

LESSON 4 | MEET THE IDEA

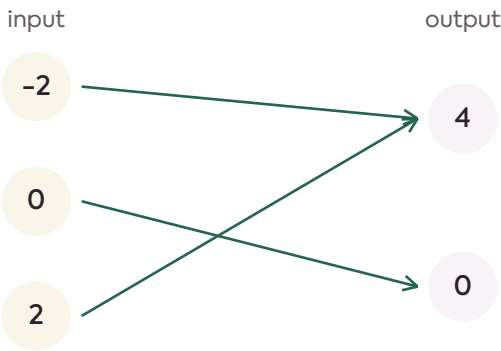
Relations, functions and function notation

Thursday, October 22, 2026 . 6:00–7:00 PM Central

By the end, I can...
Decide whether a relationship is a function and find an output using a rule, table, graph or mapping.

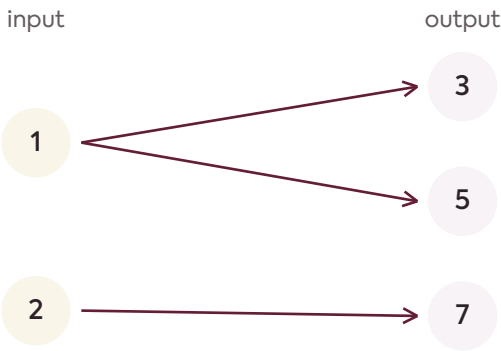
A **relation** connects inputs and outputs. A **function** gives exactly **one output for each input** in its domain. Different inputs are allowed to share the same output.

FUNCTION



Different inputs may share an output.

NOT A FUNCTION



Input 1 has two different outputs.

Word or symbol	Meaning
Input / output	The value you start with / the value the rule gives back.
Ordered pair (x, y)	Input x comes first; output y comes second.
f(x)	The output of the function f at input x. Say “f of x.”

Notice: the left mapping has two inputs that lead to 4. That is allowed. On the right, the same input 1 leads to 3 and 5, so it is not a function.

LESSON 4 | WORKED EXAMPLES

Read a rule or a table

Example 1 | If $f(x) = 2x + 1$, find $f(-2)$

$$f(-2) = 2(-2) + 1$$

The input is -2 . Replace x with (-2) .

$$f(-2) = -4 + 1 = -3$$

Follow the order of operations.

f is the name of the function. $f(-2)$ is an output, not f multiplied by -2 .

Example 2 | If $g(x) = x^2 - 3$, find $g(-2)$

$$g(-2) = (-2)^2 - 3$$

Put the entire negative input in parentheses.

$$g(-2) = 4 - 3 = 1$$

Square first, then subtract.

Example 3 | A function can be given by a table

Input x	-2	-1	0	1	2
Output $h(x)$	5	3	1	-1	-3

Read the column, rather than searching for a formula: **$h(1) = -1$** . The ordered pair is $(1, -1)$. Each listed input has one output, so the table represents a function on those inputs.

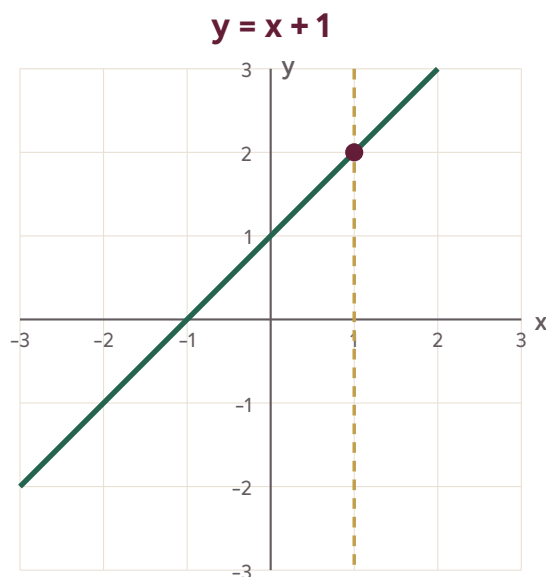
Repeated rows or repeated outputs?

Two copies of the same pair do not create two different outputs. The problem occurs when **one input has different outputs**.

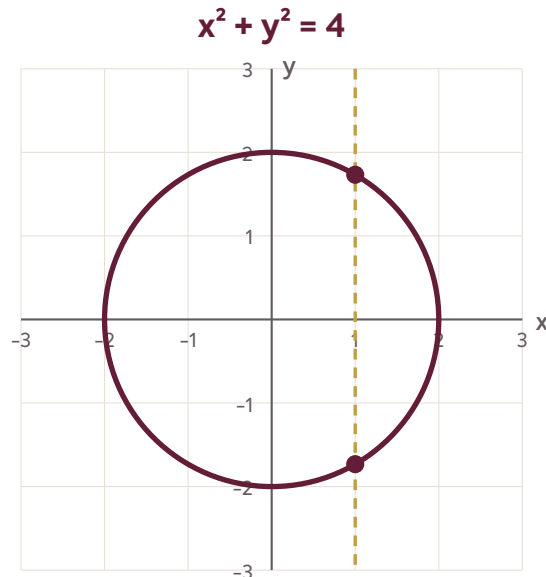
LESSON 4 | THE VERTICAL LINE TEST

Spot a function on a graph

Imagine moving a vertical line across a graph. If any vertical line hits the graph more than once, one x -value has more than one y -value: the relation is **not a function of x** .



One output at $x = 1$: a function.



Two outputs at $x = 1$: not a function.

The dashed test line in both pictures is $x = 1$. On the straight line there is one marked output. On the circle there are two. You only need one such counterexample to show a relation is not a function.

You can also decide from words

“Each student is assigned exactly one locker number” describes a function from students to locker numbers. If one student is assigned two different numbers, that relationship is not a function from students to locker numbers.

Keep the direction clear: a statement about inputs going to outputs does not automatically tell you whether the reversed relationship is a function.

LESSON 4 | SHORT CHECKS

Your turn

For classification questions, explain your decision using inputs and outputs.

1. Which set represents a function?

$$A = \{(1, 2), (2, 2), (3, 5)\}$$

$$B = \{(1, 2), (1, 5), (3, 5)\}$$

2. If $f(x) = 2x - 5$, find $f(-3)$.

3. A table gives $h(1) = -4$, $h(2) = 0$ and $h(3) = 6$. What is $h(3)$? Write the matching ordered pair.

4. Inputs -2 and 2 both give output 4 . Does that fact alone stop the relation being a function? Explain.

5. Is the horizontal line $y = 4$ a function of x ? Explain using the vertical line test.

One sentence to remember

Every input must have exactly one output. Outputs do not have to be different from one another.

LESSON 4 | WORKED ANSWERS AND RECAP

Check your thinking

1. **A is a function:** each input has one output. **B is not:** input 1 has two different outputs, 2 and 5.
2. $f(-3) = 2(-3) - 5 = -6 - 5 = -11$.
3. $h(3) = 6$, so the ordered pair is **(3, 6)**. Input comes first.
4. **No.** Different inputs may share an output. The problem would be one input producing two different outputs.
5. **Yes.** At every x -value, the line gives exactly one output: 4. A vertical line meets it once.

Different representations, one question

Whether you see words, ordered pairs, a table, a mapping, a graph or a formula, ask: “**Does each input have exactly one output?**”

I can...

- ☐ Identify an input and its output.
- ☐ Read $f(x)$ as function notation, not multiplication.
- ☐ Use an input-output argument or a vertical line test.

Next class: solve and graph inequalities. Standard Algebra I: A.12A–B. Advanced Grade 8: §111.31(d)(12)(A)–(C).