

**Essential Question** How can you use tables and graphs to solve equations?



**1 ACTIVITY: Using a Table, Graph, and Algebra**

Work with a partner. You start a website design company. How many sites must you design before you start making a profit?

- You pay \$4000 for a new computer and software.
- It costs you \$100 to design each website.
- You charge \$500 to design each website.



Let  $x$  represent the number of sites you design.

$C = 4000 + 100x$  Cost of designing  $x$  sites

$R = 500x$  Income for designing  $x$  sites

You will start making a profit when  $C = R$ . That is, when you have designed enough websites to cover your start-up cost of \$4000 and \$100 for each site.

- a. **TABLE** Use “Guess, Check, and Revise” with a table to find the value of  $x$  for which  $C = R$ .

$x$							
$C$							
$R$							

- b. **GRAPH** Graph  $C = 4000 + 100x$  and  $R = 500x$  in the same coordinate plane. Find the value of  $x$  for which the two lines intersect.

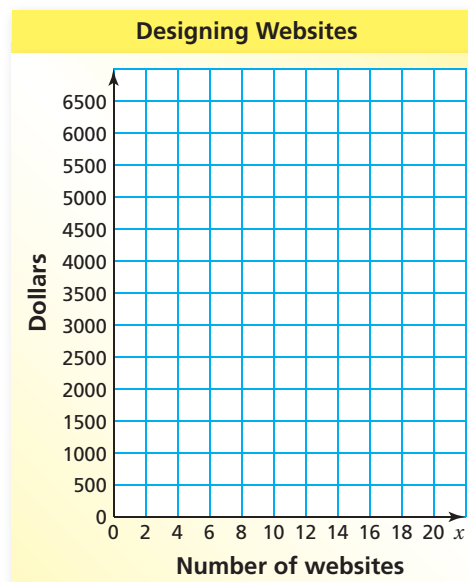
- c. **ALGEBRA** Set  $C$  equal to  $R$ .

$$C = R$$

$$4000 + 100x = 500x$$

Solve for  $x$ .

- d. The point at which the two lines intersect is called the “break-even” point. Why is it called this?



1  
2  
3  
4  
5  
6  
7  
8  
9  
0

## 2 ACTIVITY: Planning Your Own Business

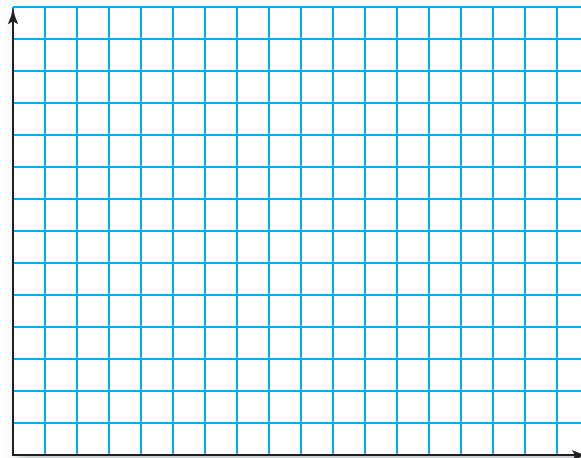
Make a plan to start your own business.

- Describe your business.
- Are you providing a product or a service?
- Make a list of the things you need to start the business. Find the cost of each item or service.
- Write an equation that represents the cost of making  $x$  items. Write an equation that represents the income for selling  $x$  items.
- Use a table to compare the cost and income for several values of  $x$ .



$x$							
$C$							
$R$							

- Draw a graph that shows when your company will reach the break-even point.



- Organize all of your planning in a folder. Include your company name, logo, and a plan for advertising and selling your product or service.

### What Is Your Answer?

3. **IN YOUR OWN WORDS** How can you use tables and graphs to solve equations? Describe a real-life example.

#### Practice

Use what you learned about solving equations using tables and graphs to complete Exercises 4–6 and 13–15 on page A26.

## Key Idea

### Solving Equations

**Method 1** Use algebra. (Section B.1 and Section B.2)

**Method 2** Use a table. Find the value of the variable that makes the value of each side of the equation the same. (Section B.3)

**Method 3** Use a graph. Graph each side of the equation. The  $x$ -coordinate of the point of intersection is the solution of the equation. (Section B.3)

### EXAMPLE 1 Solving an Equation Using a Table

Use a table to solve  $4x + 2 = 5x$ . Check your solution.

Find the  $x$ -value that makes  $4x + 2$  equal to  $5x$ .

Try different values of  $x$ .

$x$	$4x + 2$	$5x$
-1	$4(-1) + 2 = -2$	$5(-1) = -5$
0	$4(0) + 2 = 2$	$5(0) = 0$
1	$4(1) + 2 = 6$	$5(1) = 5$
2	$4(2) + 2 = 10$	$5(2) = 10$

Each side of the equation equals 10 when  $x = 2$ .

∴ The solution is  $x = 2$ .

#### Check

$$4x + 2 = 5x$$

$$\underline{-4x} \quad \underline{-4x}$$

$$2 = x \quad \checkmark$$

### EXAMPLE 2 Solving an Equation Using Graphs

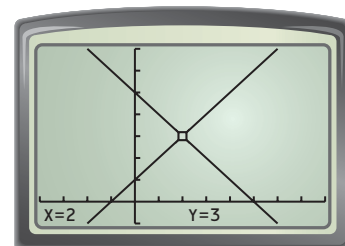
Use a graph to solve  $x + 1 = 5 - x$ . Check your solution.

Write equations for each side of the original equation.

$$x + 1 = 5 - x$$

$$y = x + 1$$

$$y = 5 - x$$



Use a graphing calculator to graph  $y = x + 1$  and  $y = 5 - x$ .

∴ The lines intersect at  $(2, 3)$ . So, the solution is  $x = 2$ .

#### Check

$$x + 1 = 5 - x$$

$$2 + 1 \stackrel{?}{=} 5 - 2$$

$$3 = 3 \quad \checkmark$$

## On Your Own

Now You're Ready  
Exercises 4–15

Use a table or a graph to solve the equation. Check your solution. Then explain your choice of method.

1.  $1 - 2z = 2z - 3$

2.  $-3x + 2 = x + 18$

3.  $-x = 2x - 3$

4.  $x + 2 = 2x - 3$

## EXAMPLE 3 Real-Life Application

Hourly Rentals	
Canoe	Kayak
\$15	\$10

You pay \$30 for a workshop on environmental conservation. Then you rent a canoe for  $x$  hours. Your friend pays \$45 for a kayak paddling lesson, then rents a kayak for  $x$  hours. At the end of the day, you both spent the same amount. How many hours did you rent the canoe?

Write equations for your total cost and your friend's total cost.

*Your total cost*

$$y = 15x + 30$$

canoe cost

workshop cost

*Your friend's total cost*

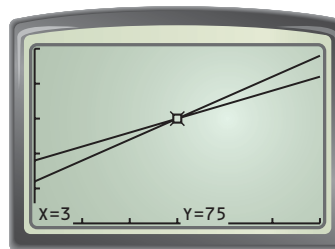
$$y = 10x + 45$$

kayak cost

lesson cost



Use a graphing calculator to graph each equation.



∴ The lines intersect at (3, 75). So, you rented the canoe for 3 hours and paid a total of \$75.

**Check** Find the total costs for 3 hours.

*Your total cost*

$$\begin{aligned} y &= 15x + 30 \\ &= 15(3) + 30 \\ &= 75 \end{aligned}$$

*Your friend's total cost*

$$\begin{aligned} y &= 10x + 45 \\ &= 10(3) + 45 \\ &= 75 \quad \checkmark \end{aligned}$$

## On Your Own

5. **WHAT IF?** In Example 3, your friend receives a \$5 discount on the paddling lesson. At the end of the day, you both spent the same amount. How many hours did you rent the canoe?

# B.3 Exercises

## Vocabulary and Concept Check

- REASONING** What equation is being solved by the table? What is the solution?
- VOCABULARY** You graph each side of an equation. The point of intersection is  $(4, -2)$ . What is the solution of the equation?
- WRITING** Would you rather use a table or a graph to solve an equation? Explain.

$x$	$3x - 2$	$x + 2$
0	-2	2
1	1	3
2	4	4

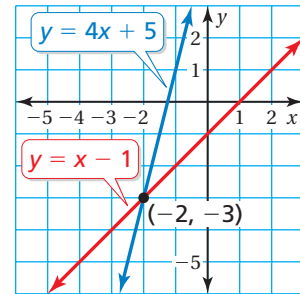
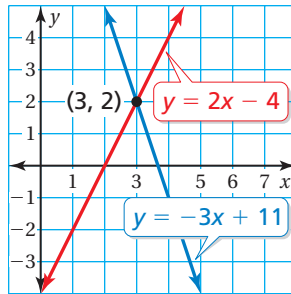
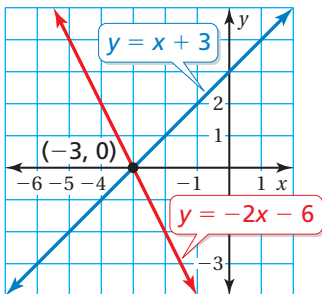
## Practice and Problem Solving

Use a table to solve the equation. Check your solution.

- $4x = 3x + 1$
  - $7h - 6 = 4h$
  - $-3k - 4 = k$
- $9 = 3g - 6$
  - $6z = 8z + 2$
  - $3a + 5 = -11 - 5a$
- $3 - 4q = 2q - 21$
  - $-5p - 3 = 2p + 18$
  - $-7w + 15 = 3w - 5$

Use the graph to solve the equation. Check your solution.

- $-2x - 6 = x + 3$
  - $2x - 4 = -3x + 11$
  - $x - 1 = 4x + 5$

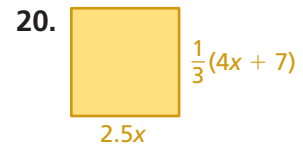
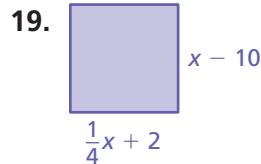
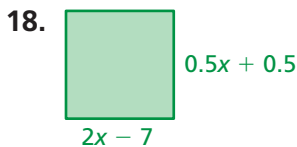


- SHOPPING** You buy 5 shirts and your friend buys 8 shirts. You spend \$48 on shoes. You both spend the same amount of money. All the shirts cost the same amount. Use a table to find the cost of each shirt.
- CELL PHONE** A wireless carrier offers a free cell phone with Plan A or a \$120 cell phone with Plan B. Use a graph to find the number of months it takes for the cost of Plan A to equal the cost of Plan B.

**Plan A**  
\$85/mo  
**Plan B**  
\$45/mo

**Text All You Want**

Find  $x$ . Then find the perimeter of the square.



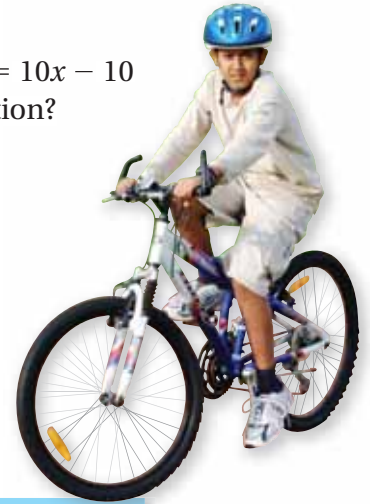
21. **CRITICAL THINKING** Explain how to solve the equation  $5x + 1 = 10x - 10$  using a table and “Guess, Check, and Revise.” What is the solution?

22. **RIBBON** You cut a piece of ribbon into two pieces so that one piece is 24 inches longer than the other. The longer piece is four times as long as the shorter piece.

- How long is each piece of ribbon?
- How long was the original ribbon?

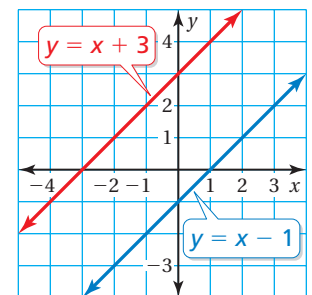
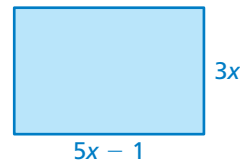
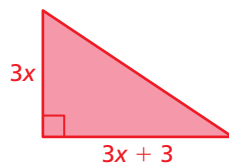
23. **BICYCLING** You and a friend are participating in a bicycling fundraiser. Both of you start at the same location. You leave 30 minutes before your friend. How many hours will it take for your friend to catch you?

Cycling Rate (mi/h)	
You	Your Friend
15	18



24. **REASONING** Use the graph to determine whether the equation  $x + 3 = x - 1$  has a solution. Explain your reasoning.

25. **Geometry** The area of the rectangle is twice the area of the triangle. Find the area of each figure.



## Fair Game Review what you learned in previous grades & lessons

Find the slope of the line that passes through the two points. (Section 3.2)

26.  $(0, 0), (4, 6)$

27.  $(2, 1), (6, 3)$

28.  $(-3, -1), (6, 2)$

29. **MULTIPLE CHOICE** Your backpack contains 3 blue pens and 2 black pens. You randomly choose one pen to give to a friend and then you randomly choose another pen to use yourself. What is the probability that both pens are blue? (Section 9.4)

(A)  $\frac{6}{25}$

(B)  $\frac{3}{10}$

(C)  $\frac{9}{25}$

(D)  $\frac{3}{5}$