

Students' Guide to Using Excel

General Excel Directions

To select, copy, & paste a large block of data: Click in upper left corner of needed data, then scroll to bottom of needed data, and shift-click in lower-right corner of needed data. Choose Copy. Go to where you want the data and click in the upper left corner of where you want the data to be. Choose Paste to put in the data.

Copying a formula: Type in the formula you want & press return; check that the formula has worked as expected. Click in the cell with the formula to select it. Place your cursor over the black box at the lower right of the selected cell; the cursor will change from the usual large plus to a small +. Click and drag the + over the cells where you want to copy the formula, and release it when finished - check to see that it worked for all the cells you intended. In some cases, a shortcut to the dragging is to simply double-click when you have the + cursor, and Excel will copy the formula to all the cells it thinks you might want, e.g., the rest of a column; however, this does not always work as you want, and will need to be checked.

Filling a series of numbers or dates: If you need a column of numbers or dates, use 2 cells to start the series, e.g., 1, 2, if you want an interval of 1; or 5, 10 if you want an interval of 5; or 1/1/2003, 1/2/2003 if you want an interval of 1 day. Drag your cursor over both cells to select them both. Then (as in copying a formula, above), place your cursor over the black box at the lower right of the lower selected cell; the cursor will change from the usual large plus to a small +. Click and drag the + over the cells where you want to fill the series, and release it when finished - check to see that it worked for all the cells you intended. The same shortcut mentioned in copying a formula, above, may also work, but check its results.

How to make & edit a chart (graph)

1. Starting a chart (graph):

a. Select data to be plotted by clicking on the letter at the top of the column for the relevant columns (these instructions assume the data to apply to each axis is in columns; if it's ever in rows, simply select whole rows instead). If the columns you need are not adjacent, click one and then control-click the other one. It will be best if data for X axis is to the left, Y axis data is to the right; otherwise, you will need to interchange them on the graph.

b. Click Chart Wizard icon; the Steps that follow are the sequential windows in the Wizard.

c. Wizard Step 1: Select XY(Scatter) and choose the sub-type which has points and smoothed lines.

d. Wizard Step 2: If your graph looks basically OK at this point, click next; if not, go back and try again.

e. Wizard Step 3, the Chart Options window (you can get back to these choices at any time later, if needed):

1. Titles tab: Put in a correct title now and label the axes with their quantity & units.

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2. Legend tab: If you have only 1 line on this graph, you can uncheck the "Show legend" choice.
3. Gridlines tab - Add whatever lines are needed to analyze your data effectively.
 - f. Wizard Step 4, Place chart: Click "As new sheet" and give it a short name. Click Finish.
 - g. Now that you can see the chart, choose Chart -> Chart Options... if you see some things you need to change.
 - h. Save your workbook (data + graphs).

2. To edit an axis

- a. When Excel sets up a chart using the Wizard, it adds space at the ends of the axis beyond the actual data plotted; this may waste space on your graph. To make the range of the axis fit your data better, click on the numbers on the axis (boxes should appear on the ends of the axis itself), and choose Format --> Selected axis (you can also simply right-click on the numbers on the axis, and choose Format axis).
- b. To change the range, click on the Scale tab, and type in the minimum and maximum you need - see date information below if this axis has dates. This is also the place to specify the major and minor gridline amounts (major & minor units) if needed.
- c. The format axis window is also the place to change a font size if needed.
- d. If you have dates on an axis - usually the X axis - it will help to understand that Excel handles dates as "serial values," which is the number of days since January 1, 1900. So, for example, here are some dates and their serial values that may be useful:

<u>Date</u>	<u>Serial value</u>
10/1/1998	36069
10/15/1998	36075
10/1/1999	36434
10/1/2000	36800
10/1/2002	37530
12/03/2002	37600
10/1/2003	37895

The serial values are what you will need to type into the minimum and maximum boxes to specify a particular range of dates on the axis. The major & minor units will also be in days, such as 30 for approximately monthly, 91 for quarters of year, and 365 for a year; these will vary some since the lengths of months, and years, vary. Note that the source data for a graph can be an entire column of dates, but if the axis only includes part of those dates, that part will be the only data on the graph - this is useful for looking at various parts of the data by simply changing the minimum & maximum on the axis.

3. To add a 2nd data series, which will use the secondary or right-hand axis for its scale:

- a. Look in the data at what is the column letter for the data you're adding.
- b. Select Chart -> Source Data... -> Series tab.

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- c. Click in Name block and give a name for the data already entered. This is the name that will appear in the legend.
- d. Select all of the X values info and Copy it.
- e. Click the Add button
- f. Click in the X values space and Paste the X values info.
- g. Click in the Y values space and paste again. Then click within this info and change the column letters in the Y values space to the letter for the data you want to add. Note that arrow keys don't work on these lines - click to get the cursor within the info where you need to make a change.
- h. In the Name box, type in a name for the new data series.
- i. Close the Series window.
- j. Don't worry that your graph probably looks very strange right now; this is because it is currently plotting both sets of data using the same scale even though the numbers may be very different. To correct that, click on the graph on one of the data dots for the data you just added. Choose Format -> Selected Data Series..., select Axis tab, and click Secondary axis. Click OK and the graph should look better.
- k. Go to Chart -> Chart Options to label the new Second value (Y) axis with a name and units.
- l. A chart with only one Y axis doesn't really need a legend, but a chart that has 2 lines on it does need a legend. Your charts will be wider if the legend is located at the top, which can be changed under Chart Options.

4. Copying graphs: If you are making multiple graphs, once you have the first graph done, it may be easier to copy it and just change the Y axes column letters and labels. To make a copy:

- a. Go to the chart you want to copy and choose Edit -> Move or Copy Sheet...
- b. In the scrolling box, choose the last item that is "(move to end)", and check off "Create a copy", and click OK.
- c. When you have the new chart, double-click on its tab at the bottom of the screen and type in a new name for this chart that reflects the new data it will chart.
- d. Determine the column letters that contain the data you want for this new chart.
- e. Choose Chart -> Source Data... and re-type column letters. Remember the X values (e.g., time) may stay the same for your new graph; if so, change only Y values, names, and axes labels. Note that arrow keys don't work on these lines - click to get the cursor within the info where you need to make a change.
- f. Save the workbook after each chart is completed.

5. Editing lines and points

To edit the lines (thickness, color) or the points (called markers, editing their shape or color), first click on the chart on the line/points you want to edit - some new marks will show on the line to indicate it is selected, but these marks won't cover every data point. Then choose Format -> Selected Data Series -> Patterns tab. Then you can edit either the line or the markers. You can also choose None to eliminate either the line or the markers.

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Notes for specific charts used in the BES Exploring Watersheds in Baltimore Module

Charts 1 to 3

a. On Charts 1 to 3, if both Y axes are at zero at the bottom of the chart, much of the discharge lines will plot on top of each other and so be hard to see. To fix this, lift one or more of the lines up from the bottom of the chart by editing one axis so it has a negative value for its minimum (see instruction 2 above) - it will be best to do this for the axis with the smallest overall range. Of course, the stream discharge will never have a negative value; this is just a way to raise the zero line off the bottom of the graph.

b. Due to the large amount of data on this chart (if you include several years of data), it will be better if the graph lines do not have a marker on them, and instead are just lines. To do this, go to Chart --> Chart type..., and select the XY scatter graph that does not have marker points; or see instruction 5 above to edit individual lines.

c. If you only need to use the BES streams

Charts 4 & 5

To create these charts, the data must be developed from the basic discharge data.

a. First determine a value for base flow: Go to the bottom of the column of discharge data and finding the average discharge by typing in a formula similar to `=AVERAGE(C2:C1462)` where C2 to C1462 contains the discharge data. In this case, the average can be thrown off by exceptionally high values, and zero values, so other measures of central tendency may be more useful. So also calculate `=MODE(C2:C1462)` and `=MEDIAN(C2:C1462)`. Decide on a best base flow value based on these numbers, and make another cell for the value you choose (for example, cell C1469); by putting this value in a separate cell, we can refer to it in another formula, but easily change it and Excel will re-calculate all formulas and graphs that use it. Look at your graph of discharge and see if the value you have chosen for base flow is a sensible one for the normal flow of the stream.

b. Next calculate the multiple/fraction of base flow: At the top of a new column, type in the formula to determine multiple/fraction, which is simply dividing the day's discharge by the base flow amount chosen in step (a) above, e.g., `= C2/C1469`, where C2 has the first daily discharge value, and C1469 is where your base flow value is located. The \$ signs tell Excel to always use cell C1469 even when the formula is copied to the rest of the column, as the C2 will change to C3, then C4, and so on, but we want the C1469 reference to stay constant. Copy this formula for the rest of the discharge data, and graph it by the usual steps. Note that these charts have only a few months of data graphed, so the details of individual lines are visible.

Charts 6-8

a. For all water quality charts, be sure each line plotted uses the dates that go with that quantity, as not all water quality measures appear for a particular date. So, for example, the line for Villa Nova is columns E and F to get dates & data, then Carroll Park is columns G and H to get dates and data, and so on.

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b. Charts 6 & 8 should have no markers because they are a large amount of data. Chart 7 is somewhat less, and can have markers, especially to differentiate the lines if the chart is to be printed in black & white.

c. Chart 8 is a copy of Chart 6, with snow data added as a new Series, plotted on the secondary (right) Y-axis; this axis has been given a negative minimum to raise the dots for snow amounts so they are easier to see and do not obscure as much of the chloride ion line. Since the snow amounts are discrete daily values, they should not have a line connecting the points.

Charts 9 & 10

a. See note (a) above for Charts 6-8.

b. Because the McDonogh site didn't start until late 1999, Chart 9 is for 1/1/2000 to 12/3/2003 (days 36526 to 37593). This data is sufficiently spread apart that you can put markers on it, especially if you want to print it in black & white.

c. Since Chart 10 has a lot of data on it, it is better to have no markers on the lines.

Downloading USGS stream data

1. Go to the USGS web site for water at: <http://water.usgs.gov/>.
2. Select NWIS-Web (if needed), then Surface Water, then Streamflow.
3. When first using the site, you will probably want to look at a list of stream gages in Maryland. Asking for them listed by site name, grouped by county, may help you find a particular site. Look through the list to find streams in your area, and note their number.
4. Then return to screen where you can specify that you want to type in a site number, and type it in. Once you are on the page for that site, you may want to select the site map to see where the gage is. It may also be of value to note the area of the watershed for your stream.
5. Once you know a site you want to use, type in the dates that you want; note that there may be data gaps between the starting and ending dates shown, and the only way to see if or where those gaps are is by requesting the data. You should request tab-separated data, and specify the date format as MM/DD/YYYY so the data will go into your spreadsheet easily. Give the saved data file a distinctive name so you can tell what it is, especially if you get data for several streams or various time periods, and add a ".txt" ending if needed.
6. Open Excel, and open your discharge text file. Excel will start its Text Import Wizard; you can probably just press Next for each screen, and the data will be imported into Excel. Read the information provided so you understand what column is what data, then you can delete any extra lines or columns except dates and discharge amounts.