

INTRODUCTION TO COMPUTER TOOLS

OBJECTIVE

To familiarize yourself with the computer programs and utilities that will be used throughout the semester. You will learn to use *Microsoft Excel* and *Kaleidagraph* to perform some simple tasks. You will use *Microsoft Word* to write up your lab.

THEORY

Microsoft Excel is a spreadsheet program that allows you to manipulate text as well as data. Most importantly for the labs you will be doing, *Excel* can perform calculations that would otherwise be very time-consuming. Learning a few basic commands and skills in *Excel* will allow you to save much calculation time the rest of the semester.

A few starters:

- Always bring a disk with you to class and save your work often! Your instructor can tell you how to save and where to save your work on the computer if you don't have a disk today.
- The *Excel* spreadsheet is made up of rectangles called "cells."
- Text is entered into a "cell" by clicking on the cell with the mouse, typing the desired text, and pressing "return."
- To execute a mathematical formula in a cell, you must **always first type "="** (an equals sign), followed by the desired formula. For example, to compute $5+6$, type "**=5+6**" into an empty cell and press "return." The desired answer, "11," appears in the cell where you entered the formula. The actual formula you entered in the cell appears at the top of the screen underneath the menu bar. This works for any cell. If you are in an unfamiliar spreadsheet and want to see the formula for a particular cell, all you have to do is "click" on the cell using the mouse, and the formula for that cell appears at the top of the spreadsheet.
- *Kaleidagraph* is a graphing program that you will use to analyze the data we compute in the *Excel* spreadsheet. To do this, you must transfer the data from the *Excel* spreadsheet to the *Kaleidagraph* spreadsheet. We will use a typical method called "cut and paste."
- Once you have the data you can make a graph that will quickly and easily show what trends or relations the data exhibits. *Kaleidagraph* is versatile and allows the user complete control over how the data will be presented. It is up to you to decide (or to be instructed!) as to what kind of graph will be best.
- After we have analyzed our data through relevant calculations and graphs, we can write up the results using *Microsoft Word* (see the Report Example file in the *Phy251* folder or ask your instructor about the proper form of your report). The spreadsheet we created in *Excel* and the graph we made in *Kaleidagraph* can be pasted into this document as well, and the whole saved as one complete document. Keep in mind that the principles used today will be used again and again throughout the semester.

PROCEDURE

Open the lab folder entitled *Introduction to Computers* which is in the “251 Lab” folder on the Desktop. Remember that you can open these by double-clicking on their icons with the mouse. Then double-click on the document whose name ends in “.xls.” We will always use the version of the labs in the folders that end in “.xls,” which indicates that the document is an Excel spreadsheet. You will see a spreadsheet with short instructions, and 3 columns. Fill the column labeled X with numbers ranging from 0 to 2π in steps of 0.2. Do not take the time to do this all by hand! You can have *Excel* do it for you.

Here’s how: In the first cell of the column, **B8**, enter our first value which is zero. Then in the second cell, **B9**, we can give *Excel* a formula we want it to follow in order to fill in the rest of the column. In each cell, we want it to add 0.2 to the value in the cell just above. That will fill in the column in steps of 0.2. Therefore in cell **B9** enter the formula “=B8+0.2” and press return. Then highlight the entire column starting with the cell that has the formula in it, B9. Then go to the “Edit” menu at the top of the screen, scroll down to “Fill,” then “Down,” and then let go of the mouse button. Your column should be entirely filled in increments of 0.2.

In the next column you are going to compute the sine of X. We will again do this using a formula. Begin in the first cell of the column and type “=Sin(B8)” and hit Return. By typing **B8** in the parentheses we are telling *Excel* to take the sine of the value which it finds in **B8**. Then you can use the same process as above to “fill-down” the entire column. If you do this just as described above, *Excel* knows to start with **B8**, take the sine of each successive value in the B-column, and place the new value in each successive cell of the C-column. Now repeat this same procedure, only this time for cosine X in the D-column. When your spreadsheet is complete, make sure you save!

Once this is done, you are ready to transfer data into *Kaleidagraph* using the cut-and-paste method. The steps of this process are:

1. Highlight the area on the spreadsheet you want to move. Highlight ONLY data. Do NOT bring any cells with text in them, such as column headings, to *Kaleidagraph*. The program will NOT make a graph for you if you do.
2. Choose “Copy” from the “Edit” menu at the top of the screen, OR press “Ctrl-C” to copy the highlighted text to the computer’s “clipboard.”
3. Open *Kaleidagraph* (usually by double-clicking its icon on the desktop) and click on the upper left-most cell on its spreadsheet that appears.
4. Choose “Paste” from the “Edit” menu OR press “Ctrl-V” to paste in your data.

You can change the column names easily in the *Kaleidagraph* spreadsheet by double clicking on them after you’ve transferred in your data. In this case you will want to call the first column X, the second Sin X and the third Cos X, or something similar. Renaming the columns at this time is

convenient because when you later plot your graph, *Kaleidagraph* will automatically label your axes for you using your column names.

Now you are ready to make a graph. At the top of the screen pull down the “Gallery” menu, and scroll down to “Linear” and then “Scatter.” This option will create a scatter-plot of the points you computed for Sin X and Cos X; a graph similar to what you would have if you graphed the points out by hand on paper. A menu box will pop up asking you to specify which columns are to be plotted on the x- and y-axes. Select the X column for the x-axis, and BOTH Sin X and Cos X for the y-axis. (You are plotting Sin X *and* Cos X versus X). Select “New Plot.” After a few seconds, your graph will appear.

Now you are ready to experiment with some options of *Kaleidagraph*. You can double click on almost anything in your graph to change it. For example by clicking on the title, you can change it to something more appropriate than “DATA 1.” You should do this. The appropriate way to title graphs is “‘What’s on the y-axis’ vs. ‘What’s on the x-axis.’” So for our graph, the most appropriate title is “Sin X and Cos X vs. X.” You can also change the axis labels by double-clicking on them. However, if you labeled your columns on the *Kaleidagraph* spreadsheet properly, you’ll have less work to do. Normally you might want to change the axis names just so you can add units to them, since axes labels should always include the appropriate units. However, in this case no units are necessary. Since you already labeled your headings correctly, your graph already has the axis titles “Sin X” for the y-axis and “X” for the x-axis, or something similar. However, technically the graph is plotting Sin X **and** Cos X so you should change your y-axis title accordingly. Have some fun with the options on the menu bar too. Try doing a “Curve Fit” to your points. Use the “Smooth” option for best results. You can also change the range over which your graph is plotted by choosing “Plot” from the menu bar and then “Axis Options.” You will see that you can select which axis you wish to change and then specify a “min” and a “max” value. Try changing your graph’s ranges to 0 to 6.5 for the x-axis and -1 to 1 for the y-axis. You will see that this makes your graph more nicely centered. Once you are happy with the results, save them before trying to print!

You now have data and you have a graph. You can print them out now or transfer them into *Microsoft Word* while you are writing up your introduction and conclusion, depending upon what your instructor would like you to do. If you need to transfer everything into *Word* use the cut-and-paste method you have learned. To copy your graph however, you will need to use the “Copy Graph” option under the “Edit” option on the menu bar. Once you have your write-up completed you are done! Even if you don’t copy your spreadsheet and your graph into *Word*, make sure you hand them in with your write-up.