## #1

ID: 548a4929

The function $h$ is defined by $h(x) = 4x + 28$. The graph of $y = h(x)$ in the *xy*-plane has an *x*-intercept at $(a, 0)$ and a *y*-intercept at $(0, b)$, where $a$ and $b$ are constants. What is the value of $a + b$?

A)  21

B)  28

C)  32

D)  35

## #2

ID: e62cfe5f

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?

## #3

ID: a5834ea4

$$f(x) = 39$$

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 |

## #4

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

## #5

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 $a$?

## #6

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.

## #7

The pressure exerted on a scuba diver at sea level is $14.70$ pounds per square inch (psi). For each foot the scuba diver descends below sea level, the pressure exerted on the scuba diver increases by $0.44$ psi. What is the total pressure, in psi, exerted on the scuba diver at 105 feet below sea level?

A)  60.90

B)  31.50

C)  14.70

D)  0.44

## #8

The function $f$ is defined by $f(x) = 7x - 84$. What is the $x$-intercept of the graph of $y = f(x)$ in the $xy$-plane?

A)  $(-12,0)$

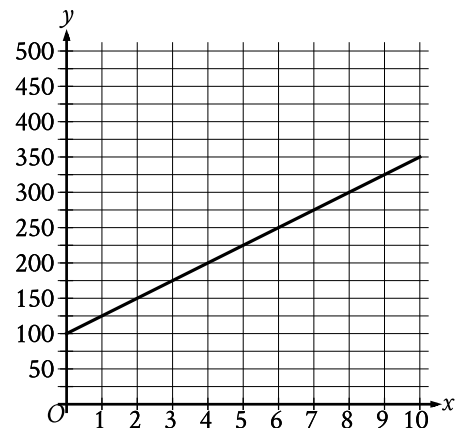B)  $(-7,0)$

C)  $(7,0)$

D)  $(12,0)$

## #9

| $x$ | 10 | 15 | 20 | 25 |
|---|---|---|---|---|
| $f(x)$ | 82 | 137 | 192 | 247 |

The table shows four values of $x$ and their corresponding values of $f(x)$. There is a linear relationship between $x$ and $f(x)$ that is defined by the equation $f(x) = mx - 28$, where $m$ is a constant. What is the value of $m$?

## #10

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 $\$100$.

## #11

Caleb used juice to make popsicles. The function $f(x) = -5x + 30$ approximates the volume, in fluid ounces, of juice Caleb had remaining after making $x$ popsicles. Which statement is the best interpretation of the $y$-intercept of the graph of $y = f(x)$ in the $xy$-plane in this context?

A) Caleb used approximately $5$ fluid ounces of juice for each popsicle.

B) Caleb had approximately $5$ fluid ounces of juice when he began to make the popsicles.

C) Caleb had approximately $30$ fluid ounces of juice when he began to make the popsicles.

D) Caleb used approximately $30$ fluid ounces of juice for each popsicle.

## #12

In the $xy$-plane, the graph of the linear function $f$ contains the points $(0, 2)$ and $(8, 34)$. Which equation defines $f$, where $y = f(x)$?

A)  $f(x) = 2x + 42$

B)  $f(x) = 32x + 36$

C)  $f(x) = 4x + 2$

D)  $f(x) = 8x + 2$

## #13

| Number of cars | Maximum number of passengers and crew |
|---|---|
| 3 | 174 |
| 5 | 284 |
| 10 | 559 |

The table shows the linear relationship between the number of cars, $c$, on a commuter train and the maximum number of passengers and crew, $p$, that the train can carry. Which equation represents the linear relationship between $c$ and $p$?

A)  $55c - p = -9$

B)  $55c - p = 9$

C)  $55p - c = -9$

D)  $55p - c = 9$

## #14

Brian saves $\frac{2}{5}$ of the $\$215$ he earns each week from his job. If Brian continues to save at this rate, how much money, in dollars, will Brian save in 9 weeks?

**#15**                    ID: 6c5c2a81

For the linear function $h$, the graph of $y = h(x)$ in the *xy*-plane passes through the points $(7,21)$ and $(9,25)$. Which equation defines $h$?

A)  $h(x) = \frac{1}{2}x - \frac{7}{2}$

B)  $h(x) = 2x + 7$

C)  $h(x) = 7x + 21$

D)  $h(x) = 9x + 25$

**#16**                    ID: dae126d7

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

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

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

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

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

**#17**                    ID: 271f7e3f

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

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

A)  1

B)  2

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

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

**#18**                    ID: c651cc56

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

Some values of the linear function f are shown in the table above. What is the value of $f(3)$?
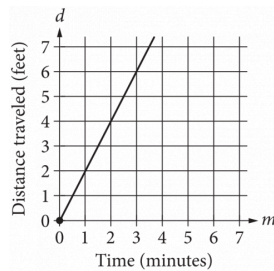
A)  6

B)  7

C)  8

D)  9

## #19

In the xy-plane, the points $(-\frac{}{2}, 3)$ 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) $f(x) = -\frac{3}{2}x + 1$

## #20

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) $d = 2m + 2$

## #21

$c(x) = mx + 500$

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.)

## #22

The function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature $f(x)$, in degrees Celsius, of a body of water on the $x$th day of the year, where $220 \le x \le 360$. Based on the model, what is the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year?

A) 55.20

B) 3.04

C) -0.16

D) -52.16

**#23**                                         ID: 3122fc7b

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 $x$?

**#24**                                         ID: 23dedddd

In the linear function $f$, $f(0) = 8$ and $f(1) = 12$. Which equation defines $f$?

A)  $f(x) = 12x + 8$

B)  $f(x) = 4x$

C)  $f(x) = 4x + 12$

D)  $f(x) = 4x + 8$

**#25**                                         ID: c8fb6bcb

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

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

**#26**                                         ID: 56dc8045

$$w(t) = 300 - 4t$$

The function $w$ models the volume of liquid, in milliliters, in a container $t$ seconds after it begins draining from a hole at the bottom. According to the model, what is the predicted volume, in milliliters, draining from the container each second?

A)  300

B)  296

C)  75

D)  4

**#27**                                         ID: c01f4a95

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

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

**#28**                                         ID: 4b0c156b

In the linear function $h$, $h(28) = 15$ and $h(26) = 22$. Which equation defines $h$?

A)  $h(x) = -\frac{2}{7}x + 23$

B)  $h(x) = -\frac{2}{7}x + 113$

C)  $h(x) = -\frac{7}{2}x + 23$

D)  $h(x) = -\frac{7}{2}x + 113$

**#29**

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) $xk = 4.2$

**#30**

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) $f(h) = 90h + 65$

**#31**

For the linear function $g$, the graph of $y = g(x)$ in the xy-plane has a slope of $2$ and passes through the point $(1, 14)$. Which equation defines $g$?

A) $g(x) = 2x$

B) $g(x) = 2x + 2$

C) $g(x) = 2x + 12$

D) $g(x) = 2x + 14$

**#32**   ID: 0cadb20e

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

**#33**   ID: 042aa429

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

**#34**   ID: 1bc11c4e

$$g(m) = -0.05m + 12.1$$

The given function $g$ models the number of gallons of gasoline that remains from a full gas tank in a car after driving $m$ miles. According to the model, about how many gallons of gasoline are used to drive each mile?

A)  0.05

B)  12.1

C)  20

D)  242.0

**#35**                                    ID: 113b938e

$y = 18 - 5x$

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

**#36**                                    ID: 295a41f0

The graph of $y = f(x) - 11$ is shown.
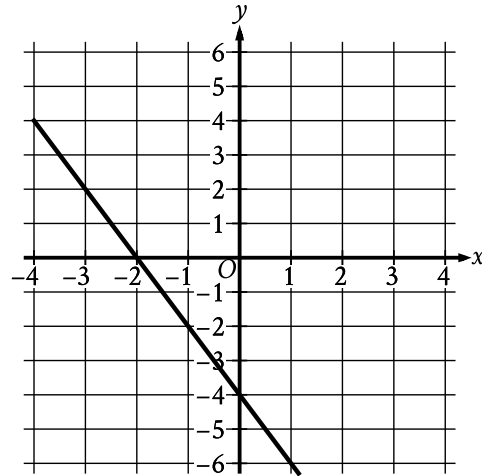


Which equation defines the linear function $f$?

A) $f(x) = -13x - 11$

B) $f(x) = -2x + 7$

C) $f(x) = -13x + 7$

D) $f(x) = -2x - 11$

**#37**                                    ID: 1f0966db

The function $f$ is defined by $f(x) = \frac{9}{7}x + \frac{8}{7}$. For what value of $x$ does $f(x) = 5$?

**#38**

ID: 441558e7

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

**#39**

ID: f0773a55
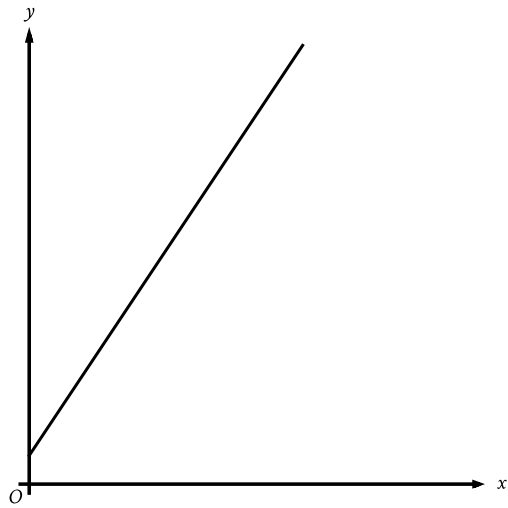


The graph represents the total charge, in dollars, by an electrician for $x$ hours of work. The electrician charges a onetime fee plus an hourly rate. What is the best interpretation of the slope of the graph?

A) The electrician's hourly rate

B) The electrician's onetime fee

C) The maximum amount that the electrician charges

D) The total amount that the electrician charges

## #40

ID: 53487897

The relationship between two variables, $x$ and $y$, is linear. For every increase in the value of $x$ by 1, the value of $y$ increases by 8. When the value of $x$ is 2, the value of $y$ is 18. Which equation represents this relationship?

A) $y = 2x + 18$

B) $y = 2x + 8$

C) $y = 8x + 2$

D) $y = 3x + 26$

## #41

ID: 3ce92ce8

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

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 $j$?

## #42

ID: 8a6de407

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 ?

## #43

ID: 41fdc0b8

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) $P(t) = 862 + 16(t - 2000)$

D) $P(t) = 862 - 1.6(t - 2000)$

## #44

ID: 8ad64841

A linear function $f$ gives a company's profit, in dollars, for selling $x$ items. The company's profit is $\$ 220$ when it sells 8 items, and its profit is $\$ 320$ when it sells 10 items. Which equation defines $f$?

A) $f(x) = 150x - 320$

B) $f(x) = 32x$

C) $f(x) = 50x - 10x$

D) $f(x) = 50x - 180$