# UNIT #2 - MEASUREMENTS AND CALCULATIONS

## SECTION #4: GRAPHING
## (continued)

Previously we used measurements from a data table to make a graph. In the "Mass Of Water Versus Volume" graph we ended up with a straight line of best fit.

In Lab 2B you will be expected to calculate the slope of the line of best fit. Fortunately if the line is straight, then this is not hard to do.

Let's use our graph as an example. You will find it on the next page.

$$\textbf{SLOPE} = \frac{\textbf{RISE}}{\textbf{RUN}}$$

Here, pick two points off of the line of best fit. DO NOT use data points. Instead pick a high point and a low point from the line itself. Choose two points that are far apart. This will give you a more accurate result.

In our example, the two line points are represented by large red dots. The dashed lines coming off of these dots tell us the mass and volume numbers for each point.

To make it easy, even gram amounts were chosen. For Line Point #1, I simply followed the 1 gram grid line until it reached the line of best fit. For Line Point #2, the 9 gram grid line was used. Dropping a perpendicular (red dashed) line allows one to see the volume number for each point.

This gives us the co-ordinates for the two points:

Line Point #1 - (1.0 mL, 1.0 g)
Line Point #2 - (9.1 mL, 9.0 g)

The slope of the graph tells us how fast the mass is changing, relative to the volume. In other words how many grams are gained when the volume increases by one millilitre.

$$\textbf{SLOPE} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

$Y_2 - Y_1$ represents the increase in the mass of the water, as one goes up the line of best fit from Line Point #1 to Line Point #2.

$X_2 - X_1$ represents the equivalent increase in the volume of the water.

Thus one can use the line point co-ordinates to find the slope.

**SLOPE** = $\frac{9.0\text{ g} - 1.0\text{g}}{9.1\text{ mL} - 1.0\text{ mL}}$ = $\frac{8.0\text{ g}}{8.1\text{ mL}}$ = 0.987 654 g/mL

**Rounded Answer = 0.99 g/mL**

This number means that each additional milliliter of water will gain us an extra 0.99 grams. In other words the graph is telling us that water has a density of 0.99 g/mL.