According to the model, the population is predicted to increase by n% every 18 months. What is the value of n?

A) 0.38
B) 1.04
C) 4
D) 6

11

$$2(kx - n) = -\frac{28}{15}x - \frac{36}{19}$$

In the given equation, k and n are constants and $n > 1$. The equation has no solution. What is the value of k?

12

A gift shop buys souvenirs at a wholesale price of 7.00 dollars each and resells them each at a retail price that is 290% of the wholesale price. At the end of the season, any remaining souvenirs are marked at a discounted price that is 80% off the retail price. What is the discounted price of each remaining souvenir, in dollars?

13

$$x^2 - 34x + c = 0$$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n?

14

Data set A consists of the heights of 75 buildings and has a mean of 32 meters. Data set B consists of the heights of 50 buildings and has a mean of 62 meters. Data set C consists of the heights of the 125 buildings from data sets A and B. What is the mean, in meters, of data set C?

15

The expression $4x^2 + bx - 45$, where b is a constant, can be rewritten as $(hx + k)(x + j)$, where h, k, and j are integer constants. Which of the following must be an integer?

A) $\frac{b}{h}$
B) $\frac{b}{k}$
C) $\frac{45}{h}$
D) $\frac{45}{k}$

16

$$y = -1.5$$
$$y = x^2 + 8x + a$$

In the given system of equations, a is a positive constant. The system has exactly one distinct real solution. What is the value of a?

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