Name: A2H.**L2-1**.NOTES

LESSON 2-1: RELATIONS & FUNCTIONS [COMPLETE USING PGS. 60-64]

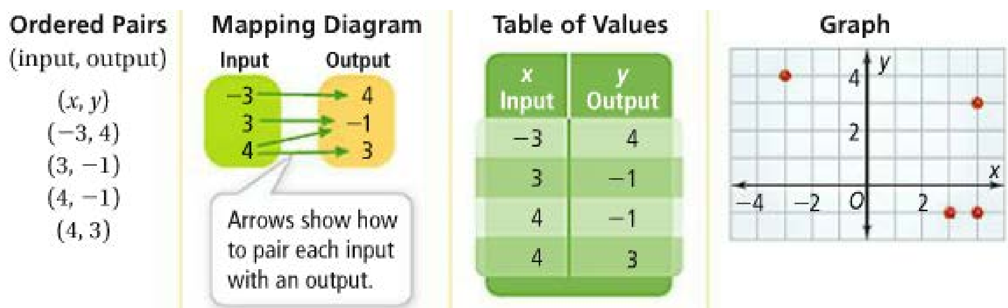
Content Objective Students will be able to graph relations, identify and evaluate functions.

Language Objective Students will use academic language with sentence frames to identify whether a relation meets the necessary criteria to be a function.

Big Idea A pairing of items from two sets is special if each item from one set pairs with exactly one item from the set.

Vocabulary A ______________ is a set of pairs of input and output values. You can represent a relation in four different ways as shown below.

Key Concept



REPRESENTING A RELATION

Example #1

When skydivers jump out of an airplane, they experience free fall. The photos show various heights of a skydiver at different times during free fall, ignoring air resistance. How can you represent this relation in four different ways?

Ordered Pairs

Mapping Diagram

Table of Values

Graph

Vocabulary The ______________ of a relation is the set of *inputs*, also called x-coordinates, of the ordered pairs. The ________ is a set of *outputs*, also called y-coordinates, of the ordered pairs.

FINDING DOMAIN AND RANGE

Example #2

Use the relation from *Example #1*. What are the domain and range of the relation?

The ***domain*** is the set of __________________.

D: { }

The ***range*** is the set of ___________________.

R: { }

You Try:

What are the domain and range of this relation?

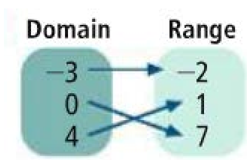
$\{(-3, 14), (0, 7), (2, 0), (9, -18), (23, -99)\}$

Vocabulary A ______________ is a *relation* in which each element of the domain corresponds with exactly one element of the range.

IDENTIFYING A FUNCTION

Example #3A

Is the relation a function? Explain why or why not.



Each element in the ___________ corresponds with exactly _____ element in the _______.

Circle one.

This relation <u>is/is not</u> a function.

Example #3B

Is the relation a function? Explain why or why not.

$\{ (4, -1), (8, 6), (1, -1), (6, 6), (4, 1)\}$

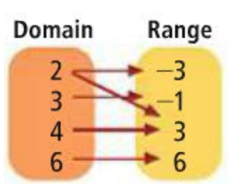
Each __-coordinate must correspond to only _____ __-coordinate. The ___-coordinate ___ corresponds to ____ and ____.

Circle one.

The relation <u>is/is not</u> a function.

You Try:

Is the relation a function? Explain why or why not.



You Try:

Is the relation a function? Explain why or why not.

$\{(-7, 14), (9, -7), (14, 7), (7, 14)\}$

REASONING How does a mapping diagram of a relation that is not a function differ from a mapping diagram of a function?

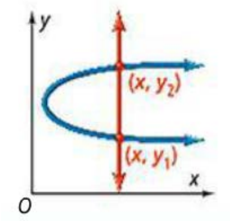
____

____

____

Big Idea You can use the *vertical-line test* to determine whether a relation is a function.

Vocabulary The ______________ ________ ______ states that if a vertical line passes through more than one point on the graph of a relation, then the relation is *not* a function.



Here's Why It Works! If a vertical line passes through a graph at more than one point, there is ____________________________________

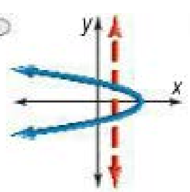
____.

USING THE VERTICAL-LINE TEST

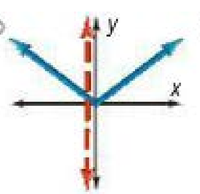
Example #4

Use the vertical-line test. Which graph(s) represent functions?

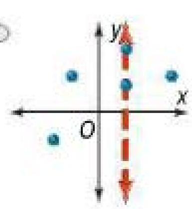
A



B



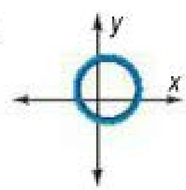
C



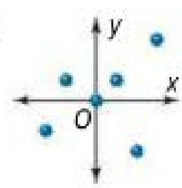
You Try:

Use the vertical-line test. Which graph(s) represent functions?

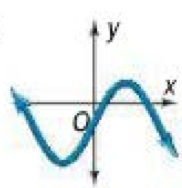
a.



b.



c.



Vocabulary A _____________ _______ is an equation that represents an *output* value in terms of an *input* value. You can write a ***function rule*** in _____________ _____________.

Example:

$y = 3x + 2$

Output Input

$f(x) = 3x + 2$

Read as "f of x" or "function f of x."

$f(1) = 3(1) + 2$

"f of 1" is the output when 1 is the input.

The _________________ ____________, x, represents the input of the function. The ______________ _____________, $f(x)$, represents the output of function. It is called the ***dependent variable*** because its value depends on the input.

USING FUNCTION NOTATION

Example #5

For $f(x) = -2x + 5$, what is the output for the inputs, $-3, 0, ¼$?

You Try:

For $f(x) = -4x + 1$, what is the output for the given input?

a. -2

b. 0

c. 5

Big Idea To model a real-world situation using a function rule, you need to identify the dependent and independent quantities. One way to describe the dependence of a variable quantity is to use a phrase such as, "distance is a function of time." This means that distance *depends* on time.

WRITING AND EVALUATING A FUNCTION

Example #6

Tickets to a concert are available online for \$35 each plus a handling fee of \$2.50. The total cost is a function of the number of tickets bought. What function rule models the cost of the concert tickets? Evaluate the function for 4 tickets.

t:

$C(t)$:

You Try:

You are buying bottles of a sports drink for a softball team. Each bottle costs \$1.19. What function rule models the total cost of a purchase? Evaluate the functions for 15 bottles.