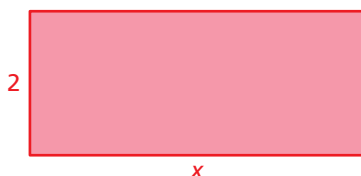


9.2 Functions as Words and Equations

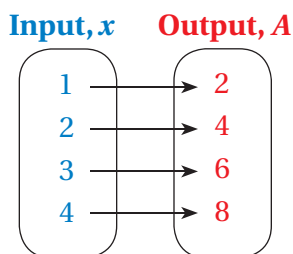
Essential Question How can you describe a function with words? How can you describe a function with an equation?

1 ACTIVITY: Describing a Function

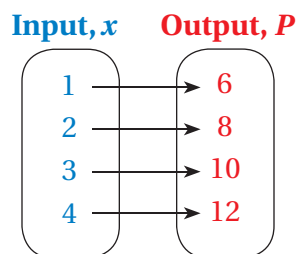
Work with a partner. Two mapping diagrams related to the rectangle are shown. Describe each function in words. Then write an equation for each function.



a. Area A

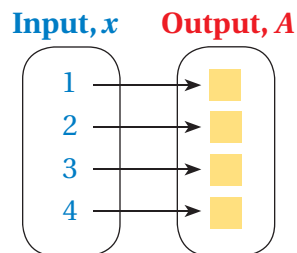
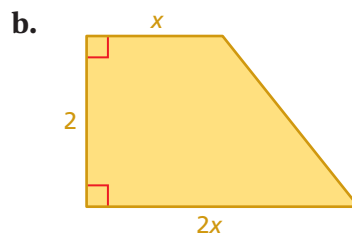
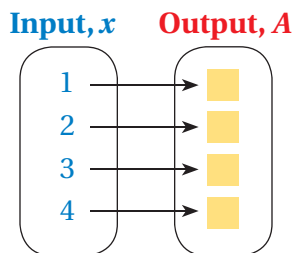
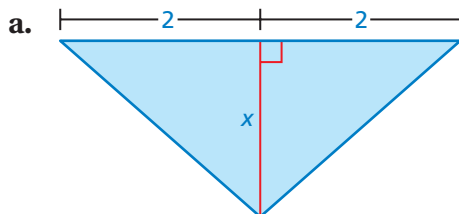


b. Perimeter, P



2 ACTIVITY: Describing a Function

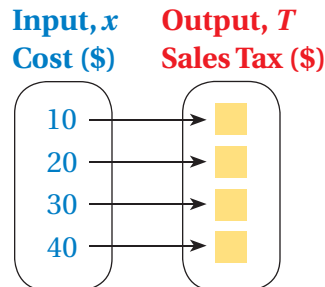
Work with a partner. Copy and complete the mapping diagram for the area of the figure. Then write an equation that describes the function.



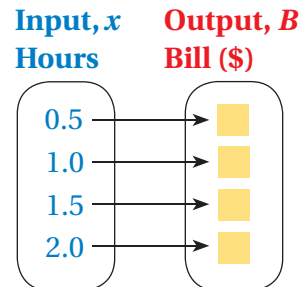
3 ACTIVITY: Describing a Function

Work with a partner. Copy and complete the mapping diagram. Then write an equation that describes the function.

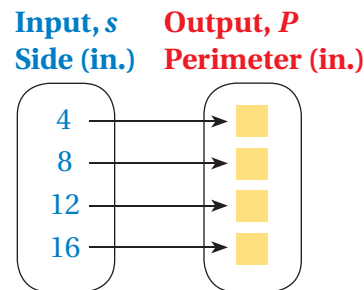
a. Sales tax of 6%



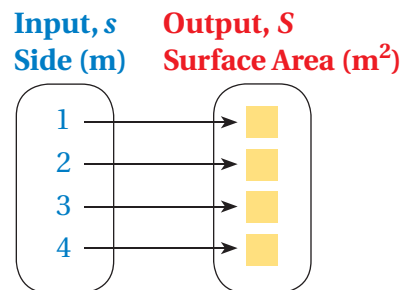
b. Phone bill of \$5 per hour



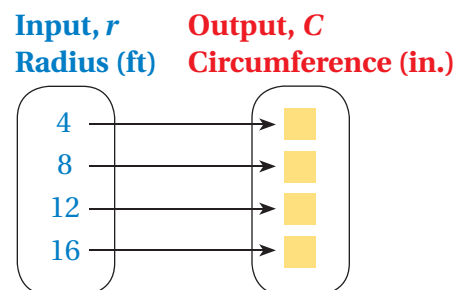
c. Perimeter of a square



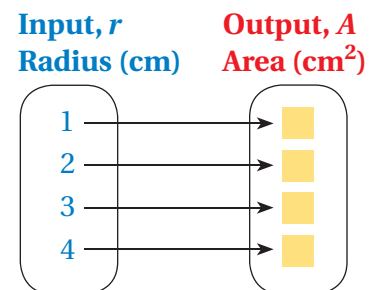
d. Surface area of a cube



e. Circumference of a circle



f. Area of a semicircle



What Is Your Answer?

4. **IN YOUR OWN WORDS** How can you describe a function with words? How can you describe a function with an equation? Give some examples from lessons you have studied this year.

Practice

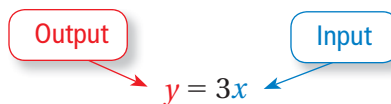
Use what you learned about writing functions as words and equations to complete Exercises 3–5 on page 376.

Key Vocabulary

function rule, p. 374

Key Idea
Function Rule

A **function rule** describes the relationship between inputs and outputs. A function can be written as an equation in two variables.


EXAMPLE 1 Writing an Equation in Two Variables

Write an equation for “The output is five less than the input.”

Words The output is five less than the input.

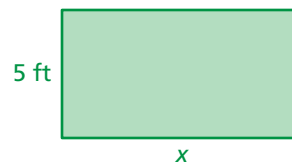
Equation $y = x - 5$

An equation is $y = x - 5$.

On Your Own

Write an equation that describes the function.

- The output is eight more than the input.
- The output is four times the input.
- The output is the area of the rectangle.



Now You're Ready
Exercises 6–9

EXAMPLE 2 Evaluating a Function

What is the value of $y = 2x + 5$ when $x = 3$?

$$\begin{aligned}
 y &= 2x + 5 && \text{Write the equation.} \\
 &= 2(3) + 5 && \text{Substitute 3 for } x. \\
 &= 11 && \text{Simplify.}
 \end{aligned}$$

When $x = 3$, $y = 11$.

On Your Own

Find the value of y when $x = 5$.

- $y = 4x - 1$
- $y = 10x$
- $y = 3 + 7x$

Now You're Ready
Exercises 10–15

EXAMPLE 3 Checking Solutions

Study Tip

A solution of an equation with two variables is an ordered pair that makes the equation true.

Tell whether $(x, y) = (3, 4)$ is a solution of the equation.

a. $y = x - 2$

$$y = x - 2$$

Write equation.

$$(4) \stackrel{?}{=} 3 - 2$$

Substitute.

$$4 \neq 1$$

Simplify.

∴ $(3, 4)$ is *not* a solution.

b. $y = 5x - 11$

$$y = 5x - 11$$

Write equation.

$$(4) \stackrel{?}{=} 5(3) - 11$$

Substitute.

$$4 = 4$$

Simplify.

∴ $(3, 4)$ is a solution.

EXAMPLE 4 Real-Life Application



Cedar Point Park Hours
10:00 A.M.–10:00 P.M.

The maXair ride can accommodate 1000 riders in an hour.

- Write an equation that relates riders and time.
- How many people can ride the maXair each day?

a. **Words** Number of riders equals the number of riders per hour times the number of hours.

Variables Let r be the number of riders.

Let h be the number of hours.

Equation $r = 1000 \cdot h$

∴ An equation is $r = 1000h$.

- The park is open for 12 hours. Substitute 12 for h in the equation from part (a).

$$r = 1000h \quad \text{Write the equation.}$$

$$= 1000(12) \quad \text{Substitute 12 for } h.$$

$$= 12,000 \quad \text{Multiply.}$$

∴ Each day, 12,000 people can ride the maXair.

On Your Own

- Is $(2, 5)$ a solution of $y = x + 3$? Explain.
- The Millennium Force roller coaster at Cedar Point can accommodate 1500 riders in an hour.
 - Write an equation that relates riders and time.
 - How many people can ride the Millennium Force each day?

Now You're Ready
Exercises 16–21

Vocabulary and Concept Check

- VOCABULARY** Identify the input variable and the output variable for the function rule $y = 2x + 5$.
- REASONING** Explain why $(2, 6)$ is a solution of $y = x + 4$, but $(6, 2)$ is *not* a solution.

Practice and Problem Solving

Write an equation that describes the function.

3. **Input** **Output**

0	→	0
1	→	4
2	→	8
3	→	12

4. **Input** **Output**

1	→	8
2	→	9
3	→	10
4	→	11

5. **Input** **Output**

10	→	5
20	→	15
30	→	25
40	→	35

Write an equation that describes the function.

6. The output is three less than the input.
7. The output is six times the input.
8. The output is half of the input.
9. The output is eleven more than the input.

Find the value of y for the given value of x .

10. $y = x + 5$; $x = 3$
11. $y = 7x$; $x = 6$
12. $y = 2x - 1$; $x = 9$
13. $y = 3x + 2$; $x = 0.5$
14. $y = 4x + 7$; $x = \frac{5}{2}$
15. $y = \frac{x}{2} + 9$; $x = 8$

Tell whether the ordered pair is a solution of the equation.

16. $y = x - 6$; $(6, 0)$
17. $y = x + 7$; $(2, 8)$
18. $y = 11x$; $(2, 22)$
19. $y = \frac{x}{5}$; $(5, 25)$
20. $y = 9x + 8$; $(1, 18)$
21. $y = \frac{x}{3} - 6$; $(18, 0)$

- ERROR ANALYSIS** Describe and correct the error in checking whether $(13, 3)$ is a solution of $y = 3x + 4$.

X

$$y = 3x + 4$$

$$13 = 3(3) + 4$$

$$13 = 13 \quad \checkmark$$

$(13, 3)$ is a solution.



- SPEED** A Scrub-Jay flies at a rate of 18 feet per second.

- Write an equation that relates the distance d traveled in s seconds.
- How many feet does a Scrub-Jay fly in 30 seconds?

Find the value of x for the given value of y .

24. $y = 5x - 7$; $y = 13$

25. $y = 7x + 2$; $y = 37$

26. $y = \frac{x}{4} - 7$; $y = 2$

27. **BRACELETS** You decide to make and sell bracelets. The cost of your materials is \$84. You charge \$3.50 for each bracelet.

- Write an equation you can use to find the profit P for selling b bracelets.
- You will *break even* if the cost of your materials equals your income. How many bracelets must you sell to break even?



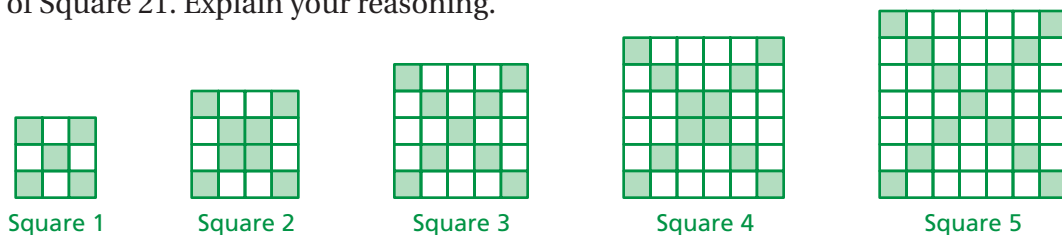
28. **AIRBOAT TOURS** You want to take a two-hour airboat tour.

- Write an equation that represents the cost G of a tour at Gator Tours.
- Write an equation that represents the cost S of a tour at Snake Tours.
- Which is a better deal? Explain.

<p>Tools - Repairing</p> <p>Smith Wood & Metal Works Inc. 51 Penn Ave, Lockwood 45843 845-0845</p> <p>Lake Mead Power Tools 2514 Sun Dr, Meadville 45866 845-3145</p> <p>Tools - Sharpening</p> <p>See Sharpening Services</p> <p>Tools - Steel Disks</p> <p>See Steel Distributing & Warehousing</p>	<p>Gator Tours</p> <p>\$35 boarding fee plus \$5 each 1/2 hour all rates are per person</p>
<p>Top Soil</p> <p>CONNIE'S LANDSCAPE SUPPL. 8740 Wabash Rd, 10507 485-3254</p> <p>Sunnyville Peat Products 312 Tumpeke Rd, Woodland 16454 ... 458-3251</p> <p>Landtown Landscape Supl 6589 W. Town Rd., 14585 489-1125</p>	<p>Tours</p> <p>Snake Tours</p> <p>\$25 per hour</p> <p>All rates are per person</p>
<p>Tours</p> <p>Our Town's Visual Tours 484 W. County Rd. 45451 985-3231</p> <p>Get-A-Way Travel & Tours 4845 Conway Ave., 45843 479-3641</p> <p>Our Town's Visual Tours 484 W. County Rd. 45451 985-3231</p> <p>Get-A-Way Travel & Tours 4845 Conway Ave. 45843 479-3641</p>	<p>Towing - Auto</p> <p>A & B Service Center 5485 East Way Lane 54845 485-2695</p> <p>A-1 Towing 5945 Shipping Lane 45845 548-1451</p> <p>Ace Towing 4858 Airport Road 45854 125-1584</p> <p>Armstrong Auto and Repair 4584 Creek Rd. 58452 584-2147</p> <p>Bennett's Towing Service 129 Penny Lane 45846 458-2158</p> <p>Tom's Towing 4851 Grahamville Rd. 48546 589-7588</p> <p>Vince Auto Repair 5488 Walnut Ave. 45843 479-3641</p>

29. **CRITICAL THINKING** Can you write a function for the area of any rectangle given the perimeter of the rectangle? Explain.

30. **Puzzle** The blocks that form the diagonals of each square are shaded. Each block is one square unit. Find the “green area” of Square 20. Find the “green area” of Square 21. Explain your reasoning.



Fair Game Review what you learned in previous grades & lessons

Copy and complete the table.

31.

x	1	2	3
$x + 7$			

32.

x	6	8	13
$x - 3$			

33. **MULTIPLE CHOICE** You want to volunteer for at most 20 hours each month. So far, you have volunteered for 7 hours this month. Which inequality represents the number of hours you can volunteer for the rest of this month?

- (A) $h \geq 13$ (B) $h \geq 27$ (C) $h \leq 13$ (D) $h < 27$