Functions - Definition

Grade 12

FIRST WE NEED TO KNOW WHAT A RELATIONSHIP IS

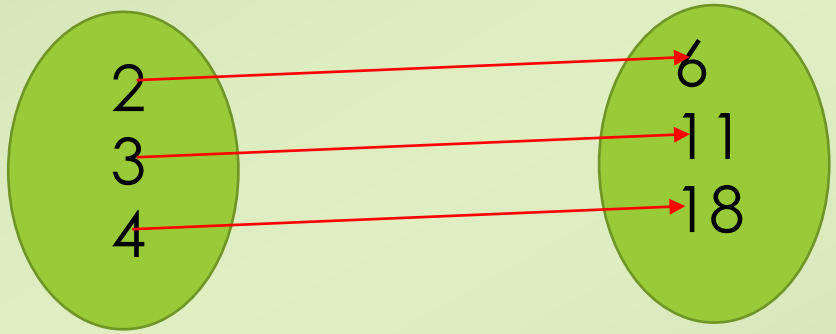
- What is a Relationship?

A RELTIONSHIP is

Any Rule or Formula

That connects two sets of numbers

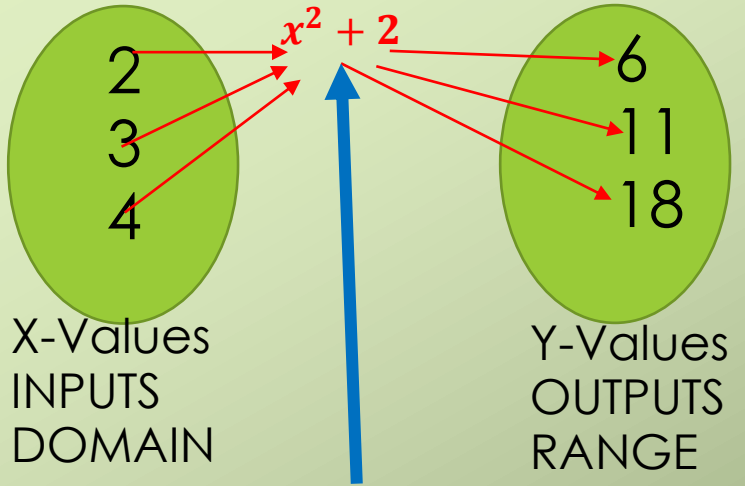
THEREFORE:



Domain $x \in \{2;3;4\}$ Range $y \in \{6;11;18\}$

RULE or FORMULA

$y = x^2 + 2$

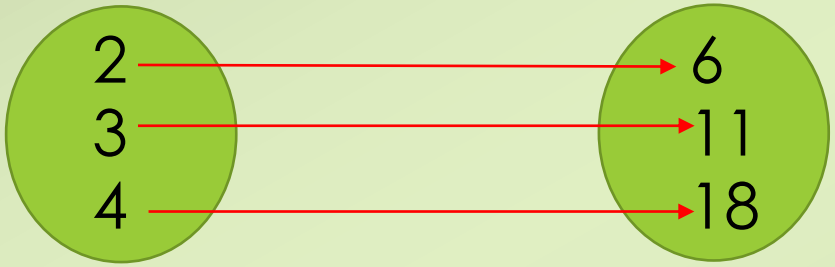


X-Values connects to Y-Values
Using the Rule $x^2 + 2$ in this example

Different Types of Relationships

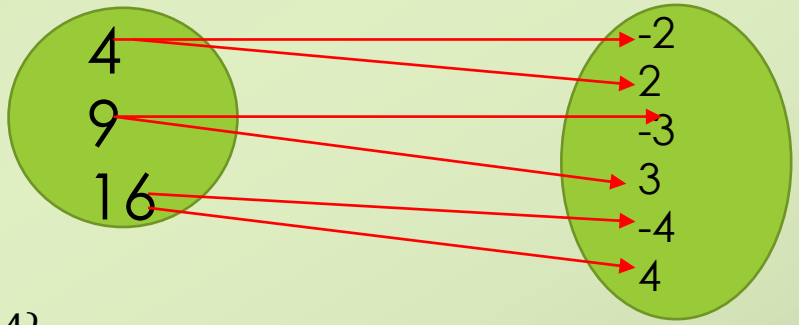
- ONE to ONE Relationship

ONE X-Value CONNECTS to ONE Y-Value
BY A Rule or Formula
DOMAIN $x \in \{2; 3; 4\}$ RANGE $y \in \{6; 11; 18\}$



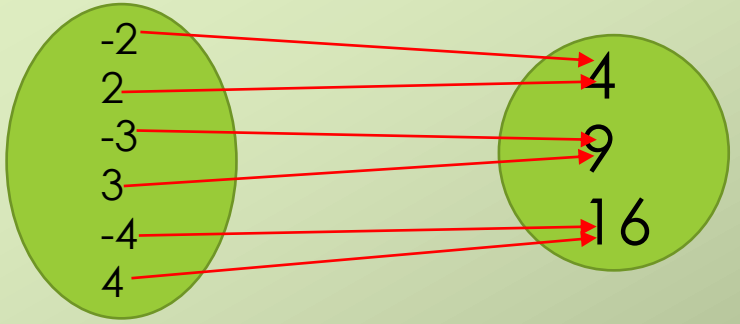
- ONE to MANY Relationship

ONE X-Value CONNECTS to MORE THAN ONE (MANY) Y-Values BY A Rule or Formula
DOMAIN $x \in \{4; 9; 16\}$ RANGE $y \in \{-4; -3; -2; 2; 3; 4\}$



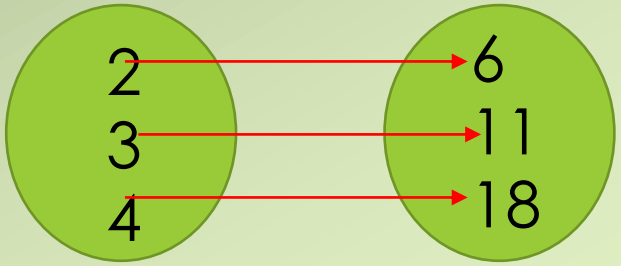
- MANY to ONE Relationship

MORE THAN ONE (MANY) X-Value CONNECTS to ONE Y-Values BY A Rule or Formula
DOMAIN $x \in \{-4; -3; -2; 2; 3; 4\}$ RANGE $y \in \{4; 9; 16\}$

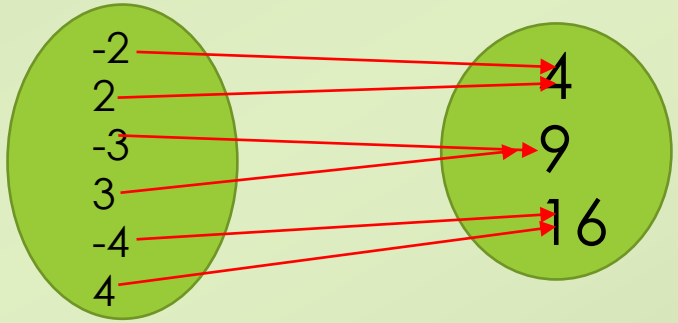


Definition of A FUNCTION

- A FUNCTION is a RELATIONSHIP ← A RELTIONSHIP is Any Rule or Formula That connects two sets of numbers
- Where for EVERY X-Value (INPUT) there is ONLY ONE Y-Value (OUTPUT)



ONE TO ONE RELATIONSHIP IS A FUNCTION
FOR EVERY X-VALUE THERE IS ONLY ONE Y-VALUE
ONE X-Value CONNECTS to ONE Y-Value
BY A Rule or Formula
DOMAIN $x \in \{2; 3; 4\}$ RANGE $y \in \{6; 11; 18\}$



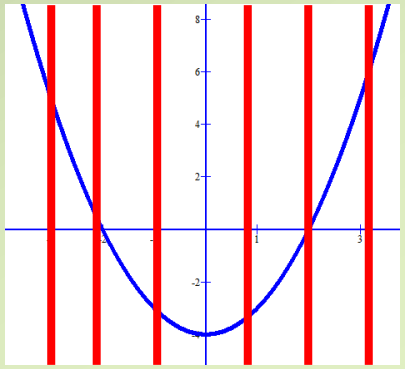
MANY TO ONE RELATIONSHIP IS A FUNCTION
FOR EVERY X-VALUE THERE IS ONLY ONE Y-VALUE.
(THERE IS MANY X-VALUES GOING TO ONLY ONE Y-VALUE)

MORE THAN ONE (MANY) X-Value CONNECTS to ONE Y-Values BY A Rule or Formula
DOMAIN $x \in \{-4; -3; -2; 2; 3; 4\}$ RANGE $y \in \{4; 9; 16\}$

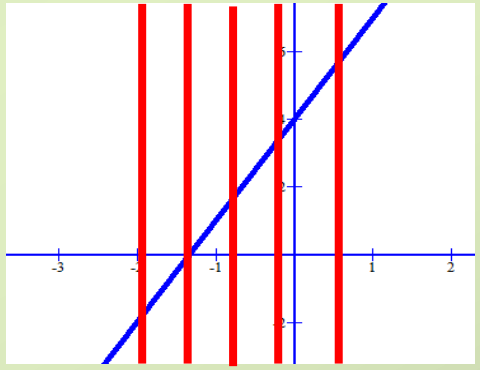
To Test if a Graph is a Function

- **VERTICAL LINE TEST**

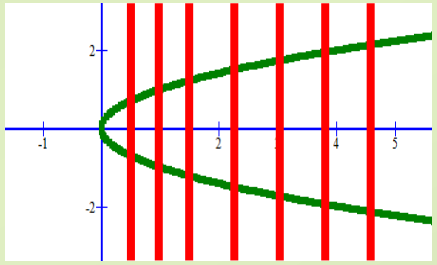
If a line is drawn parallel to the y-axis and moved from left to right (or right to left) and only cuts the graph only once.



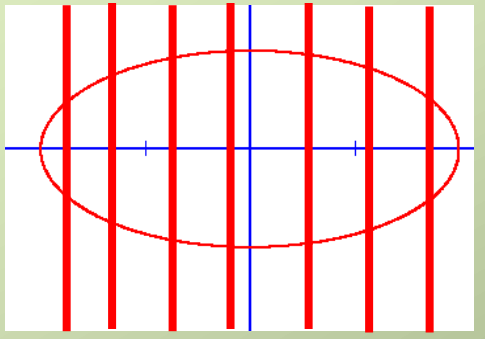
GRAPH IS ONLY CUT ONCE THEREFORE A FUNCTION



GRAPH IS ONLY CUT ONCE THEREFORE A FUNCTION



GRAPH IS CUT TWICE THEREFORE NOT A FUNCTION



GRAPH IS CUT TWICE THEREFORE NOT A FUNCTION

Function Notation

- The function notation f(x) is used to show that each y-value is a function of an x-value.
- Other letters can be used as well g(x), h(x), p(x) etc…
- Therefore y=x+3 can be written as f(x) = x+3 for example.
- Example

At x = -2 we obtain f(-2) = (-2) +3 = 1

So the point (-2;1) lies on the graph f(x) = x+3