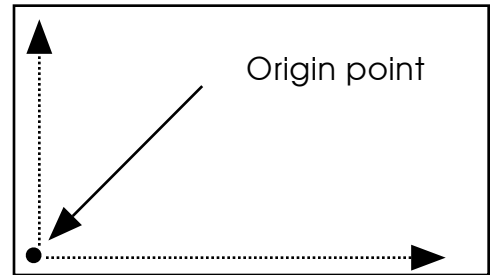


Graphing Directions

1. Since you often must make changes as you construct a graph, ALWAYS USE A WELL SHARPENED PENCIL WITH AN ERASER.

2. If you are creating a graph on a separate sheet of graph paper, you'll need room for labeling and numbering each axis. To do this, position the origin point for the x and y axes about a half inch up from the bottom of the page and a half inch in from the lower left side of the page. Then draw your x and y axis lines.



3. If there already is a graph on a page as part of a lab activity, you can skip step #2 above, since there is normally a margin around the graph to start with.

4. The x-axis is the independent variable. It is that factor that you, the experimenter, are changing or adjusting during the experiment.

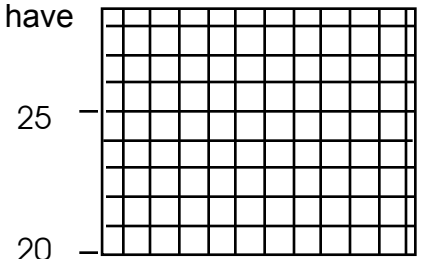
5. The y-axis is the dependent variable. It is the factor that changes or responds to the changes in the independent variable.

6. One of the graphing skills you need to have, is how to set up a proper scale for the x and y axes. Scaling means to number the axis in such a way that you :

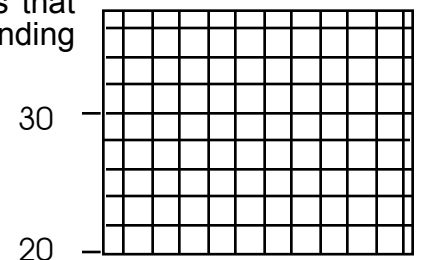
- use most of the horizontal and vertical space for the graph.
- you have the same distance between each of the numbers on an axis.

7. Count how many lines you have to work with for each axis, not counting the origin.

8. Look at the range of data to be plotted for each axis. If you don't have too wide a range of data for one or both of the axes, then you can let each line along the axes represent "1" unit of whatever the data is. You don't have to start your axis at zero on a science graph, but your data should cover most of the length of each axis. For example: If there are 40 lines extending upward along the y-axis, and you need to plot some temperature data that begins at 20° and goes to 58° , that gives you a range of data of 38° . With 40 lines to work with, you can start your y-axis at 20° and end at 60° with just a little leftover space. A portion of the sample graph is shown at right. Place a small 'tick' mark along the side of the axis line and place your number so it lines up with the 'tick' mark. It's a good idea to not have a tick for each line of an axis. It will be neater, and more readable if tick marks are placed every 5 lines along an axis.



9. If however, the range of data is too great to allow each line on the axis to represent 1 unit of data, then have each line represent numbers that are a multiple of 2, 5, or 10. For example: If there are 40 lines extending upward along the y-axis, and you need to plot some different temperature data that begins at 20° and goes to 98° , that gives you a range of data of 78° . With 40 lines to work with, you can again start your y-axis at 20° but this time end at 100° . Each line this time will represent 2° of temperature data, as seen in the sample graph to the right. Since each tick mark represents 2 units this time, tick marks placed 5 lines apart are different by 10° .



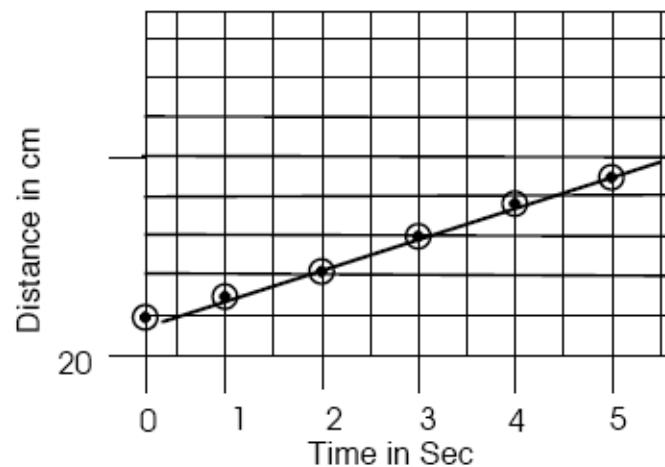
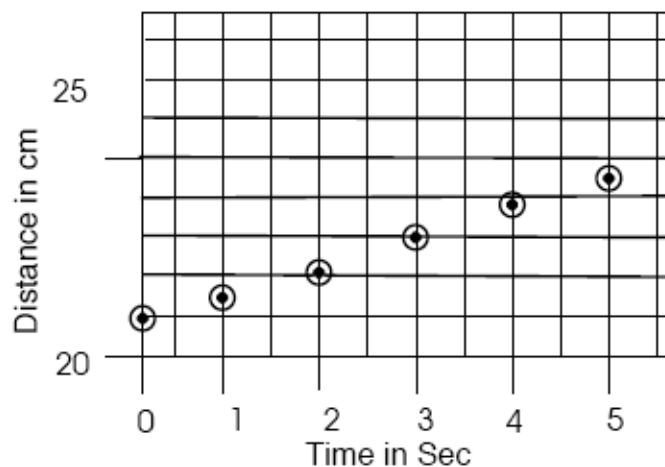
10. Make sure that the numbers are evenly spaced along the x and y axis, and is able to include your lowest as well as your highest data. Even though the sample data has referred to the y-axis, do something similar for the x-axis as well.

11. Label your axis' according to the information you will be plotting. Put the label for the x-axis just below the numbers and put the label for the y-axis just to the left of the numbers, and written from bottom to top. Include the correct units for each label.

12. Plot your points by carefully estimating where the numbers for the x- and y- axis' intersect. Use a small pencil point to locate the spot. When you are sure of the location, draw a small circle around the point, so it is easier to see. Repeat for all of the remaining data points.

13. An important difference between constructing graphs for science as compared to math is as follows. For math graphs, points are always plotted at the intersection of the lines on the graph. For most science graphs, it's rare that you'll ever plot the data at the intersection of the lines on the graph since you often don't get data as whole numbers. Look at the following example of a car rolling down a ramp. A student wants to see how the length of time that a car is allowed to roll down a ramp, affects its distance down the ramp.

Plot the following data	
Time in Sec	Distance in cm
0	21
1	21.5
2	22.1
3	23
4	23.8
5	24.5



- When you plot data that doesn't fall exactly along the line of the graph, you need to approximate where it should be placed. When plotting the point for a time of 1 second, the distance of 21.5 cm would place it halfway between where the line for 21 and 22 cm would be located.

- Since the data was not continuously collected, construct a best-fit graph as shown at right.

- You can see that the points fall in almost a straight line. Some of the points have the line passing through their centers, while others are just a bit off.

14. Had the plotted points seemed to go in a curve, you would have used your hand to draw a smooth arc that comes close to most of the points.

15. Give your graph a title, based on the information plotted and what it was based on. One way to come up with a title, is to state the effect that the independent variable has on the dependent variable or vice versa, and include what it is based on. For the graph just above you could have:

- "HOW THE TIME A CAR IS ALLOWED TO ROLL DOWNHILL AFFECTS THE DISTANCE TRAVELED."
- "DISTANCE TRAVELED BY CAR OVER TIME" Shorter titles are better !
- If you did not mention the car in the title, it would be difficult to determine what the graph is about and you would lose some credit.