Write an equation in slope-intercept form for the line described.

1. slope 1.5, passes through (0, 5)

SOLUTION:
Substitute m = 1.5 and (x, y) = (0, 5) in the equation $y = mx + b$.

$$5 = 1.5(0) + b$$
$$5 = b$$

Substitute m = 1.5 and b = 5 in the equation

$y = mx + b$.

$$y = 1.5x + 5$$

2. passes through (–2, 3) and (0, 1)

SOLUTION:
Substitute $(x_1, y_1) = (-2, 3)$ and $(x_2, y_2) = (0, 1)$ in the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$.

$$m = \frac{1-3}{0-(-2)}$$
$$= -1$$

Substitute m = –1 and $(x_1, y_1) = (0, 1)$ in the point slope form $y - y_1 = m(x - x_1)$.

$$y - 1 = -1(x - 0)$$
$$y - 1 = -x$$
$$y - 1 + 1 = -x + 1$$
$$y = -x + 1$$

3. passes through (3, 5); m = –2

SOLUTION:
Substitute m = –2 and (x, y) = (3, 5) in the equation $y = mx + b$.

$$5 = -2(3) + b$$
$$5 = -6 + b$$
$$11 = b$$

Substitute m = –2 and b = 11 in the equation

$y = mx + b$.

$y = -2x + 11$

4. passes through (–8, –2); $m = \frac{5}{2}$

SOLUTION:
Substitute $m = \frac{5}{2}$ and (x, y) = (–8, –2) in the equation $y = mx + b$.

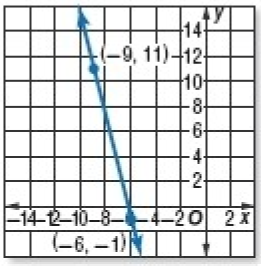
$$-2 = \frac{5}{2}(-8) + b$$
$$-2 = -20 + b$$
$$18 = b$$

Substitute $m = \frac{5}{2}$ and b = 18 in the equation

$y = mx + b$.

$$y = \frac{5}{2}x + 18$$

5. **MULTIPLE CHOICE** Which is an equation of the line?



A $y = -4x - 25$

B $y = -\frac{2}{3}x - 5$

C $y = \frac{4}{5}x + \frac{29}{25}$

D $y = 6x + 35$

SOLUTION:

Substitute $(x_1, y_1) = (-9, 11)$ and $(x_2, y_2) = (-6, -1)$ in the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$.

$$\begin{aligned} m &= \frac{-1-11}{-6-(-9)} \\ &= \frac{-12}{3} \\ &= -4 \end{aligned}$$

Substitute m = –4 and $(x_1, y_1) = (-9, 11)$ in the point slope form $y - y_1 = m(x - x_1)$

$$\begin{aligned} y - 11 &= -4(x - (-9)) \\ y - 11 &= -4(x + 9) \\ y - 11 &= -4x - 36 \\ y - 11 + 11 &= -4x - 36 + 11 \\ y &= -4x - 25 \end{aligned}$$

CCSS PERSEVERANCE Write an equation in slope-intercept form for the line that satisfies each set of conditions.

6. passes through (–9, –3), perpendicular to $y = -\frac{5}{3}x - 8$

SOLUTION:

The slope of the line $y = -\frac{5}{3}x - 8$ is $-\frac{5}{3}$. The slope of the line perpendicular to the given line is $\frac{3}{5}$.

Substitute $m = \frac{3}{5}$ and $(x_1, y_1) = (-9, -3)$ in the point slope form $y - y_1 = m(x - x_1)$.

$$\begin{aligned} y - (-3) &= \frac{3}{5}(x - (-9)) \\ y + 3 &= \frac{3}{5}x + \frac{27}{5} \\ y + 3 - 3 &= \frac{3}{5}x + \frac{27}{5} - 3 \\ y &= \frac{3}{5}x + \frac{12}{5} \\ y &= 0.6x + 2.4 \end{aligned}$$

7. passes through (4, –10), parallel to $y = \frac{7}{8}x - 3$

SOLUTION:

The slope of the line $y = \frac{7}{8}x - 3$ is $\frac{7}{8}$. The slope of the line parallel to the given line is $\frac{7}{8}$.

Substitute $m = \frac{7}{8}$ and $(x_1, y_1) = (4, -10)$ in the point slope form $y - y_1 = m(x - x_1)$.

$$\begin{aligned} y - (-10) &= \frac{7}{8}(x - 4) \\ y + 10 &= \frac{7}{8}x - \frac{28}{8} \\ y + 10 - 10 &= \frac{7}{8}x - \frac{28}{8} - 10 \\ y &= \frac{7}{8}x - \frac{108}{8} \\ y &= \frac{7}{8}x - \frac{27}{2} \end{aligned}$$

Write an equation in slope-intercept form for the line described.

8. slope 3, passes through (0, –2)

SOLUTION:

Substitute $m = 3$ and $(x, y) = (0, -2)$ in the equation $y = mx + b$.

$$\begin{aligned} -2 &= 3(0) + b \\ -2 &= b \end{aligned}$$

Substitute $m = 3$ and $b = -2$ in the equation

$y = mx + b$.

$$y = 3x - 2$$

9. slope $-\frac{1}{2}$, passes through (0, 5)

SOLUTION:

Substitute $m = -\frac{1}{2}$ and $(x, y) = (0, 5)$ in the equation

$y = mx + b$.

$$\begin{aligned} 5 &= -\frac{1}{2}(0) + b \\ 5 &= b \end{aligned}$$

Substitute $m = -\frac{1}{2}$ and $b = 5$ in the equation

$y = mx + b$.

$$y = -\frac{1}{2}x + 5$$

10. slope $-\frac{6}{5}$, passes through (0, 8)

SOLUTION:

Substitute $m = -\frac{6}{5}$ and $(x, y) = (0, 8)$ in the equation

$y = mx + b$.

$$\begin{aligned} 8 &= -\frac{6}{5}(0) + b \\ 8 &= b \end{aligned}$$

Substitute $m = -\frac{6}{5}$ and $b = 8$ in the equation

$y = mx + b$.

$$y = -\frac{6}{5}x + 8$$

11. slope $\frac{9}{2}$, passes through $\left(0, -\frac{13}{2}\right)$

SOLUTION:

Substitute $m = \frac{9}{2}$ and $(x, y) = (0, -\frac{13}{2})$ in the equation

$y = mx + b$.

$$-\frac{13}{2} = \frac{9}{2}(0) + b$$
$$-\frac{13}{2} = b$$

Substitute $m = \frac{9}{2}$ and $b = -\frac{13}{2}$ in the equation

$y = mx + b$.

$$y = \frac{9}{2}x - \frac{13}{2}$$
$$y = 4.5x - 6.5$$

12. slope –2, passes through (–3, 14)

SOLUTION:
Substitute $m = -2$ and $(x, y) = (-3, 14)$ in the equation

$y = mx + b$.

$$14 = -2(-3) + b$$
$$14 = 6 + b$$
$$8 = b$$

Substitute $m = -2$ and $b = 8$ in the equation

$y = mx + b$.

$$y = -2x + 8$$

13. slope 4, passes through (6, 9)

SOLUTION:
Substitute $m = 4$ and $(x, y) = (6, 9)$ in the equation

$y = mx + b$.

$$9 = 4(6) + b$$
$$9 = 24 + b$$
$$-15 = b$$

Substitute $m = 4$ and $b = -15$ in the equation

$y = mx + b$.

$$y = 4x - 15$$

14. slope $\frac{3}{5}$, passes through (–6, –8)

SOLUTION:

Substitute $m = \frac{3}{5}$ and $(x, y) = (-6, -8)$ in the equation

$y = mx + b$.

$$-8 = \frac{3}{5}(-6) + b$$
$$-8 = -\frac{18}{5} + b$$
$$-\frac{22}{5} = b$$

Substitute $m = \frac{3}{5}$ and $b = -\frac{22}{5}$ in the equation

$y = mx + b$.

$$y = \frac{3}{5}x - \frac{22}{5}$$

15. slope $-\frac{1}{4}$, passes through (12, –4)

SOLUTION:

Substitute $m = -\frac{1}{4}$ and (x, y) = (12, –4) in the equation

$y = mx + b$.

$$\begin{aligned} -4 &= -\frac{1}{4}(12) + b \\ -4 &= -3 + b \\ -1 &= b \end{aligned}$$

Substitute $m = -\frac{1}{4}$ and b = –1 in the equation

$y = mx + b$.

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

16. **PART-TIME JOB** Each week, Carmen earns a base pay of $15 plus $0.17 for every pamphlet that she delivers. Write an equation that can be used to find how much Carmen earns each week. How much will she earn the week that she delivers 300 pamphlets?

SOLUTION:

Let x be the number of pamphlets that Carmen delivers.
Let y be the amount Carmen earns each week.

The equation to find the amount that Carmen earns each week is $y = 0.17x + 15$
.
Substitute $x = 300$ in the equation $y = 0.17x + 15$.

$$\begin{aligned} y &= 0.17(300) + 15 \\ y &= 66 \end{aligned}$$

Thus, Carmen will earn $66.

Write an equation of the line passing through each pair of points.

17. (–2, –6), (4, 6)

SOLUTION:

Substitute $(x_1, y_1) = (-2, -6)$ and $(x_2, y_2) = (4, 6)$ in the slope formula

$m = \frac{y_2 - y_1}{x_2 - x_1}$.

$$\begin{aligned} m &= \frac{6 - (-6)}{4 - (-2)} \\ &= \frac{12}{6} \\ &= 2 \end{aligned}$$

Substitute $m = 2$ and $(x_1, y_1) = (-2, -6)$ in the point-slope form

$y - y_1 = m(x - x_1)$.

$$\begin{aligned} y - (-6) &= 2(x - (-2)) \\ y + 6 &= 2x + 4 \end{aligned}$$

Subtract 6 from each side.

$$y = 2x - 2$$

18. (–8, –5), (–3, 10)

SOLUTION:

Substitute $(x_1, y_1) = (-8, -5)$ and $(x_2, y_2) = (-3, 10)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{10 - (-5)}{-3 - (-8)} \\ &= \frac{15}{5} \\ &= 3 \end{aligned}$$

Substitute m = 3 and $(x_1, y_1) = (-8, -5)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - (-5) &= 3(x - (-8)) \\ y + 5 &= 3x + 24 \end{aligned}$$

Subtract 5 from each side.

$$y = 3x + 19$$

19. (–4, 12), (–2, –4)

SOLUTION:

Substitute $(x_1, y_1) = (-4, 12)$ and $(x_2, y_2) = (-2, -4)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-4 - 12}{-2 - (-4)} \\ &= \frac{-16}{2} \\ &= -8 \end{aligned}$$

Substitute m = –8 and $(x_1, y_1) = (-4, 12)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - 12 &= -8(x - (-4)) \\ y - 12 &= -8x - 32 \end{aligned}$$

Add 12 to each side.

$$y = -8x - 20$$

20. (4.6, 3.4), (2.2, 2.8)

SOLUTION:

Substitute $(x_1, y_1) = (4.6, 3.4)$ and $(x_2, y_2) = (2.2, 2.8)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{2.8 - 3.4}{2.2 - 4.6} \\ &= \frac{-0.6}{-2.4} \\ &= 0.25 \end{aligned}$$

Substitute *m* = 0.25 and $(x_1, y_1) = (4.6, 3.4)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - 3.4 &= 0.25(x - 4.6) \\ y - 3.4 &= 0.25x - 1.15 \\ y &= 0.25x + 2.25 \end{aligned}$$

21. (5.5, 0.6), (1.1, 2.8)

SOLUTION:

Substitute $(x_1, y_1) = (5.5, 0.6)$ and $(x_2, y_2) = (1.1, 2.8)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{2.8 - 0.6}{1.1 - 5.5} \\ &= \frac{2.2}{-4.4} \\ &= -0.5 \end{aligned}$$

Substitute *m* = –0.5 and $(x_1, y_1) = (5.5, 0.6)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - 0.6 &= -0.5(x - 5.5) \\ y - 0.6 &= -0.5x + 2.75 \\ y - 0.6 + 0.6 &= -0.5x + 2.75 + 0.6 \\ y &= -0.5x + 3.35 \end{aligned}$$

22. (–25, –16), (–29, 12)

SOLUTION:

Substitute $(x_1, y_1) = (-25, -16)$ and $(x_2, y_2) = (-29, 12)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-12 - (-16)}{-29 - (-25)} \\ &= \frac{28}{-4} \\ &= -7 \end{aligned}$$

Substitute *m* = –7 and $(x_1, y_1) = (-25, -16)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - (-16) &= -7(x - (-25)) \\ y + 16 &= -7x - 175 \end{aligned}$$

Subtract 16 from each side.

$$y = -7x - 191$$

CCSS PERSEVERANCE Write an equation in slope-intercept form for the line that satisfies each set of conditions.

23. passes through (4, 2), perpendicular to *y* = –2*x* + 3

SOLUTION:

The slope of the line *y* = –2*x* + 3 is –2. The slope of the line perpendicular to the given line is $\frac{1}{2}$.

Substitute *m* = $\frac{1}{2}$ and $(x_1, y_1) = (4, 2)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - 2 &= \frac{1}{2}(x - 4) \\ y - 2 &= \frac{1}{2}x - 2 \\ y &= \frac{1}{2}x \end{aligned}$$

24. passes through (–6, –6), parallel to $y = \frac{4}{3}x + 8$

SOLUTION:

The slope of the line $y = \frac{4}{3}x + 8$ is $\frac{4}{3}$. The slope of the line parallel to the given line is $\frac{4}{3}$.

Substitute *m* = $\frac{4}{3}$ and $(x_1, y_1) = (-6, -6)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - (-6) &= \frac{4}{3}(x - (-6)) \\ y + 6 &= \frac{4}{3}x + 8 \\ y &= \frac{4}{3}x + 8 - 6 \\ y &= \frac{4}{3}x + 2 \end{aligned}$$

25. passes through (12, 0), parallel to $y=-\frac{1}{2}x-3$

SOLUTION:

The slope of the line $y=-\frac{1}{2}x-3$ is $-\frac{1}{2}$. The slope of the line parallel to the given line is $-\frac{1}{2}$.

Substitute $m = -\frac{1}{2}$ and $(x_1, y_1)=(12,0)$ in the point slope form

$y-y_1=m(x-x_1)$.

$$\begin{aligned} y-0&=-\frac{1}{2}(x-12)\\ y&=-\frac{1}{2}x+6 \end{aligned}$$

26. passes through (10, 2), perpendicular to $y = 4x + 6$

SOLUTION:

The slope of the line $y = 4x + 6$ is 4. The slope of the line perpendicular to the given line is $-\frac{1}{4}$.

Substitute $m = -\frac{1}{4}$ and $(x_1, y_1)=(10,2)$ in the point slope form

$y-y_1=m(x-x_1)$.

$$\begin{aligned} y-2&=-\frac{1}{4}(x-10)\\ y-2&=-\frac{1}{4}x+\frac{10}{4}\\ y&=-\frac{1}{4}x+\frac{9}{2}\\ y&=-0.25x+4.5 \end{aligned}$$

27. **FINANCIAL LITERACY** Julio buys a used car for $5900. Monthly expenses for the car—which include insurance, maintenance, and gas—total $180 per month. Write an equation that represents the total cost of buying and owning the car for *x* months.

SOLUTION:

Let y be the total cost of buying and owning the car.

Substitute $m = 180$ and $b = 5900$ in the equation

$y = mx + b$.

$y=180x+5900$

28. **DELI** The sales of a sandwich store increased from \$52,000 to \$116,000 during the first five years of business. Write an equation that models the sales *y* after *x* years. Determine what the sales will be at the end of 12 years if the pattern continues.

SOLUTION:

The two ordered pairs which represent the year and their sale are (1, 52000) and (5, 116000).

Substitute $(x_1, y_1) = (1, 52000)$ and $(x_2, y_2) = (5, 116000)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = \frac{116,000 - 52,000}{5 - 1}$$
$$= 16,000$$

Substitute m = 16,000 and $(x_1, y_1) = (1, 52000)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - 52,000 = 16,000(x - 1)$$
$$y - 52,000 = 16,000x - 16,000$$

Add 52,000 to each side.

$$y = 16,000x + 36,000$$

Substitute x = 12 in the equation

$$y = 16,000x + 36,000$$

.

$$y = 16,000(12) + 36,000$$
$$y = 228,000$$

At the end of 12 years, the sale will be \$228,000.

29. **WHALES** In 2009, it was estimated that there were 300 northern right whales in existence. The population of northern right whales is expected to decline by at least 25 whales each generation. Write an equation that represents the number of right whales that will be in existence in *x* generations.

SOLUTION:

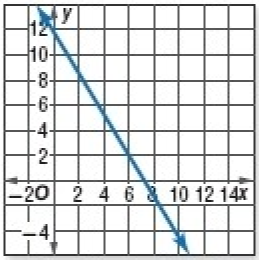
Let *y* be the number of right whales

.

The slope is –25.

The equation to find the number of right whales that will be in existence in *x* generations is $y = -25x + 300$.

Write an equation in slope-intercept form for each graph.

30. 

SOLUTION:
The line passes through the points (0, 12) and (6, 2).

Substitute $(x_1, y_1) = (0, 12)$ and $(x_2, y_2) = (6, 2)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = \frac{2 - 12}{6 - 0} = -\frac{5}{3}$$

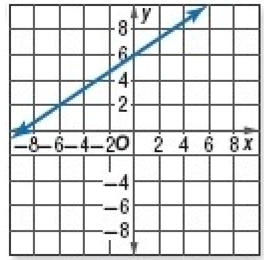
Substitute $m = -\frac{5}{3}$ and $(x_1, y_1) = (0, 12)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$y - 12 = -\frac{5}{3}(x - 0)$$
$$y - 12 = -\frac{5}{3}x$$

Add 12 to each side.

$$y = -\frac{5}{3}x + 12$$

31. 

SOLUTION:
The line passes through the points (0, 6) and (–6, 2).

Substitute $(x_1, y_1) = (0, 6)$ and $(x_2, y_2) = (-6, 2)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = \frac{2 - 6}{-6 - 0} = \frac{2}{3}$$

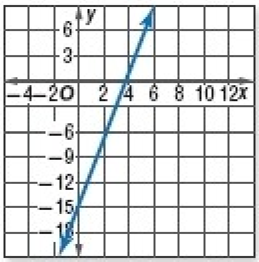
Substitute $m = \frac{2}{3}$ and $(x_1, y_1) = (0, 6)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - 6 = \frac{2}{3}(x - 0)$$
$$y - 6 = \frac{2}{3}x$$

Add 6 to each side.

$$y = \frac{2}{3}x + 6$$

32. 

SOLUTION:

The line passes through the points (3, –3) and (0, –15).

Substitute $(x_1, y_1) = (3, -3)$ and $(x_2, y_2) = (0, -15)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-15 - (-3)}{0 - 3} \\ &= \frac{-12}{-3} \\ &= 4 \end{aligned}$$

Substitute $m = 4$ and $(x_1, y_1) = (0, -15)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - (-15) &= 4(x - 0) \\ y + 15 &= 4x \\ y &= 4x - 15 \end{aligned}$$

33. **ROSES** Brad wants to send his girlfriend Kelli a dozen roses. He visits two stores. For what distance do the two stores charge the same amount to deliver a dozen roses?

Full Bloom	Flowers R US
Dozen roses \$30 Delivery: \$3 per mile	Dozen roses \$40 Delivery: \$2 per mile

SOLUTION:

Let x be the number of miles.
Let y be the amount to deliver a dozen roses.

The amount charged by Full Bloom store is $y = 3x + 30$.

The amount charged by Flowers-R-Us store is $y = 2x + 40$.

Equate two equations.

$$3x + 30 = 2x + 40$$

Solve for x.

$$\begin{aligned} 3x + 30 - 2x - 40 &= 0 \\ x - 10 &= 0 \\ x &= 10 \end{aligned}$$

For the distance of 10 mi the two stores will charge the same amount.

34. **TYPING** The equation $y = 55(23 - x)$ can be used to model the number of words y you have left to type after x minutes.

a. Write this equation in slope-intercept form.

b. Identify the slope and y-intercept.

c. Find the number of words you have left to type after 20 minutes.

SOLUTION:

a. Distribute 55 within the parenthesis.

$$\begin{aligned} y &= 55(23 - x) \\ &= 1265 - 55x \\ &= -55x + 1265 \end{aligned}$$

b. Slope of the equation is the coefficient of x, –55. y- intercept of the equation is 1265.

c. Substitute $x = 20$ in the equation $y = 1265 - 55x$.

$$y = 1265 - 55(20)$$
$$y = 165$$

35. **RECRUITING** As an army recruiter, Ms. Cooper is paid a daily salary plus commission. When she recruits 10 people, she earns $100. When she recruits 14 people, she earns $120.

a. Write a linear equation to model this situation.

b. What is Ms. Cooper's daily salary?

c. How much would Ms. Cooper earn in a day if she recruits 20 people?

SOLUTION:

a. The two ordered pairs which represent the number of recruits and the salary are (10, 100) and (14, 120). Substitute $(x_1, y_1) = (10, 100)$ and $(x_2, y_2) = (14, 120)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{120 - 100}{14 - 10} \\ &= 5 \end{aligned}$$

Substitute $m = 5$ and $(x_1, y_1) = (10, 100)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - 100 = 5(x - 10)$$
$$y - 100 = 5x - 50$$

Add 100 to each side

.

$$y = 5x + 50$$

b. The y-intercept of the equation $y = 5x + 50$ is 50. Thus, Ms. Cooper's daily salary is $50.

c. Substitute $x = 20$ in the equation $y = 5x + 50$.

$$y = 5(20) + 50$$
$$y = 150$$

Ms. Cooper will earn $150 if she recruits 20 people.

36. **CCSS MODELING** Refer to the table.

Miles	Kilometers
100	161
50	80.5

a. Write and graph the linear equation that gives the distance y in kilometers in terms of the number x in miles.

b. What distance in kilometers corresponds to 20 miles?

c. What number is the same in kilometers and miles? Explain your reasoning.

SOLUTION:

a. The two ordered pairs which represent the number of miles and its distance in kilometers are (100, 161) and (50, 80.5).

Substitute $(x_1, y_1) = (100, 161)$ and $(x_2, y_2) = (50, 80.5)$ in the slope formula

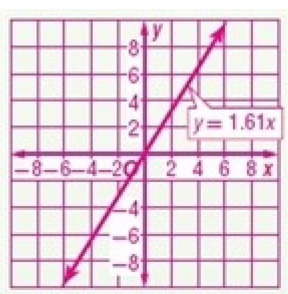
$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{80.5 - 161}{50 - 100} \\ &= \frac{-80.5}{-50} \\ &= 1.61 \end{aligned}$$

Substitute m = 1.61 and $(x_1, y_1) = (100, 161)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned} y - 161 &= 1.61(x - 100) \\ y - 161 &= 1.61x - 161 \\ y &= 1.61x \end{aligned}$$



b. Substitute x = 20 in the equation

y = 1.61x.

$$\begin{aligned} y &= 1.61(20) \\ &= 32.2 \end{aligned}$$

32.2 km corresponds to 20 miles.

c. 0; because this is the point on the graph where the x-value and the y-value are the same.

37. **REASONING** Determine whether the following statement is always, sometimes, or never true. Explain your reasoning.

The quadrilateral formed by any two parallel lines and two lines perpendicular to those lines is a square.

SOLUTION:

Sample answer: Sometimes; while the two sets of parallel and perpendicular lines will always form a quadrilateral with four 90º angles, that figure will always be a rectangle, but not necessarily a square.

38. **CHALLENGE** Given $\square ABCD$ with vertices $A(a, b)$, $B(c-a, d)$, $C(c+a, d)$, and $D(c, b)$, write an equation of a line perpendicular to diagonal $\overline{BD}$ that contains A.

SOLUTION:

Substitute $(x_1, y_1) = (c-a, d)$ and $(x_2, y_2) = (c, b)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = \frac{b-d}{c-(c-a)} = \frac{b-d}{a}$$

Thus, slope of diagonal $\overline{BD}$ is $\frac{b-d}{a}$.

Slope of the line perpendicular to the diagonal $\overline{BD}$ is $\frac{a}{d-b}$.

Substitute $m = \frac{a}{d-b}$ and $(x_1, y_1) = (a, b)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - b = \frac{a}{d-b}(x-a)$$

$$y - b = \frac{ax}{d-b} - \frac{a^2}{d-b}$$

$$y = \frac{ax}{d-b} - \frac{a^2}{d-b} + b$$

39. **REASONING** Write $y = ax + b$ in point-slope form.

SOLUTION:

Substitute $y = 0$ in the equation $y = ax + b$.

$$0 = ax + b$$

$$-\frac{b}{a} = x$$

Substitute $m = a$ and $(x_1, y_1) = \left(-\frac{b}{a}, 0\right)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - 0 = a\left(x - \left(-\frac{b}{a}\right)\right)$$

$$y - 0 = a\left(x + \frac{b}{a}\right)$$

40. **OPEN ENDED** Write the equations of two parallel lines with negative slopes.

SOLUTION:

$y = -2x + 3$ and $y = -2x - 1$

41. **REASONING** Write an equation in point-slope form of a line with an x-intercept of c and y-intercept of d.

SOLUTION:

Substitute $(x_1, y_1) = (c, 0)$ and $(x_2, y_2) = (0, d)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = -\frac{d}{c}$$

Substitute $m = -\frac{d}{c}$ and $(x_1, y_1) = (0, d)$ in the point slope form

$$y - y_1 = m(x - x_1).$$

$$y - d = -\frac{d}{c}(x - 0)$$

42. **WRITING IN MATH** Why do we represent linear equations in more than one form?

SOLUTION:

Sample answer: Depending on what information is given and what the problem is, it might be easier to represent a linear equation in one form over another. For example, if you are given the slope and the y-intercept, you could represent the equation in slope-intercept form. If you are given a point and the slope, you could represent the equation in point-slope form. If you are trying to graph an equation using the x- and y-intercepts, you could represent the equation in standard form.

43. The total cost c in dollars to go to a water park and ride n water rides is given by the equation $c = 15 + 3n$.

If the total cost was $33, how many water rides were ridden?

A 6

B 7

C 8

D 9

SOLUTION:

Substitute $c = 33$ in the equation

$c = 15 + 3n$.

$$\begin{aligned} 33 &= 15 + 3n \\ 18 &= 3n \\ 6 &= n \end{aligned}$$

So, the correct choice is A.

44. **SHORT RESPONSE** To raise money, the service club bought 1000 candy bars for $0.60 each. If the club sells all of the candy bars for $1 each, what will be their total profit?

SOLUTION:

$$\begin{aligned} \text{Total Profit} &= 1000(1) - 1000(0.60) \\ &= 1000 - 600 \\ &= 400 \end{aligned}$$

If the club sells all of the candy bars for $1, they will get a profit of $400.

45. **PROBABILITY** A fair six-sided die is tossed. What is the probability that a number less than 3 will show on the face of the die?

F $\frac{1}{6}$

G $\frac{1}{3}$

H $\frac{1}{2}$

J $\frac{2}{3}$

SOLUTION:

The numbers less than 3 in a six-sided die are 2 and 1.

$$\begin{aligned}\text{Probability} &= \frac{\text{number of favorable events}}{\text{total number of events}}\\ &= \frac{2}{6}\\ &= \frac{1}{3}\end{aligned}$$

So the correct choice is G.

46. **ACT/SAT** What is an equation of the line through $\left(\frac{1}{2}, -\frac{3}{2}\right)$ and $\left(-\frac{1}{2}, \frac{1}{2}\right)$?

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

B $y = -3x$

C $y = 2x - 5$

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

E $y = -2x - \frac{5}{2}$

SOLUTION:

Substitute $(x_1, y_1) = \left(\frac{1}{2}, -\frac{3}{2}\right)$ and $(x_2, y_2) = \left(-\frac{1}{2}, \frac{1}{2}\right)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned}m &= \frac{\frac{1}{2} - \left(-\frac{3}{2}\right)}{-\frac{1}{2} - \frac{1}{2}}\\ &= \frac{\frac{4}{2}}{-\frac{2}{2}}\\ &= -2\end{aligned}$$

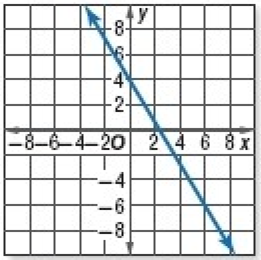
Substitute $m = -2$ and $(x_1, y_1) = \left(\frac{1}{2}, -\frac{3}{2}\right)$ in the point-slope form

$$y - y_1 = m(x - x_1).$$

$$\begin{aligned}y - \left(-\frac{3}{2}\right) &= -2\left(x - \frac{1}{2}\right)\\ y + \frac{3}{2} &= -2x + 1\\ y &= -2x + 1 - \frac{3}{2}\\ y &= -2x - \frac{1}{2}\end{aligned}$$

So, the correct choice is A.

Determine the rate of change of each graph.

47. 

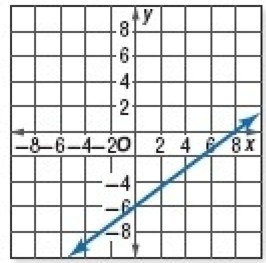
SOLUTION:

The line passes through the points (0, 4) and (6, –6).

Substitute $(x_1, y_1) = (0, 4)$ and $(x_2, y_2) = (6, -6)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-6 - 4}{6 - 0} \\ &= \frac{-10}{6} \\ &= -\frac{5}{3} \end{aligned}$$

48. 

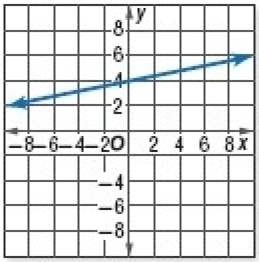
SOLUTION:

The line passes through the points (0, –6) and (8, 0).

Substitute $(x_1, y_1) = (0, -6)$ and $(x_2, y_2) = (8, 0)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{0 - (-6)}{8 - 0} \\ &= \frac{6}{8} \\ &= \frac{3}{4} \end{aligned}$$

49. 

SOLUTION:
The line passes through the points (0, 4) and (10, 6).

Substitute $(x_1, y_1) = (0, 4)$ and $(x_2, y_2) = (10, 6)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$m = \frac{6-4}{10-0} = \frac{2}{10} = \frac{1}{5}$$

50. **RECREATION** Scott is currently on page 210 of an epic novel that is 980 pages long. He plans to read 30 pages per day until he finishes the novel. Write and solve a linear relation to determine how many days it will take Scott to complete the novel.

SOLUTION:
Let *x* be the number of days.

The equation to determine the number of days Scott will take to complete the novel is 30*x* + 210 = 980.

Solve the equation for *x*.

$$30x + 210 = 980$$
$$30x = 770$$
$$x = 25\frac{2}{3}$$

Thus, Scott will take 26 days to complete the novel.

Solve each inequality.

51. $-6x - 4 \le 12 - 2x$

SOLUTION:
Add 2*x* and 4 to each side of the inequality.

$$-4x \le 16$$

Divide each side by –4.

$$\frac{-4x}{-4} \le \frac{16}{-4}$$
$$x \ge -4$$

52. $\frac{x+2}{5} > -3x + 1$

SOLUTION:
Multiply both sides of the inequality by 5.

$$x + 2 > -15x + 5$$

Add 15*x* to each side.

$$16x + 2 > 5$$

Subtract 2 from each side
.
$$16x > 3$$

Divide each side of the inequality by 16.

$$\frac{16x}{16} > \frac{3}{16}$$
$$x > \frac{3}{16}$$

53. $\frac{5x+3}{3} \geq \frac{4x-2}{5}$

SOLUTION:
Multiply both sides of the inequality by 15.

$$5(5x+3) \geq 3(4x-2)$$
$$25x+15 \geq 12x-6$$

Subtract 12*x* and 15 from each side
.
$$13x \geq -21$$

Divide each side of the inequality by 13.

$$\frac{13x}{13} \geq \frac{-21}{13}$$
$$x \geq \frac{-21}{13}$$

Determine if the triangles with the following lengths are right triangles.

54. 5, 12, 13

SOLUTION:
The longest side is 13, so use 13 as c, the measure of the hypotenuse.

Let a and b be the lengths of the two shorter sides.

Substitute the values of a, b and c in the Pythagorean Theorem and simplify.

$$5^2+12^2 \stackrel{?}{=} 13^2$$
$$25+144 \stackrel{?}{=} 169$$
$$169 = 169 \checkmark$$

Thus, the lengths 5, 12, 13 form a right triangle.

55. 36, 48, 60

SOLUTION:
The longest side is 60, so use 60 as c, the measure of the hypotenuse.

Let a and b be the lengths of the two shorter sides.

Substitute the values of a, b and c in the Pythagorean Theorem and simplify.

$$36^2+48^2 \stackrel{?}{=} 60^2$$
$$1296+2304 \stackrel{?}{=} 3600$$
$$3600 = 3600 \checkmark$$

Thus, the lengths 36, 48, 60 form a right triangle.

56. 7, 23, 25

SOLUTION:
The longest side is 25, so use 25 as c, the measure of the hypotenuse.

Let a and b be the lengths of the two shorter sides.

Substitute the values of a, b and c in the Pythagorean Theorem and simplify.

$$7^2+23^2 \stackrel{?}{=} 25^2$$
$$49+529 \stackrel{?}{=} 625$$
$$578 \neq 625$$

Thus, the lengths 7, 23, 25 do not form a right triangle.

Multiply.

57. $(4c-6)(2c+5)$

SOLUTION:

Use the FOIL method to multiply the two binomials.

$$\begin{aligned}&(4c-6)(2c+5)\\&=(4c)(2c)+(4c)(5)\\&\quad+(-6)(2c)+(-6)(5)\\&=8c^2+20c-12c-30\\&=8c^2+8c-30\end{aligned}$$

58. $(-3b+2)(b+3)$

SOLUTION:

Use the FOIL method to multiply the two binomials.

$$\begin{aligned}&(-3b+2)(b+3)\\&=(-3b)(b)+(-3b)(3)\\&\quad+(2)(b)+(2)(3)\\&=-3b^2-9b+2b+6\\&=-3b^2-7b+6\end{aligned}$$

59. $(2a-5)(-3a-4)$

SOLUTION:

Use the FOIL method to multiply the two binomials.

$$\begin{aligned}&(2a-5)(-3a-4)\\&=(2a)(-3a)+(2a)(-4)\\&\quad+(-5)(-3a)+(-5)(-4)\\&=-6a^2-8a+15a+20\\&=-6a^2+7a+20\end{aligned}$$

Find the slope of the line that passes through each pair of points. Express as a fraction in simplest form.

60. (4, 8), (–2, –6)

SOLUTION:

Substitute $(x_1, y_1)=(4,8)$ and $(x_2, y_2)=(-2,-6)$ in the slope formula

$$m=\frac{y_2-y_1}{x_2-x_1}.$$

$$\begin{aligned}m&=\frac{-6-8}{-2-4}\\&=\frac{-14}{-6}\\&=\frac{7}{3}\end{aligned}$$

61. (–6, 3), (–2, 9)

SOLUTION:

Substitute $(x_1, y_1)=(-6,3)$ and $(x_2, y_2)=(-2,9)$ in the slope formula

$$m=\frac{y_2-y_1}{x_2-x_1}.$$

$$\begin{aligned}m&=\frac{9-3}{-2-(-6)}\\&=\frac{6}{4}\\&=\frac{3}{2}\end{aligned}$$

62. (–4, –1), (–8, –8)

SOLUTION:

Substitute $(x_1, y_1) = (-4, -1)$ and $(x_2, y_2) = (-8, -8)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-8 - (-1)}{-8 - (-4)} \\ &= \frac{7}{4} \end{aligned}$$

63. (12, 4), (42, 10)

SOLUTION:

Substitute $(x_1, y_1) = (12, 4)$ and $(x_2, y_2) = (42, 10)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{10 - 4}{42 - 12} \\ &= \frac{6}{30} \\ &= \frac{1}{5} \end{aligned}$$

64. (10.5, –3), (18, –8)

SOLUTION:

Substitute $(x_1, y_1) = (10.5, -3)$ and $(x_2, y_2) = (18, -8)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-8 - (-3)}{18 - 10.5} \\ &= -\frac{5}{7.5} \\ &= -\frac{2}{3} \end{aligned}$$

65. (3.5, –2.5), (–1, –2)

SOLUTION:

Substitute $(x_1, y_1) = (3.5, -2.5)$ and $(x_2, y_2) = (-1, -2)$ in the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

$$\begin{aligned} m &= \frac{-2 - (-2.5)}{-1 - 3.5} \\ &= -\frac{0.5}{4.5} \\ &= -\frac{1}{9} \end{aligned}$$