

## Graphing “Style Sheet”

One of the most effective tools used by scientists is the **GRAPH**:

- visual presentation of data
- used to establish cause/effect relationships between variables or to extract physical constants.

1. Plot on **graph paper**
2. The axes are darker and drawn with a ruler (NO freehand).
3. Both axes are labeled with the variable name and its units. (do not label them x or y)
4. The independent variable is plotted on the horizontal (x) axis (generally).
5. The dependent variable is plotted on the vertical (y) axis (generally).
6. The axes are properly scaled so that the graph **fills** the PAPER (at least 2/3 to 3/4) and all of the data fits on the graph.
7. The data points have point protectors “⊙”
8. Always consider whether the point (0, 0) should be included.
9. A line of best fit is drawn which shows the trend of the data. The line of best fit may have some points above it, some below it, and some on it.
10. **DO NOT CONNECT THE DOTS!**
11. If the trend of the data is **linear**, the line of best fit is drawn with a **RULER**. If the trend of the data is curved, a smooth curve should be drawn.
12. Determine the slope ( $\Delta Y/\Delta X$ ) of the “best fit” line. Take two points on the line (should be far apart and NOT data points) and draw a triangle using dotted lines ( $\Delta Y/\Delta X$ ). Calculate the slope on the graph using the equation:

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

13. Include appropriate units and “box” the answer
14. The graph is clearly titled using the convention **dependent variable vs. independent variable**.
15. Determine the type of relationship

## Graphical Methods-Summary

A graph is one of the most effective representations of the relationship between two variables. The **independent variable** (one controlled by the experimenter) is usually placed on the **x-axis**. The **dependent variable** (one that responds to changes in the independent variable) is usually placed on the **y-axis**. It is important for you to be able interpret a graphical relationship and express it in a written statement and by means of an algebraic expression.

Graph shape	Written relationship	Modification required to linearize graph	Algebraic representation
	As x increases, y remains the same. There is no relationship between the variables.	None	$y = b$ , or y is constant
	As x increases, y increases proportionally. Y is directly proportional to x.	None	$y = mx + b$
	As x increases, y decreases. Y is inversely proportional to x.	Graph y vs $\frac{1}{x}$ , or y vs $x^{-1}$	$y = m\left(\frac{1}{x}\right) + b$
	Y is proportional to the square of x.	Graph y vs $x^2$	$y = mx^2 + b$
	The square of y is proportional to x.	Graph $y^2$ vs x	$y^2 = mx + b$

When you state the relationship, tell how y depends on x ( e.g., as x increases, y ...).