

## 2-7 Reteaching

### Using Function Notation

You have seen functions represented as equations involving  $x$  and  $y$ , such as  $y = -3x + 1$ . Below is the same equation written using **function notation**.

$$f(x) = -3x + 1$$

Notice that  $f(x)$  replaces  $y$ . It is read “ $f$  of  $x$ .” The letter  $f$  is the name of the function, not a variable. Function notation is used to emphasize that the function value  $f(x)$  depends on the independent variable  $x$ . Other letters besides  $f$  can also be used, such as  $g$  and  $h$ .

The domain is the set of input values for the function. The range is the set of output values.

#### Problem

The domain of  $f(x) = -1.5x + 4$  is  $\{1, 2, 3, 4\}$ . What is the range?

**Step 1** Make a table. List the domain values as the  $x$ -values.

**Step 2** Evaluate  $f(x)$  for each domain value.  
The values of  $f(x)$  form the range.

$x$	$-1.5x + 4$	$f(x)$
1	$-1.5(1)x + 4$	2.5
2	$-1.5(2)x + 4$	1
3	$-1.5(3)x + 4$	-0.5
4	$-1.5(4)x + 4$	-2

The range is  $\{-2, -0.5, 1, 2.5\}$ .

### Exercises

Find the range of each function for the given domain.

1.  $h(x) = 3x + 3$ ;  $\{-1.2, 0, 0.2, 1.2, 4\}$

2.  $f(x) = 8x - 3$ ;  $\{-\frac{1}{2}, \frac{1}{8}, \frac{1}{4}, \frac{3}{4}\}$

3.  $f(x) = x - 3$ ;  $\{-3, -1, 1, 5, 7\}$

4.  $f(x) = -2x + 5$ ;  $\{0, 2, 4, 6\}$

5.  $h(x) = 4x + 2$ ;  $\{-1, 0, 2, 6, 7\}$

6.  $f(x) = x + 1$ ;  $\{-\frac{1}{2}, \frac{1}{8}, \frac{1}{4}, \frac{3}{4}\}$

## 2-7 Reteaching (continued)

### Using Function Notation

When evaluating functions, it is important to be able to determine reasonable values for the domain or range. The reasonable value is usually discernible from the problem.

#### Problem

You have 3 qt of paint to paint the trim in your house. A quart of paint covers 100 ft<sup>2</sup>. The function  $A(q) = 100q$  represents the area,  $A(q)$ , in square feet that  $q$  quarts of paint cover. What domain and range are reasonable for the function? What is the graph of the function?

The least amount of paint you can use is none. So the least domain value is 0. You have only 3 qt of paint, so the most paint you can use is 3 qt. The greatest domain value is 3. The domain is  $0 \leq A(q) \leq 3$ .

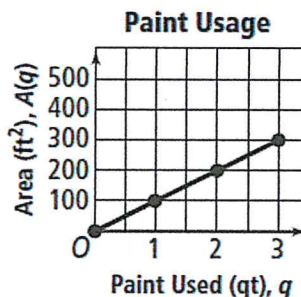
To find the range, evaluate the function using the least and greatest domain values.

$$A(0) = 100(0) = 0 \quad A(3) = 100(3) = 300$$

The range is  $0 \leq A(q) \leq 300$ .

To graph the function, make a table of values. Choose values of  $q$  that are in the domain. The graph is a line segment that extends from  $(0, 0)$  to  $(3, 300)$ .

$q$	$A(q)$
0	0
1	100
2	200
3	300



### Exercises

Find a reasonable domain and range for each function. Represent the domain and range using inequalities. Then graph the function.

- A car can travel 32 mi for each gallon of gasoline. The function  $d(x) = 32x$  represents the distance  $d(x)$ , in miles, that the car can travel with  $x$  gallons of gasoline. The car's fuel tank holds 17 gal.
- There are 98 International Units (IUs) of vitamin D in 1 cup of milk. The function  $V(c) = 98c$  represents the amount  $V(c)$  of vitamin D, in IUs, that you get from  $c$  cups of milk. You have a 16-cup jug of milk.

## 2-7 Practice

Form K

### Using Function Notation

1. The function  $m(x) = 60x$  represents the number of miles,  $m(x)$ , you travel for  $x$  hours that you drive. How many miles will you drive in 5 hours?
2. The function  $h(x) = 2.5x + 20$  represents your height in inches,  $h(x)$ , for  $x$  years that you have been alive. How many inches tall will you be when you are 12 years old?
3. The domain of  $f(x) = 4x + 1$  is  $\{1, 2, 3, 4\}$ . What is the range?
4. The range of  $f(x) = -5x$  is  $\{-5, 0, 10, 15\}$ . What is the domain?
5. Beth wants to earn \$500 to purchase a new television. She earns \$8 an hour at her job. The function  $B(h) = 8h$  represents the amount of money Beth earns in dollars,  $B(h)$ , for each hour  $h$  that she works. What domain and range are reasonable for the function?
6. You want to make pillows for your bed. You have 5 yards of fabric and need 0.6 yard of fabric for each pillow. The function  $M(p) = 0.6p$  represents the amount of material in yards,  $M(p)$ , to make  $p$  pillows. What domain and range are reasonable for the function?

**2-7 Practice** (continued)

Form K

## Using Function Notation

Write the equation in function notation.

7.  $y = 8 - x$

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

For each problem, identify the domain and range. Then indicate if the equation is written in function notation.

9.  $f(x) = 2x + 5$  with input values  $x = \{1, 4, 7\}$

10.  $-7x = 5w$  with input values  $x = \{-3, 2, 5\}$

11.  $g(k) = 9 - k^2$  with input values  $k = \{0, -2, 3\}$

12.  $p + 3 = m$  with input values of  $p = \{-2, 3, 6, 8\}$

Use the function  $f(x) = 4x$  and  $g(x) = x^2 - 1$  to find the value of each expression.

13.  $f(1) + g(2)$

14.  $g(0) - 3 \cdot f(2)$

15.  $f(g(-1))$

16. **Writing** At your local video store, you can rent movies for \$2 per movie plus a \$10 membership fee for the year. You have \$20 to spend on movies. Write an equation in function notation where  $m(x)$  represents the total cost and  $x$  represents the number of movies you rent. Then find a reasonable domain.

17. **Open-Ended** Use function notation to write an equation for a relation that can be classified as a function. The domain is given as  $x = \{1, 2, 3, 4\}$ . Find the range for the function.

**2-7 Practice**

Form G

**Using Function Notation**

Use the functions  $f(x) = 2x$  and  $g(x) = x^2 + 1$  to find the value of each expression.

1.  $f(3) + g(4)$

2.  $f(g(3))$

3.  $g(f(3))$

4.  $g(3) + f(4)$

5.  $f(2) + 3 \cdot g(4)$

6.  $f(3) - 2 \cdot g(1)$

7.  $f(f(5))$

8.  $g(g(4))$

9. The function  $w(x) = 60x$  represents the number of words  $w(x)$  you can type in  $x$  minutes. How many words can you type in 9 minutes?

10. Sound travels about 343 meters per second. The function  $d(t) = 343t$  gives the distance  $d(t)$ , in meters, that sound travels in  $t$  seconds. How far does sound travel in 8 seconds?

**2-7 Practice** (continued)

Form G

## Using Function Notation

Find the range of each function for the given domain.

11.  $f(x) = -3x + 2$ ;  $\{-2, -1, 0, 1, 2\}$

12.  $f(x) = x^3$ ;  $\{-1, -0.5, 0, 0.5, 1\}$

13.  $f(x) = 4x + 1$ ;  $\{-4, -2, 0, 2, 4\}$

14.  $f(x) = x^2 + 2$ ;  $\{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\}$

Find a reasonable domain and range for each function. Then graph the function.

15. A high school is having a pancake breakfast fundraiser. They have 3 packages of pancake mix that each feed 90 people. The function  $N(p) = 90p$  represents the number of people  $N(p)$  that  $p$  packages of pancake mix feed.

16. A charter boat travels at a maximum rate of 25 miles per hour. The function  $d(x) = 25x$  represents the distance  $d(x)$ , in miles, that the boat can travel in  $x$  hours. The charter boat travels a maximum distance of 75 miles from the shore.

17. **Reasoning** If  $f(x) = x^2 - 3$  and  $f(a) = 46$ , what is the value of  $a$ ? Explain.

18. **Open-Ended** What is a value of  $x$  that makes the relation  $\{(2, 4), (3, 6), (8, x)\}$  a function?