STATE STANDARDS

MA.6.A.3.6

Essential Question What is a mapping diagram? How can it be used to represent a function?

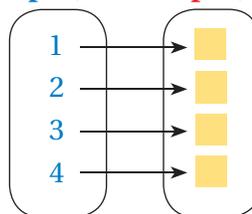**1** **ACTIVITY: Constructing Mapping Diagrams**

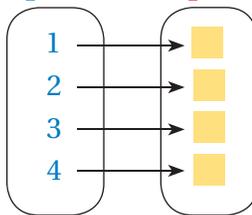**Work with a partner. Copy and complete the mapping diagram.**
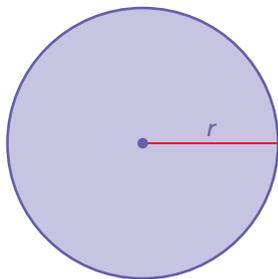
a. Area A
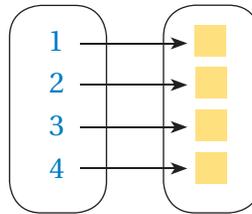
Input, x   **Output, A**

1
2
3
4

b. Perimeter P

Input, x   **Output, P**

1
2
3
4

c. Circumference C

Input, r   **Output, C**

1
2
3
4

d. Volume V

Input, h   **Output, V**

1
2
3
4
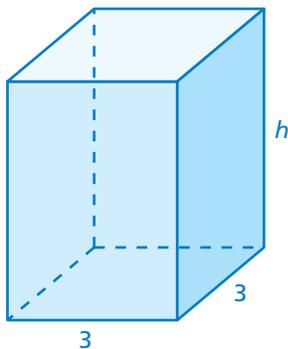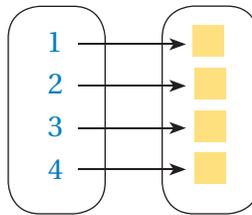
ACTIVITY: Interpreting Mapping Diagrams

Work with a partner. Describe the pattern in the mapping diagram. Copy and complete the diagram. Find two earlier lessons where you used a similar function.

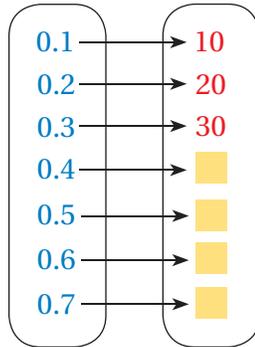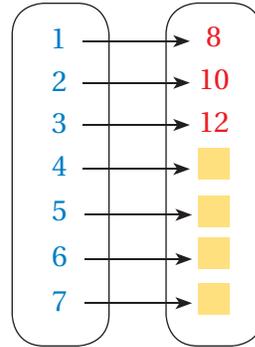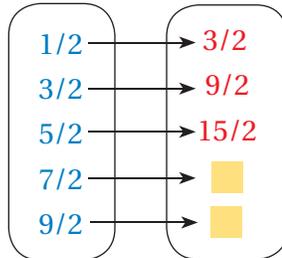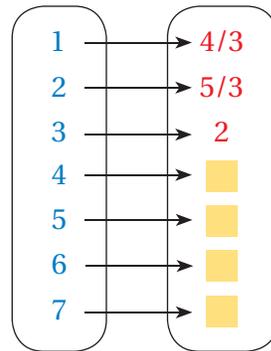**a.** Input, d Output, P

0.1	10
0.2	20
0.3	30
0.4	▢
0.5	▢
0.6	▢
0.7	▢

b. Input, t Output, M

1	8
2	10
3	12
4	▢
5	▢
6	▢
7	▢

c. Input, n Output, S

1/2	3/2
3/2	9/2
5/2	15/2
7/2	▢
9/2	▢

d. Input, x Output, A

1	4/3
2	5/3
3	2
4	▢
5	▢
6	▢
7	▢

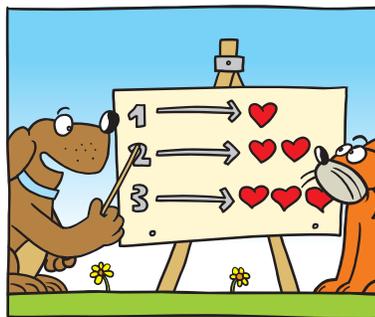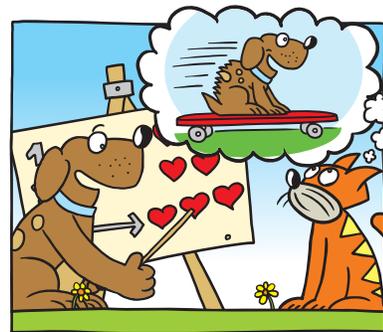## What Is Your Answer?

3. IN YOUR OWN WORDS What is a mapping diagram? How can it be used to represent a function?

4. Construct a mapping diagram that represents a function you have studied.

"I made a mapping diagram."

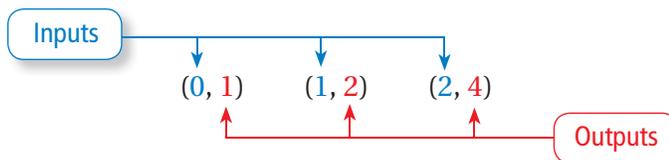"It shows how I feel about my skateboard with each passing day."

Practice

Use what you learned about mapping diagrams to complete Exercises 3–5 on page 370.

Key Vocabulary 🔊

input, *p. 368*
output, *p. 368*
function, *p. 368*
mapping diagram, *p. 368*

Ordered pairs can be used to show **inputs** and **outputs**.

Inputs
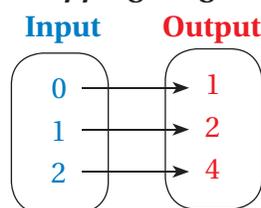
$(0, 1)$ $(1, 2)$ $(2, 4)$

Outputs

🔑 Key Idea

Functions and Mapping Diagrams

A **function** is a relationship that pairs each input with exactly one output. A function can be represented by ordered pairs or a **mapping diagram**.
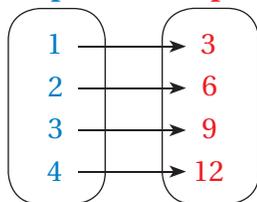
Ordered Pairs	*Mapping Diagram*
$(0, 1)$	**Input** **Output**
$(1, 2)$	0 → 1
$(2, 4)$	1 → 2
	2 → 4

EXAMPLE 1 Listing Ordered Pairs

List the ordered pairs shown in the mapping diagram.

a. **Input** **Output**

1 → 3
2 → 6
3 → 9
4 → 12

b. **Input** **Output**

0
1 → 0
2 → 2
4 → 3
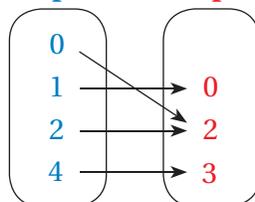
a. The ordered pairs are $(1, 3)$, $(2, 6)$, $(3, 9)$, and $(4, 12)$.

b. The ordered pairs are $(0, 2)$, $(1, 0)$, $(2, 2)$, and $(4, 3)$.

🔴 On Your Own

Now You're Ready
Exercises 6–8

List the ordered pairs shown in the mapping diagram.

1. **Input** **Output**

0 → 12
2 → 10
4 → 8
6 → 6

2. **Input** **Output**

1
2 → 1
3 → 2
4

🔊 **Multi-Language Glossary at BigIdeasMath√com.**
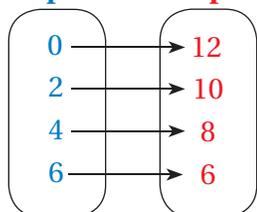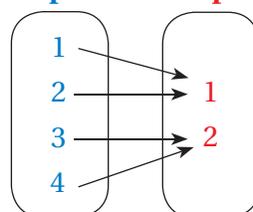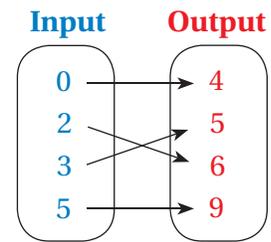
EXAMPLE 2 **Drawing a Mapping Diagram**

Draw a mapping diagram of (0, 4), (2, 6), (3, 5), and (5, 9).

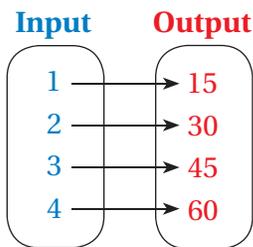List the inputs and outputs in order from least to greatest.

Inputs: 0, 2, 3, 5

Outputs: 4, 5, 6, 9

Draw arrows from the inputs to their outputs.

Input	Output
0	4
2	5
3	6
5	9

EXAMPLE 3 **Describing a Mapping Diagram**

Input	Output
1	15
2	30
3	45
4	60

Describe the pattern of inputs and outputs in the mapping diagram.
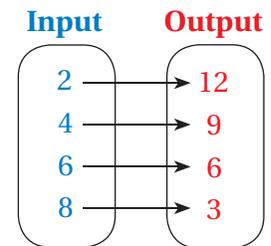
Look at the relationship between the inputs and outputs.

Input	Output
+1 1	15 +15
+1 2	30 +15
+1 3	45 +15
4	60

∴ As each input increases by 1, the output increases by 15.
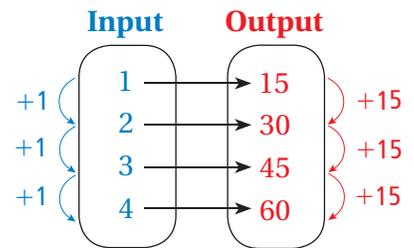
On Your Own

Now You're Ready
Exercises 9–17

3. Draw a mapping diagram of (1, 2), (2, 4), (5, 3), and (8, 1).

4. Describe the pattern of inputs and outputs in the mapping diagram shown.

| Input	Output
2	12
4	9
6	6
8	3

EXAMPLE 4 **Real-Life Application**

Number of Songs Played	Time Onstage (minutes)
8	45
10	60
7	45
14	90

The table shows the number of songs played by four bands at a festival and the amount of time each band played. Use the table to draw a mapping diagram.

Let the number of songs played be the inputs and the times onstage be the outputs.

Inputs: 7, 8, 10, 14

Outputs: 45, 60, 90

Input	Output
7	45
8	60
10	90
14	
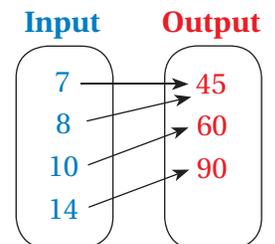
On Your Own

5. WHAT IF? In Example 4, a fifth band plays 12 songs and is onstage for 70 minutes. Draw a mapping diagram for the five bands.
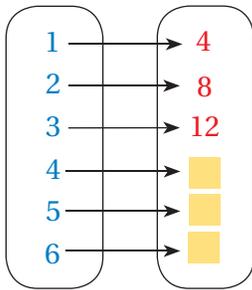
✔ Vocabulary and Concept Check

1. **VOCABULARY** In an ordered pair, which number represents the input? the output?

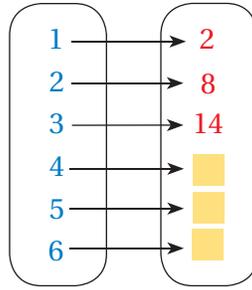2. **OPEN-ENDED** Draw a mapping diagram where the number of inputs is greater than the number of outputs.

Practice and Problem Solving

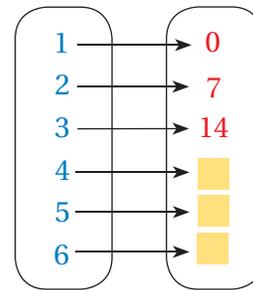**Describe the pattern in the mapping diagram. Copy and complete the diagram.**

3. | Input | Output |
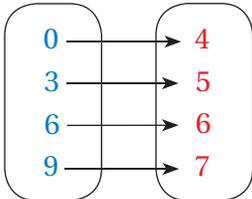 |-------|--------|
    | 1 | 4 |
    | 2 | 8 |
    | 3 | 12 |
    | 4 | |
    | 5 | |
    | 6 | |

4. | Input | Output |
    |-------|--------|
    | 1 | 2 |
    | 2 | 8 |
    | 3 | 14 |
    | 4 | |
    | 5 | |
    | 6 | |

5. | Input | Output |
    |-------|--------|
    | 1 | 0 |
    | 2 | 7 |
    | 3 | 14 |
    | 4 | |
    | 5 | |
    | 6 | |

List the ordered pairs shown in the mapping diagram.

❶ 6. | Input | Output |
    |-------|--------|
    | 0 | 4 |
    | 3 | 5 |
    | 6 | 6 |
    | 9 | 7 |

7. | Input | Output |
    |-------|--------|
    | 1 | 8 |
    | 3 | 6 |
    | 5 | 4 |
    | 7 | 2 |
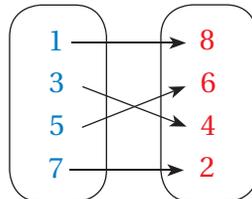
8. | Input | Output |
    |-------|--------|
    | 6 | |
    | 7 | 1 |
    | 8 | 2 |
    | 9 | |
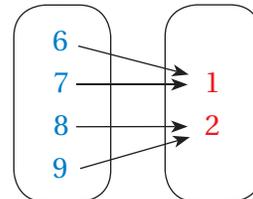
Draw a mapping diagram of the set of ordered pairs.

❷ 9. (1, 3), (5, 7), (8, 10), (14, 16)

10. (0, 10), (4, 6), (6, 4), (7, 3)

11. (0, 11), (1, 8), (4, 15), (6, 19)

12. (1, 0), (2, 0), (3, 0), (4, 2), (5, 2)

13. **ERROR ANALYSIS** Describe and correct the error in drawing a mapping diagram of the set of ordered pairs.
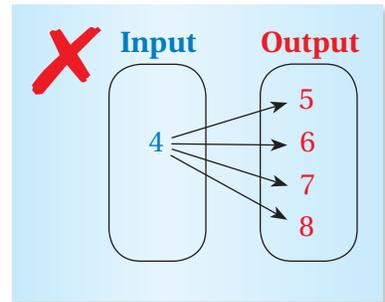
(5, 4), (6, 4), (7, 4), (8, 4)

✗ | Input | Output |
   |-------|--------|
   | | 5 |
   | 4 | 6 |
   | | 7 |
   | | 8 |

Radius (ft)	Area (ft²)
2	12.56
3	28.26
7	153.86
9	254.34

14. **AREA** The table shows the radius and approximate area for four circles. Use the table to draw a mapping diagram.

Draw a mapping diagram for the graph. Then describe the pattern of inputs and outputs.

③ 15.

16.

17.
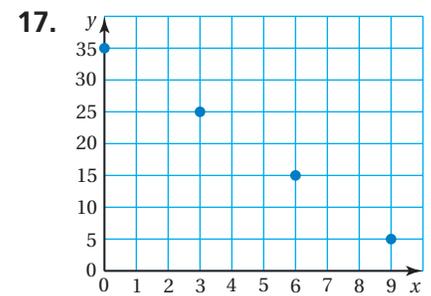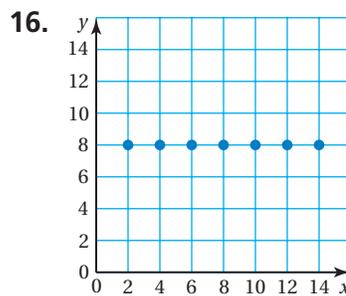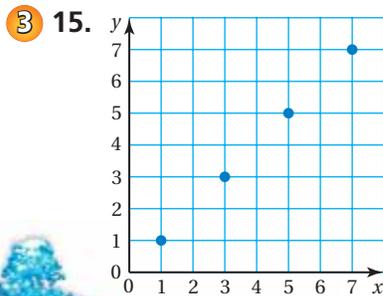
**18. SCUBA DIVING** The normal pressure at sea level is one atmosphere of pressure (1 ATM). As you dive below sea level, the pressure increases by 1 ATM for each 10 meters of depth.

  a. Complete the mapping diagram.

  b. List the ordered pairs. Then graph the ordered pairs in a coordinate plane.

  c. Compare the mapping diagram and graph. Which do you prefer? Why?

  d. **RESEARCH** What are common depths for people who are just learning to scuba dive? What are common depths for experienced scuba divers?

Input Depth		Output Pressure
0 m	→	1 ATM
10 m	→	2 ATM
20 m	→	▨
30 m	→	▨
40 m	→	▨
50 m	→	▨
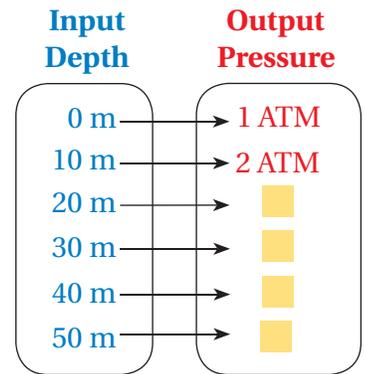
19. MOVIES A store sells previously viewed movies. The table shows the cost of buying 1, 2, 3, or 4 movies.

  a. Use the table to draw a mapping diagram.

  b. Describe the pattern. How does the cost per movie change as you buy more movies?

Movies	Cost
1	$10
2	$18
3	$24
4	$28

20. **Critical Thinking** The table shows the outputs for several inputs.

What do you think the output would be for an input of 200? Explain.

Input, x	0	1	2	3	4
Output, y	25	30	35	40	45

Fair Game Review *What you learned in previous grades & lessons*

Write the word sentence as an equation. Then solve.

21. The sum of a number x and 7 is 15.

22. 3 times a number n is 24.

23. MULTIPLE CHOICE Which inequality represents the word sentence?

"The sum of a number x and 7 is at least 25."

  Ⓐ $x + 7 > 25$ Ⓑ $x + 7 \leq 25$ Ⓒ $x + 7 \geq 25$ Ⓓ $x + 7 < 25$