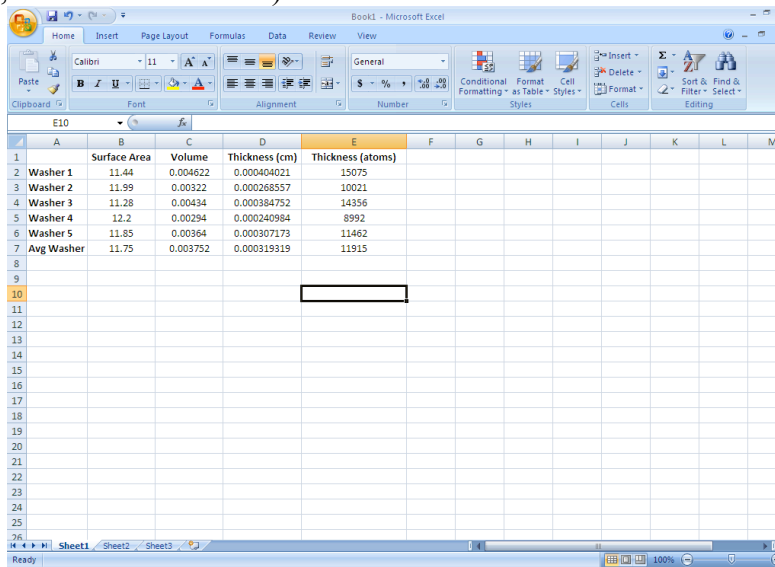


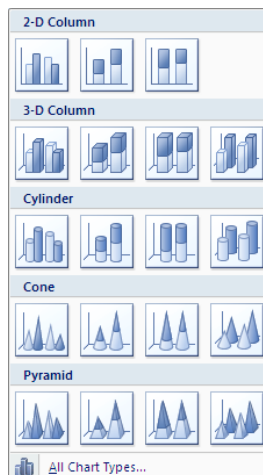
Directions for Creating a Column Graph and Plotting the Standard Deviation of the Average in Excel 2007

We will create a column graph comparing 5 volumes and their average volume for 5 Zinc washers. Also we would like to plot a standard deviation error bar on our average volume column to show the spread/dispersion of our experimental volume data.

1.) Enter your raw experimental data into Excel. Let the rows be for individual washers (i.e., Washer 1 to Washer 5 & Average Washer). The columns then will be designated for the washer properties (i.e., Surface Area, Volume, Thickness in Atoms).



2.) To plot the data entered. Click on Insert Tab (to the right of the Home Tab). Choose Column Graph. Click on the Column Graph icon. Choose the 2-D Column graph called “clustered column” or the button on the far left under 2-D.



3.) Choose Chart Layout 9 (third row on the right). Layout 9 is the easiest option for adding titles later. Under chart styles you may choose your own color preference.

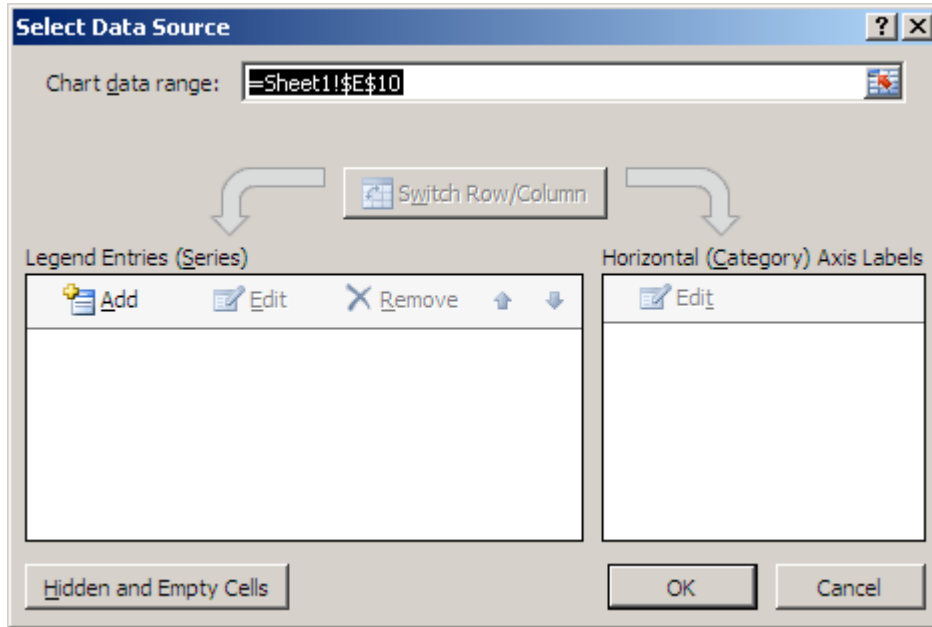


Chart Layout

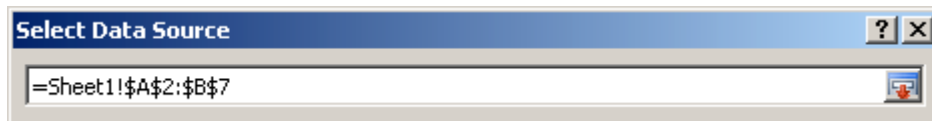


Chart Styles

4.) Click on the button “Select Data”. The box shown should appear.

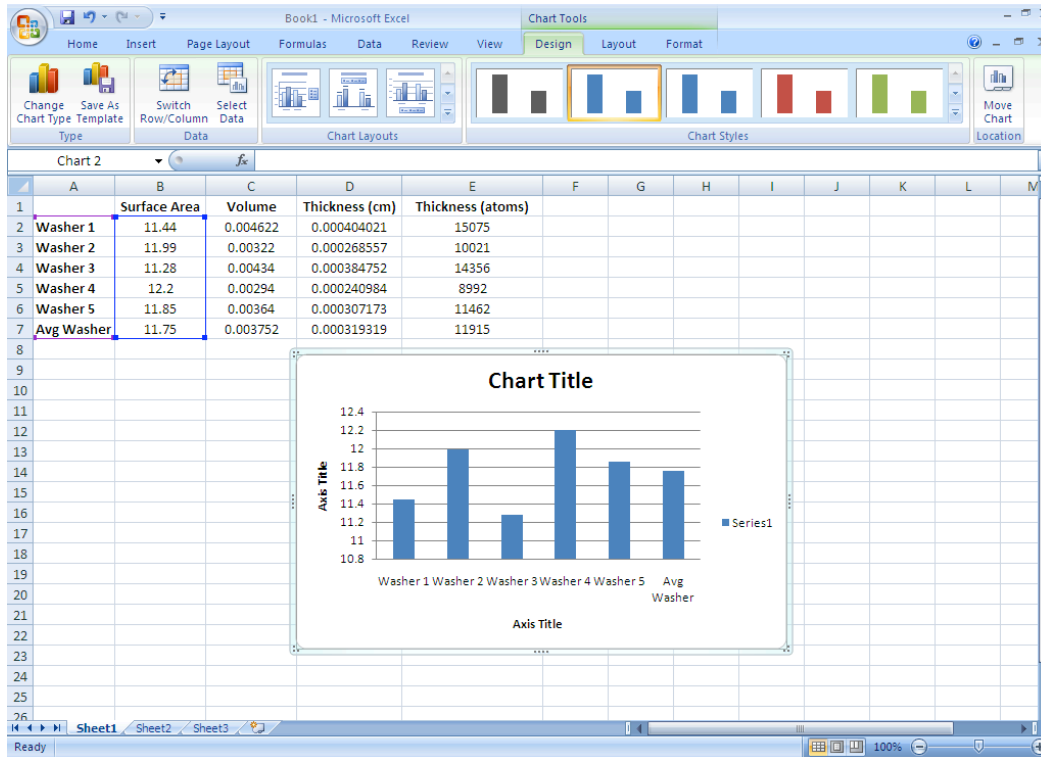


5.) Click on the red arrow to the left of the “Chart data range” box. This will take you to your spreadsheet. Highlight the values that you want to graph, by clicking on the top left cell “Washer 1” and holding the left mouse button down scroll over the desired data. When you let go of the mouse button, the values to be graphed should be encircled by a dashed line and the cell numbers will appear in the Select Data Source box. At which point you will need to click on the red arrow to the left of the box again.

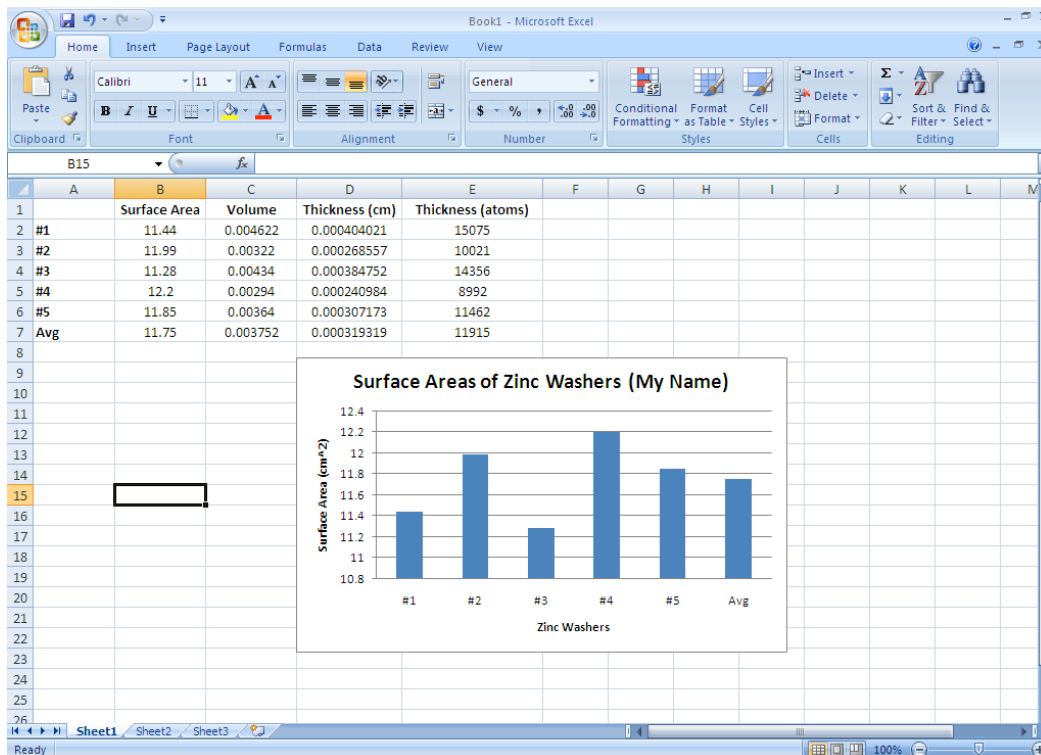


The selected data should automatically appear in your graph. Click on the OK button on the bottom of the Select Data Source box. [NOTE: For adding data series that are *not* in adjacent columns – highlight the first column (washers) then holding down the Ctrl button highlight the next column desired (e.g., volumes).]

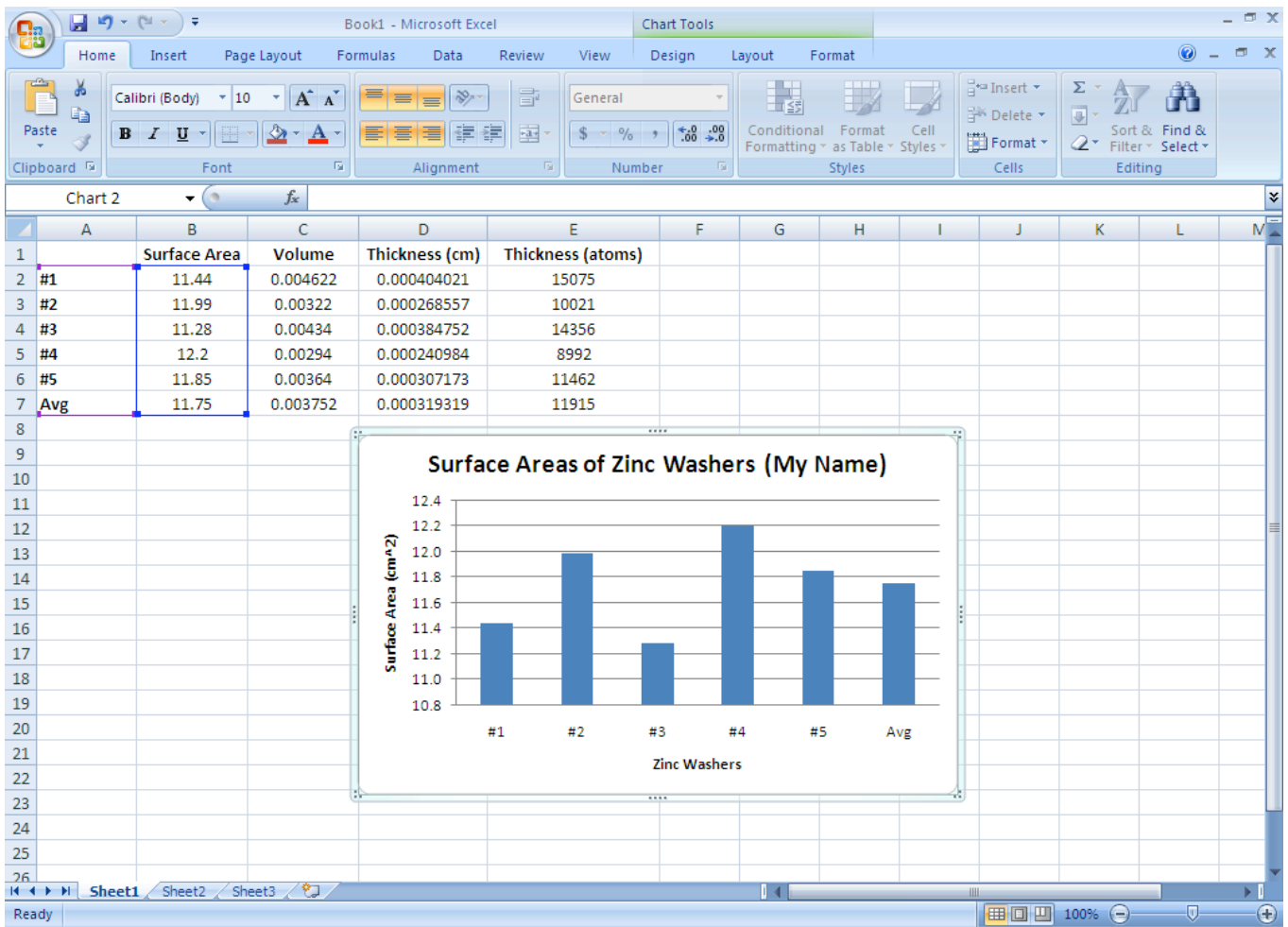
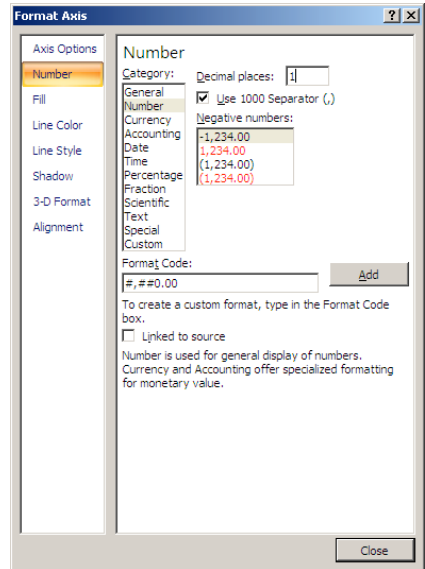
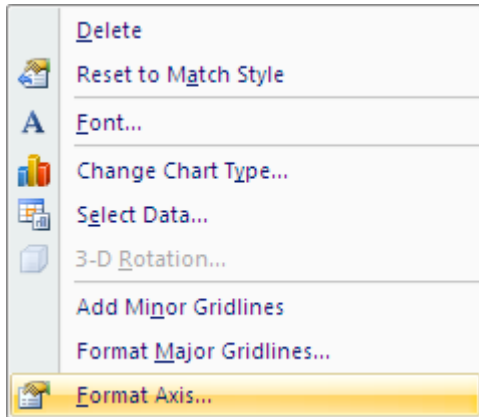
6.) The Chart will automatically appear on your screen with generic chart titles. Simply click on the text box for the title and change it to what you want. For the Chart title it is often good (but not mandatory) to include your name in case your chart gets separated from your data. The axes titles should also include the units, if applicable.



Once I had my titles in, I thought maybe having Washer 1 under Zinc Washers was redundant, so I changed it. You can have it either way. Also I clicked on the "Series 1" box and hit delete. If there is only one series, then this is not necessary information.

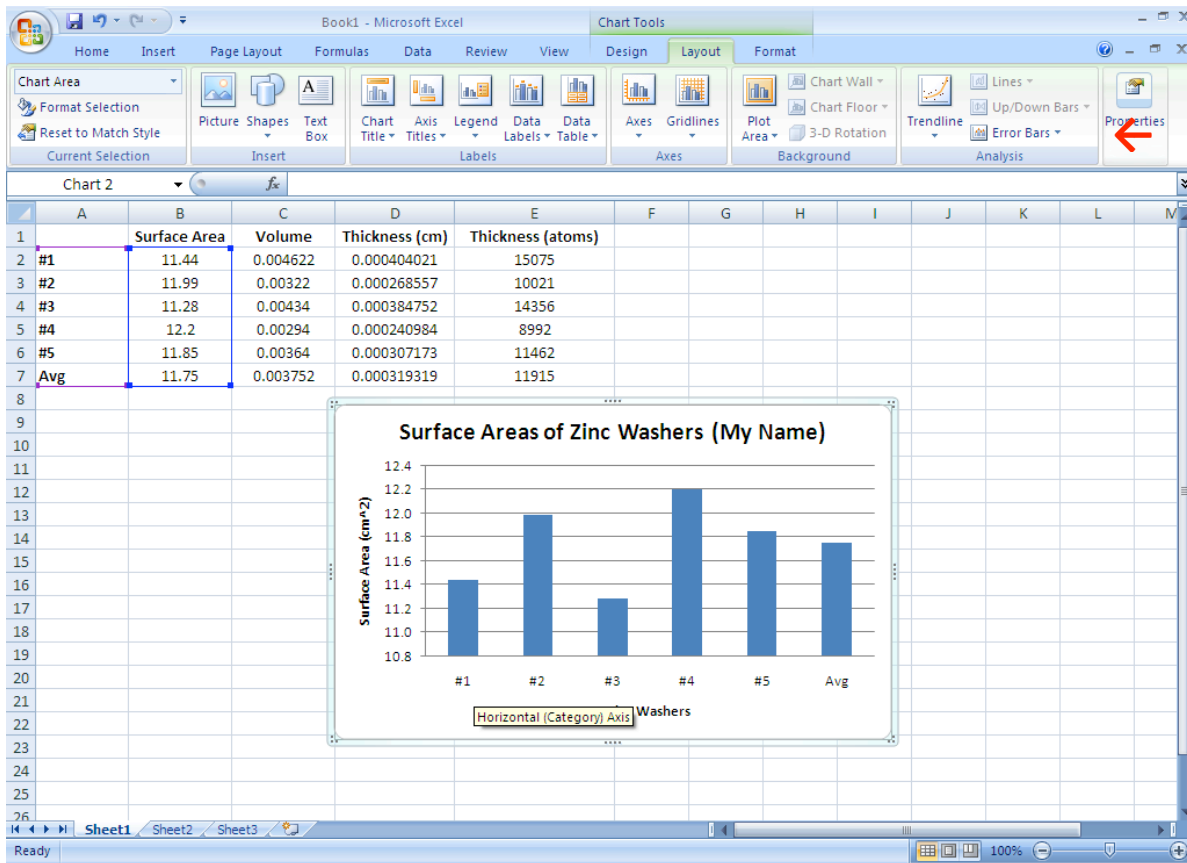


7. Another optional feature is to change the properties of the y-axis values such that they all extend to the hundredths place. Right click on the y-axis values. Then choose “Format Axis”. Then choose the second button down “Number”. Then under category choose “Number”. The default is 2 decimal places. You can choose 1 or 2, since the axis grid is to the 10ths place but we measured to the 100ths place. This just gives the graph a more professional look.

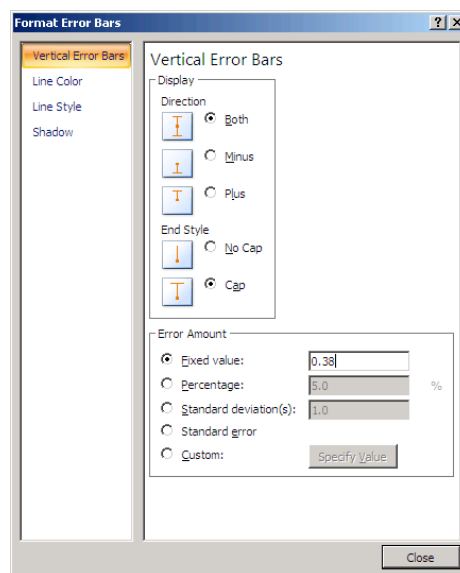


8. Finally, to add the Standard Error Bar for the Average:

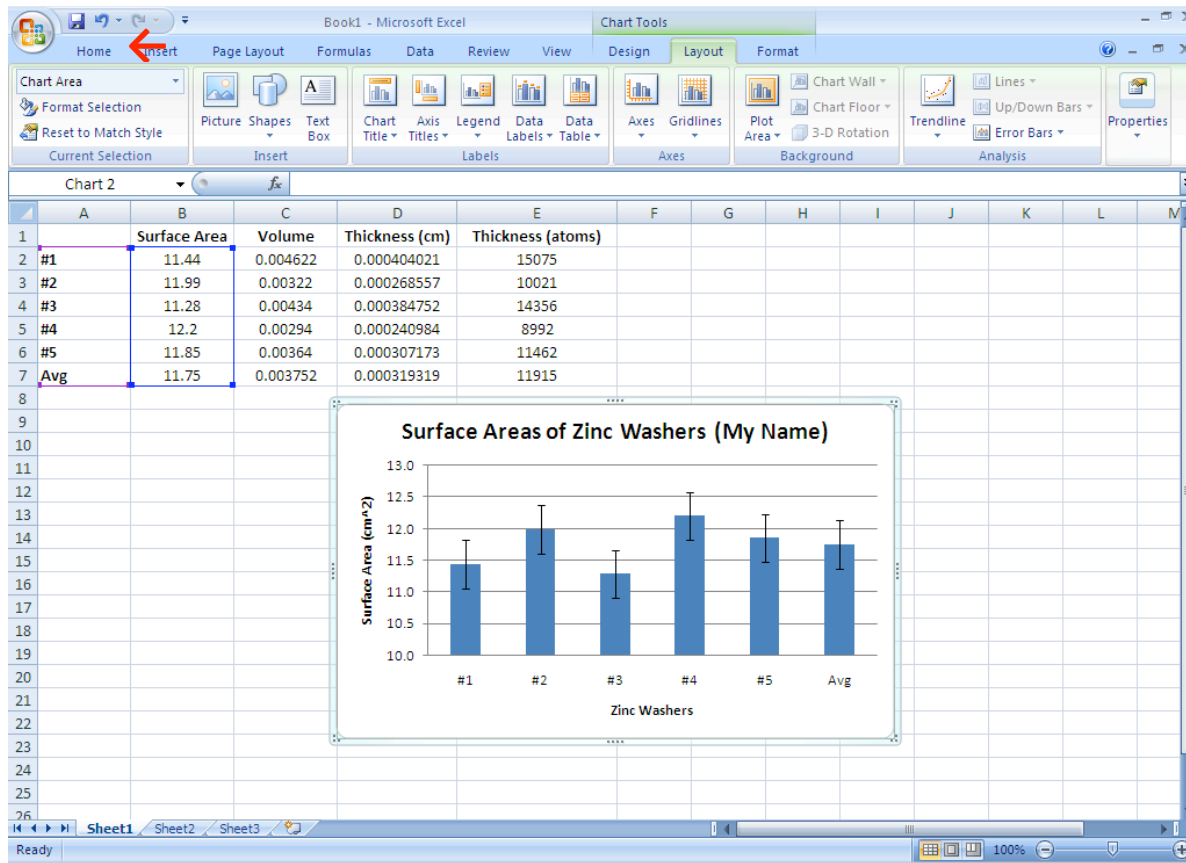
- a. Click anywhere in the chart. This displays the Chart Tools, adding the Design, Layout, and Format tabs.
- b. Click on the Layout tab. Then in the Analysis group (second from the right), click Error Bars.



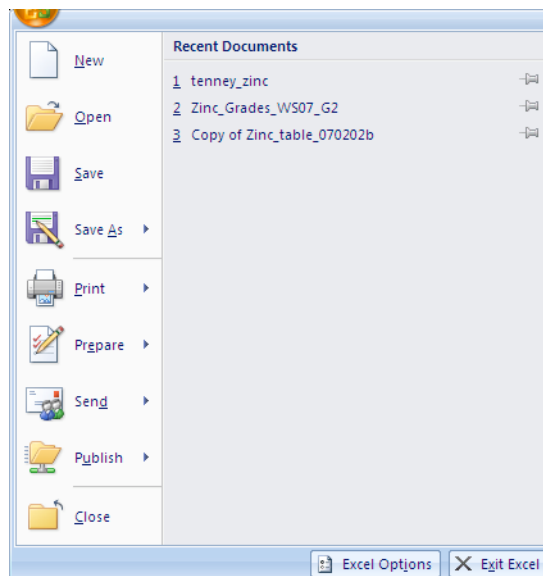
- c. Click More Error Bar Options, and then under Vertical Error Bars, choose “Both” for the direction. Under “Fixed value” type in your calculated standard deviation estimate value. For Surface Area this is the value you calculated for #7.



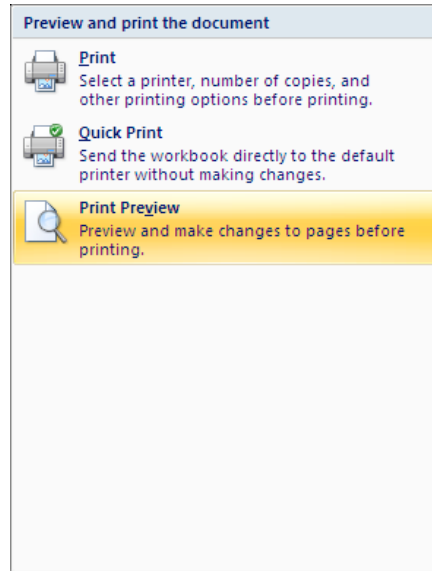
d. The resulting graph will have error bars for all values. (In 2003, you can click on the error bars individually and delete the ones that you do not want. I haven't been able to get 2007 to do this – so just leave the error bars on the entire series. If you figure out how to adjust them, please let us know.)



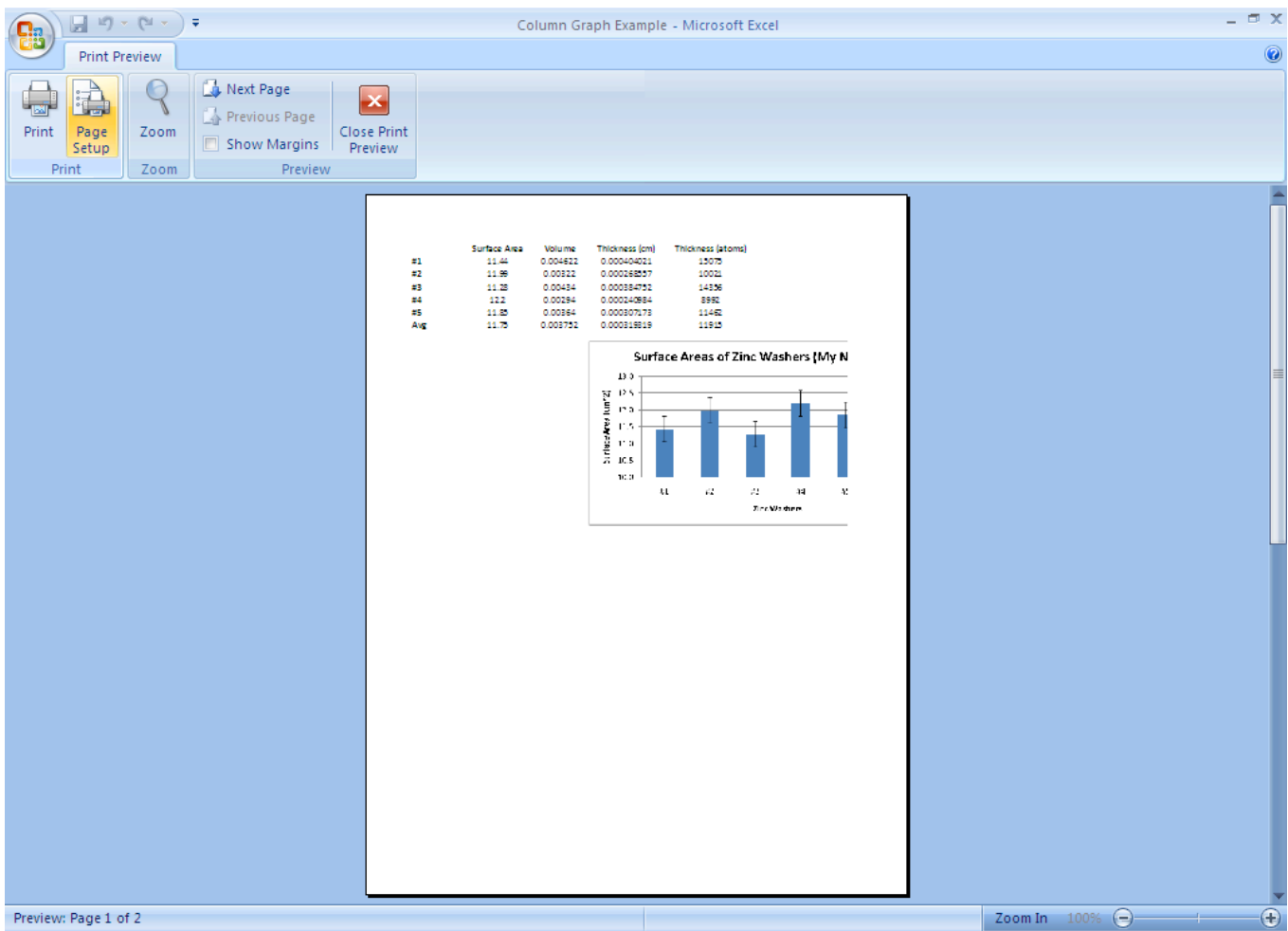
9. To Save your work, there is a save button in the top left next to the Microsoft icon. To Save As, click on the Microsoft icon and it will bring up a list of options.



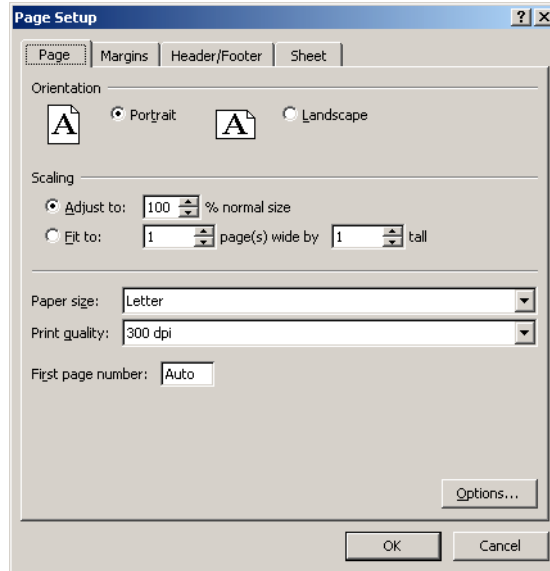
10. To Print your work, there is a print button in the list of options under the Microsoft icon. You'll need to choose Print Preview to verify that your work is on one page.



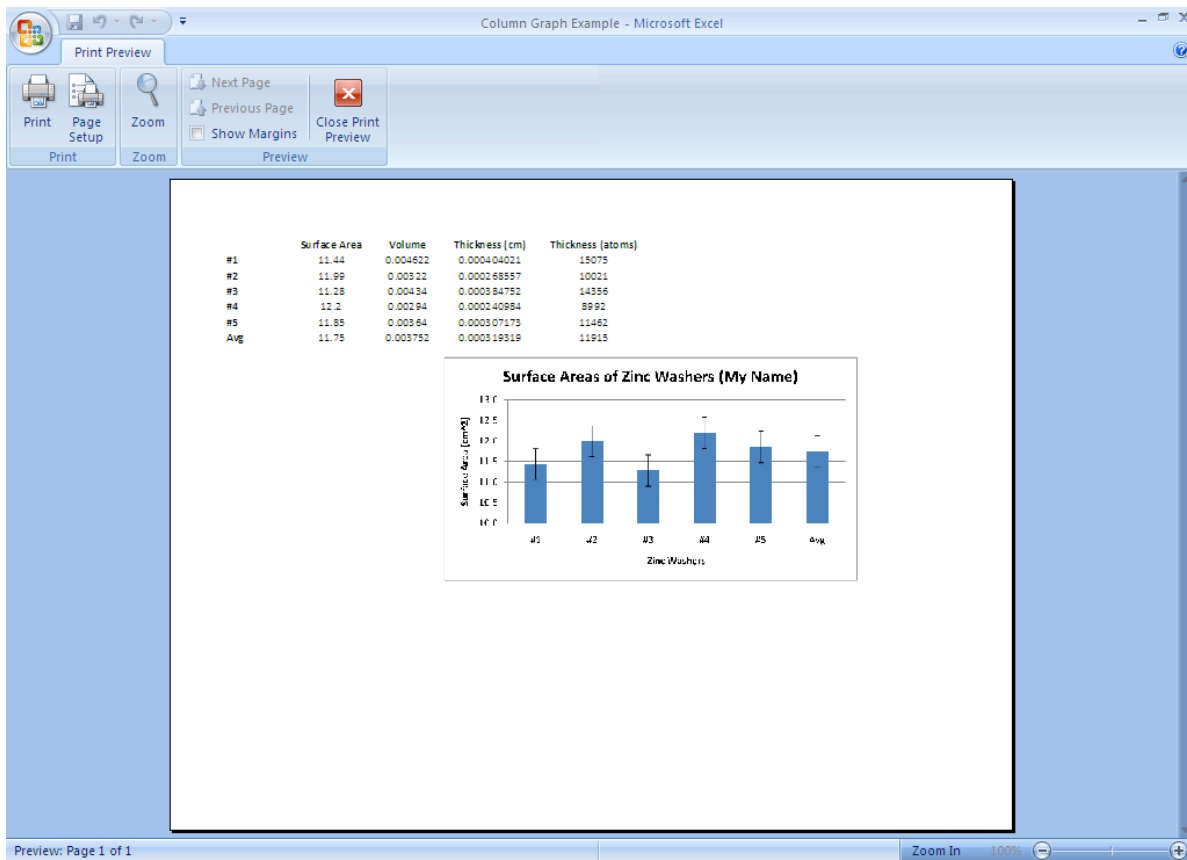
a. Under Print Preview, you will need to choose Page Setup. (Notice our example would have printed on 2 pages and cut our graph in half.)



b. Under Page Setup, choose Fit to 1 page. Then if it fits better to a landscape format, choose landscape. Otherwise, leave it as portrait.

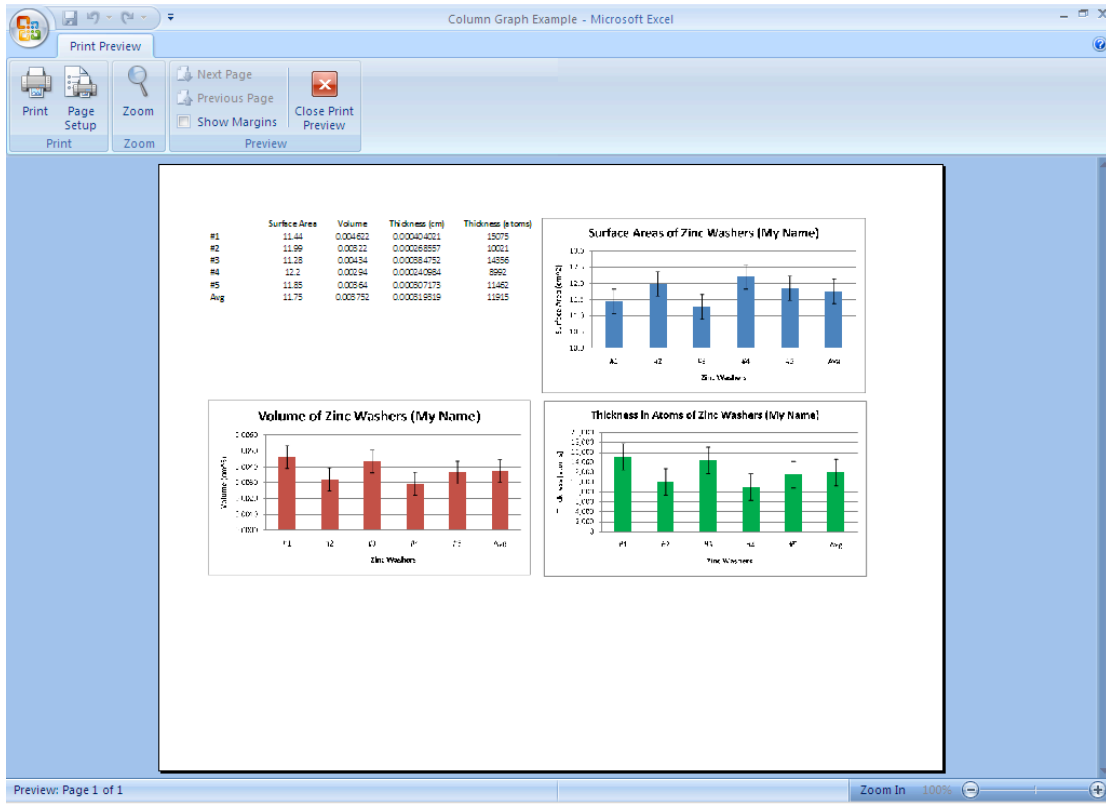


The updated version then should easily print to one page:



In order to conserve paper and money you'll want to print to one page. On the following page are examples of Landscape and Portrait setups.

Landscape:



Portrait:

