



Slope

The **slope** of a line is a numerical way of describing the “steepness” and the direction of the line. It tells you nothing about the position of the line—where it is on the xy -plane.

To find the slope of a line from its equation, rewrite the equation in the form $y = mx + b$, so that the y is isolated on one side. The coefficient on x is the slope (m).

Example 1: Find the slope of the equation $8x + 3y = 8$.

Solution: Isolate the y , and then extract the x coefficient:

$$\begin{aligned} 8x + 3y &= 8 \\ 3y &= -8x + 8 \\ y &= -3x + \frac{8}{3} \end{aligned}$$

Therefore the slope is -3 .

To find the slope between two points, use the mnemonic “**rise over run**” to remember what to do. If the coordinates of the points are (x_1, y_1) and (x_2, y_2) :

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 2: Find the slope of the line containing the points $(3, 6)$ and $(7, 10)$.

Solution: Use the rise-over-run formula:

$$\begin{aligned} m &= \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{10 - 6}{7 - 3} \\ &= \frac{4}{4} = 1 \end{aligned}$$

Therefore the slope is 1 .

Vertical lines have an infinite, or undefined, slope since there is no “run” to the line; they don’t have an x component to divide by. Vertical lines have equations in the form “ $x = a$ ”.

Horizontal lines have a slope of 0 since there is no “rise” to the line; there’s no y component to divide into. Horizontal lines have equations in the form “ $y = b$ ”.