English Spanish

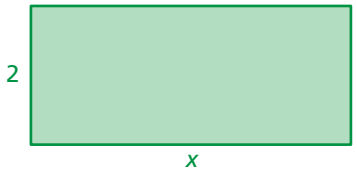
# 9.1 Mapping Diagrams

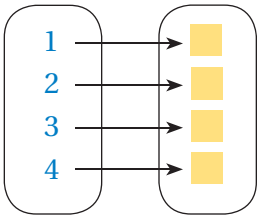
**Essential Question** What is a mapping diagram? How can it be used to represent a function?

## 1 ACTIVITY: Constructing Mapping Diagrams

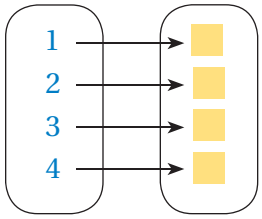
**Work with a partner. Copy and complete the mapping diagram.**

**a.** Area $A$

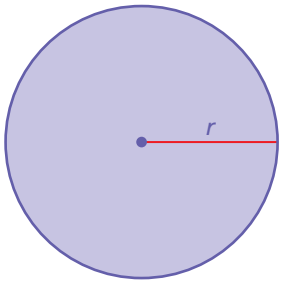


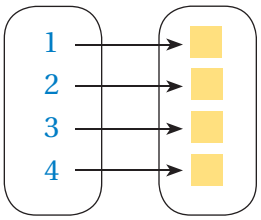




**b.** Perimeter $P$

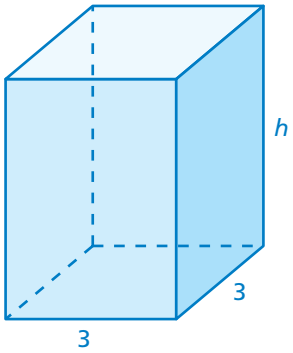



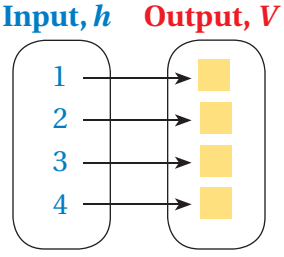

**c.** Circumference $C$




**d.** Volume $V$

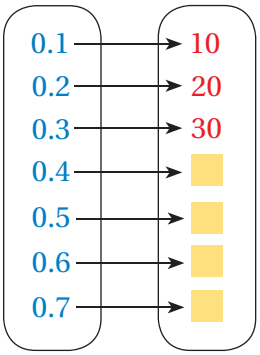


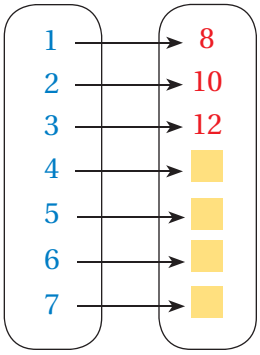
## 2 ACTIVITY: Interpreting Mapping Diagrams

**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.**

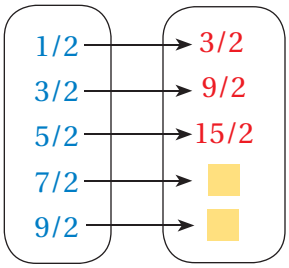
**a.** Input, $d$ Output, $P$



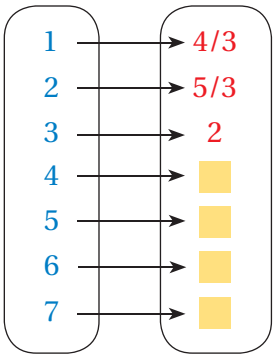

**b.** Input, $t$ Output, $M$




**c.** Input, $n$ Output, $S$



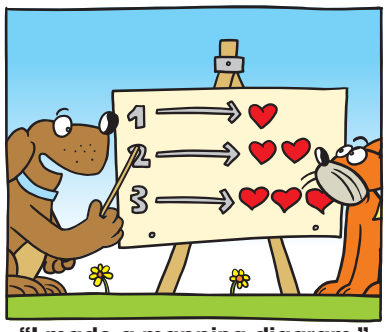

**d.** Input, $x$ Output, $A$



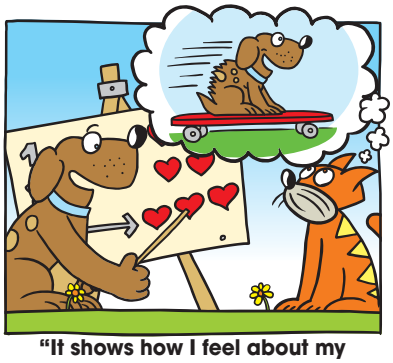

## What Is Your Answer?

**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.

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# 9.1 Lesson

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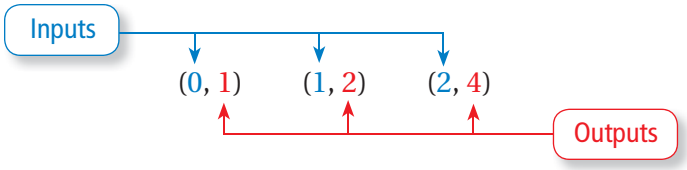
**Key Vocabulary**
input, *p. 368*
output, *p. 368*
function, *p. 368*
mapping diagram, *p. 368*

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




## 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**.

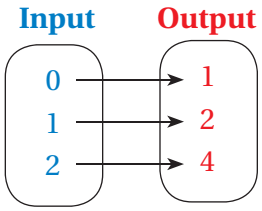
***Ordered Pairs***

(0, 1)

(1, 2)

(2, 4)

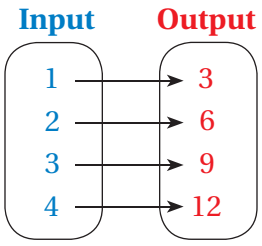
***Mapping Diagram***



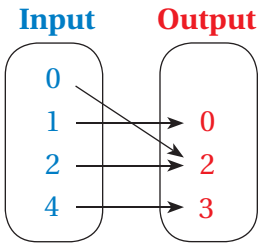

## EXAMPLE 1 Listing Ordered Pairs

**List the ordered pairs shown in the mapping diagram.**

**a.**




**b.**




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

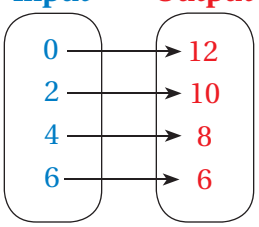
**b.** The ordered pairs are (0, 2), (1, 0), (2, 2), and (4, 3).

## On Your Own

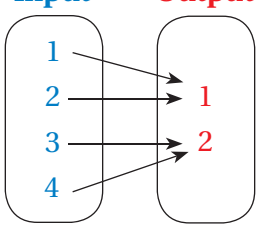
Now You're Ready
Exercises 6–8

**List the ordered pairs shown in the mapping diagram.**

**1.**




**2.**





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## EXAMPLE 2 Drawing a Mapping Diagram

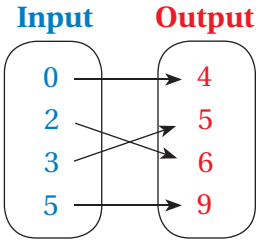
**Draw a mapping diagram of (0, 4), (2, 6), (3, 5), and (5, 9).**

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

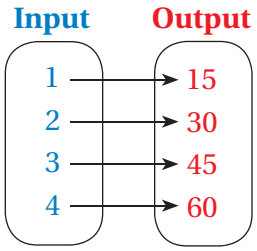
Inputs: 0, 2, 3, 5

Outputs: 4, 5, 6, 9

Draw arrows from the inputs to their outputs.



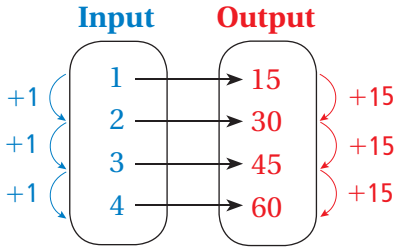

## EXAMPLE 3 Describing a Mapping Diagram




**Describe the pattern of inputs and outputs in the mapping diagram.**

Look at the relationship between the inputs and outputs.

As each input increases by 1, the output increases by 15.

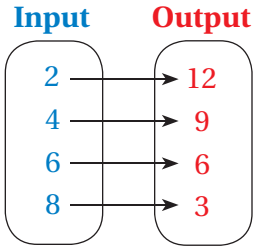



### On Your Own

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.




## EXAMPLE 4 Real-Life Application

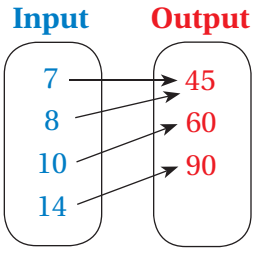
| Number of Songs Played | Time Onstage (minutes) |
|---|---|
| 8 | 45 |
| 10 | 60 |
| 7 | 45 |
| 14 | 90 |

**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




### 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.

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# 9.1 Exercises

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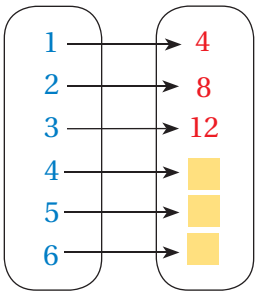
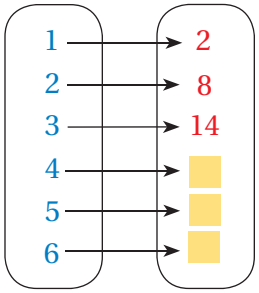
## Vocabulary and Concept Check

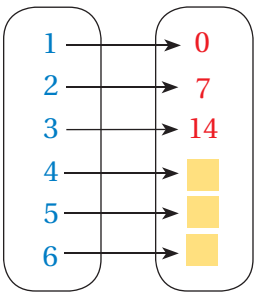
1. **VOCABULARY** In an ordered pair, which number represents the input? the output?
2. **OPEN-ENDED** Draw a mapping diagram where the number of inputs is greater than the number of outputs.

## Practice and Problem Solving

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

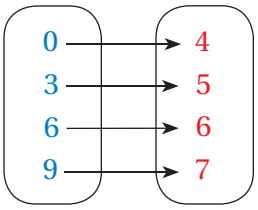
3.


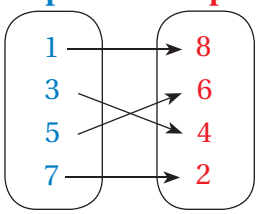

4.


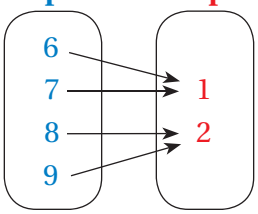

5.



**List the ordered pairs shown in the mapping diagram.**

1

6.



7.



8.


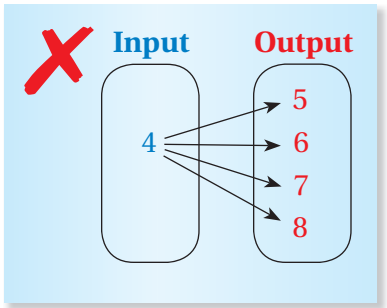

**Draw a mapping diagram of the set of ordered pairs.**

2

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)




| Radius (ft) | Area ($ft^2$) |
|---|---|
| 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.

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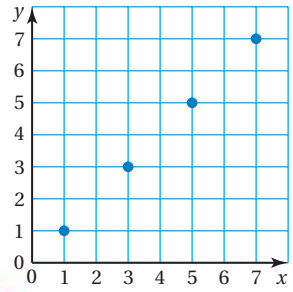
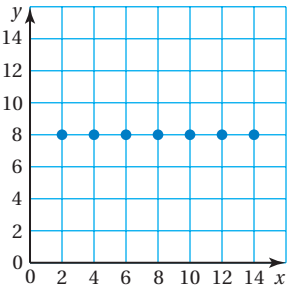
**Draw a mapping diagram for the graph. Then describe the pattern of inputs and outputs.**

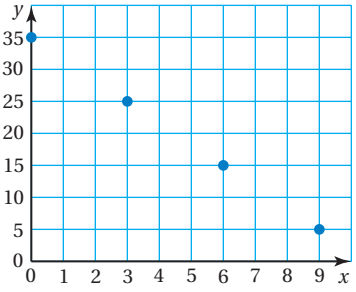
**15.**




**16.**




**17.**



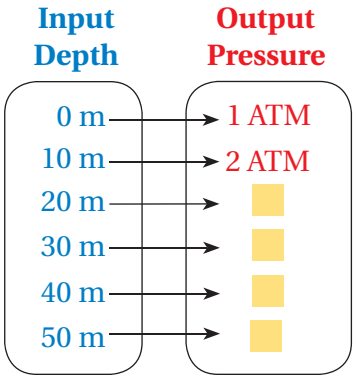

**18. SCUBA DIVING** The normal pressure at sea level is one atmosphere of pressure (1 ATM). As you dive below sea level, the pressure increases by 1 ATM for each 10 meters of depth.

**a.** Complete the mapping diagram.

**b.** List the ordered pairs. Then plot 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?




**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.** SECTION 7.2 SECTION 7.3

**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? SECTION 8.1

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

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