

# Linear Equations

Linear equations come in two main forms – Standard, and Slope-Intercept.

Standard form is like your signature. “ $Ax + By = C$ ” compares to “John Q. Doe,” because it gives the information in a straight-forward manner: First (x), Second (y), and Last (the Constant).

Slope-Intercept is also like your name, but in a workable format. “Doe, John Q.” puts your name in an order so it can be worked with easily. So does  $y = mx + b$ , since the “m” tells us the slope of the line and “b” tells us where the line crosses, or “intercepts,” the y-axis.

## Parallel Lines

Two lines are parallel if they have the same slope.

If the equations are in Standard form, the “A” and “B” (including sign) must have the same ratio and the “C” ratio must not match. So “ $3x - 4y = 12$ ” and “ $6x - 8y = 10$ ” would represent parallel lines.

If the equations are in Slope-Intercept form, parallelism is easier to spot. The “m” values must be equal and the “b” values not equal. Therefore, “ $y = 2x + 5$ ” and “ $y = 2x - 7$ ” are parallel.

If one equation is in Standard form and the other in Slope-Intercept, either convert the Standard form into Slope-Intercept or use “ $m = -\frac{A}{B}$ ” and compare the “m” values of the two equations.

## Perpendicular Lines

Two lines are perpendicular if the slopes are “negative reciprocals.” This means that if we multiply the slopes, the product is -1. The lines may have the same y-intercept. So “ $y = -2x + 5$ ” and “ $y = \frac{1}{2}x + 9$ ” would be perpendicular.

## Graphing lines

We first learned to graph lines by using a T-chart and choosing 3 possible values for x. We then solved the equations for the corresponding y-value, and drew the lines.

If, however, the linear equation is written in Slope-Intercept form, we can use the “b” and then “m” values to graph the line more quickly. So if, for example, we need to graph “ $y = \frac{1}{2}x + 9$ ,” we look first at the b-value, 9. This means the line passes through the y-axis 9 above the origin, or at (0, 9). We mark our first point there. Since slope can also be expressed as “the change in y over the change in x,” if we start from (0, 9) and move up one and two to the right (or two to the right, then up one), we have found another point on our line. We repeat this pattern a couple of more times, then draw our line. We could have moved left and down, since both of these directions are negative, meaning that the two negative moves would produce a positive slope.