UNIT #2 - MEASUREMENTS AND CALCULATIONS

SECTION 4: GRAPHING

A well designed graph makes things clear. The reader can easily see how two variables are related to each other. A collection of numbers turns into a visible pattern.

For example, city engineers can count the number of cars that drive past a certain point in a road. From this data one can put together a graph that compares the volume of traffic to the time of day. By looking at this graph, any member of the public can see how the two variables (number of cars, time of day) are related to each other.

A graph can be a valuable source of information. In the previous example, people could use this graph to schedule their traveling time.

A graph shows the general pattern of the data. We don't get lost in the measurements. We see the forest instead of the trees.

How To Make a Graph

The **dependent variable** is always placed on the 'Y' (vertical) axis. The **independent variable** goes on the 'X' (horizontal) axis.

The dependent variable is the one whose value is controlled by the independent variable. For example, the time of day determines the temperature. Therefore if we did a graph of temperature versus the time of day, 'Temperature' would go on the vertical axis, 'Time of Day' on the horizontal axis.

Lets make a graph that compares water mass to water volume. The mass of each sample depends upon the amount (volume) of water that gets poured out. Therefore, 'mass' is the dependent variable and 'volume' is the independent variable.

Below is a data table containing the masses and volumes of five water samples.

DATA TABLE

VOLUME (mL)	MASS (grams)
0.6	0.62
3.3	3.32
4.0	4.69
7.7	7.62
9.2	8.50

A good graph has these features:

1. It **carefully** plots out each data point. In our graph, the first data point MUST match BOTH 0.6 mL on the horizontal axis and 0.62 g on the vertical axis.

2. Each axis is properly labeled. State the units.

3. Use **consistent** increments. Do not stretch or shrink any sections of the axis. In our graph the space between 1 and 2 grams is equal to the amount of space between 2 and 3 grams. Do not distort the relationship between 'Mass' and 'Volume'.

4. The scale of the graph is appropriate. It is not too big or too small. You don't want all of your data points crowded into one small corner of the graph paper. Besides wasting paper, this is a bad idea because it makes your graph less precise. The data points should spread out across most of the paper. However, please ensure that no data points fall off of the edges of the graph.

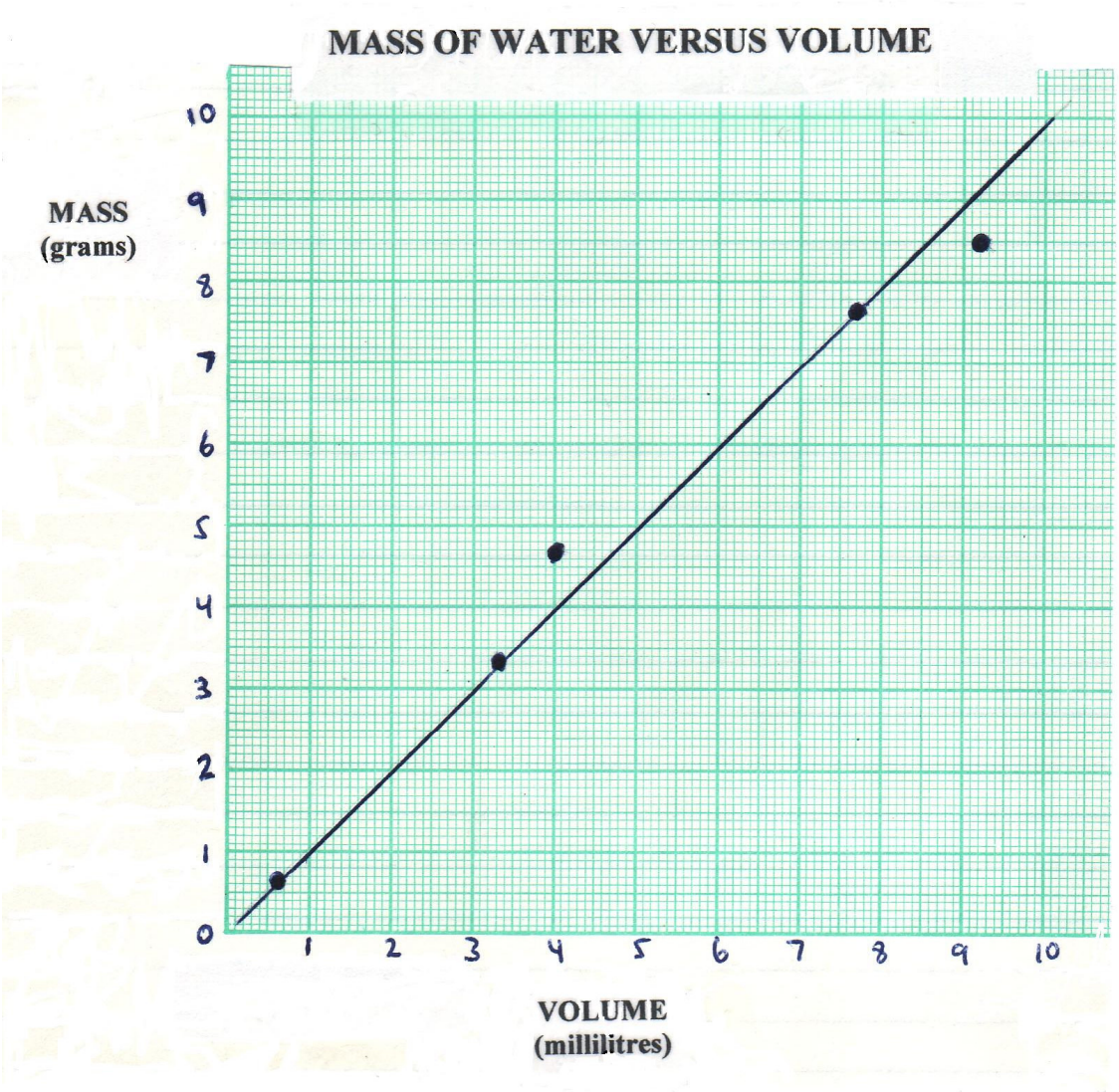
5. Choose a descriptive title. "Mass of Water Versus Volume" clearly tells the reader what this graph is all about.

Next, draw a line of best fit. Do not connect the dots.

A good line of best fit shows the average pattern of the data points. It tends to average out the errors and inconsistencies of the individual data points. A number of data points could end up lying above and below the line, because the line gives a balanced overall picture of the data.

In our example, the pattern of the data points suggests a linear (straight line) relationship between mass and volume. Therefore a straight line was drawn through the points. One data point is significantly above the line, another significantly below. However the line balances out these differences.

Please refer to the graph on the next page.


MASS OF WATER VERSUS VOLUME
MASS
(grams)
0
1
2
3
4
5
6
7
8
9
10
1
2
3
4
5
6
7
8
9
10
VOLUME
(millilitres)