

Graphing Tutorial

This tutorial is intended to get you started with the basics of creating graphs from the results of your models¹. Although there are other software packages available that may be better for scientific graphics, this tutorial will utilize Excel because most students will have access to or some familiarity with that program. You should be able to learn enough about Excel to draw simple graphs as needed for the course reports, but many (even most) of the features of this program will not be considered.

Start by opening the Excel program to a basic spreadsheet and enter the following data into two columns:

0.5	1.0
1.2	1.1
1.9	2.1
2.7	3.5
3.8	4.1
4.9	4.9

Now for most of our graphs, we will want to draw a simple x:y plot of these data points connected by lines. Here, the left column will represent values on the x-axis and the right column represents values for the y-axis. To begin the graph creation process, select the two columns of data that you have just entered. Next, select the toolbar tab “Insert” and from the choices in the Charts section, pick Scatter, and then the graph type with point symbols connected by straight lines.

Note that it is important to select a “scatter” type of plot. If you pick an Excel “line” graph, the program will use the row number of the data on the horizontal axis instead of the values specified in the left column above.

The chart should appear in your spreadsheet. There are probably many things about the graph that you would like to change. You might want different ranges from the horizontal and vertical axes. You might want to change the overall appearance of the graph. If you select the graph in your spreadsheet, a set of Chart tools should be visible near the top of the program’s window. If you pick the Layout tab, you can add or edit items like:

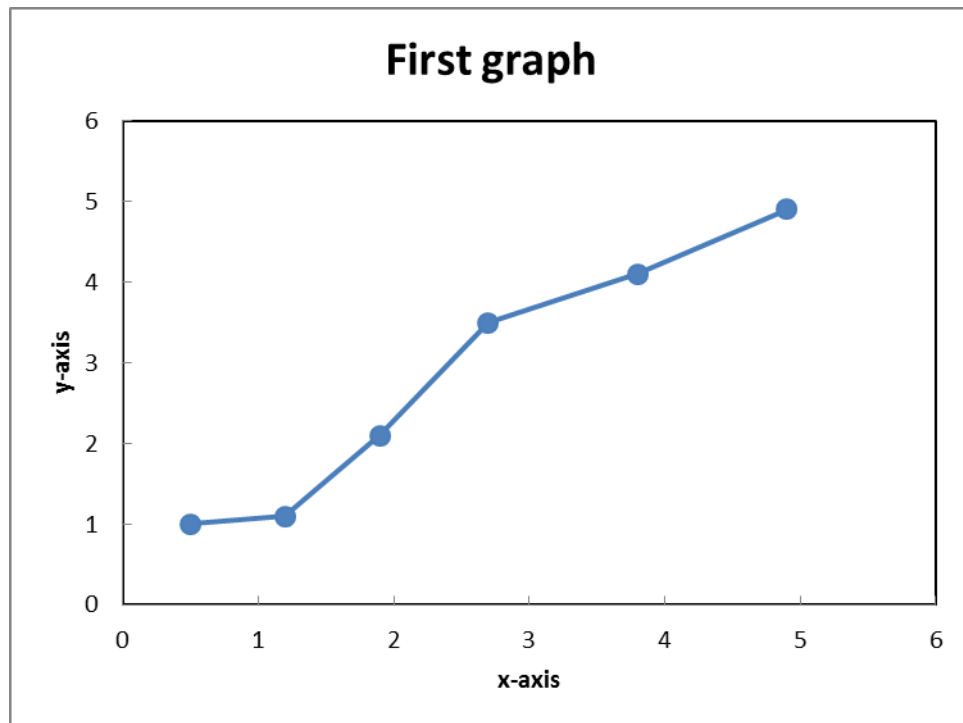
- Axis titles
- A chart title
- The range for the axes and whether or not gridlines appear.

A legend may be present in the graph with a name like “Series1”. You can edit this name to make it more meaningful to your graph. Or you can delete it altogether.

¹ For a more extensive tutorial, try <http://www.ncsu.edu/labwrite/res/gt/graphhut-home.html>, or search the internet with keywords like “graphing tutorial”.

If you hover your mouse pointer over one of the data points, you can right-click and select Format data series to change the type of marker (the symbol for each point) to, say, a circle or square.

Once your graph has been pasted into the spreadsheet, you can move it around or change its size. You can also edit many of the graph features. Often scientific graphing would not utilize the horizontal gridlines that may be drawn by default next to each value on the y-axis. These can be removed from the Layout graph tool, using the Gridlines choice in the Axes section. Below is one possible version of the graph



Note that you can also copy and paste these graphs into a word processor as part of your report. That's how the above graph was inserted into this document.. For now, move on to looking over some of the features that may be edited. Practice "right-clicking" your mouse on the various elements of the graph and seeing some of these options.

You can change or add to the data plotted in the graph:

- With your graph selected in Excel, look under the Chart tools and pick the Design tab. In the Data section, pick the Select data choice. A dialog will appear for selecting the data source for the graph. There should be a Series1 already present.
- You can select Add to include another line in your graph. .

- Then pick the x and y columns using the little button on the right next to each place for entering a data range. After picking this button, use your mouse to select each set of data to be used for drawing the added line on your graph.
- The best way to experiment with adding more lines to your graph is to add another column or two of numbers to the spreadsheet. Then go through the steps above to add another series.

Many of the chart editing options can be reached by right clicking with your mouse within the plot area or within the axes themselves. Try out some of these options to see how they affect the appearance of the graph.

Importing data from text files

The above exercise started with data entered manually into the spreadsheet. It is also possible to import data from a file that has been produced by another program. We will use this method a lot because our model programs can generate lots of data and we do not want to type all this data into the spreadsheet by hand.

So create a sample data file. Start up a simple text editor on your computer like the “Notepad” program supplied with the operating system. Type in the same data as shown above with a single space between the numbers in each row. Your results will probably look like this:

0.5	1.0
1.2	1.1
1.9	2.1
2.7	3.5
3.8	4.1
4.9	4.9

Next, save the file somewhere on your computer that you can find later - use the default “.txt” extension as part of the file name.

Now return to your Excel spreadsheet. Find an open area in the spreadsheet (could be an unused pair of columns) and select a cell as a place where you will insert this external data from your newly created file.

- Choose the Data tab and then in the Get External Data section, pick From Text.
- Now browse around your computer until you find the file you just created.
- Select that file and push “Ok”.

You will see the text import wizard that will help Excel figure out how to import the external data. The first choice has to do with how the numbers are located within the rows of the file. Are they organized into fixed width columns? Not likely, in many cases. Most likely they will be separated (delimited) by spaces or some other characters. Make sure the Original data type has Delimited selected.

Push “Next” to move on to where you will indicate how the numbers are spaced.

Now you can select from a list of possible delimiters, like commas or tabs. You want to have “Space” checked because you used spaces in between the numbers when typing in the file.

At this point, the “Data preview” should show you a line in between the columns of numbers indicating that Excel will be making a correct choice about how to separate (or parse) the rows of numbers.

Push “Finish” and then “Ok” to put the data into the existing worksheet.

Once the data are present in the worksheet, you can use them to draw a graph just like the one outlined in the first part of this exercise.

Sometimes it is better to use different characters to separate numbers as opposed to using just single spaces. For example, if the numbers in various rows take up different amounts of space, they may not line up vertically and Excel may not be able to figure out the correct alignment. Here’s an example:

Go back and edit that data file from earlier until it looks like this, where we have added spaces before some of the rows and changed the 1.9 into 10.9:

0.5	1.0
1.2	1.1
10.9	2.1
2.7	3.5
3.8	4.1
4.9	4.9

Now try to import this data file into Excel by the same method outlined above. After selecting “Space” as the delimiter, you will see that some incorrect choices are being made as to how to divide up the rows of numbers.

Now go back and edit the data file, replacing the spaces between the numbers with commas giving:

0.5, 1.0
1.2, 1.1
10.9, 2.1
2.7, 3.5
3.8, 4.1
4.9, 4.9

When you import this new data file, you can check “Comma” as a delimiter and the spacing will be corrected. You can also use tabs for spacing numbers.