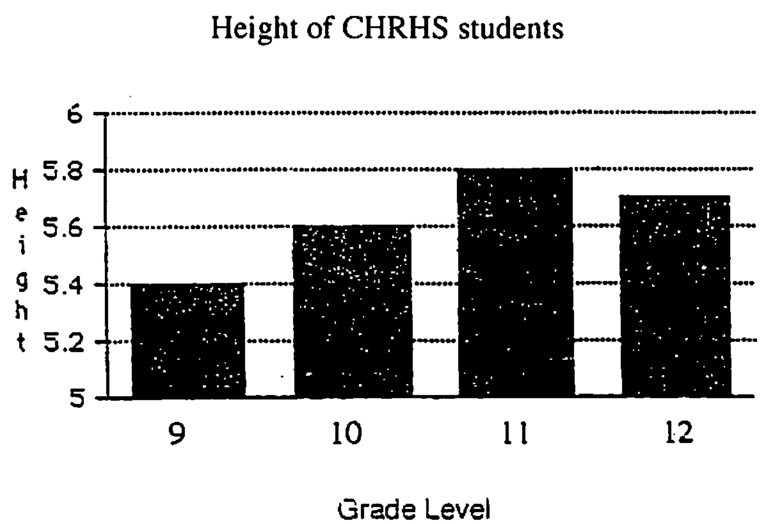
TYPES OF GRAPHS
(and when to use them)

There are essentially three types of graphs that are used extensively in science, each for a different reason. You should be aware of the three types of graphs, and be able to discern when to use each.

BAR GRAPH

This is the most elementary type of graph. It is used when only ONE measurement is made for two or more different trials, and the desired effect of the graph is to COMPARE that measured value among the different trials. (Note: The "trials" can be average values; the important aspect of the experiment is that only a SINGLE measurement is to be compared.)

For Example: I decide to conduct a scientific study of the average height of freshmen, sophomore, junior, and senior students at CHRHS. For each student I use in my experiment, I measure and record only a single value: their height. I then average the values in each single class. To compare the four average values, I would prepare a bar graph:



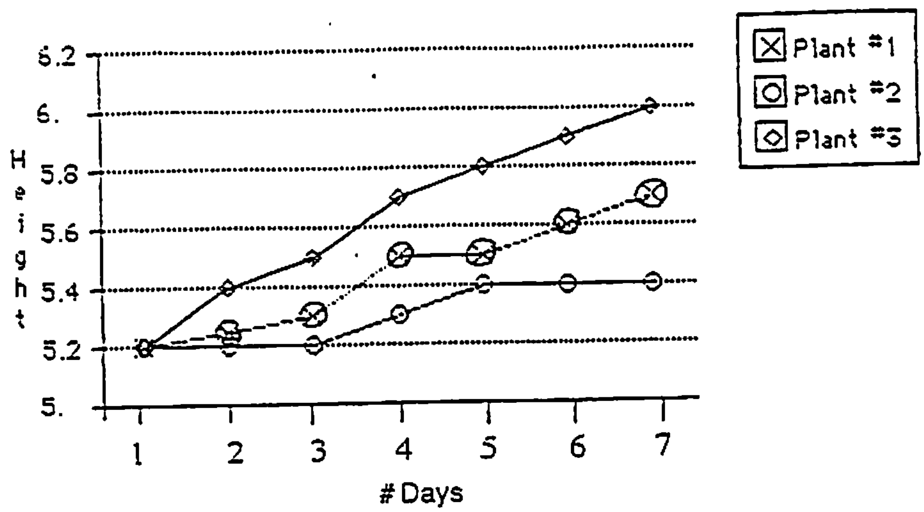
LINE GRAPH - "CONNECT THE DOTS"

Scientists use this type of graph when they measure a specific variable several times from each trial they conduct **AND** when they expect that there is NO simple mathematical relationship between the dependent and independent variable.

If more than one trial is completed, there are two options for displaying the data, again based on what you want to show. If you want to COMPARE the performance of the trials, construct a single graph, and plot EACH line on that ONE graph. If, on the other hand, your trials were identical and were completed to give you the best "average" data, you would then average each set of points and plot a single line on the graph.

For Example: I decide to conduct a study of how tall three plants fed with different fertilizers grow over time. Every day for a week I measure the height of the plants. At the end of the week, I want to compare the growth of the three plants, so I plot the line for each plant on a single graph

Plant Growth

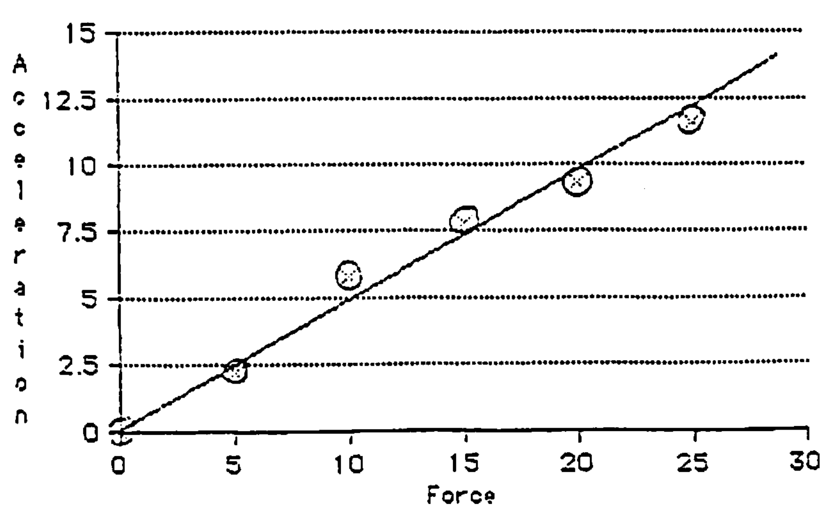


LINE GRAPH - SMOOTH CURVE

Scientists use this type of graph when they measure a specific variable several times from each trial they conduct **AND** when they expect that there IS a simple mathematical relationship between the dependent and independent variable. Most often (at least in high school science!) that "simple mathematical relationship" produces either a straight line or a smooth curved line. In either case, you do **NOT** "connect the dots" on the graph; instead, draw a smooth line or curve which hits SOME of the points on the graph, and that has an approximate equal number of points above the line (or curve) as below the line (or curve).

For Example: I learn in science class that the force exerted on an object is equal to that mass of the object multiplied by its acceleration (F = ma). I test this equation by measuring the acceleration produced when I exert various amounts of force on a ball. I display my results in the following graph:

F=ma



Graphing

Often it is easier to see how a pair of variables are related by plotting a graph. The following steps will help you plot graphs for your lab activities.

(dependent variable) Distance (m)	*(independent vari* Time (sec)
2.0	1.1
2.6	2.3
3.8	2.9
5.0	3.7
9.0	5.2
11.1	6.1
12.7	6.9
17.3	8.3
17.7	9.0
19.0	9.8

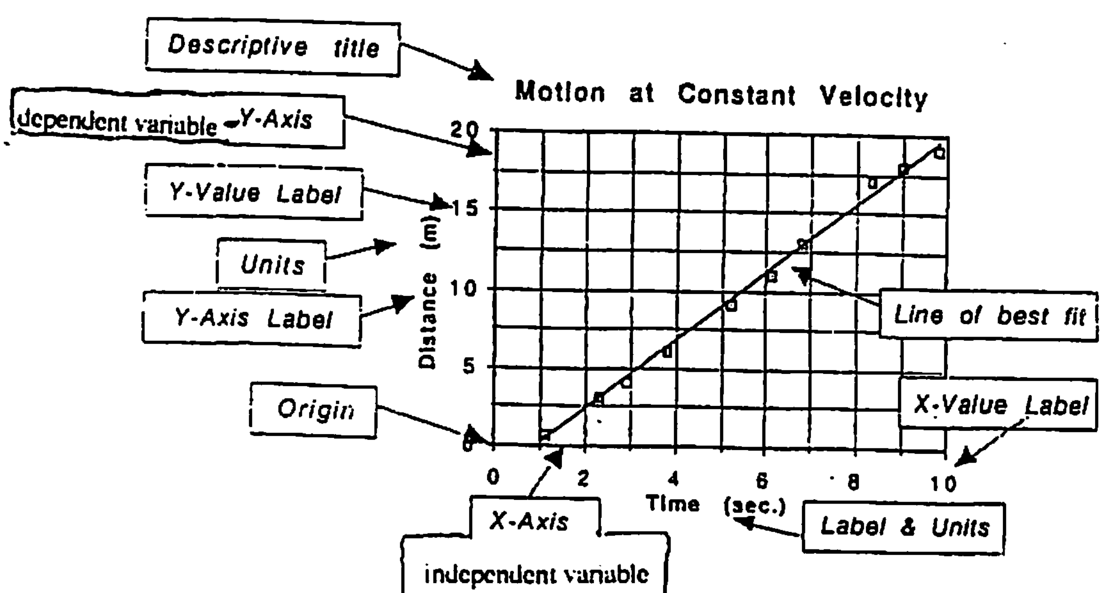
1. Identify the independent and dependent variables. The independent variable is plotted on the horizontal (x) axis. The dependent variable is plotted on the vertical (y) axis.
2. Subtract the lowest value of the independent variable from the highest value. This gives you the range of the independent variable.

In this case, what is the range of the independent variable? ____________

* 3. Mark off the horizontal axis in a way that best fits the range of the independent variable. Spread out the data as much as possible. Let each space stand for a convenient amount. Choosing three or six spaces equal to 10 units is not convenient. How would you find where to plot 1.4? Rather, choose 2, 5, or 10 spaces to represent 10 units.
4. Number and label the horizontal axis. Do not forget to include zero if your data begin at zero.
5. Repeat Steps 2 through 4 for the dependent variable on the vertical axis.

In this case, what is the range of the dependent variable? ____________

6. Plot your data values on the graph. Make each point a small, dark dot with a small circle around it.
7. Draw the best straight line with a RULER that comes closest to connecting the data points.
8. Title the graph. Make sure the title clearly tells what the graph represents.



Experiment #3

Hypothesis : If you smile at people, then more people will be friendly to you.

Experiment : John walks down Main Street in Thomaston at noon on Monday without smiling. He counts and records the number of people who talk to him, and what they said. On Tuesday, he again walks down Main Street in Thomaston, this time smiling. He counts and records the number of people who talk to him, and what they said. John then compares the number of people who talked to him, and what they said.

What is the independent variable? ______________________________

What is the dependent variable? ______________________________

List one constant in the experiment. ______________________________

What is the control? ______________________________

Experiment #4

Hypothesis: If a teacher allows students to eat during a lecture, then the students will stay more focused on the lecture.

Experiment: Mrs. Jones has two Chemistry classes, each with 15 students of average ability. She prepares the same lecture for each of the classes, and delivers it to Class A at 9:00 AM on Monday, and to Class B at 9:00 AM on Tuesday. Class A is prohibited from eating during the lecture, while Class B is permitted to eat. At the end of the lecture, she gives each student a quiz on the material covered in the lecture. She then compares the average quiz scores of the students in each class.

What is the independent variable? ______________________________

What is the dependent variable? ______________________________

List one constant in the experiment. ______________________________

What is the control? ______________________________