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.

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

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

Subtract 9 from both sides.

$$y-6x=-9$$
 Simplify.
 $y-6x+6x=-9+6x$ Add 6x to both sides.
 $y=6x-9$ Write in slope-intercept form.

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

Slope:
$$m = 6$$

y-intercept:
$$b = 9$$

Complete.

1.
$$2x + 6y = 15$$

$$2x + 6y = 15$$

Subtract _____ on both sides.

Divide both sides by _____.

$$x = -\frac{1}{x} + \frac{1}{x}$$

Write in slope-intercept form.

Comparing the equation $y = \underline{\hspace{1cm}}$ with y = mx + b:

Slope:
$$m = -$$

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,
$$b = 2$$

$$y = mx + b$$

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,
$$b = -8$$

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 $m = \frac{-\frac{5}{3}}{3}$ and y-intercept $b = \frac{\frac{2}{3}}{3}$.

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

$$y = mx + b$$

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

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

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

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.

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

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

Subtract 3 from both sides.



Simplify.

Multiply both sides by _____.

Simplify. Write in slope-intercept form.

The line has slope m = and y-intercept b =

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

$$y = mx + b$$

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.

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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.

$$y = mx + b$$

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

$$4 = 2 + b$$

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

$$b=2$$

Write the slope-intercept form.

Substitute the values for m, x, and y.

Simplify.

Subtract 2 from both sides.

Simplify. Rearrange.

So, the *y*-intercept is _____2__.

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

$$y = mx + b$$

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

$$y = -x + 2$$

Write in slope-intercept form.

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

Simplify.

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

Complete.

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

$$y = mx + b$$

Write in slope-intercept form.

Substitute the values for m, x, and y.

<u>_</u> -	=	=	+	

Simplify. Subtract _____ from both sides.

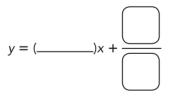
		,
$\overline{\ \ }$	=	b

Simplify.

So, the *y*-intercept is
$$-\frac{1}{2}$$
.

y = mx + b

Write in slope-intercept form.



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

Simplify.

So, an equation of the line is ______.

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 $m = \underline{}$

$$y = mx + b$$

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 $\frac{5}{2}$

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

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.

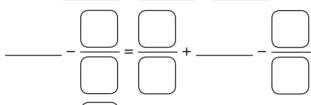
The line y = 3x has slope m =_____.

So, the line parallel to y = 3x has slope m =_____.

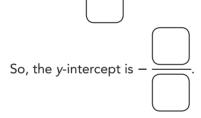
Write the equation of a line that passes through the point $\left(\frac{1}{2}, 0\right)$ and has slope ______.

Write in slope-intercept form.

Substitute the values for m, x, and y.



Simplify. Subtract _____ from both sides.



Simplify.

So, an equation of the line is _____

Solve.

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- **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.

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) .

Slope =
$$\frac{y_2 - y_1}{x_2 - x_1}$$

Use the slope formula.

$$=\frac{-3-5}{-1-2}$$

Substitute values.

$$=\frac{-8}{-3}$$

Subtract.

$$=\frac{8}{3}$$

Simplify.

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

Method 1

Method 1Use the slope $m = \frac{8}{3}$ and the point (2, 5) to find the *y*-intercept.

$$y = mx + b$$

Write in slope-intercept form.

$$5 = \frac{8}{3}(2) + b$$

Substitute the values for m, x, and y.

$$5 = \frac{16}{3} + b$$

Simplify.

$$5 - \frac{16}{3} = \frac{16}{3} + b - \frac{16}{3}$$

Subtract $\frac{16}{3}$ from both sides.

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

Simplify.

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

Method 2

Use the slope $m = \frac{3}{3}$ 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.

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.

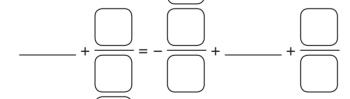
$$y = mx + b$$

Write in slope-intercept form.

Substitute the values for m, x and y.



Simplify.



Add _____ to both sides.



Simplify.

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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).