

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

Marisa needs to hire at least 10 staff members for an upcoming project. The staff members will be made up of junior directors, who will be paid \$640 per week, and senior directors, who will be paid \$880 per week. Her budget for paying the staff members is no more than \$9,700 per week. She must hire at least 3 junior directors and at least 1 senior director. Which of the following systems of inequalities represents the conditions described if x is the number of junior directors and y is the number of senior directors?

$$640x + 880y \geq 9,700$$

$$x + y \leq 10$$

$$x \geq 3$$

A. $y \geq 1$

$$640x + 880y \leq 9,700$$

$$x + y \geq 10$$

$$x \geq 3$$

B. $y \geq 1$

$$640x + 880y \geq 9,700$$

$$x + y \geq 10$$

$$x \leq 3$$

C. $y \leq 1$

$$640x + 880y \leq 9,700$$

$$x + y \leq 10$$

$$x \leq 3$$

D. $y \leq 1$

$$y \leq x$$

$$y \leq -x$$

Which of the following ordered pairs (x,y) is a solution to the system of inequalities above?

A. $(1,0)$

B. $(-1,0)$

C. $(0,1)$

D. $(0,-1)$

In North America, the standard width of a parking space is at least 7.5 feet and no more than 9.0 feet. A restaurant owner recently resurfaced the restaurant's parking lot and wants to determine the number of parking spaces, n , in the parking lot that could be placed perpendicular to a curb that is 135 feet long, based on the standard width of a parking space. Which of the following describes all the possible values of n ?

A. $18 \leq n \leq 135$

B. $7.5 \leq n \leq 9$

C. $15 \leq n \leq 135$

D. $15 \leq n \leq 18$

$$y < -4x + 4$$

Which point (x, y) is a solution to the given inequality in the xy -plane?

- A. $(-4, 0)$
- B. $(0, 5)$
- C. $(2, 1)$
- D. $(2, -1)$

A certain elephant weighs 200 pounds at birth and gains more than 2 but less than 3 pounds per day during its first year. Which of the following inequalities represents all possible weights w , in pounds, for the elephant 365 days after birth?

- A. $400 < w < 600$
- B. $565 < w < 930$
- C. $730 < w < 1,095$
- D. $930 < w < 1,295$

$$H = 120p + 60$$

The Karvonen formula above shows the relationship between Alice's target heart rate H , in beats per minute (bpm), and the intensity level p of different activities. When $p = 0$, Alice has a resting heart rate. When $p = 1$, Alice has her maximum heart rate. It is recommended that p be between 0.5 and 0.85 for Alice when she trains. Which of the following inequalities describes Alice's target training heart rate?

- A. $120 \leq H \leq 162$
- B. $102 \leq H \leq 120$
- C. $60 \leq H \leq 162$
- D. $60 \leq H \leq 102$

A number x is at most 17 less than 5 times the value of y . If the value of y is 3, what is the greatest possible value of x ?

An event planner is planning a party. It costs the event planner a onetime fee of **\$35** to rent the venue and **\$10.25** per attendee. The event planner has a budget of **\$200**. What is the greatest number of attendees possible without exceeding the budget?

A model estimates that whales from the genus *Eschrichtius* travel **72** to **77** miles in the ocean each day during their migration. Based on this model, which inequality represents the estimated total number of miles, x , a whale from the genus *Eschrichtius* could travel in **16** days of its migration?

- A. $72 + 16 \leq x \leq 77 + 16$
- B. $(72)(16) \leq x \leq (77)(16)$
- C. $72 \leq 16 + x \leq 77$
- D. $72 \leq 16x \leq 77$

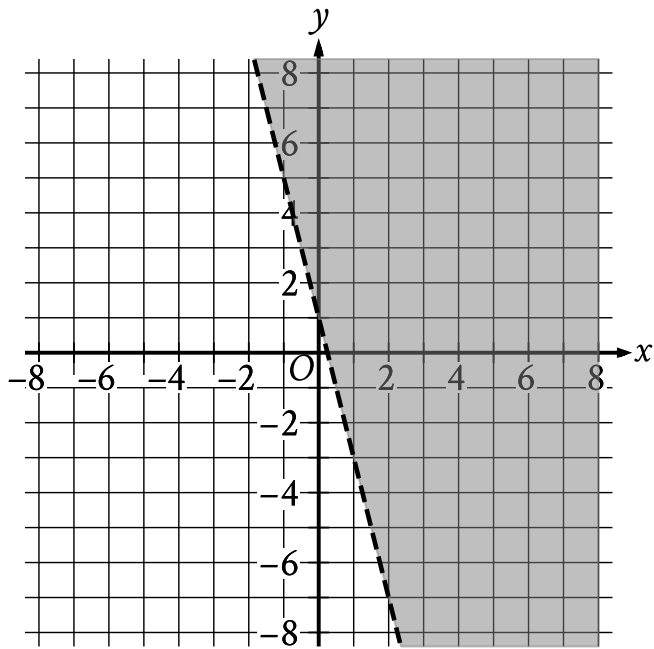
The average annual energy cost for a certain home is \$4,334. The homeowner plans to spend \$25,000 to install a geothermal heating system. The homeowner estimates that the average annual energy cost will then be \$2,712. Which of the following inequalities can be solved to find t , the number of years after installation at which the total amount of energy cost savings will exceed the installation cost?

A. $25,000 > (4,334 - 2,712)t$

B. $25,000 < (4,334 - 2,712)t$

C. $25,000 - 4,334 > 2,712t$

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



The shaded region shown represents the solutions to which inequality?

- A. $y < 1 + 4x$
- B. $y < 1 - 4x$
- C. $y > 1 + 4x$
- D. $y > 1 - 4x$

$$y \leq 3x + 1$$

$$x - y > 1$$

Which of the following ordered pairs (x, y) satisfies the system of inequalities above?

A. $(-2, -1)$

B. $(-1, 3)$

C. $(1, 5)$

D. $(2, -1)$

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

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

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

$$y = 3x$$

$$2x + y = 12$$

The solution to the given system of equations is (x, y) . What is the value of $5x$?

A. 24

B. 15

C. 12

D. 5

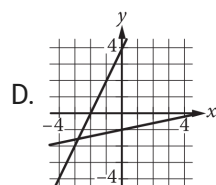
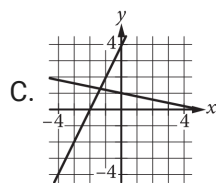
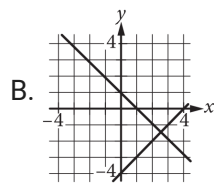
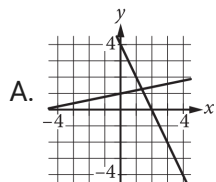
A group of 202 people went on an overnight camping trip, taking 60 tents with them. Some of the tents held 2 people each, and the rest held 4 people each. Assuming all the tents were filled to capacity and every person got to sleep in a tent, exactly how many of the tents were 2-person tents?

- A. 30
- B. 20
- C. 19
- D. 18

$$x + 5y = 5$$

$$2x - y = -4$$

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



$$y = -\frac{1}{9}x$$

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

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

- A. -9
- B. -7
- C. 0
- D. 2

A bus traveled on the highway and on local roads to complete a trip of **160 miles**. The trip took **4 hours**. The bus traveled at an average speed of **55 miles per hour (mph)** on the highway and an average speed of **25 mph** on local roads. If x is the time, in hours, the bus traveled on the highway and y is the time, in hours, it traveled on local roads, which system of equations represents this situation?

A. $55x + 25y = 4$

$$x + y = 160$$

B. $55x + 25y = 160$

$$x + y = 4$$

C. $25x + 55y = 4$

$$x + y = 160$$

D. $25x + 55y = 160$

$$x + y = 4$$

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

$$x - 3 = 2y + 7$$

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

A. -2

B. 6

C. 12

D. 24

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$$4x + 5y = 100$$

$$5x + 4y = 62$$

If the system of equations above has solution (x, y) ,

what is the value of $x + y$?

- A. 0
- B. 9
- C. 18
- D. 38

In the xy -plane, the graph of $y = x + 3$ intersects the graph of $y = 2x - 6$ at the point (a, b) . What is the value of a ?

- A. 3
- B. 6
- C. 9
- D. 12

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The score on a trivia game is obtained by subtracting the number of incorrect answers from twice the number of correct answers. If a player answered 40 questions and obtained a score of 50, how many questions did the player answer correctly?

$$x + 2y = 6$$

$$x - 2y = 4$$

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

A. 2.5

B. 5

C. 6

D. 10

$$-15x + 25y = 65$$

One of the two equations in a system of linear equations is given. The system has infinitely many solutions. Which of the following could be the second equation in the system?

- A. $12x + 20y = 52$
- B. $12x + 20y = -52$
- C. $-12x + 20y = 52$
- D. $-12x + 20y = -52$

Which of the following systems of linear equations has no solution?

A. $y = 6x + 3$
 $y = 6x + 9$

B. $y = 10$
 $y = 10x + 10$

C. $y = 14x + 14$
 $y = 10x + 14$

D. $x = 3$
 $y = 10$

$$y = 2x - 3$$

$$3y = 5x$$

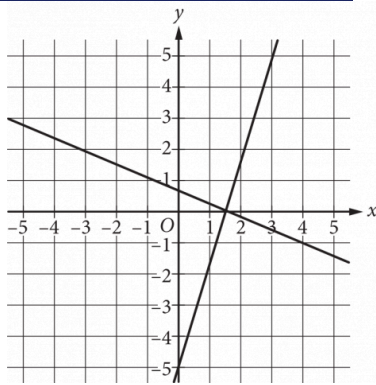
In the solution to the system of equations above, what is the value of y ?

A. -15

B. -9

C. 9

D. 15



Which of the following systems of equations has the same solution as the system of equations graphed above?

A. $y = 0$
 $x = \frac{3}{2}$

B. $y = \frac{3}{2}$
 $x = 0$

C. $y = 0$
 $x = 1$

D. $y = 1$
 $x = 0$

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$$5x + 3y = 38$$

$$x + 3y = 10$$

In the solution (x, y) to the system of equations above, what is the value of x ?

$$x + 3y = 29$$

$$3y = 11$$

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

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams.

According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

$$f(x) = 39$$

For the given linear function f , which table gives three values of x and their corresponding values of $f(x)$?

A.

x	$f(x)$
0	0
1	0
2	0

B.

x	$f(x)$
0	39
1	39
2	39

C.

x	$f(x)$
0	0
1	39
2	78

D.

x	$f(x)$
0	39
1	0
2	-39

In the xy -plane, the graph of the linear function f contains the points $(0, 3)$ and $(7, 31)$. Which equation defines f , where $y = f(x)$?

A. $f(x) = 28x + 34$

B. $f(x) = 3x + 38$

C. $f(x) = 4x + 3$

D. $f(x) = 7x + 3$

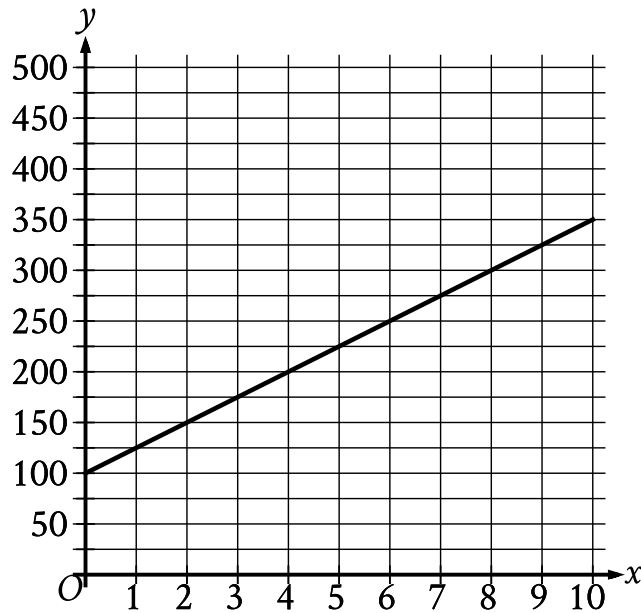
A model predicts that a certain animal weighed **241** pounds when it was born and that the animal gained **3** pounds per day in its first year of life. This model is defined by an equation in the form $f(x) = a + bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. What is the value of a ?

A team of workers has been moving cargo off of a ship. The equation below models the approximate number of tons of cargo, y , that remains to be moved x hours after the team started working.

$$y = 120 - 25x$$

The graph of this equation in the xy -plane is a line. What is the best interpretation of the x -intercept in this context?

- A. The team will have moved all the cargo in about 4.8 hours.
- B. The team has been moving about 4.8 tons of cargo per hour.
- C. The team has been moving about 25 tons of cargo per hour.
- D. The team started with 120 tons of cargo to move.



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

- A. Each game costs **\$25**.
- B. The video game system costs **\$100**.
- C. The video game system costs **\$25**.
- D. Each game costs **\$100**.

The boiling point of water at sea level is 212 degrees Fahrenheit ($^{\circ}\text{F}$). For every 550 feet above sea level, the boiling point of water is lowered by about 1°F . Which of the following equations can be used to find the boiling point B of water, in $^{\circ}\text{F}$, x feet above sea level?

A. $B = 550 + \frac{x}{212}$

B. $B = 550 - \frac{x}{212}$

C. $B = 212 + \frac{x}{550}$

D. $B = 212 - \frac{x}{550}$

$$f(x) = \frac{(x+7)}{4}$$

For the function f defined above, what is the value of $f(9) - f(1)$?

A. 1

B. 2

C. $\frac{1}{4}$

D. $\frac{9}{4}$

x	$f(x)$
0	-2
2	4
6	16

Some values of the linear function f are shown in the table above. What is the value of $f(3)$?

- A. 6
- B. 7
- C. 8
- D. 9

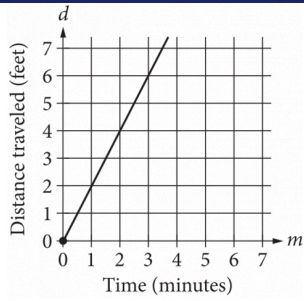
In the xy -plane, the points $(-2, 3)$ and $(4, -5)$ lie on the graph of which of the following linear functions?

A. $f(x) = x + 5$

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

C. $f(x) = -\frac{4}{3}x + \frac{1}{3}$

D. $f(x) = -\frac{3}{2}x + 1$



The graph above shows the distance traveled d , in feet, by a product on a conveyor belt m minutes after the product is placed on the belt. Which of the following equations correctly relates d and m ?

A. $d = 2m$

B. $d = \frac{1}{2}m$

C. $d = m + 2$

D. $d = 2m + 2$

$$c(x) = mx + 500$$

A company's total cost $c(x)$, in dollars, to produce x shirts is given by the function above, where m is a constant and $x > 0$. The total cost to produce 100 shirts is \$800. What is the total cost, in dollars, to produce 1000 shirts? (Disregard the \$ sign when gridding your answer.)

A linear model estimates the population of a city from **1991** to **2015**. The model estimates the population was **57** thousand in **1991**, **224** thousand in **2011**, and x thousand in **2015**. To the nearest whole number, what is the value of x ?

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

The given function f represents the perimeter, in **centimeters (cm)**, of a rectangle with a length of x **cm** and a fixed width. What is the width, in **cm**, of the rectangle?

- A. 2
- B. 122
- C. 244
- D. 488

$$j(x) = mx + 144$$

For the linear function j , m is a constant and $j(12) = 18$. What is the value of $j(10)$?

Energy per Gram of Typical Macronutrients

Macronutrient	Food calories	Kilojoules
Protein	4.0	16.7
Fat	9.0	37.7
Carbohydrate	4.0	16.7

The table above gives the typical amounts of energy per gram, expressed in both food calories and kilojoules, of the three macronutrients in food. If x food calories is equivalent to k kilojoules, of the following, which best represents the relationship between x and k ?

A. $k = 0.24x$

B. $k = 4.2x$

C. $x = 4.2k$

D. $xk = 4.2$

The table gives the number of hours, h , of labor and a plumber's total charge $f(h)$, in dollars, for two different jobs.

h	$f(h)$
1	155
3	285

There is a linear relationship between h and $f(h)$. Which equation represents this relationship?

- A. $f(h) = 25h + 130$
- B. $f(h) = 130h + 25$
- C. $f(h) = 65h + 90$
- D. $f(h) = 90h + 65$

If $f(x) = x + 7$ and $g(x) = 7x$, what is the value of $4f(2) - g(2)$?

A. -5

B. 1

C. **22**

D. **28**

$$y = 18 - 5x$$

The equation above represents the speed y , in feet per second, of Sheila's bicycle x seconds after she applied the brakes at the end of a ride. If the equation is graphed in the xy -plane, which of the following is the best interpretation of the x -coordinate of the line's x -intercept in the context of the problem?

- A. The speed of Sheila's bicycle, in feet per second, before Sheila applied the brakes
- B. The number of feet per second the speed of Sheila's bicycle decreased each second after Sheila applied the brakes
- C. The number of seconds it took from the time Sheila began applying the brakes until the bicycle came to a complete stop
- D. The number of feet Sheila's bicycle traveled from the time she began applying the brakes until the bicycle came to a complete stop

Scientists collected fallen acorns that each housed a colony of the ant species *P. ohioensis* and analyzed each colony's structure. For any of these colonies, if the colony has x worker ants, the equation $y = 0.67x + 2.6$, where $20 \leq x \leq 110$, gives the predicted number of larvae, y , in the colony. If one of these colonies has 58 worker ants, which of the following is closest to the predicted number of larvae in the colony?

- A. 41
- B. 61
- C. 83
- D. 190

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

For the given function f , the graph of $y = f(x)$ in the xy -plane is parallel to line j . What is the slope of line j ?

The function f is defined by $f(x) = mx + b$, where m and b are constants. If

$f(0) = 18$ and $f(1) = 20$, what is the value of m ?

Population of Greenleaf, Idaho

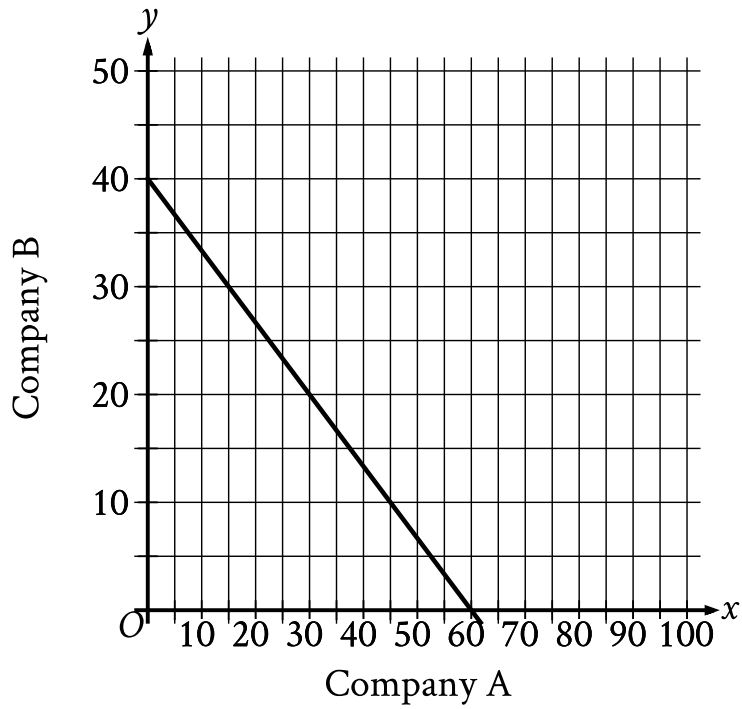
Year	Population
2000	862
2010	846

The table above shows the population of Greenleaf, Idaho, for the years 2000 and 2010. If the relationship between population and year is linear, which of the following functions P models the population of Greenleaf t years after 2000?

- A. $P(t) = 862 - 1.6t$
- B. $P(t) = 862 - 16t$
- C. $P(t) = 862 + 16(t - 2,000)$
- D. $P(t) = 862 - 1.6(t - 2,000)$

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 ?

On a 210-mile trip, Cameron drove at an average speed of 60 miles per hour for the first x hours. He then completed the trip, driving at an average speed of 50 miles per hour for the remaining y hours. If $x = 1$, what is the value of y ?



The graph shows the relationship between the number of shares of stock from Company A, x , and the number of shares of stock from Company B, y , that Simone can purchase. Which equation could represent this relationship?

- A. $y = 8x + 12$
- B. $8x + 12y = 480$
- C. $y = 12x + 8$
- D. $12x + 8y = 480$

An artist paints and sells square tiles. The selling price P , in dollars, of a painted tile is a linear function of the side length of the tile s , in inches, as shown in the table below.

Side length, s (inches)	Price, P (dollars)
3	8.00
6	18.00
9	28.00

Which of the following could define the relationship between s and P ?

A. $P = 3s + 10$

B. $P = \frac{10}{3}s + 8$

C. $P = \frac{10}{3}s - 2$

D. $P = \frac{3}{10}s - \frac{1}{10}$

In an article about exercise, it is estimated that a 160-pound adult uses 200 calories for every 30 minutes of hiking and 150 calories for every 30 minutes of bicycling. An adult who weighs 160 pounds has completed 1 hour of bicycling. Based on the article, how many hours should the adult hike to use a total of 1,900 calories from bicycling and hiking?

- A. 9.5
- B. 8.75
- C. 6
- D. 4

When line n is graphed in the xy -plane, it has an x -intercept of $(-4, 0)$ and a y -intercept of $(0, \frac{86}{3})$. What is the slope of line n ?

- A. $\frac{3}{344}$
- B. $\frac{6}{43}$
- C. $\frac{43}{6}$
- D. $\frac{344}{3}$

In the xy -plane, line k passes through the points $(0, -5)$ and $(1, -1)$. Which equation defines line k ?

A. $y = -x + \frac{1}{4}$

B. $y = \frac{1}{4}x - 5$

C. $y = -x + 4$

D. $y = 4x - 5$

Characteristics for Rock Types

Rock type	Weight per volume (lb/ft ³)	Cost per pound
Basalt	180	\$0.18
Granite	165	\$0.09
Limestone	120	\$0.03
Sandstone	135	\$0.22

A city is planning to build a rock retaining wall, a monument, and a garden in a park. The table above shows four rock types that will be considered for use in the project. Also shown for each rock type is its weight per volume, in pounds per cubic foot (lb/ft³), and the cost per pound, in dollars. Only basalt, granite, and limestone will be used in the garden. The rocks in the garden will have a total weight of 1,000 pounds. If 330 pounds of granite is used, which of the following equations could show the relationship between the amounts, x and y , in ft³, for each of the other rock types used?

A. $165x + 180y = 670$

B. $165x + 120y = 1,000$

C. $120x + 180y = 670$

D. $120x + 180y = 1,000$

Figure A and figure B are both regular polygons. The sum of the perimeter of figure A and the perimeter of figure B is **63** inches. The equation $3x + 6y = 63$ represents this situation, where x is the number of sides of figure A and y is the number of sides of figure B. Which statement is the best interpretation of **6** in this context?

- A. Each side of figure B has a length of **6** inches.
- B. The number of sides of figure B is **6**.
- C. Each side of figure A has a length of **6** inches.
- D. The number of sides of figure A is **6**.

x	y
-6	$n + 184$
-3	$n + 92$
0	n

The table shows three values of x and their corresponding values of y , where n is a constant, for the linear relationship between x and y . What is the slope of the line that represents this relationship in the xy -plane?

- A. $-\frac{92}{3}$
- B. $-\frac{3}{92}$
- C. $\frac{n+92}{-3}$
- D. $\frac{2n-92}{3}$

What is the slope of the graph of $y = \frac{1}{4}(27x + 15) + 7x$ in the xy -plane?

A line passes through the points $(4, 6)$ and $(15, 24)$ in the xy -plane. What is the slope of the line?

$$3(2x - 6) - 11 = 4(x - 3) + 6$$

If x is the solution to the equation above,
what is the value of $x - 3$?

A. $\frac{23}{2}$

B. $\frac{17}{2}$

C. $\frac{15}{2}$

D. $-\frac{15}{2}$

$$2n + 6 = 14$$

A tree had a height of 6 feet when it was planted. The equation above can be used to find how many years n it took the tree to reach a height of 14 feet. Which of the following is the best interpretation of the number 2 in this context?

- A. The number of years it took the tree to double its height
- B. The average number of feet that the tree grew per year
- C. The height, in feet, of the tree when the tree was 1 year old
- D. The average number of years it takes similar trees to grow 14 feet

$$2x + 16 = a(x + 8)$$

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

$$(b - 2)x = 8$$

In the given equation, b is a constant. If the equation has no solution, what is the value of b ?

- A. 2
- B. 4
- C. 6
- D. 10

$$a(3-x)-b = -1-2x$$

In the equation above, a and b are constants. If the equation has infinitely many solutions, what are the values of a and b ?

- A. $a=2$ and $b=1$
- B. $a=2$ and $b=7$
- C. $a=-2$ and $b=5$
- D. $a=-2$ and $b=-5$

An agricultural scientist studying the growth of corn plants recorded the height of a corn plant at the beginning of a study and the height of the plant each day for the next 12 days. The scientist found that the height of the plant increased by an average of 1.20 centimeters per day for the 12 days. If the height of the plant on the last day of the study was 36.8 centimeters, what was the height, in centimeters, of the corn plant at the beginning of the study?

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$$2(p+1)+8(p-1)=5p$$

What value of p is the solution of the equation above?

If $4x - \frac{1}{2} = -5$, what is the value of $8x - 1$?

A. 2

B. $-\frac{9}{8}$

C. $-\frac{5}{2}$

D. -10

Megan's regular wage at her job is p dollars per hour for the first 8 hours of work in a day plus 1.5 times her regular hourly wage for work in excess of 8 hours that day. On a given day, Megan worked for 10 hours, and her total earnings for that day were \$137.50. What is Megan's regular hourly wage?

- A. \$11.75
- B. \$12.50
- C. \$13.25
- D. \$13.75

The width of a rectangular dance floor is w feet. The length of the floor is 6 feet longer than its width. Which of the following expresses the perimeter, in feet, of the dance floor in terms of w ?

A. $2w + 6$

B. $4w + 12$

C. $w^2 + 6$

D. $w^2 + 6w$

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

- A. 2
- B. 5
- C. 7
- D. 12

$$\frac{1}{4}(x + 5) - \frac{1}{3}(x + 5) = -7$$

What value of x is the solution to the given equation?

- A. **−12**
- B. **−5**
- C. **79**
- D. **204**

A candle is made of **17** ounces of wax. When the candle is burning, the amount of wax in the candle decreases by **1** ounce every **4** hours. If **6** ounces of wax remain in this candle, for how many hours has it been burning?

- A. **3**
- B. **6**
- C. **24**
- D. **44**