What a Function Is: One In, One Out

A function is a rule where one input gives exactly one output. f(x) is read f of x. y is another name for f(x). Every input and output is a point (x, y).

1 THE VOCABULARY
Words we use

Function a rule that takes one input and gives back exactly one output. Same input in, same output out, never two.

Spreadsheet type 4 in A1 and =A1+3 in B1. B1 shows 7, one number. Change A1, B1 changes to one new number. That is a function.

f(x) read f of x: a function of x. f(x) = x + 3 means the formula is x + 3 and x feeds in. The parentheses are a slot, not multiplication.

f(4) feed in 4: replace every x with 4. f(4) = 4 + 3 = 7. Input 4, output 7.

y the output's other name. Graphing writes y = x + 3, calculus writes f(x) = x + 3. Same rule.

Ordered pair a point's address (x, y): x first, sideways; then y, up or down. (3, 2) and (2, 3) are different points.

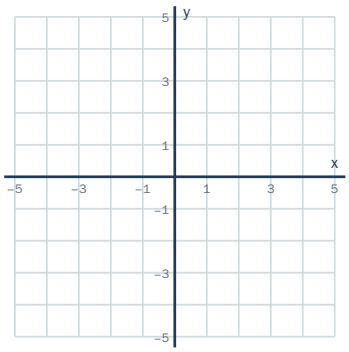
Coordinate plane the x-axis (flat) and the y-axis (standing) crossing at the origin (0, 0).

- Watch out for these four.
- f(4) is not f times 4. It is the output when 4 goes in.
- Two inputs may share an output (k(3) = 9 and k(–3) = 9). One input may never have two outputs.
- x first. Along the hall, then up the stairs.
- A negative input still works: f(–5) = –5 + 3 = –2.

2 THE METHOD
From rule to graph

1. **READ THE RULE** y = 2x – 1, or f(x) = 2x – 1. The formula is 2x – 1; x is the input.
2. **PICK SOME x VALUES** a few negatives, zero, a few positives: –2, –1, 0, 1, 2, 3.
3. **FEED EACH ONE IN** f(–2) = 2(–2) – 1 = –5, f(0) = –1, f(3) = 5. Write them in a table.
4. **EVERY ROW IS A POINT** (–2, –5), (–1, –3), (0, –1), (1, 1), (2, 3), (3, 5).
5. **PLOT EACH POINT** start at the origin, walk x sideways, then y up or down, dot. Check your table in a spreadsheet: x down column A, =2*A1-1 in B1, drag down.

TRY IT HERE
y = x – 2, for x = –3, 0, 2, 4. Fill the table, plot the four points on the grid.



3 EVERY LINE NAMED
Worked example: f(x) = –x + 4

f(x) = –x + 4	the rule: take the opposite of x, then add 4. Same as y = –x + 4
f(–2) = –(–2) + 4 = 6	input –2, output 6: the point (–2, 6). Walk 2 left, 6 up
f(0) = –0 + 4 = 4	input 0, output 4: the point (0, 4). No sideways walk, 4 up: it sits on the y-axis
f(3) = –3 + 4 = 1	input 3, output 1: the point (3, 1). Walk 3 right, 1 up
f(6) = –6 + 4 = –2	input 6, output –2: the point (6, –2). Walk 6 right, 2 down

SPREADSHEET CHECK
A1: –2, A2: 0, A3: 3, A4: 6. B1: =-A1+4, then drag B1 down. Column B reads 6, 4, 1, –2. One output for every input.

SAY IT OUT LOUD
One in, one out. f of x. x first, then y. Fill the table, plot the rows.

Unit 2, Lesson 1 in one line: a function gives one output for each input, f(x) and y both name that output, and each (x, y) is a dot.