MATH SKILL INFORMATION PAGE

Algebra	**For use with 7-4**

SLOPE

CONCEPTS:

- Slope is a number that tells you how steep a line is.
- The larger the number, the steeper the line.
- Slope can be really, really, really small numbers (fractions like 1/100), which means a very small slope, almost a horizontal line: ⟷
- Positive slopes go ↗ and negative slopes go ↖
- You can find slope in an equation, but you have to put it into slope-intercept form: $y = mx + b$ (this is part of section 7-5). M, which is the coefficient of the x is the slope.

A. FIND THE SLOPE

- Memorize two things:
  - Rise over run: $\frac{\text{rise}}{\text{run}}$
  - Change in the y-coordinates divided by the change in the x-coordinates.
  - These two things are the same, actually, and they are the way that you calculate slope.
- If you're given two points, divide the difference of the y-coordinates by the difference of the x-coordinates.

Example 1: Given (–3,–4) and (–1, 4), find the slope of the line. It will help if you identify the x and y coordinates as belonging to one pair or the other. Normal mathematical convention is to identify one pair of coordinates as (x_1, y_1) and the second pair of coordinates as (x_2, y_2). We'll identify (–3,–4) as (x_1, y_1), and (–1, 4) as (x_2, y_2).

Slope = m $= \frac{\text{rise}}{\text{run}} = \frac{\textbf{change in y-coordinates}}{\textbf{change in x-coordinates}} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{-4 - 4}{-3 - (-1)} = \frac{-8}{-2} = \mathbf{2.}$

WARNING: Notice that the first number, top and bottom, comes from the same pair of coordinates.

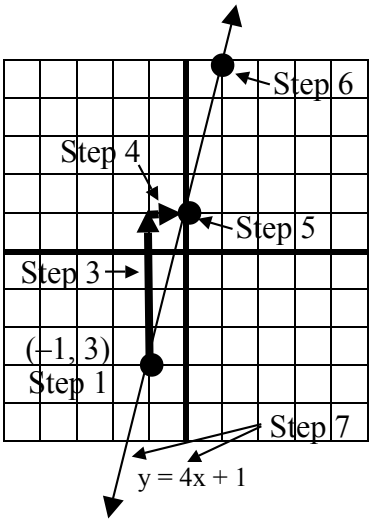
Remember that slope is actually $\frac{\text{rise}}{\text{run}}$, so although 2 is the correctly reduced number for slope, when you use the slope to graph points, you will want to put it back into a form that you can better use, which is $\frac{2}{1}$.

Example 2: Given (2,–3) and (6, –9), find the slope of the line.

Slope = m $= \frac{\text{rise}}{\text{run}} = \frac{\textbf{change in y-coordinates}}{\textbf{change in x-coordinates}} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{2 - 6}{-3 - (-9)} = \frac{-4}{6} = \frac{-2}{3}$.

WARNING: Always reduce.

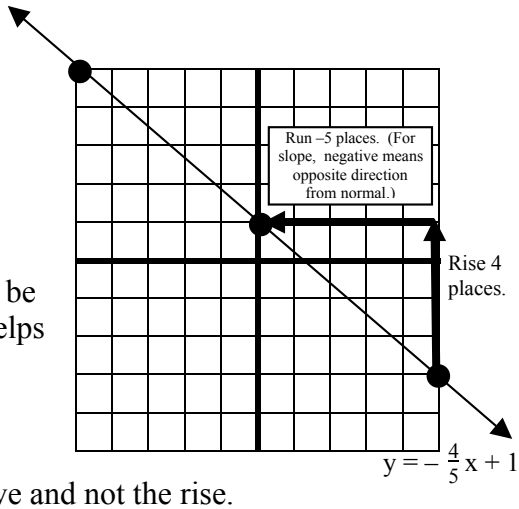
B. USING SLOPE WHEN GRAPHING



Example 3: Graph the line that has the slope 4 and the point (–1, 3).

Step 1: Plot the point.
Step 2: Identify the rise and run in the slope: $4 = \frac{4}{1} = \frac{\text{rise}}{\text{run}}$
So the rise is 4 and the run is 1.
Step 3: "Rise" 4 places from the plotted point.
Step 4: "Run" 1 place from where you stopped after rising 4.
Step 5: Plot the point you've come to. That point is also on the line.
Step 6: It's often helpful to make a third point, so do rise and run again.
Step 7: Draw a line connecting the three dots. Make sure you put arrows on both ends. Name the line by putting the equation of the line (you'll be doing this in section 7-5).

C. NEGATIVE SLOPE



When a slope is negative, you must move the opposite way when you do rise or run (not both).

Example 4: Graph the line that has the slope $-\frac{4}{5}$ and the point (5, –3).

Special note: remember that in fractions, a negative fraction can be written as $-\frac{4}{5}$ or $\frac{-4}{5}$ or $\frac{4}{-5}$. Choose the form that helps you graph the line most easily.

Step 1: Plot the point (5, –3).
Step 2: Identify the rise and run. Rise is 4, run is –5. See step 4 for explanation of why I chose to make the run negative and not the rise.
Step 3: "Rise" 4 places from the plotted point.
Step 4: "Run" 5 places from where you stopped after rising 4, but now you go to the left (towards the negative numbers). I chose the **run** to be negative simply because if I went down instead of up, when doing the rise, I would have gone off the graph, and it's easier to do it this way.
Step 5: Plot the new point (0, 1).
Step 6: Make a third point: rise 4, run –5, to (–5, –5)
Step 7: Draw a line connecting the three dots. Make sure you put arrows on both ends. Name the line by putting the equation of the line (you'll be doing this in section 7-5).

D. HORIZONTAL AND VERTICAL LINES: Closely study Part 2, page 320, so that you can immediately recognize the equations for horizontal and vertical lines. Anytime you see y = just a number alone (like y = –7) that's always a **horizontal** line, and anytime you see x = just a number alone (like x = 5), that's **always** a vertical line. You can also plot a few points, just to be sure.

- *Plot points like this: for x = 5, when y is 0, x is 5, so (5, 0). When y is 3, x is 5, so (5, 3). In fact, when y is **anything**, x is 5…so you just draw a straight line along the line where x is always 5.*