6.1 Relations and Functions

Learning Target: Understand the concept of a function.

Success Criteria:
- I can represent a relation as a set of ordered pairs.
- I can determine whether a relation is a function.
- I can find the domains and ranges of relations and functions represented by mapping diagrams and ordered pairs.
- I can use functions to solve real-life problems.

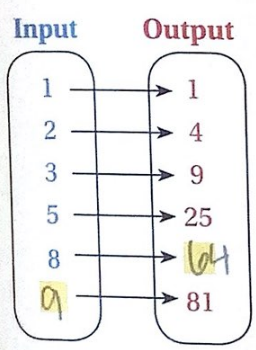
Functions
MA.8.F.1.1 Given a set of ordered pairs, a table, a graph or mapping diagram, determine whether the relationship is a function. Identify the domain and range of the relation.

like a vending machine bc you input the # and output the soda

Exploration 1 Interpreting Diagrams

Work with a partner. Describe the relationship between the *inputs* and *outputs* in each diagram. Then complete each diagram. Is there more than one possible answer? Explain your reasoning.

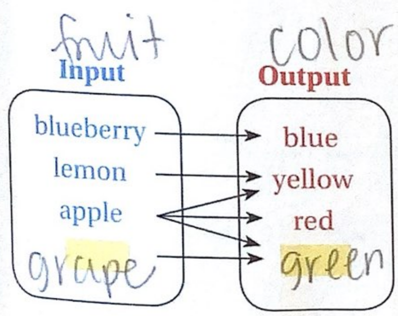
a.



multiply by itself

or square the input

b.



the apple has arrows to 3 colors

and the missing input also goes to missing color

can have diff answers for green fruit

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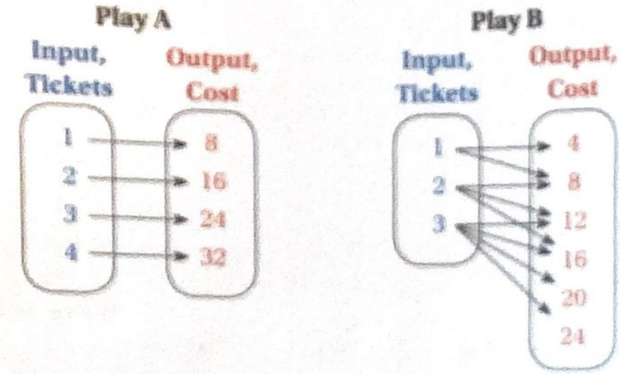
Exploration 2 Describing Relationships Between Quantities

Work with a partner. The diagrams show the numbers of tickets bought by customers for two different plays and the total costs (in dollars).



a. For each diagram, how many outputs does each input have?

Play A - each input has one output

Play B - each input has multiple outputs

b. Describe the prices of tickets for each play.

Play A 1 ticket $8

Play B 1 ticket $4 or $8

c. A person buys 4 tickets for each play. Can you determine the total cost of all 8 tickets? Explain.

1 MTR ANALYZE A PROBLEM

Is it possible for one person to pay $16 for 2 tickets to Play B and another person to pay $8 for 2 tickets to Play B? Explain.

yes

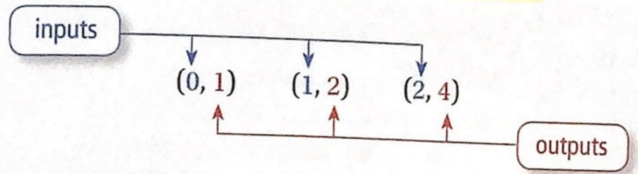
yes

Maybe the tickets are in different sections of the theatre in Play B and 2 tickets have different costs.

6.1 Lesson

x y
(input , output) ordered pair

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



Key Vocabulary
input, *p. 419*
output, *p. 419*
relation, *p. 419*
mapping diagram, *p. 419*
domain, *p. 419*
range, *p. 419*
function, *p. 420*

domain is inputs

range is outputs

Key Ideas

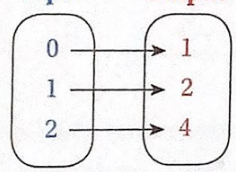
Relations and Mapping Diagrams

A **relation** pairs inputs with outputs. A relation can be represented by ordered pairs or a **mapping diagram**. The **domain** is the set of all possible input values. The **range** is the set of all possible output values.

Ordered Pairs

(0, 1)
(1, 2)
(2, 4)

Mapping Diagram



Domain: 0, 1, 2

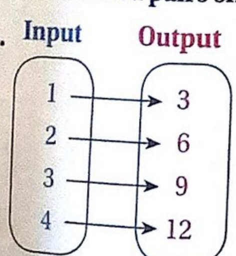
Range: 1, 2, 4

the order matters!

Example 1 Listing Ordered Pairs of Relations

List the ordered pairs shown in each mapping diagram.

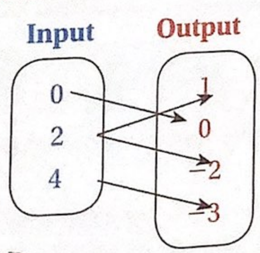
a.



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

(1,3) (2,6) (3,9) (4,12)

b.

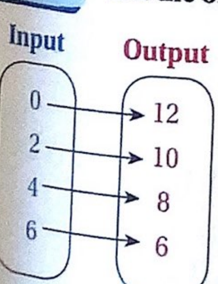


▶ The ordered pairs are (0, 0), (2, 1), (2, −2), and (4, −3).

(0,0) (2,1) (2,−2) (4,−3)

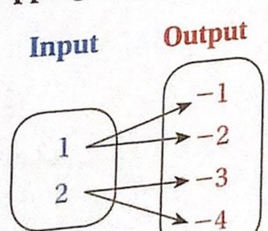
Try It List the ordered pairs shown in the mapping diagram.

1.



(0,12)
(2,10)
(4,8)
(6,6)

2.



(1,−1) (1,−2)
(2,−3) (2,−4)

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input with one arrow to output is a function

A relation that pairs each input with *exactly one* output is a **function**.

Example 2 Determining Whether Relations Are Functions

2 MTR MAKE A CONNECTION

How can you visually tell that a relation is not a function using a mapping diagram?

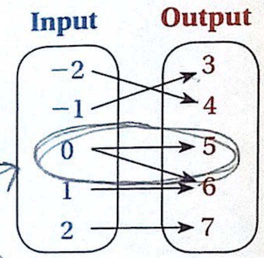
each input has more than one output

Determine whether each relation is a function. Then find the domain and range.

a. $(-9, 0), (-2, 5), (5, 10), (12, 10)$

▶ Each input has exactly one output. So, the relation is a function. The domain is -9, -2, 5, and 12. The range is 0, 5, and 10.

b.



0 goes to 2 outputs

~~not a function~~

Notice that in part (b), you need to list 0 only once in the domain. When finding the domain or range, you need to list a repeated value only once.

▶ The input 0 has two outputs, 5 and 6. So, the relation is *not* a function. The domain is -2, -1, 0, 1, and 2. The range is 3, 4, 5, 6, and 7.

Try It **Determine whether the relation is a function. Then find the domain and range.**

repeat

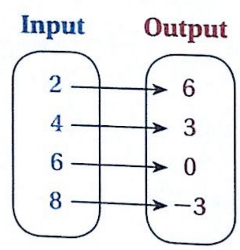
3. $\left(-\frac{1}{2}, 2\right), \left(-\frac{1}{2}, 4\right), \left(\frac{1}{3}, 7\right), \left(\frac{1}{3}, 9\right)$

not a function

$-\frac{1}{2}$ and $\frac{1}{3}$ → domain

2, 4, 7, 9 → range

4.



function

2, 4, 6, 8 domain

6, 3, 0, −3 range

In-Class Practice

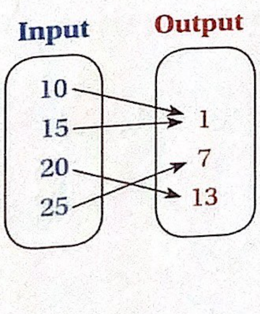
1 I don't understand yet. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

5. VOCABULARY Describe how relations and functions are different.

relation can have multiple inputs to outputs. Function exactly one.

IDENTIFYING FUNCTIONS **List the ordered pairs shown in the mapping diagram. Then determine whether the relation is a function, and find the domain and range.**

6.



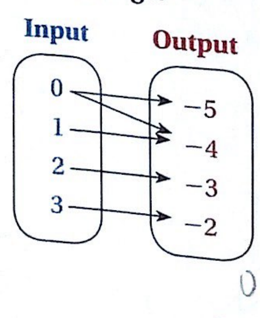
(10, 1)
(15, 1)
(20, 13)
(25, 7)

function

10, 15, 20, 25 domain

1, 7, 13 range

7.



(0, −5) (0, −4)
(1, −4) (2, −3)
(3, −2)

not function

0, 1, 2, 3 domain

−5, −4, −3, −2 range

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