

Linear Equations

Linear Equations (equations whose graph is a line) come in two main* forms:

Standard Form: $Ax + By = C$

This is handy when you solve a system of equations (See our study guide for systems of equations).

Slope/Intercept Form: $y = mx + b$

Where “m” represents the slope of the line, and “b” tells you where the line crosses the y-axis. This form is handiest for graphing the line.

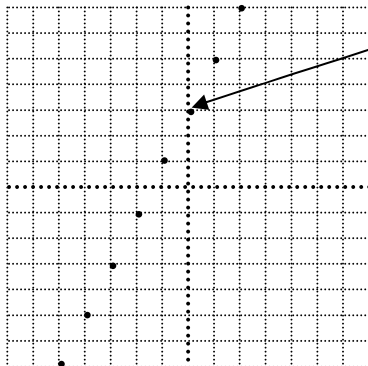
To help students understand why we need two forms, remind them that a person named “Adam Jones” is often listed as “Jones, Adam” when we need to work with his name. The same is true for equations – we have a familiar form and a “working form.”

Whenever you need to graph an equation, we can build a “t-chart” of x and y values. The slope/intercept format allows us to skip the t-chart. Suppose we have the formula $y = 2x + 3$.

The 3 tells us two things: Since it is positive, the line crosses the y-axis above (0, 0). Since it is a 3, the line goes through the point (0, 3), and now we have one point on our line.

The 2 tells us two things: Since it is positive, the line will slope upward from left to right. Since it is greater than 1, it will be fairly steep. (See our box on slope, below.)

To graph this line we first graph the point (0, 3). Then, from that point, we count one right and up 2. We repeat this “right, up” method until we have enough points to graph our line (We could also have moved left, down, since those are both negative directions and the two negative make it positive.)



The formula for slope is:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

This is sometimes expressed as “change in y over change in x” or “rise over run.”

Thus, a slope of 2 means that each time the x value changes one block, the y value will change two blocks.

A slope of $-\frac{2}{3}$ means if the x value moves 3 right, the y value will move 2 down. If x moves 3 left, then y moves 2 up.

To convert from Standard Form into Slope/Intercept Form, solve the Standard Form equation for y. Another method requires memorization of two formulas.

Given Standard Form $Ax + By = C$:

$$\text{Slope (m)} = -\frac{A}{B} \quad (\text{Remember “A over B, change the sign!”})$$

$$\text{and } y\text{-Intercept (b)} = \frac{C}{B}$$

*There is another form called Point-Slope, but it is not as useful as these two.