M Math Application

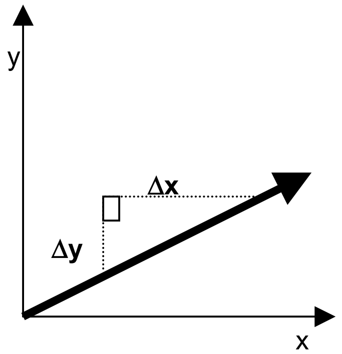
Slope and Rate

In algebra, we learn that every line has certain characteristics: slope and intercepts, and we learn how to calculate these. What we often fail to appreciate at the time we are learning about slope is its practical application to science. What follows is an attempt to make this connection so that you may take advantage of the math you have learned.

"Slope is a rate." If you remembered nothing else about slope, this would be a profound truth, but we are forced to ask, a rate of what? (see below)

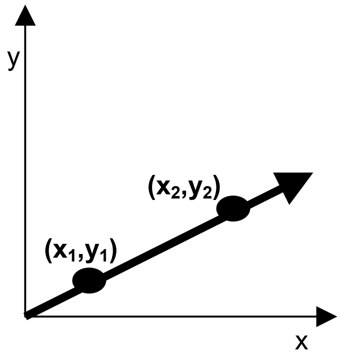
slope = m = $\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ **=** rate of change of y (dependent variable) with respect to x (independent variable)

1) Slope may be found *graphically*:



slope = m = $\frac{\Delta y}{\Delta x}$

2) Or *numerically*, by knowing two points on the line:



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

3) And of course, slope may be found *algebraically* using the slope-intercept form of the linear equation:
y = mx + b, where **m** = slope.

Which of the three methods you should choose depends on what information you are given. Use the chart below as a guideline to help you decide.

When given:	**Use:**
the graph of a line,	method #1
two lists of data, or ordered pairs,	method #2
a formula, first solve for the dependent variable then,	method #3

Your ability to apply this concept to science is totally dependent on your ability to distinguish between the dependent and independent variable. Remember that the dependent variable is the variable **you are affecting** in the experiment, while the independent variable is "independent" of your ability to affect it. Usually, TIME will be your independent variable, and almost without exception, TIME is graphed on the x-axis. (see below)

distance = velocity $\times$ *time*

d = vt

where: "d" is the dependent variable,
"t" is the independent variable,
and "v" is the rate of change (slope)