3.1 Relations and Functions

Monday, September 23, 2019 7:46 AM

Warm Up

Solve the each of the equations below for y, given the value of x.

$y = 5x - 6, x = 3$ $y = \frac{5}{6}x + 17, x = 6$ $y = 13x - 8, x = -4$

$y = -8x + 12, x = 4$ $y = -\frac{2}{3}x + 13, x = 8$ $y = -\frac{3}{13}x - \frac{4}{13}, x = 5$

Essential Question

What is a function? Why is domain and range important in defining a function?

Needed Vocab:

- **Continuous**
- **Discrete**
- **Domain**
- **Function**
- **One-to-one**
- **Range**
- **Relation**

Goal: "I can. . .

Determine whether a relation is a function."

Given the table below, what are the possible values of x and possible values of y?

x	1	2	3	4	5
y	11	12	13	13	13

x: [1, 2, 3, 4, 5]

y: [11, 12, 13]

A RELATION is a set of ordered pairs. A FUNCTION is a relation in which each input is assigned to exactly one output. The DOMAIN of a function is the set of inputs. The RANGE of a function is the set of outputs. By convention, inputs are x-values and outputs are y-values.

EXAMPLE 1 Identify if the following is a Relation or a Function.

x	1	2	3	4	5

Function.

Even though 3, 4, + 5

x	1	2	3	4	5
y	11	12	13	13	13

Even though 3, 4, & 5 output 13 there is still only one output for each input.

Identify the domain and range of each function.

x	2	3	4	5	6
y	0	1	2	3	4

x	-3	-1	1	3	4
y	1	3	-2	2	6

Example 2 A function can model each situation. What is a reasonable domain and range of each function?

A hose fills a 10,000-gallon swimming pool at a rate of 10 gallons per minute.

D: Ø minutes to ~~last~~ minutes to fill

A restaurant needs to order chairs for its tables. One table can accommodate four chairs.

D: Ø tables to # of tables

D: Ø minutes to total minutes to fill the pool.
R: Ø gallons to 10,000 gallons.

chairs.

D: Ø tables to # of tables needed.
R: Multiples of 4 starting @ Ø, going to # of tables needed.

Is the domain for each situation continuous or discrete?

A hose fills a 10,000-gallon swimming pool at a rate of 10 gallons per minute.

Reasonable Domain: 0 minutes to actual amount of time to fill the pool.

Reasonable Range: 0 to 10,000 gallons.

A restaurant needs to order chairs for its tables. One table can accommodate four chairs.

Reasonable Domain: 0 tables to actual number of tables needed.

Reasonable Range: Multiples of 4 from 0 to 4 times the number of tables needed.

The domain of a function is CONTINUOUS when it includes all real numbers. The graph of this function will be a line or a curve. The domain of a function is DISCRETE when it consists of just whole numbers or integers. The graph of this function is data points.

Analyze each situation. Identify a reasonable Domain and Range for each situation. Is the Domain and Range discrete or continuous?

A) A bowler pays $2.75 per game.

B) A car travels 25 miles using 1 gallon of gas.

Example3 Is the relation a function? If so, is it one-to-one or not one-to-one?

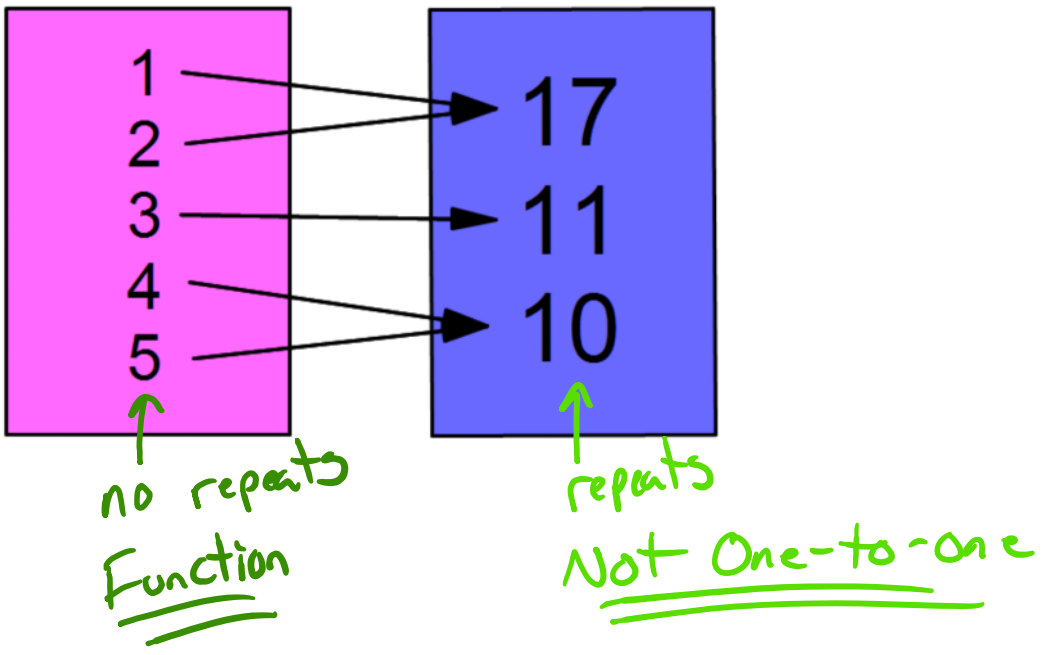
{(1, 2), (5, 6), (7, -1), (8, 0)}

No # repeated. Function.

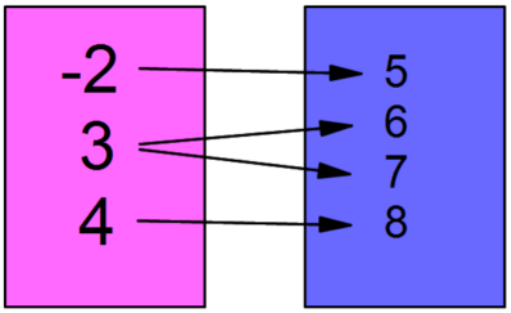
No # repeated. One-to-one.

A function is ONE-TO-ONE if no two elements of the domain map to the same element in the range. When two or more elements of the domain map to the same element of the range, the function is not one-to-one.

Is the relation a function? If so, is it one-to-one or not one-to-one?

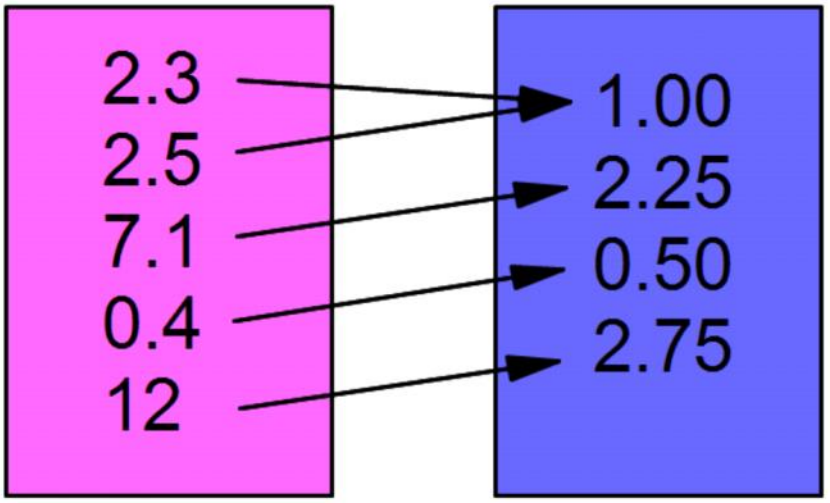


Is the relation a function? If so, is it one-to-one or not one-to-one?



Example 4

The diagram shows shipping charges as a function of the weight of several online orders. Based on the situation, what constraints, if any, are on the domain of the function?



D: must have a weight.

R: greater than Ø.

Margaret has a monthly clothes budget of $50. She maps the amount of money she spends each month to the number of items of clothing she buys. What constraints are there on the domain?

Relations and Functions

WORDS A **relation** is any set of ordered pairs.

A relation is a **function** when each input, or element in the domain, has exactly one output, or element in the range.

TABLE

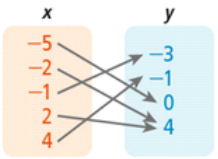
x	−5	−2	−1	2	4
y	0	4	−3	4	−1

Each element in the domain is associated with exactly one element in the range.

NUMBERS {(−5, 0), (−2, 4), (−1, −3), (2, 4), (4, −1)}

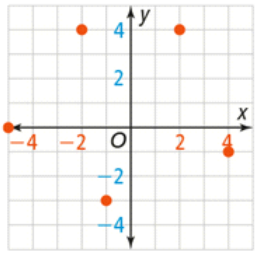
The domain is the set of x-values. The range is the set of y-values.

DIAGRAM



Each element in the domain is assigned one element in the range.

GRAPH



Homework

Pg. 93
8, 10, 13, 14, 18-21, 27, 28