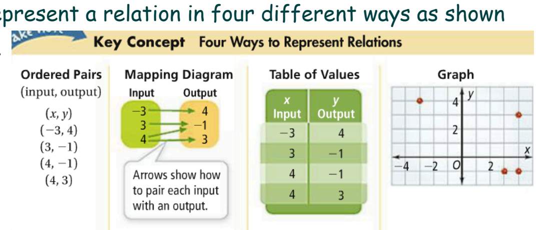
Chapter 2: Functions, Equations, and Graphs

Lesson 2.1 Relations & Functions (Clickers)

Essential Understanding: A pairing of items from two sets is special if each item from one set pairs with exactly one item from the second set.

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



Ex. 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?

The domain of a relation is the set of inputs, also called x-coordinates, of the ordered pairs.

The range of a relation is the set of outputs, also called the y-coordinates of the ordered pairs.

Ex. What are the domain and range of the relation: (0, 10000); (4, 9744); (8, 8976); (12, 7696)

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1 What is the range of the relation:

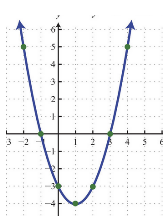
(0,4), (2, 6), (3, 8), (10, 6)?

2 What is the domain of the relation:

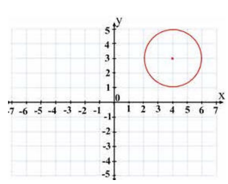
(1, -1), (5, 12), (1, 12), (5, -9)?

Ex. What is the domain and range of the graphs below?

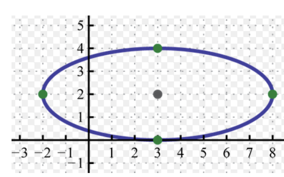
a.



b.



Ex. What is the domain and range of the graph below?



A function is a relation in which each element of the domain corresponds with exactly one element of the range. (For every x-value there is exactly one y-value--y-values cannot repeat with different x-values.)

Ex. (-3, 2) (0, 7) (4, 1) is a function since there is exactly one y-value for each x-value.

Ex. (4, -1), (8, 6), (1, -1), (6, 6), (4, 1) is NOT a function since -1 repeats in the y-values with different x-values.

3 Is the relation a function?

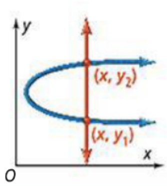
$\{(2,-3),(5,7),(6,-8),(10,-3)\}$

Yes

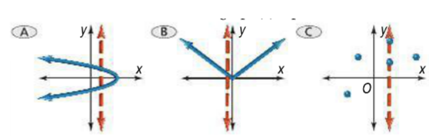
No

Another way to check whether a relation is a function is by a vertical line test. The vertical line test 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.

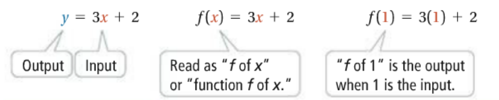
Knowing what we know about functions, why does the vertical line test work?



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



A <u>function rule</u> is an equation that represents an output value in terms of an input value. You can write a function rule in <u>function notation</u>. Shown below are examples of function rules.



The <u>independent variable, x,</u> represents the input of the function. The <u>dependent variable, f(x),</u> represents the output of the function. Its value **depdends** on the input value.

Ex. For $f(x) = -2x + 5$, what is the output for the inputs, -3, 0, 1/4?

5 For $f(x) = -4x + 1$, what is the output for $x = -2$?

6 What is the output of the following function for when $x = -2$?

$$f(x) = x^2 + 6$$

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.

Ex. 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.

7 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 the purchase? Make sure to use function notation.