

## Lesson 4.3 Writing Linear Equations

Use the slope-intercept form to identify slopes and y-intercepts.

*Example*

An equation of a line is given. State the slope and y-intercept of the line.

$$y - 6x + 9 = 0$$

First write the equation in slope-intercept form.

$$\begin{array}{l} y - 6x + 9 = 0 \\ y - 6x + 9 - 9 = 0 - 9 \quad \text{Subtract 9 from both sides.} \\ y - 6x = -9 \quad \text{Simplify.} \\ y - 6x + 6x = -9 + 6x \quad \text{Add 6x to both sides.} \\ y = 6x - 9 \quad \text{Write in slope-intercept form.} \end{array}$$

Comparing the equation  $y = 6x - 9$  with  $y = mx + b$ :

Slope:  $m = \underline{6}$

y-intercept:  $b = \underline{-9}$

**Complete.**

1.  $2x + 6y = 15$

$$2x + 6y = 15$$

$$2x + 6y - \underline{\quad\quad} = 15 - \underline{\quad\quad}$$

Subtract \_\_\_\_\_ on both sides.

$$\underline{\quad\quad} = \underline{\quad\quad} - \underline{\quad\quad}$$

Simplify.

$$\frac{\boxed{\quad}}{\boxed{\quad}} = \frac{\boxed{\quad} - \boxed{\quad}}{\boxed{\quad} - \boxed{\quad}}$$

Divide both sides by \_\_\_\_\_.

$$y = -\frac{\boxed{\quad}}{\boxed{\quad}}x + \frac{\boxed{\quad}}{\boxed{\quad}}$$

Write in slope-intercept form.

Comparing the equation  $y = \underline{\quad\quad}$  with  $y = mx + b$ :

Slope:  $m = -\frac{\boxed{\quad}}{\boxed{\quad}}$

y-intercept:  $b = \frac{\boxed{\quad}}{\boxed{\quad}}$

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**For each line, state its slope and its y-intercept.**

2.  $x + 4y = 1$

3.  $6y - 2x = 15$

**Write an equation of a line given its slope and y-intercept.**

*Example*

**Use the given slope and y-intercept of a line to write an equation in slope-intercept form**

Slope,  $m = \frac{4}{3}$

y-intercept,  $b = -1$

$y = mx + b$

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

Substitute the given values for  $m$  and  $b$ .

$y = \frac{4}{3}x - 1$

**Complete.**

4. Slope,  $m = 9$

y-intercept,  $b = 2$

$y = mx + b$

$y = \underline{\hspace{2cm}}x + \underline{\hspace{2cm}}$

Substitute the given values for  $m$  and  $b$ .

**Use the given slope and y-intercept of a line to write an equation in slope-intercept form.**

5. Slope,  $m = -\frac{3}{8}$

y-intercept,  $b = \frac{1}{4}$

6. Slope,  $m = -3$

y-intercept,  $b = -8$

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Write an equation of a line, given its y-intercept and the equation of another line parallel to the line.**

*Example*

A line has the equation  $3y = 2 - 5x$ . Write an equation of a line parallel to this given line that has a y-intercept of 2.

First write the given equation in slope-intercept form.

$$3y = 2 - 5x$$

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

Divide both sides by 3.

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

Simplify.

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

Write in slope-intercept form.

The given line has a slope  $m = -\frac{5}{3}$  and y-intercept  $b = \frac{2}{3}$ .

Then write an equation for the parallel line with slope  $m = -\frac{5}{3}$  and y-intercept,  $b = 2$ .

$$y = mx + b$$

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

Substitute the given values for  $m$  and  $b$ .

So, an equation of the line parallel to  $3y = 2 - 5x$  is  $y = -\frac{5}{3}x + 2$ .

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Complete.**

7. A line has the equation  $\frac{1}{2}y + 3 = 4x$ . Write an equation of a line parallel to this given line that has a y-intercept of 5.

First write the given equation in slope-intercept form.

$$\frac{1}{2}y + 3 = 4x$$

$$\frac{1}{2}y + 3 - \underline{\hspace{2cm}} = 4x - \underline{\hspace{2cm}}$$

Subtract 3 from both sides.

$$\frac{\boxed{\hspace{1cm}}}{\boxed{\hspace{1cm}}}y = \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$$

Simplify.

$$\underline{\hspace{1cm}} = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} - \underline{\hspace{1cm}})$$

Multiply both sides by \_\_\_\_\_.

$$y = \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$$

Simplify. Write in slope-intercept form.

The line has slope  $m = \underline{\hspace{1cm}}$  and y-intercept  $b = \underline{\hspace{1cm}}$ .

Then write an equation for the parallel line with slope  $m = \underline{\hspace{1cm}}$  and y-intercept,  $b = \underline{\hspace{1cm}}$ .

$$y = mx + b$$

$$y = \underline{\hspace{1cm}}$$

Substitute the given values for  $m$  and  $b$ .

So, an equation of the line parallel to  $\frac{1}{2}y + 3 = 4x$  is \_\_\_\_\_.

**Write an equation.**

8. A line has the equation  $4x - 13 = 2y$ . Write an equation of a line parallel to this given line that has a y-intercept of 1.
9. A line has the equation  $8 - 3y - 9x = 0$ . Write an equation of a line parallel to this given line that has a y-intercept of 2.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Write an equation of a line given its slope and a point on the line.***Example*

A line has slope  $-1$  and passes through the point  $(-2, 4)$ . Write an equation of the line.

First use the given slope,  $-1$ , and the values  $x = -2$  and  $y = 4$  to find the y-intercept.

$$y = mx + b$$

Write the slope-intercept form.

$$4 = -1(-2) + b$$

Substitute the values for  $m$ ,  $x$ , and  $y$ .

$$4 = 2 + b$$

Simplify.

$$4 - 2 = 2 + b - 2$$

Subtract 2 from both sides.

$$b = 2$$

Simplify. Rearrange.

So, the y-intercept is 2.

Then use the given slope,  $-1$  and the y-intercept, 2, to write an equation in slope-intercept form.

$$y = mx + b$$

Write in slope-intercept form.

$$y = (-1)x + 2$$

Substitute the values for  $m$  and  $b$ .

$$y = -x + 2$$

Simplify.

So, an equation of the line is  $y = -x + 2$ .

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Complete.**

10. A line has slope 6 and passes through the point  $(1, \frac{1}{3})$ . Write an equation of the line.

$$y = mx + b$$

Write in slope-intercept form.

$$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

Substitute the values for  $m$ ,  $x$ , and  $y$ .

$$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} - \underline{\hspace{2cm}}$$

Simplify. Subtract \_\_\_\_\_ from both sides.

$$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = b$$

Simplify.

So, the  $y$ -intercept is  $-\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$ .

$$y = mx + b$$

Write in slope-intercept form.

$$y = (\underline{\hspace{2cm}})x + \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

Substitute the values for  $m$  and  $b$ .

$$y = \underline{\hspace{2cm}} - \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

Simplify.

So, an equation of the line is \_\_\_\_\_.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Solve.**

11. A line has slope  $-3$  and passes through the point  $(2, 3)$ . Write an equation of the line.

12. A line has slope  $-\frac{3}{2}$  and passes through the point  $(2, -4)$ . Write an equation of the line.

**Write an equation of a line, given a point on the line and the equation of a parallel line.***Example*

A line passes through the point  $\left(1, \frac{1}{2}\right)$  and is parallel to the line represented by the equation  $y = 5 - 2x$ . Write the equation of the line.

Use the given equation to find the slope of the parallel line.

First write the equation  $y = 5 - 2x$  in slope-intercept form.

$$y = 5 - 2x$$

$$y = -2x + 5$$

Write in slope-intercept form.

The line has slope  $m = \underline{-2}$ .

So, the line parallel to  $y = 5 - 2x$  has slope  $m = \underline{-2}$ .

Then write the equation of a line that passes through the point  $\left(1, \frac{1}{2}\right)$  and has slope  $\underline{-2}$ .

$$y = mx + b$$

Write in slope-intercept form.

$$\frac{1}{2} = -2(1) + b$$

Substitute the values for  $m$ ,  $x$ , and  $y$ .

$$\frac{1}{2} + 2 = -2 + b + 2$$

Simplify. Add 2 to both sides.

$$\frac{5}{2} = b$$

Simplify.

So, the  $y$ -intercept is  $\underline{\frac{5}{2}}$ .

So, an equation of the line is  $\underline{y = -2x + \frac{5}{2}}$ .

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Complete.**

13. A line passes through the point  $\left(\frac{1}{2}, 0\right)$  and is parallel to the line represented by the equation  $y = 3x$ . Write the equation of the line.

The line  $y = 3x$  has slope  $m =$  \_\_\_\_\_.

So, the line parallel to  $y = 3x$  has slope  $m =$  \_\_\_\_\_.

Write the equation of a line that passes through the point  $\left(\frac{1}{2}, 0\right)$  and has slope \_\_\_\_\_.

$$y = mx + b$$

Write in slope-intercept form.

$$\begin{array}{r} \text{_____} = \text{_____} + \text{_____} \\ - \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} + \text{_____} - \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} \end{array}$$

Substitute the values for  $m$ ,  $x$ , and  $y$ .

Simplify. Subtract \_\_\_\_\_ from both sides.

$$\begin{array}{r} \boxed{\phantom{0}} \\ - \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} = b \end{array}$$

Simplify.

So, the  $y$ -intercept is  $-\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$ .

So, an equation of the line is \_\_\_\_\_.

**Solve.**

14. A line passes through the point  $(0, 4)$  and is parallel to the line represented by the equation  $y = 8x + 3$ . Write the equation of the line.
15. A line passes through the point  $(-1, -2)$  and is parallel to the line represented by the equation  $y = 1 - 7x$ . Write the equation of the line.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Write an equation of a line given two points on a line.***Example*

Write an equation of the line that passes through the pair of points (2, 5) and (-1, -3).

First use the slope formula to find the slope.

Let (2, 5) be  $(x_1, y_1)$  and (-1, -3) be  $(x_2, y_2)$ .

$$\begin{aligned} \text{Slope} &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Use the slope formula.} \\ &= \frac{-3 - 5}{-1 - 2} && \text{Substitute values.} \\ &= \frac{-8}{-3} && \text{Subtract.} \\ &= \frac{8}{3} && \text{Simplify.} \end{aligned}$$

The line has slope  $m = \frac{8}{3}$ .

**Method 1**

Use the slope  $m = \frac{8}{3}$  and the point (2, 5) to find the y-intercept.

$$y = mx + b \quad \text{Write in slope-intercept form.}$$

$$5 = \frac{8}{3}(2) + b \quad \text{Substitute the values for } m, x, \text{ and } y.$$

$$5 = \frac{16}{3} + b \quad \text{Simplify.}$$

$$5 - \frac{16}{3} = \frac{16}{3} + b - \frac{16}{3} \quad \text{Subtract } \frac{16}{3} \text{ from both sides.}$$

$$-\frac{1}{3} = b \quad \text{Simplify.}$$

The y-intercept is  $-\frac{1}{3}$ . So, an equation of the line is  $y = \frac{8}{3}x - \frac{1}{3}$ .

**Method 2**

Use the slope  $m = \frac{8}{3}$  and the point  $(-1, -3)$  to find the y-intercept.

$y = mx + b$  Write in slope-intercept form.

$-3 = \frac{8}{3}(-1) + b$  Substitute the values for  $m$ ,  $x$ , and  $y$ .

$-3 = -\frac{8}{3} + b$  Simplify.

$-3 + \frac{8}{3} = -\frac{8}{3} + b + \frac{8}{3}$  Add  $\frac{8}{3}$  to both sides.

$-\frac{1}{3} = b$  Simplify.

The y-intercept is  $-\frac{1}{3}$ . So, an equation of the line is  $y = \frac{8}{3}x - \frac{1}{3}$ .

**Complete.**

16. Write an equation of the line that passes through the pair of points  $(2, 5)$  and  $(-1, -3)$ .

Use the slope  $m = \frac{8}{3}$  and the point  $(-1, -3)$  to find the y-intercept.

$y = mx + b$  Write in slope-intercept form.

\_\_\_\_\_ = \_\_\_\_\_ + \_\_\_\_\_ Substitute the values for  $m$ ,  $x$  and  $y$ .

\_\_\_\_\_ =  $-\frac{\square}{\square}$  + \_\_\_\_\_ Simplify.

\_\_\_\_\_ +  $\frac{\square}{\square}$  =  $-\frac{\square}{\square}$  + \_\_\_\_\_ +  $\frac{\square}{\square}$  Add \_\_\_\_\_ to both sides.

$-\frac{\square}{\square} = b$  Simplify.

The y-intercept is  $-\frac{\square}{\square}$ . So, an equation of the line is  $y = \underline{\hspace{2cm}}$ .

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Solve. Show your work.**

17. Write an equation of the line that passes through the pair of points  $(-6, 8)$  and  $(6, -4)$ .

18. Write an equation of the line that passes through the pair of points  $(0, 3)$  and  $(5, 11)$ .

19. Write an equation of the line that passes through the pair of points  $(-3, 0)$  and  $(0, 6)$ .

20. Write an equation of the line that passes through the pair of points  $(4, 7)$  and  $(10, 15)$ .