

Algebra 1 - Functions and Function Notation - Lesson

Common Core F-IF.A.1, F-IF.A.2, F-IF.B.5 · maths-pdf.fr/en/

A function is a rule that gives exactly one output for each input. The inputs form the domain and the outputs form the range. A graph is a function if no vertical line crosses it more than once. Function notation $f(x)$ names the output for input x , so $f(5)$ means replace x with 5 and simplify.

Algebra 1 · Common Core State Standards: **F-IF.A.1, F-IF.A.2, F-IF.B.5**

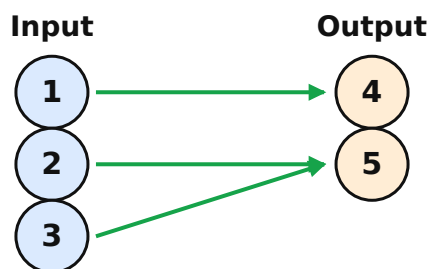
Key facts

- A function assigns exactly one output to each input.
- The domain is the set of inputs; the range is the set of outputs.
- The vertical line test: a graph is a function if no vertical line meets it twice.
- $f(x)$ is read “ f of x ” and means the output when the input is x .
- In context, the domain is limited to the inputs that make sense.

What is a function?

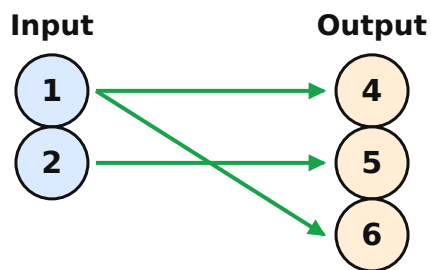
Function

A **function** is a rule that assigns to each input exactly one output. The set of allowed inputs is the **domain**. The set of resulting outputs is the **range**.



A function: each input has exactly one output. Two inputs may share an output.

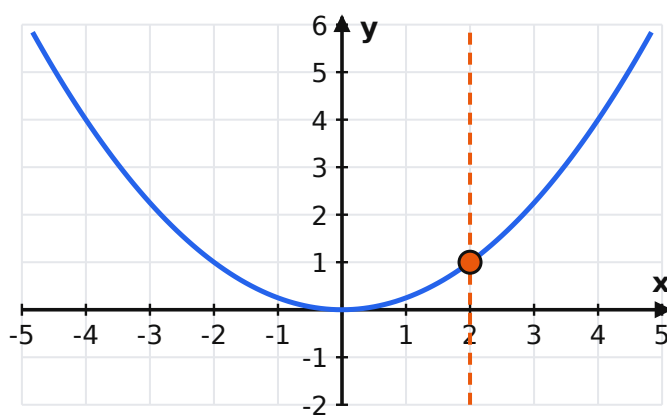
In the diagram, each input has one arrow, so the relation is a function. The domain is $\{1,2,3\}$ and the range is $\{4,5\}$.



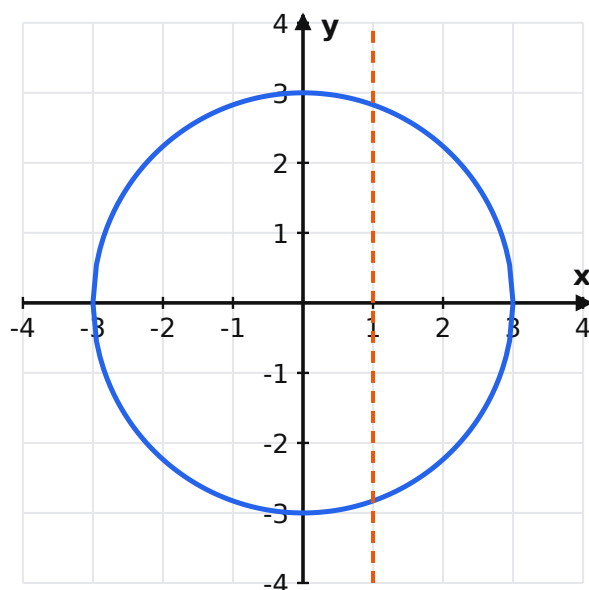
Not a function: the input 1 has two outputs, 4 and 6.

How do you tell if a graph is a function?

Use the **vertical line test**. If any vertical line crosses the graph more than once, one input has more than one output, so the graph is not a function.



Vertical line test: every vertical line meets this graph at most once, so it is a function.



A circle fails the vertical line test: the line meets it in two points.

What does function notation mean?

The notation $f(x)$ is read “f of x.” It names the output of the function f when the input is x . It does not mean f times x. If $f(x) = 2x + 3$, then $f(5) = 2(5) + 3 = 13$ by replacing every x with 5.

1. Write the function rule.
2. Replace the variable with the input, using parentheses around negative numbers.
3. Follow the order of operations.

Example: For $g(x) = x^2 - 4x$, find $g(-3)$. Substitute: $g(-3) = (-3)^2 - 4(-3)$. Then $9 + 12 = 21$.

How do you find the domain and range in a real situation?

Ask which inputs make sense. If $C(g) = 3.25g$ gives the cost in dollars of g gallons of gas at \$3.25 per gallon, and the tank holds 15 gallons, the domain is $0 \leq g \leq 15$. The range then runs from \$0 to \$48.75 dollars.

Tip: When a relation is given as a list of ordered pairs, check the inputs. If one input appears twice with different outputs, the relation is not a function. An equation such as $y = x^2 + 1$ is a function of x because each x gives exactly one y , but $x = y^2$ is not, since $x = 4$ gives both $y = 2$ and $y = -2$.

Questions about functions and function notation

What is the difference between a relation and a function?

A relation is any set of input-output pairs. A function is a relation in which each input has exactly one output.

Can two different inputs have the same output?

Yes. A function only forbids one input having two outputs. The mapping $2 \rightarrow 5$ and $3 \rightarrow 5$ is allowed.

What does $f(3)$ mean?

It is the output of the function f when the input is 3. Replace every x in the rule with 3 and simplify.

How do you find the domain of a graph?

Read the x -values the graph covers from left to right. For a segment from $x = -3$ to $x = 4$, the

domain is $-3 \leq x \leq 4$.

How do you solve $f(x) = 15$?

Set the rule equal to 15 and solve for x . If $f(x) = 2x + 1$, then $2x + 1 = 15$ gives $x = 7$.