Using Microsoft Excel (version 4)

For readers of An Introduction to Thermal Physics
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Entering data and formulas

When you launch the program you'll see a blank "worksheet", a space with rows and columns where you can type things. Each small rectangular space in the worksheet is called a "cell". You can click the mouse in any cell and then type anything you like there. Any entry that does not start with "=" is displayed literally. An entry starting with "=" is treated as a formula, and its result is displayed in the cell. Thus the formula "=6*7" would cause the program to display the number "42". The symbols +, -, *, /, ^ represent addition, subtraction, multiplication, division, and raising to a power. Use parentheses for grouping. To refer to the contents of another cell in a formula, use the column letter and row number of that cell; for instance, the formula ".=A1+1" takes the contents of cell A1, adds 1, and displays the result. When you are finished typing an entry in a cell, be sure to press "return" or "enter"; using the mouse before you do so can produce unexpected results.

Useful functions

Excel has hundreds of built-in functions that can be used in formulas. For instance, ".=LN(D4)" calculates the natural logarithm of whatever is in cell D4. For computing multiplicities you'll need the function COMBIN; for instance, ".=COMBIN(100,20)" computes the number of combinations of 20 items chosen from 100, \( \binom{100}{20} \).

Copying formulas

To copy a formula to the cell or cells immediately beneath it, first point the mouse at the cell containing the formula, then press the button and hold it down as you drag downward to select all the destination cells. Release the mouse button. Then choose the "Fill Down" command from the Edit menu. Normally, all cell references (like "A1") are treated as relative references, so the row numbers are modified appropriately in the copied formulas. If you do not want the row number to be modified, it should be preceded in the original formula by a dollar sign (e.g., "A$1"). The same applies to column letters if you use the "Fill Right" command.

You can use the "Fill Down" command to make a column of consecutive numbers. For example, if you put a "0" in cell A1 and ".=A1+1" in cell A2, then applying "Fill Down" to cell A2 and the cells below it will generate the numbers 1, 2, 3, and so on.
**Making a graph**

To make a graph of one column of data vs. another, first use the mouse to select the first column (press on the first entry, hold the button down as you drag to the bottom, release). Then hold down the control ("ctrl") key as you select the second column of data in the same way. Now click the "Chart Wizard" button, which is the second button from the right in the tool bar at the top of the screen. Next, use the mouse to draw the outline of the chart: point to where you want the top-left corner, press the button, and hold it down as you drag to the lower right corner. After you do this, the Chart Wizard will lead you through five dialog boxes, which should be fairly self-explanatory. In most you can just click "Next" to choose default settings, but in the second box you'll usually want to choose an "XY (Scatter)" plot. Do not choose a line graph, which works only when the data points are evenly spaced horizontally. (There is a way to connect the points of a scatter plot with lines, but to learn it you'll have to ask a wizard or read the manual.)

**Printing**

Before printing anything, it's usually a good idea to choose the "Print Preview" command from the File menu. If your worksheet is wider than it is long, you may wish to use "Page Setup" to put the output in landscape orientation. To print only part of a worksheet, use the mouse to highlight that part and then choose "Set Print Area" from the Options menu.

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