Writing the Equation of a Line

Find m, find b, write y = mx + b, from a graph, a table, two points, or a slope and a point. The x-intercept is the other crossing: put y = 0 in and solve.

1 THE VOCABULARY
Words we use

m, the slope rise over run: count it, read the constant change, or subtract two points.

b, the y-intercept the value when x = 0: read it, take the x = 0 row, or put a point in and solve.

x-intercept the value of x when y = 0: put 0 in for y and solve for x. When the story hits zero.

Put the point in a point on the line makes y = mx + b true; with m known, solve for b.

Walk the table back step backward by the constant change until x = 0.

- Watch out for these.
- Using a table row as b when it is not x = 0. Walk back, or put the row in.
- Finding m and forgetting b. Every equation needs both.
- Mixing up the intercepts: y-intercept has x = 0, x-intercept has y = 0.
- Writing an intercept as a bare number. It is a point: (0, b) or (x, 0).
- Not checking with the other point. It catches almost every slip.

2 THE METHOD
From anything to y = mx + b

1. **FROM A GRAPH** b where it crosses the y-axis; m by counting rise over run between two grid corners.
2. **FROM A TABLE** m is the constant change per step; b is the x = 0 row (walk back to it if needed).
3. **FROM TWO POINTS** m = rise over run (subtract, same order). Then put one point in: y = mx + b with x and y filled, solve for b.
4. **FROM A SLOPE AND A POINT** m is given; put the point in and solve for b.
5. **BOTH INTERCEPTS** y-intercept: x = 0, read b. x-intercept: y = 0, solve 0 = mx + b for x.

WHY ONE POINT IS ENOUGH TO FIND B

A point on the line is a true sentence about the line. Once m is known, that sentence has only b unknown, and it is a one-step equation: add the opposite of the mx part to both sides.

3 FROM TWO POINTS
The line through (2, 7) and (5, 16)

m = (16 − 7) / (5 − 2) = 9/3 = 3	rise over run, second minus first both times
7 = 3 × 2 + b	put the point (2, 7) into y = mx + b with m = 3
7 = 6 + b	multiply first
7 + (−6) = 6 + b + (−6), so b = 1	add the opposite of 6 to both sides (Unit 1)
y = 3x + 1	write it
check: 3 × 5 + 1 = 16	the other point, (5, 16), makes it true

INTERCEPTS OF Y = 3X + 1

y-intercept: x = 0 gives (0, 1). x-intercept: 0 = 3x + 1, so 3x = −1, x = −1/3: the point (−1/3, 0).

SAY IT OUT LOUD

Find m. Find b: read it, or put a point in and solve. Write y = mx + b. Check with a point. x-intercept: y = 0.