Section 4.4 The Slope of a Line

The slope of a line is the number of units you go up or down divided by the number of units you go over to the right.

Up is the positive direction.
Down is the negative direction.
Right is the positive direction.
Left is the negative direction.

Although the book teaches a formula to calculate slope between two points, I prefer for you to simply memorize that $slope = \frac{rise}{run}$ where rise is the vertical change and run is the horizontal change.

Example: Find the slope of the line between (5,2) and (3,7)

Step 1: Write $slope = \frac{rise}{run}$

Step 2: Find the rise. Remember that rise is the vertical change so to find the vertical change we look at the y values. Going from 2 to 7 is a change of 5 units in the positive direction. Therefore, the rise=5.

Step 3: Find the run. Remember that run is the horizontal change so to find the horizontal change we look at the x values. Going from 5 to 3 is a change of 2 units in the negative direction. Therefore, the run=-2.

Step 4: Calculate the slope $slope = \frac{rise}{run} = \frac{5}{-2} = -\frac{5}{2}$

Please note that we could started with the second point and we would have determined that

$$slope = \frac{rise}{run} = \frac{-5}{2} = -\frac{5}{2}$$

which gets the same answer. Just remember to decide which point is first and use it as the starting point for both the rise and the run.

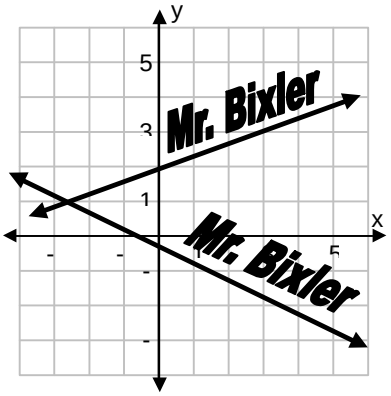
We can make the whole process very fast with just a little practice. Look at the next example to see how you should show your work.

Example: Find the slope of the line between (3,-2) and (-1,7)

$$slope = \frac{rise}{run} = \frac{9}{-4} = -\frac{9}{4}$$

The 9 came from going from –2 to 7 which is 9 in the positive direction.
The –4 came from going from 3 to –1 which is 4 in the negative direction.

It is also important to recognize that a line with a positive slope rises and a line with a negative slop falls as the line goes left to right. Imagine that you write your name on top of the line. If the writing is falling, the slope is negative. If the writing is rising, the slope is positive.



Rising writing means positive slope.

Falling writing means negative slope.

There are two more things to remember when it comes to the slope of a line.

- Vertical lines have an undefined slope.
- Horizontal lines have a zero slope.

Example: Find a coordinate given the slope and a point. Find the value of y so that the line passes through the points (-2,1) and (4,y) and has a slope of 2/3.

The book shows one way of solving this on page 228. A different method is shown here.

$slope = \frac{2}{3}$ This means that for each 3 steps up, it goes over 2 steps.

So, given (-2,1), we move up 2 and over 3 to get (1,3), move up 2 and over 3 to get (4,5), and that gives us our missing value of 5.

Please note that this does not always work and that you will have to use the book's method to find non-integer answers. The book uses the formula:

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

This is really the same thing as before because rise = $y_2 - y_1$ and run = $x_2 - s_1$

$$slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

Hopefully this will help you to understand the book formula. Understanding really helps with memorizing.