

2-6 Reteaching

Formalizing Relations and Functions

When a relation is represented as a set of ordered pairs, the **domain** of the relation is the set of x -values. The **range** is the set of y -values.

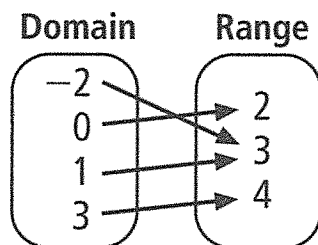
A relation where each value in the domain is paired with just one value in the range is called a **function**.

Problem

Identify the domain and range of the relation $\{(-2, 3), (0, 2), (1, 3), (3, 4)\}$. Represent the relation with a mapping diagram. Is the relation a function?

The domain (or x -values) is $\{-2, 0, 1, 3\}$.

The range (or y -values) is $\{2, 3, 4\}$.



Notice that each number in the domain is mapped to only one number in the range. This relation is a function.

Exercises

Identify the domain and range of each relation. Use a mapping diagram to determine whether the relation is a function.

- $\{(2, 3), (4, 6), (1, 5), (2, 5), (0, 5)\}$
- $\{(3, 4), (5, 4), (7, 4), (8, 4), (10, 4)\}$

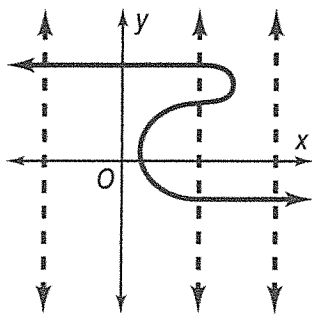
2-6 Reteaching (continued)

Formalizing Relations and Functions

You can determine whether or not a relation is a function by looking at the graph of the relation. If a vertical line is drawn anywhere on the graph and passes through two points of the relation, the relation is not a function. This is called the **vertical line test**.

Problem

Is the relation shown below a function? Use a vertical line test.



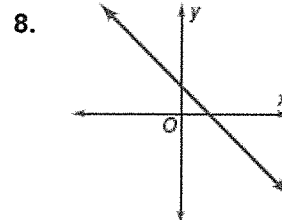
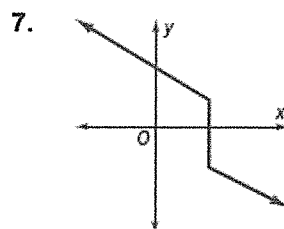
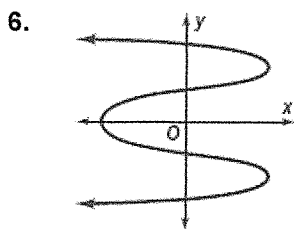
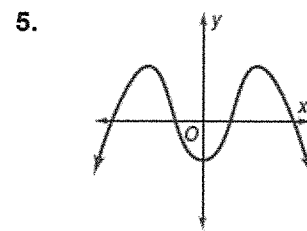
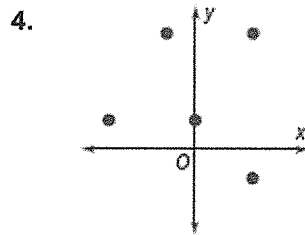
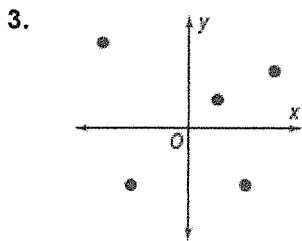
Notice that two of the dashed vertical lines pass through just one point on the graph.

However, one of the dashed vertical lines passes through three points.

The relation is not a function.

Exercises

Use the vertical line test to determine whether the relation is a function.



2-6 Practice

Form K

Formalizing Relations and Functions

Identify the domain and range of each relation. Represent the relation with a mapping diagram.

1. $\{(4, 1), (3, 0.5), (-2, -7), (0, -7)\}$

2. $\{(-3, 1), (-3, 2), (5, 4), (1, 6)\}$

Decide whether the relation shown in each table defines a function.

3.

x	y
4	2
0	-1
-1	5
3	3
-2	-4

4.

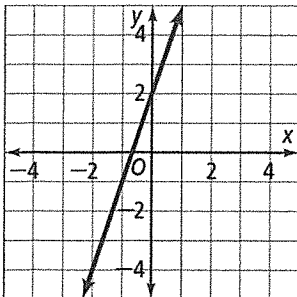
x	y
7	0
-3	-1
-2	2
-3	4

Is the relation a function? Use the vertical line test.

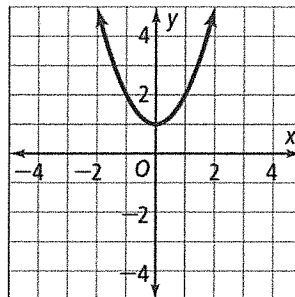
5. $\{(-3, 1), (0, 2), (4, 5), (1, 3), (0, -3)\}$

6. $\{(5, 1), (2, 4), (-1, -3), (-4, 5), (0, 0)\}$

7. $y = 3x + 2$



8. $y = x^2 + 1$

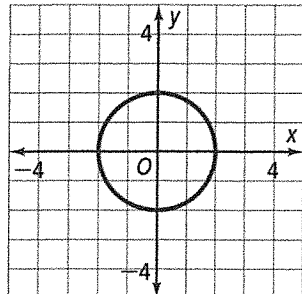


2-6 Practice (continued)

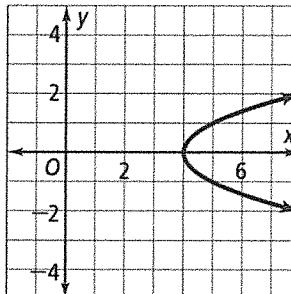
Form K

Formalizing Relations and Functions

9. $x^2 + y^2 = 4$



10. $x = y^2 + 4$



Read the description of each relation and decide whether the relation is a function.

11. The number of inches, i , that Peter grows each year, y .
12. Steven does yard work for his neighbors. He earns \$10 for every lawn that he mows plus \$3.50 for raking leaves. He records how much he earns working for each neighbor.
13. A teacher records the number of A's and the number of B's that a class earns on each test throughout the year and plots them as ordered pairs.
14. **Reasoning** Complete the table using the values 1, 4, and 5 so that the table represents a function.

x	y
1	4
2	
	7
	9
10	13

15. **Writing** An engineer tests different car models to determine which car has the best gas mileage. He records the miles per gallon for each model of car. Tell whether or not this represents a function. Explain your answer.

2-6 Practice

Form G

Formalizing Relations and Functions

Identify the domain and range of each relation. Use a mapping diagram to determine whether the relation is a function.

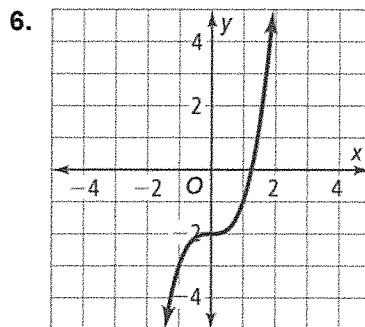
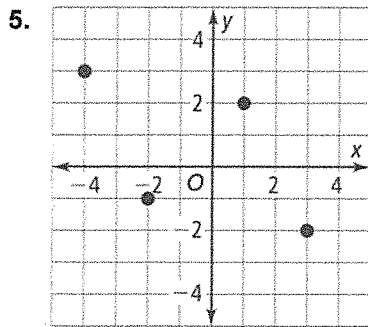
1. $\{(3, 6), (5, 7), (7, 7), (8, 9)\}$

2. $\{(0, 0.4), (1, 0.8), (2, 1.2), (3, 1.6)\}$

3. $\{(5, -4), (3, -5), (4, -3), (6, 4)\}$

4. $\{(0.3, 0.6), (0.4, 0.8), (0.3, 0.7), (0.5, 0.5)\}$

Use the vertical line test to determine whether the relation is a function.



7. **Writing** Explain when a relation is not a function.

8. How can you find the inverse of a function given the sets of the range and the domain?

9. Explain how the vertical line test can be used to determine if a relation is a function.

2-6 Practice (continued)

Form G

Formalizing Relations and Functions

Plot each of the following functions. Use the vertical line test to determine whether the relation is a function.

10. $\{(-4, 3), (-3, -1), (2, -3), (-1, 2), (2, 2)\}$

11. $\{(0, 0.4), (1, 0.8), (2, 1.2), (3, 1.6)\}$

12. $\{(5, -4), (3, -5), (4, -3), (6, 4)\}$

13. $\{(0.3, 0.6), (0.4, 0.8), (0.3, 0.7), (0.5, 0.5)\}$

14. **Reasoning** Explain how a verbal description can be used to determine if a relation is a function.

15. Describe the relationship between the relation, domain, and range.

16. Given a table of points for x and y , explain how to determine if the relation is a function.