

# Using Intercepts

**Goal:** Use x- and y-intercepts to graph linear equations.

## Vocabulary

x-intercept: The x-coordinate of the point where the graph intersects the x-axis

y-intercept: The y-coordinate of the point where the graph intersects the y-axis

## Finding Intercepts

To find the x-intercept of a line, substitute 0 for  $y$  into the equation of the line and solve for  $x$ .

To find the y-intercept of a line, substitute 0 for  $x$  into the equation of the line and solve for  $y$ .

### EXAMPLE 1 Finding Intercepts

Find the intercepts of the graph of  $y = \frac{3}{4}x - 6$ .

1. To find the x-intercept, let  $y = 0$  and solve for  $x$ .

$$y = \frac{3}{4}x - 6$$

$$0 = \frac{3}{4}x - 6$$

$$6 = \frac{3}{4}x$$

$$8 = x$$

2. To find the y-intercept, let  $x = 0$  and solve for  $y$ .

$$y = \frac{3}{4}x - 6$$

$$y = \frac{3}{4}(0) - 6$$

$$y = 0 - 6$$

$$y = -6$$

Remember that the intercepts of a line are numbers, not points.

**Answer:** The x-intercept is 8 and the y-intercept is -6.

The graph of the equation crosses the x-axis at (8, 0) and the y-axis at (0, -6).

**EXAMPLE 2** Using Intercepts to Graph a Line

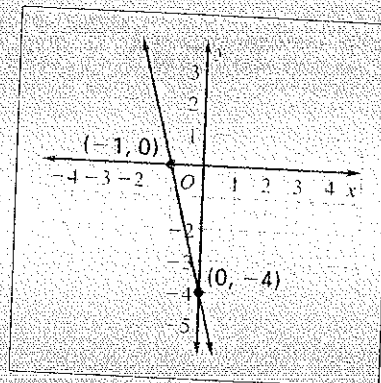
Graph the line with an  $x$ -intercept of  $-1$  and a  $y$ -intercept of  $-4$ .

The  $x$ -intercept is  $-1$ , so plot the

point  $(-1, 0)$ . The  $y$ -intercept is  $-4$ ,

so plot the point  $(0, -4)$ .

Draw a line through the two points.



**Guided Practice** Find the intercepts of the graph of the equation. Then graph the line using the intercepts.

1.  $4x + y = -3$

2.  $6x - 2y = -2$

3.  $-3x - y = -15$

4.  $12x - 6y = 18$

### EXAMPLE 3 Writing an Equation in Two Variables

**DVDs** At a video store, used DVDs cost \$5 and new DVDs cost \$15. You spend \$50 at the video store. Write an equation in two variables that models the situation.

#### Solution

1. Use a verbal model to represent the situation.

$$\boxed{\text{Amount spent on used DVDs}} + \boxed{\text{Amount spent on new DVDs}} = \boxed{\text{Total amount spent}}$$

2. **Represent** the amount spent on used DVDs as the product of the cost per used DVD and the number of DVDs  $x$  you buy:

$$\boxed{\$5/\text{DVD}} \cdot \boxed{x \text{ DVDs}} = \boxed{\$5x}$$

3. **Represent** the amount spent on new DVDs as the product of the cost per new DVD and the number of DVDs  $y$  you buy:

$$\boxed{\$15/\text{DVD}} \cdot \boxed{y \text{ DVDs}} = \boxed{\$15y}$$

4. **Write** the equation. The total amount spent, \$50, is equal to the sum of the

amount spent on  DVDs and the amount spent on  DVD

$$\boxed{\$5x + \$15y = \$50} \quad \text{or} \quad \boxed{5x + 15y = 50}$$

**Answer:** The equation  models the situation described.

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## EXAMPLE 4 Using and Interpreting Intercepts

**Fundraising** You sell pizzas and subs to raise money for a field trip. Each pizza sells for \$4 and each sub sells for \$6. You raise \$60. Graph the equation  $4x + 6y = 60$ , where  $x$  is the number of pizzas you sell and  $y$  is the number of subs you sell. What do the intercepts represent?

### Solution

1. Find the  $x$ -intercept.

To find the  $x$ -intercept,

let  $y = 0$  and solve for  $x$ .

$$4x + 6y = 60$$

$$4x + 6(0) = 60$$

$$4x = 60$$

$$x = 15$$

2. Find the  $y$ -intercept.

To find the  $y$ -intercept,

let  $x = 0$  and solve for  $y$ .

$$4x + 6y = 60$$

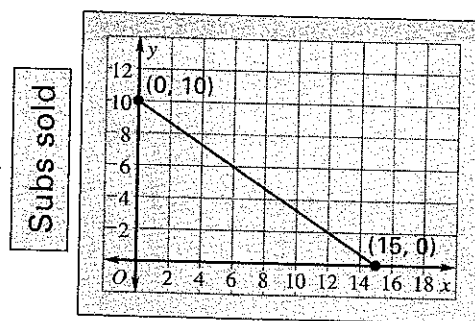
$$4(0) + 6y = 60$$

$$6y = 60$$

$$y = 10$$

3. Graph the equation. The  $x$ -intercept is  $15$  and the  $y$ -intercept is  $10$ . So the points  $(15, 0)$  and  $(0, 10)$  are on the graph. Plot these points and draw a line segment through them.

The equation is graphed only in the first quadrant because negative values of  $x$  and  $y$  do not make sense in this situation.



Pizzas sold

**Answer:** The  $x$ -intercept represents

the number of pizzas you sell if you sell only pizzas.

The  $y$ -intercept represents

the number of subs you sell if you sell only subs.

### Homework