Appendix B

Microsoft Excel Primer

Oftentimes in physics, we collect lots of data and have to analyze it. Doing this analysis (which consists mostly of performing the same operations on lots of different parts of the data) would be time-consuming and monotonous if performed manually. Knowing how to use computers and software to simplify the analysis portion leaves you with more time to do Science. Believe it or not, Microsoft Excel and similar spreadsheet programs aren’t half bad for elementary analysis.

B.1 Selecting Cells

Before it is possible to enter, edit or format data, it is necessary to select the cells required. Highlighting cells involves clicking-and-dragging across the cells you want selected. The mouse pointer (or cursor) changes shape dependant upon where in the cell the selection is made. The following shows the options available.

<table>
<thead>
<tr>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>To select cells, the pointer should be a thick, white plus sign</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>To move cells, the pointer should be a north-south-east-west facing arrow</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>If the pointer is a double arrow with a perpendicular line, the column or row it is pointed to (Column C in this example) will be resized</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>If the pointer is a black plus sign, it indicates that the Auto-Fill handle is selected.</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Rows or columns can be selected by clicking on the row or column heading. Using [SHIFT] with the arrow keys will highlight cells as will clicking on a cell in the corner of what you
want selected, then holding down the [SHIFT] key and clicking on the cell in the opposite corner of the area you want selected. Multiple ranges can be selected after the first by holding down the [CTRL] key while selecting these ranges.

B.2 Enterino and Editing Data

Data can be entered into any cell of the worksheet. When entered the data will appear in the cell and in the formula bar. The data that is entered into a cell can be a number, text or a formula. Formulas must begin with an equals (=) character. Formulas will be dealt with more fully in a later section. Some things to remember about entering and editing cells:

When entering or editing text, you can cancel your edit by clicking the red X to the left of the formula bar or by pressing the [ESC] key. To accept the entry, either click the green check mark or move off of the cell (either by selecting another cell or by pressing the [TAB] or [ENTER] key).

By default, when you type text into a cell, it will automatically align to the left of the cell. Numeric values align to the right side of a cell. The alignment of data within cells will be covered further in the Formatting section.

You can edit the contents of a cell by double-clicking the cell, or click the cell, then click the insertion point at the place you wish in the formula bar.

To delete the contents of cells, highlight the cell(s) to be deleted and press the [DELETE] key.

AutoFill

If you have to enter a series of items e.g., consecutive months, quarters, or dates then Excel can fill these in for you with the AutoFill Handle. The AutoFill Handle is a small black square at the lower right corner of the active cell. Your pointer will display as a black plus sign when you’re on it. When you click-and-drag the AutoFill handle, the computer will complete the series for you. If two cells are highlighted that have a constant increase or decrease in value Excel will detect this and AutoFill the remaining cells for you.

becomes
Resizing Columns and Rows

If the text in a column is too wide for the size of the column, it will be truncated and numbers will appear as a series of # (hash) characters. You can resize columns or rows by clicking and dragging on the column border (or below the row border). If you double click next to the column or row border it will automatically be resized to fit the widest entry. You can also resize columns (or rows) by selecting the required operation from the Format menu. If you wish to resize more than one column or row at a time you must highlight them first.

If you change the font of a cell to a different size, the height of the row will adjust automatically. When you resize a column or row, you are resizing the ENTIRE column. You cannot adjust the width or height of individual cells.

B.3 Page Setup and Print Preview

It is always a good idea to check your Page Setup and to view your work with Print Preview before printing out your work. Excel can detect the printable area of your spreadsheet automatically but Page Setup allows you much closer control over how your work is printed. Selecting Page Setup from the File menu will display a dialog box with 4 tab sheets on it.

![Page Setup dialog box]

The Page Tab allows you to select the page orientation and the scaling of the page. Often-times, the Landscape orientation will be most efficient.
Print Preview

Selecting the Print Preview button from the toolbar, Print Preview from the File menu, or Print Preview from the Page Setup dialog box will allow you to preview your spreadsheet before sending it to the printer.

B.4 Working with Formulas and Functions

Formulas are a crucial feature of Excel, as they allow different values to be entered into the worksheet and Excel will automatically calculate the result. Besides doing the basic arithmetical operations, Excel can also do more sophisticated calculations—scientific, financial, statistical—by offering a wealth of predefined functions.

Creating a Formula

Given the following worksheet:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Region</td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td>Apr</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>North</td>
<td>100</td>
<td>150</td>
<td>175</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>South</td>
<td>75</td>
<td>140</td>
<td>160</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>East</td>
<td>60</td>
<td>70</td>
<td>85</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>West</td>
<td>80</td>
<td>50</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To enter the total number of sales for Jan, we could simply select cell C10 and enter

\[ = 100+75+50+60 \]

Note that formulas ALWAYS begin with the = (equals) sign!

This would give us the correct answer, but what would happen if one of the values changed? As we had entered the values directly cell C10 would not be updated—the value displayed would then be incorrect. To overcome this problem, we could enter the Cell references.

This time, we type, into cell C10: \[ = \text{sum(C5:C8) \} and get the same answer! This way, if any of the numbers change, our sum is updated automatically.

130
Copying Formulas

You can copy formulas to other cells and Excel will update the cell references as needed. Either do a Fill Down, or use the Copy/Paste commands.

A List of Commonly-Used Formulas

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>=sum(number1, number2,...)</td>
<td>Computes the sum of the numbers in the range.</td>
</tr>
<tr>
<td>=average(number1, number2,...)</td>
<td>Computes the arithmetic mean of the numbers.</td>
</tr>
<tr>
<td>=stdev(number1, number2,...)</td>
<td>Computes the standard deviation of the numbers.</td>
</tr>
<tr>
<td>=abs(number)</td>
<td>Computes the absolute value of the number.</td>
</tr>
</tbody>
</table>

B.5 Creating Graphs with Excel

Excel offers a number of different means to present your data. In Astronomy lab, the only type of graph you’ll ever use in the XY (Scatter). This tutorial will walk you through the steps needed to create a chart of this type:

1. Enter your data into Excel. For simplicity, put the data for the x-axis variable in a column to the left of the data for the y-axis. For this example, I measured the radius and circumference of a number of different sized circles. I want to create a plot of circumference vs. diameter:

   Here’s my data. Notice how everything is labeled and has units. This is important!

   ![Data Table]

2. I have to tell Excel to calculate diameter by typing =2*A2 into cell B2 and Filling Down:

   ![Formulas Table]
3. I need to highlight the data that I want to plot:

4. Now, click the Chart Wizard button, , from the toolbar. A Chart Window will open.

5. Select . Do not select a sub-type that connects the data points with lines or smooth curves. Click the Next button.

6. A Chart Source Data window appears. We’ve taken care of this by correctly highlighting our data. Make sure that the preview of the chart looks like something you’d expect. Click the Next button.

7. In the Chart Options, give the chart an appropriate, descriptive title. Label your axes correctly, including units:

8. Click on the Legend tab and deselect Show Legend. There’s no need for a legend in the plots you’ll be making. You can adjust the properties in the other tabs to make your chart look the way you want it to.


10. You’ll want to clean up your chart to make it look more appealing. Double-click on the Chart Area (be careful not to double-click on the grid-lines):

11. A Format Plot Area window opens. In the Area section, select None. This will make your plot more readable:

12. We can add a Line of Best Fit to our graph by selecting Add Trendline... from the Chart Menu.¹

13. Select a Linear Regression. Then, click on the Options tab. Select Display equation on chart and click OK

¹If the Chart Menu isn’t visible, you must first single-click on your chart
14. Click on the equation and drag it to a location that looks nice:

15. The last thing you’ll want to do is print out your chart. If you select your chart (by single-clicking on it), and choose **Print** from the **File** menu, then *only* the chart will be printed (and it will take up an entire page. Make sure you’re printing what you want by first doing a **Print Preview**.)