

## Pre-Lab 2: Using Microsoft Excel to Plot Data

The below set of general instructions will be used to plot the following data.

Time (seconds)	Distance (cm)
0	0.0
0.10	9.8
0.20	30.2
0.30	59.9
0.40	99.2
0.50	148.9

First, fill in the x values (horizontal) starting in location A1 and moving vertically downward. (You do not necessarily have to use these particular cell locations, but it is not a bad place to enter them if you are beginning to learn about the Excel program)

Now fill in the y values (vertical) starting in location B1 and moving vertically downward. (You do not necessarily have to use these particular cell locations, but it is not a bad place to enter them if you are beginning to learn about the Excel program)

Highlight the data values you entered with the mouse using the mouse's left button.

Use the mouse and click on "insert → chart..."

Select x-y scatter.

Use the mouse and click on "next".

It is good practice to make certain that your data has the correct values in the vertical and horizontal axes.

Use the mouse and click on "series".

Verify that the column of values you want on the horizontal axis is listed as "X values".

For this first graphing exercise it should say " =Sheet1!\$A\$1:\$A\$6 "

This indicates to Excel that the list on numbers is on Sheet1 (observe the tabs labeled Sheet1, Sheet2, and Sheet3 toward the lower left on the computer screen). Each is a separate "spread sheet" in which you can enter values.

\$A\$1:\$A\$6 indicates that the numbers to be plotted at in cells located from A1 to A6.

Verify that the column of values you want on the vertical axis is listed as "Y values".

For this first graphing exercise it should say " =Sheet1!\$B\$1:\$B\$6 "

This indicates to Excel that the list on numbers is on Sheet1 (observe the tabs labeled Sheet1, Sheet2, and Sheet3 toward the lower left on the computer screen). Each is a separate "spread sheet" in which you can enter values.

\$B\$1:\$B\$6 indicates that the numbers to be plotted at in cells located from B1 to B6.

If you find the data is reversed (it should not happen if you followed ALL the instructions in the first graphing exercise) you may remedy the situation by replacing the incorrect column letters in "X Values" and "Y Values" by the appropriate letters.

For Extra neatness, you may rename the series of data points (default name is "series1") to another name by typing the new name in the "Name" box. I often re-name "series1" to "data".

Use the mouse and click on "next".

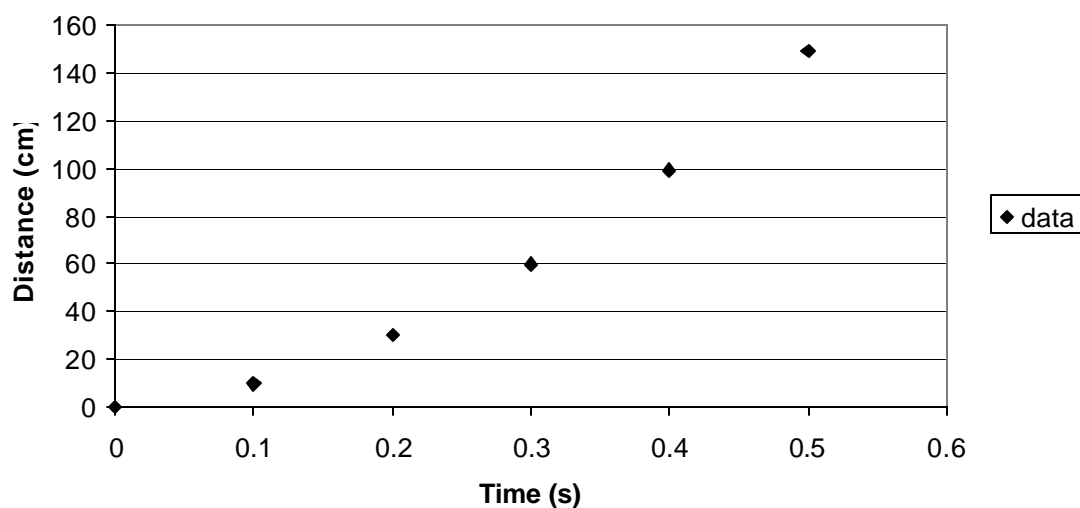
Enter the chart's title, x-axis label, y-axis label.

Use the mouse and click "next".

select new sheet.

Use the mouse and click " finish".

## Distance vs. Time



## Using Excel for calculations

Many times in physics (and when doing scientific or engineering work), one must repeat the same basic calculations using different sets of numbers. As an example, consider trying to find the average speed between the distances in the above table. The first calculation would look like ...

$$v_{ave} = \frac{\Delta x}{\Delta t} = \frac{9.8cm - 0.0cm}{0.10s - 0.0s} = 98 \frac{cm}{s}$$

The second calculation would be

$$v_{ave} = \frac{\Delta x}{\Delta t} = \frac{30.2cm - 9.8cm}{0.20s - 0.10s} = 204 \frac{cm}{s}$$

etc.

Since there are only five such calculations, doing all five on a calculator is not too bad. However, if there were 100 or 1000 such calculations, it would be extremely laborious. The good news is that Excel can do these calculations very easily and quickly.

First, enter the distance and time table into Excel. I am going to enter the first time in the box labeled A1, the second time in box A2, etc. I will also enter the distances in boxes in column B (B1 will contain the first distance, B2 the second distance, etc.).

Now in the box labeled C1, type in the following statement ...

`=(B2-B1)/(A2-A1)`

- Notes:
- 1) Make sure you enter the equal sign.
  - 2) Capitalization is not necessary
  - 3) The math statement is to take the difference of the values in boxes B2 and B1 and then divides this value by the difference of the values in boxes A2 and A1.
  - 4) If this step was done correctly, Excel should return a numerical value in box C1

Excel has now done the first calculation for us. You would be correct in noting that for a single calculation, a calculator is faster than using Excel. However, the next steps make Excel calculations useful.

Now use the mouse to highlight box C1.

Use the mouse and click on "edit → copy" (or use the shortcut Ctrl c)

Now use the mouse to highlight boxes C2 through C5.

Finally, use the mouse and click on "edit → paste" (or use the shortcut Ctrl v).

Excel should now properly calculate the average velocity for all of the other distances.

Note: Since box C2 is one box below box C1, its calculation is  $(B3-B2)/(A3-A2)$ . Box C3's calculation is  $(B4-B3)/(A4-A3)$ , etc.

## Pre-Lab 2 (To be turned in on separate page)

- 1) Construct a full-page replica of the above graph (page 2). Make certain you follow all of the rules discussed in class on graphs.
- 2) For the below set of data values, find the average acceleration between each of the speeds using Excel (you may simply hand in a print out of the spreadsheet).

Time (sec)	Speed (cm/s)
0.0906	138
0.1361	184
0.1714	219
0.2010	249
0.2267	275
0.2281	274
0.2511	299
0.2620	310
0.2916	340
0.3075	355
0.3187	364
0.3371	386
0.3417	390
0.3642	408
0.3723	422
0.3872	435
0.3994	441
0.4224	471
0.4520	499