PHYS 102    Spread Sheet & Graphing   Instructions  
  
Investigations in physics involve data collection and analysis. Throughout the term we will use excel spread sheet program for calculations, data analysis, and graphing. In this activity you will be introduced to tabulation of data, calculating new variables, and graphing with excel.

*A1. Graphs:*

* How to make them? Excel: XY scatter plot.
* How to name them?
* How to name the axes with units?
* Slopes have units. How to find the unit of a slope?

*A2.* Percent error: %Error is used to compare a measured value with an accepted value.



*B. Tabulation of data and Calculating values for new variables:*

1. Lengths and widths of many rectangular card boards are given below. Enter them in the excel spread sheet program. Please note that the titles and units are in the first row.

|  |  |
| --- | --- |
| Length (cm) | Width (cm) |
| 2.5 | 2.3 |
| 5.1 | 4.3 |
| 5.4 | 4.5 |
| 15.1 | 10.5 |
| 16.5 | 14.5 |
| 25 | 20 |
| 30.5 | 25.3 |
| 54.7 | 49.7 |
| 175 | 150 |

2. Title the third column as Area with appropriate units. Adjust the column width as necessary.

3. Enter the formula to calculate the area in cell C2 as, =A2\*B2, and enter. Go back to cell C2 and move the mouse to the lower right corner until the white plus becomes a black plus. At this point click and drag down the mouse until cell C10 is high-lighted and then release the mouse. Now the calculated area is displayed in column C.

3. Insert your data table in the data sheet.

*C. Calculating values for new variables: Volume and Density*

1. You have the length, width, height, and mass data for rectangular solids. You will calculate the volume and density using the following equations:

    Volume = length X width X height;    Density = Mass/Volume.

|  |  |  |  |
| --- | --- | --- | --- |
| Mass (g) | Length (cm) | Width (cm) | Height (cm) |
| 31.6 | 2.1 | 1.8 | 3.1 |
| 231.1 | 3.1 | 2.5 | 4.2 |
| 140.9 | 2.7 | 1.9 | 3.5 |
| 683.1 | 4.3 | 3.5 | 5.1 |
| 197 | 2.4 | 2.1 | 3.4 |

2. Enter the above data in Excel, create two more columns for volume and density and let excel calculate volume and density.

3. Insert your data table in the data sheet.

*D. Graphing Data*

Here you will enter some temperatures in degrees Celsius, convert the temperature to degrees Farenheit using this [website](http://www.wbuf.noaa.gov/tempfc.htm), and graph Tf versus Tc.

1. Start with a blank page and title the first column as Tc (0C) and the second column as Tf (0F). Enter the following temperatures in degrees Celsius in the first column: -40, -20, 0, 20, 40, 60, 80, 100, 120, 140, 160, and 180 .

2. Convert the above temperatures to degrees Farenheit and enter their values in the second column.

3. Graph Tf versus Tc: Tf on Y-axis and Tc on X-axis.  
  
4. From the displayed equation you can obtain the temperature conversion equation for Tf. Write down the equation in the data sheet.

5.  Now you will plot Tc versus Tf: Tc on Y-axis and Tf on X-axis.

6. From the above displayed equation you can obtain the temperature conversion equation for Tc. Write down the equation in the data sheet.

*E. Graphing Data: More than one set*

1. Volume and mass data for two metals are given below:

|  |  |  |  |
| --- | --- | --- | --- |
| Metal-I | | Metal-II | |
| Volume (ml) | Mass (g) | Volume (ml) | Mass (g) |
| 1.1 | 2.8 | 1.5 | 16.5 |
| 2.3 | 6.2 | 2.0 | 22.5 |
| 3.0 | 8.1 | 3.1 | 35 |
| 4.5 | 12.1 | 5.1 | 57.6 |
| 6.1 | 16.5 | 6.0 | 68 |
| 8.2 | 22.1 | 8.1 | 91.5 |

2. Enter the data for Metal-I first. Create a column for density and let excel calculate it. Continue to enter the data for Metal-II and let excel calculate its density too.

3. Plot Mass versus Volume for both metals on the same graph. Make sure to include the title for the graph and names with units for the axes.

4. Obtain the densities of the metals from the slopes and record them (including units) in your data sheet.

5. Insert your graph in the data sheet.

*F.* [*Discovering Pi*:](file:///G:\PHYS%20102%20A2011\Discover%20Pi%20Pasco%20Manual.pdf)   
Purpose: Experimentally determine the value of π and compare it to the accepted value.