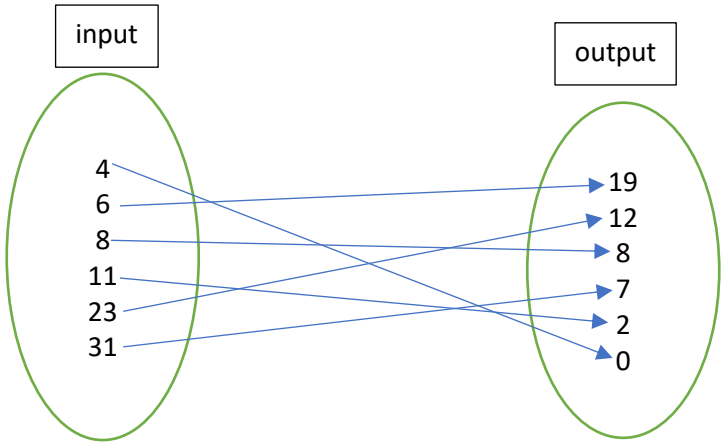
8/27/2024

Introduction to the course
Introduction to functions and relations

Relation

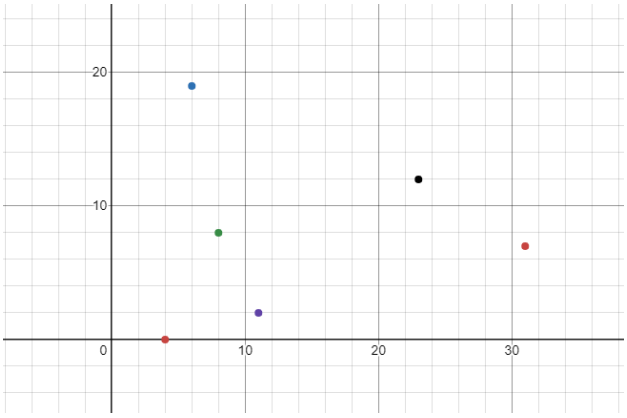
Is a way of relating an input value to an output value. This can be done with arrows, it can be done with tables, it can be done with ordered pairs (sets of points), or it can be done with equations.



$$\{(4,0),(6,19),(8,8),(11,2),(23,12),(31,7)\}$$

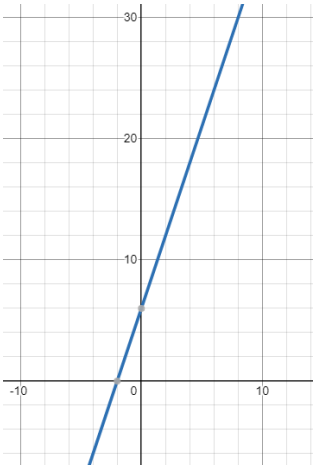
You can also, when you have numbers like this, you can make a graph of the relation by plotting the points.

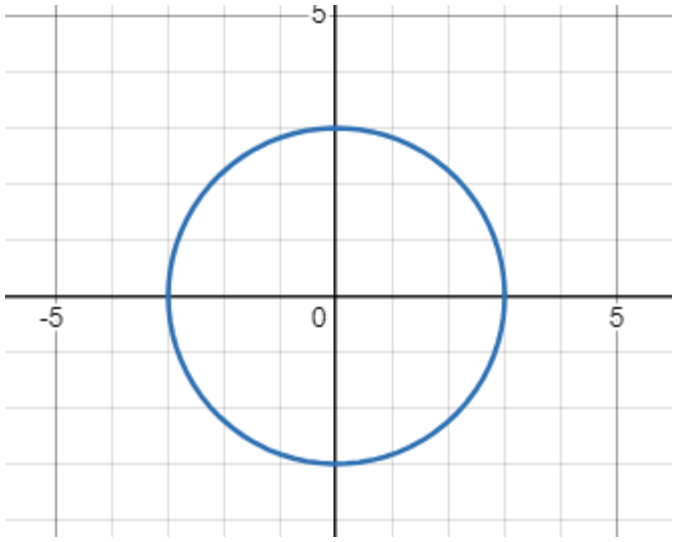
https://www.desmos.com/calculator



In an equation, x represents the input and y represents the output.

$$3x + 6 = y$$
$$x^2 + y^2 = 9$$



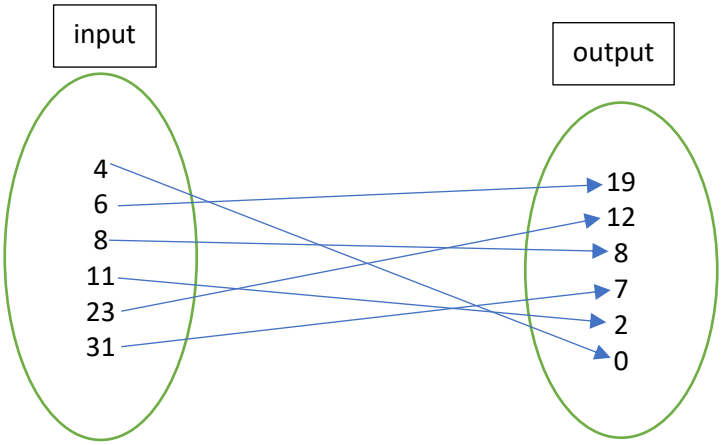
and


There are not a lot of rules that go with relations other than relating an input and an output.

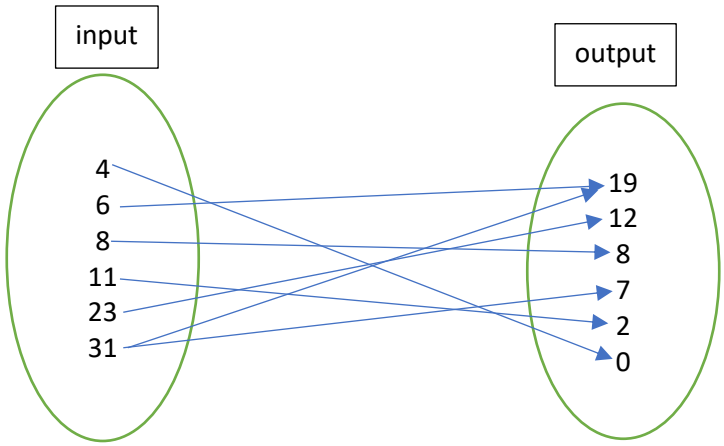
A function is a relation, but it has additional rules:

1) For each input, there is only one output.

In a bubble graph type display, the main thing to look for is whether there are two arrows leaving the same input value.
This version is a function.



The following version is not a function:
This second example has two arrows leaving 31 and going to two different values.

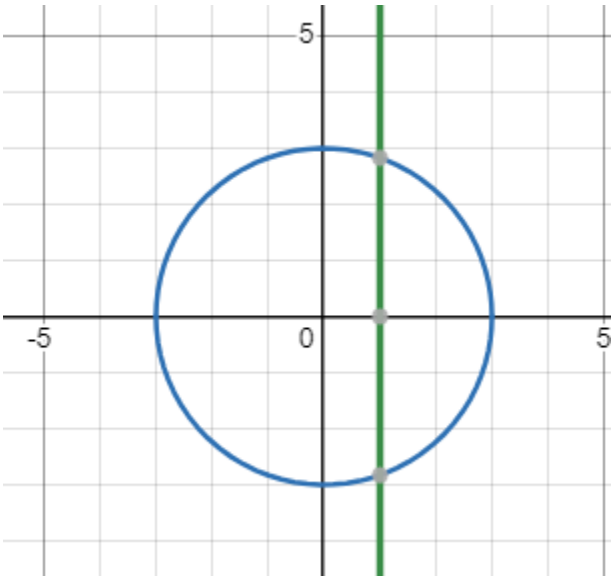


As a list of points:

$$\{(4,0),(6,19),(8,8),(11,2),(23,12),(31,7),(31,19)\}$$

If you have two points with the same initial value, that is not a function.

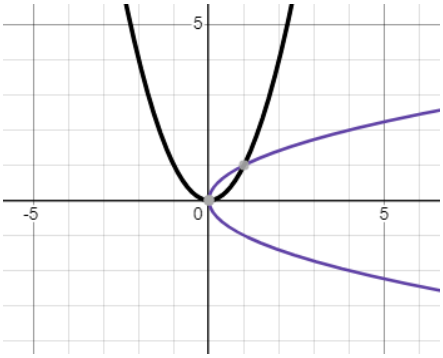
On a graph, the thing you are looking for boils down to the vertical line test. A vertical line represents a single x-value. If your graph touches a vertical line (any vertical line) more than once, then there is at least one x-input values that produces two different output values.



line: x=1

This is not a function.

$$x^2 + y^2 = 9$$
$$1^2 + y^2 = 9$$
$$y^2 = 8$$
$$y = \pm\sqrt{8} = \pm 2\sqrt{2}$$



purple is $x = y^2$, black is $y = x^2$

Input: domain
Set the of all the possible inputs (into the function or the relation) are called the domain

Output: range
Set of all the possible outputs (from the function or the relation) is called the range.

Bubble graph:
Domain: {4,6,8,11,23,31}
Range: {0,2,7,8,12,19}

In the circle:
Domain: $-3 \leq x \leq 3, [-3,3], \{x | x\ is\ any\ real\ number\ between\ (and\ including) -3\ and\ 3\}$
Range: $-3 \leq y \leq 3, [-3,3]$