6.2 Representations of Functions

Learning Target: Represent functions in a variety of ways.

Success Criteria:
- I can determine whether a table or a graph represents a function.
- I can find the domains and ranges of relations and functions represented by tables and graphs.
- I can write a rule to represent a function.
- I can evaluate functions for given inputs.

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.

Exploration 1 Identifying a Function

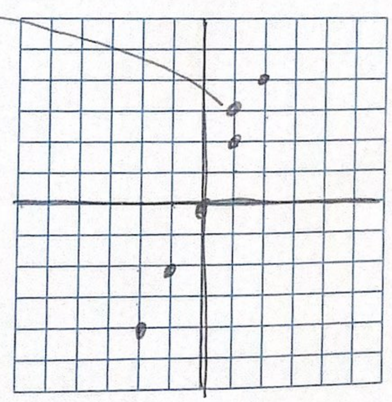
Work with a partner. Use the table.

Input, *x*	−2	−1	0	1	2
Output, *y*	−4	−2	0	2	4

a. Determine whether the table represents a function.

yes

b. Graph the relation represented by the table. How can you use the graph to determine whether the relation is a function?



If two points are on the same vertical line it's not a function

c. Draw line segments between the points in the graph as if you were making a line graph. How does this affect the domain and range of the graph? Explain.

4 MTR CONSTRUCT AN ARGUMENT
Add the point (1, 3) to the graph in part (b). Does the graph represent a function? Explain.

no two points are with x value of 1

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6.2 Lesson

Key Vocabulary
function rule, *p. 431*

You have seen relations represented as ordered pairs and mapping diagrams. Relations can also be represented using tables or graphs.

Example 1 Determining Whether Tables Represent Functions

Determine whether each table represents a function. Then find the domain and range.

no x value repeat so it is a function

a.

Input, x	Output, y
-2	-8
-1	-4
0	0
1	4
2	8

▶ Each input has exactly one output. So, the table represents a function. The domain is -2, -1, 0, 1, and 2. The range is -8, -4, 0, 4, and 8.

b.

Input, x	Output, y
1	0
2	3
2	7
4	10
6	12

x value 2 repeats not a function

▶ The input 2 has two outputs, 3 and 7. So, the table does *not* represent a function. The domain is 1, 2, 4, and 6. The range is 0, 3, 7, 10, and 12.

Try It **Determine whether the table represents a function. Then find the domain and range.**

1.

Input, x	Output, y
-1	-2
0	-1
1	0
1	1
2	2

not function
domain: -1, 0, 1, 1, 2
range: -2, -1, 0, 1, 2

2.

Input, x	Output, y
0	4
1	6
2	8
3	10
4	12

function
d: 0, 1, 2, 3, 4
r: 4, 6, 8, 10, 12

3.

Input, x	Output, y
2	2
4	2
6	3
8	3
10	4

function
d: 2, 4, 6, 8, 10
r: 2, 2, 3, 3, 4

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Example 2 Determining Whether Graphs Represent Functions

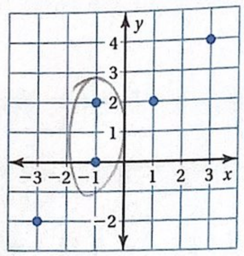
1 MTR HELP A CLASSMATE

Help a classmate understand why inequality symbols are used to represent the domain and range in part (b).

Determine whether each graph represents a function. Then find the domain and range.

input
x
-2
-1.5
-1
0
1
1.5
2

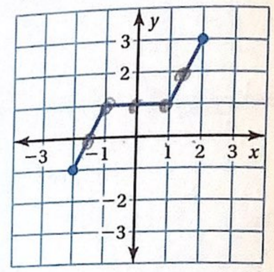
a.



no

▶ The input −1 has two outputs, 0 and 2. So, the graph does *not* represent a function. The domain is −3, −1, 1, and 3. The range is −2, 0, 2, and 4.

b.



yes

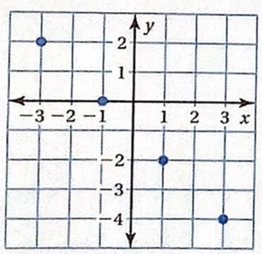
▶ Each input has exactly one output. So, the graph represents a function. The domain is $-2 \le x$ and $x \le 2$. The range is $-1 \le y$ and $y \le 3$.

input (x) are between -2 and 2

-2 ≤ x and x ≤

Try It Determine whether the graph represents a function. Then find the domain and range.

4.



yes function

domain: -3, -1, 1, 3

range: 2, 0, -2, -4

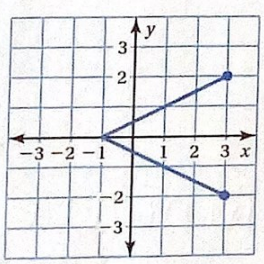
(-3, 2)

(-1, 0)

(1, -2)

(3, -4)

5.



not function

domain: -1 ≤ x and x ≤ 3

range: -2 ≤ y and y ≤ 2

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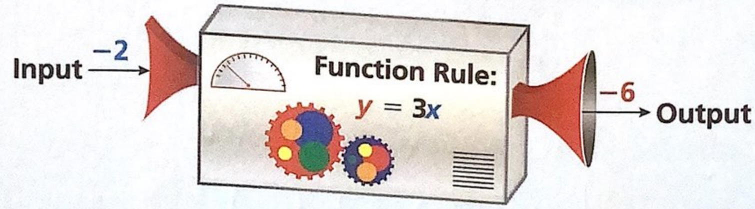
Key Idea

Remember

An independent variable represents a quantity that can change freely. A dependent variable depends on the independent variable.

Functions as Equations

A **function rule** is an equation that describes the relationship between inputs (independent variable) and outputs (dependent variable).



input is x

output is y

Example 3 Writing a Function Rule

Write a function rule for "The output is five less than the input."

Words	The output	is	five less than	the input.
Equation	y	$=$		$x - 5$

▶ A function rule is $y = x - 5$.

Try It

6. Write a function rule for "The output is one-fourth of the input."

$y = \frac{1}{4}x$

ex. The output is eight more than the input.

$y = x + 8$ or $y = 8 + x$

Example 4 Evaluating a Function

What is the value of $y = 2x + 5$ when $x = 3$?

$y = 2x + 5$	Write the equation.
$= 2(3) + 5$	Substitute 3 for x.
$= 11$	Simplify.

Try It **Find the value of y when $x = 5$.**

7. $y = 4x - 1$

$y = 4(5) - 1$

$20 - 1$

$y = 19$

8. $y = 10x$

$y = 10(5)$

$y = 50$

9. $y = 7 - 3x$

$y = 7 - 3(5)$

$7 - 15$

$y = -8$

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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.

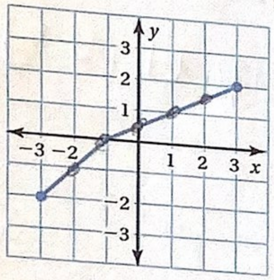
10. IDENTIFYING A FUNCTION Determine whether the table represents a function. Then find the domain and range.

Input, x	-1	0	1	2	2
Output, y	0	1	2	3	4

not function

domain: -1, 0, 1, 2 range: 0, 1, 2, 3, 4

11. IDENTIFYING A FUNCTION Determine whether the graph represents a function. Then find the domain and range.



yes function

domain: $-3 \le x$ and $x \le 3$

range: $-2 \le y$ and $y \le 2$

12. EVALUATING A FUNCTION Find the value of $y = 6x$ when $x = -5$.

$y = 6(-5)$

$y = -30$

4 MTR **13. DIFFERENT WORDS, SAME QUESTION** Which is different? Find "both" answers.

What output is 4 more than twice the input 3?

What output is twice the sum of the input 3 and 4?

What output is the sum of 2 times the input 3 and 4?

What output is 4 increased by twice the input 3?