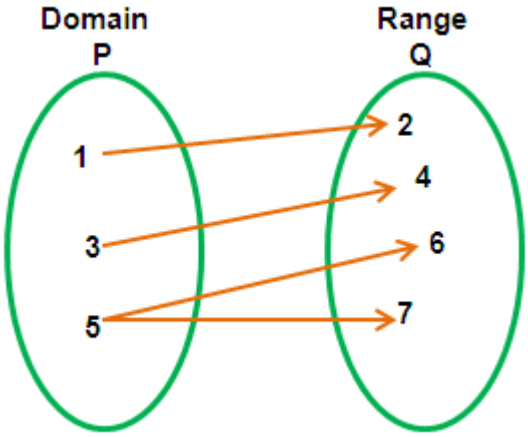
Lesson 17 Grade 9 . Relations and functions.

A relation is just a relationship between sets of information.

A relation is a set of ordered pairs $(x\,;y)$, e.g $(1\,;2)\,;\ (3\,;4)\,;\ (5\,;6)\,;\ (5\,;7)$.

The first elements of the ordered pairs are the **x-values**, they form the **domain** of the relation, and the second elements are the **y-values** which form the **range** of the relation.



A function is a set of ordered pairs in which each x-element has only one y-element associated with it.

Example : $y = x + 1$

When you calculate the value of y, for any x-value, you will only get one unique value for each x. So, if $x = 2\ \ then\ y = 2 + 1 = 3$, there is no other possible value for y if x = 2.

So we can now say that $y = x + 1$ is a function.

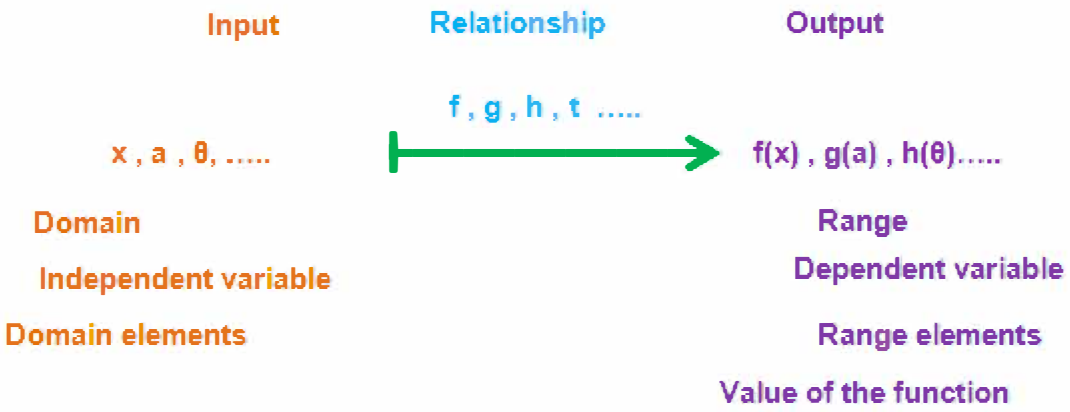
We use the function notation : $f(x) = x + 1$ for functions. We say **' f of x '**, *this notation does not mean f multiplied by x.*

In the example above we will write : $f(2) = 2 + 1 = 3$, where we substitute the x with the given value 2 in this case. ***The answer ' 3 ' is also called the image of 3 under f(x).***

$g(x), h(x)\ , p(x), B(x)$ or other letters, may also be used to name functions. This is very useful when we plot more than one function on a graph. Each function on the graph then has a unique name. We have to label each graph.

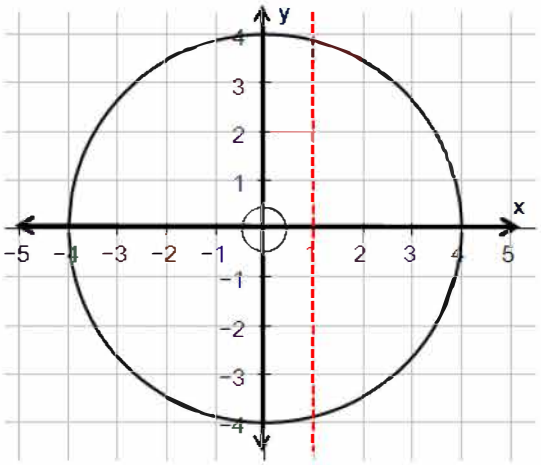
A function is a special type of relationship : Every input value must have an output value, and each input value has only one output value. So, if you work with a function, you must be able to get an answer (only one) for every input value.

Summary :



All functions are relations, but all relations are not necessarily functions.

The relation $x^2 + y^2 = 16$ describes a circle with radius 4 (you will get to that in grade 10).



Study the given graph : If x = 0, then y = +4 or y = –4

This is called a **one-to-many** relationship – you get more than one answer for one input value.

If we draw a vertical line, the line intersects the graph twice – see red dotted line.

This relation is not a function.

See many-to-one relation on the next page.