How to Make a Graph

1. Decide which variable is the one YOU changed. This is your independent variable (manipulated variable). This will be the x-axis (abscissa). The other variable is your dependent variable (responding variable). This will be the y-axis (ordinate).

2. Examine your independent variable's range of values. Decide what scale to number your x-axis in order to fit your range of values. Pick a scale with a 1, 2, 5 rule: 1, 2 or 5; 10, 20 or 50; 0.1, 0.2 or 0.5. Make the range extend across the x-axis as much as possible for a full page graph. Make sure the numbers along the axis are evenly spaced.

3. Examine your dependent variable's range of values. Decide what scale to number your y-axis in order to fit your range of values. Pick a scale with a 1, 2, 5 rule: 1, 2 or 5; 10, 20 or 50; 0.1, 0.2 or 0.5. It does NOT have to be the same scale as the x-axis. Make the range extend up the y-axis as much as possible for a full page graph. Make sure the numbers along the axis are evenly spaced.

4. Label the axes with quantity and unit. Do not just label them "*mass*" or "*temperature*". Mass of what? Temperature in what? Examples: "*mass of copper in grams*" or "*temperature of reaction (°C)"*

5. Plot your data points.

6. Examine the trend of your plotted data points. If the trend is a straight line, use a ruler to make a "best fit" line. If the trend is a curve, draw a smooth line following the trend to make a "best fit" line.

7. If there are two sets of data, repeat the above procedure for the second set using a different color and provide a key.

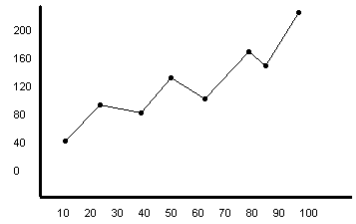
8. Give your graph a title. Use one of the following two formats:

   "The dependence of y-axis quantity on x-axis quantity" or
   "The effect of x-axis quantity on y-axis quantity"

Examples of Good and Bad Graphs

All those rules I gave you above are true and are handy to know, but it's usually a bad idea to give rules without showing you what they mean. Below are two examples of graphs. One is a bad graph (which you may be guilty of making) and the other is a good graph (which is what I always make).

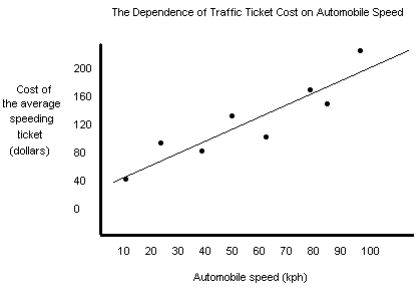
A bad graph!



Let's see what's wrong with this graph:

- There's no title. What's it a graph of? Who knows?
- There are no labels on the x or y axis. What are those numbers? Who knows?
- There are no units on the x or y axis. Is this a graph of speed in miles per hour or a graph of temperature in Kelvins? Who can tell?
- Somebody played "connect the dots". This should be a nice straight line which goes through the points or a curve that tends to follow them.

A good graph!



Doesn't the clarity and beauty of this graph just make you want to cry? Well, maybe that's overstating it a little bit, but it sure does make more sense than the first one, doesn't it? I'm starting to mist up right now.*

*No, I'm not.

Graph Checklist

- ☐ Did you use a real sheet of graph paper?
- ☐ Is your graph large and fills the sheet as much as possible?
- ☐ Does your graph have a title?
- ☐ Are both your axes labeled with quantity and unit?
- ☐ Are both your axes equidistant (equally spaced) starting from zero (0) to the last number?
- ☐ Did you use the 1, 2, 5 rule?
- ☐ Are all your data points plotted correctly?
- ☐ Did you draw a "best fit" straight line with a ruler OR draw a smooth curve "best fit" line?
- ☐ If there were two data sets on your graph and therefore two lines, did you provide a color-coded key?
- ☐ Is your graph neat and clean with legible writing?