Welcome to Basic Excel, presented by STEM Gateway as part of the Essential Academic Skills Enhancement, or EASE, workshop series. Before we begin, I want to make sure we are clear that this is by no means meant to be an all inclusive class in Excel. At each step, there are many options that I won't have time to go over, so I encourage you to spend some time on your own playing with them.

If you haven't already, please download the dataset from the URL shown here, it is case sensitive. The URL is also on your assessment sheets if I move away from this screen before your computers are booted up.

Also, the images are from the PC 2013 version of Excel. Older versions, or those in Macs may look slightly different, but the overall concepts should still apply. This power point will also be available on the this site, so you can always refer back to it at a later time if necessary.

If you are using a Mac, please download the guide to using a Mac that is listed on the website below the data set, so you can follow along in more detail than we will present with Macs. Know that I am not a Mac expert, so you may have to play around a bit, or help each other.

Lastly, in case you don't already know this, and don't have Excel on your computers, you can get it for free through IT's website under software.

Unit 1: Pre-assessment and the Basics

- To refresh your memory later:
  - http://goo.gl/xgWOLm
    - Workshop pdf
    - Videos:
      - Functions in Excel (required)
      - Cut Copy Paste (required)
      - Selecting Fields of Data (required)
      - Sorting and Filtering (required)
      - Graphing - Scatterplot (optional)
    - Basic terminology/vocabulary

You should have already gone through most of unit 1, this included the pre-assessment, the videos you watched, and the basic terminology and layout of Excel. You can always go back to these resources later if necessary.

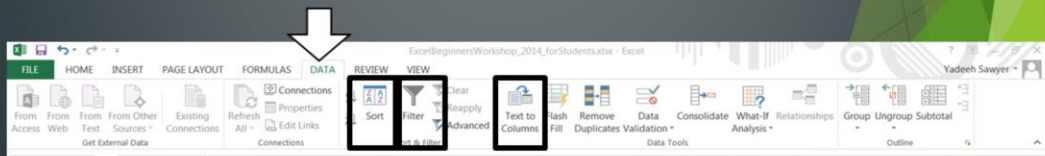The optional video is because we'll cover this in a bit of details today.

Ok, let's jump into it. In Unit 2, I'll go over how to get information into an Excel file, basic formatting, and how to manipulate the data, including the use of equations.

To expedite the workshop to the topics which having me around to help you is most beneficial, we've skipped some handy information, but it's provided on the EASE website in a PDF of a power point, with a step by step script on how to accomplish each of these features, and why you would want to. These will really help next semester in Bio 204, but could also help you now, so make sure to look over that document. It includes a few practice problems for you to do the functions on your own.

The topics covered are Entering Data – more specifically, if you have data that is in a comma delimited format, or something similar, how can you effectively past it into Excel so that the data is distributed across all columns.

Both Filter and Sort are covered in the pre-assessment videos, but we give an alternative take on these in the supplementary materials, with how you can use the data we've provided to practice these functions.

The last thing in that document is how to format cells, for example, adding borders, or limiting the numbers in a cell to 2 decimal places.

A quick screen shot of where you'd find some of these options – under the DATA tab.
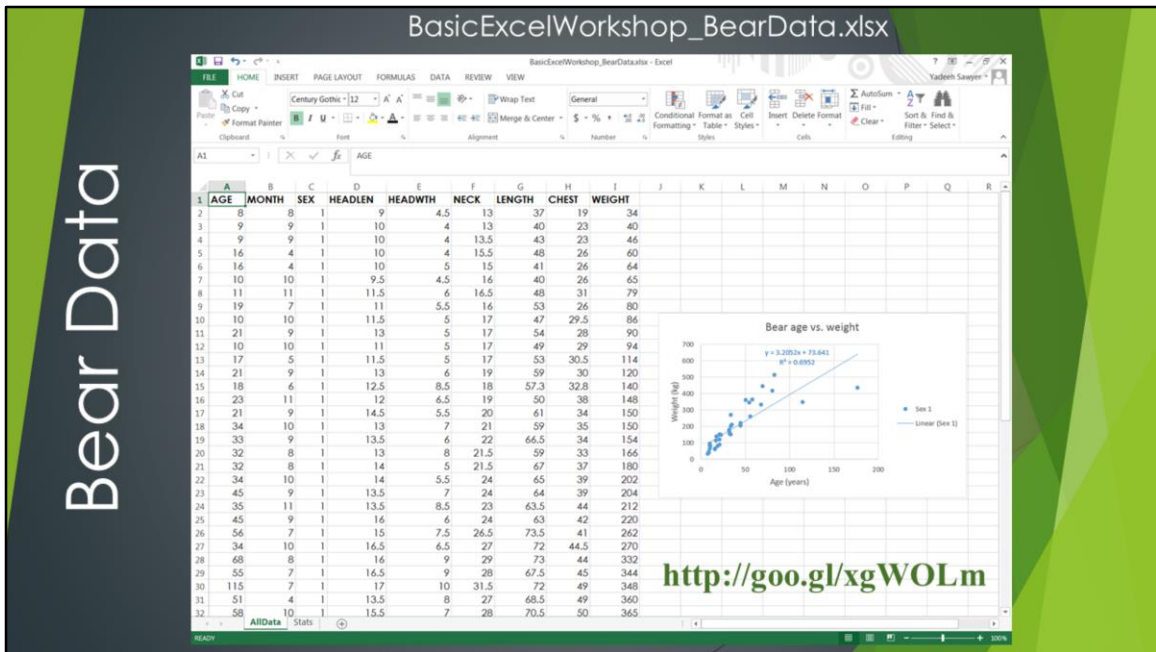
If you haven't already, open the data set. If necessary, click "enable" at the top so you can actually manipulate the content. The file should look something like this. There is no actual data yet, we'll get to that.
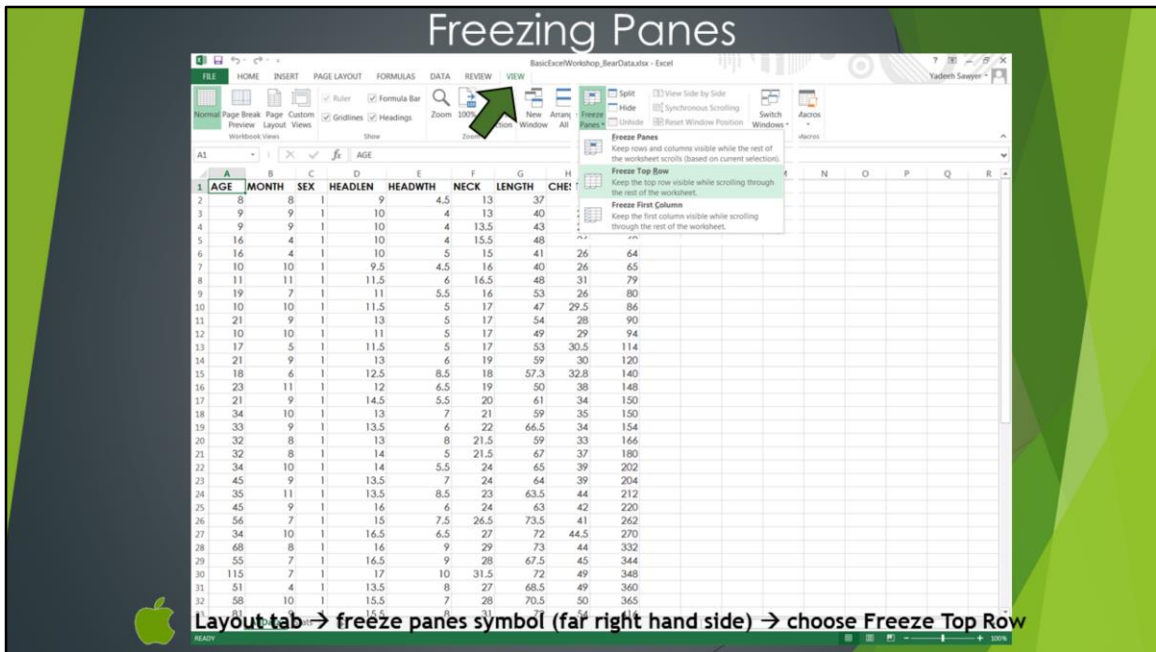
You'll notice that there are three worksheets: AllData, Stats, and Survey.

Ok, now let's get to the part where you get to work with the data. If you haven't already, open the data set. If necessary, click "enable" at the top so you can actually manipulate the content. The file should look something like this. The actual content of the data is not relevant for this workshop, it's the functions that we preform that are. This is a data set with various measurements of Bears, separated into Sex 1 and Sex 2.

You'll notice that there are three worksheets: AllData, Stats, and Survey. Let's start by going through a few tools to browse your data.

We'll start in on the AllData worksheet. I want you to take a second and scroll down quite a ways so that you no longer see the graph, but you can still see data. Now, without cheating and look up here, if I was to ask you what the data in column E is

referring to, is it easy to tell me?

Freezing Panes

Layout tab → freeze panes symbol (far right hand side) → choose Freeze Top Row

To help with this issue, we'll freeze the top row in place, while allowing you to scroll through the rest of your data.

Be aware that whatever you currently see as the top row is what will freeze in place, so you need to first scroll back up to the top. Select the View tab, then Freeze panes, and then Freeze Top Row. As I mentioned before, there are many other options within a lot of these functions, like in this case, freeze first column and more. So, you should go back and play with them on your own later.
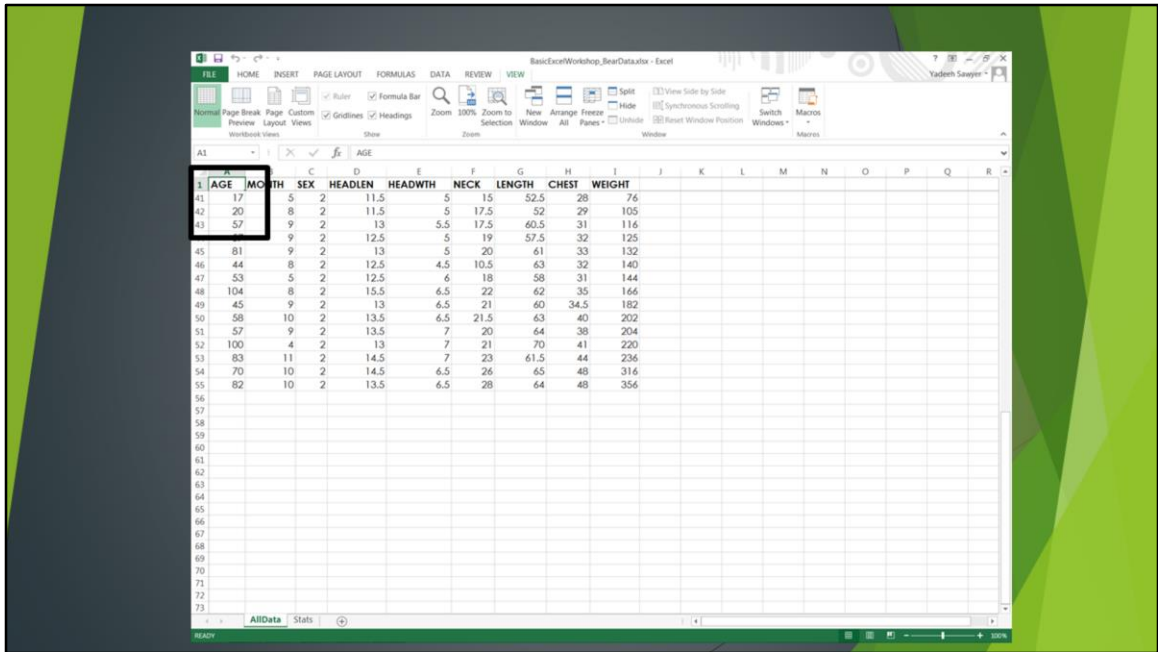
You can tell that the panes are frozen because as you scroll, the first row stays in place, but the row numbers show that you are moving through your data. And, below the freeze point, the line is a bit thicker.

Now that we have the headers in place, it will be easier to work with the data. Click over to the 'Stats' worksheet and I'll walk you through what you are seeing.

You have Averages first, with the headers that match those on the all data worksheet, this will come in hand in a moment. You can see that I already have the values entered for Sex 1, sex is highlighted in pink. You will begin by finding the average values for Sex 2, starting with age in the yellow box. Regardless of which measurement the assessment is asking about, you need to calculate all the values because we are going to use them for graphing in a bit.

Below this, you have Standard Deviations set up in the same way, and for the sake of time, I've done it for both sexes, but will show you how I did it.

Then, we will transfer SOME of these values into the table I formatted below, which separates the data by Sex, rather than calculation. You'll notice that the headers in this formatted table do NOT include Sex, because that would be redundant information. We are transferring the info to this format because of what we want to graph.
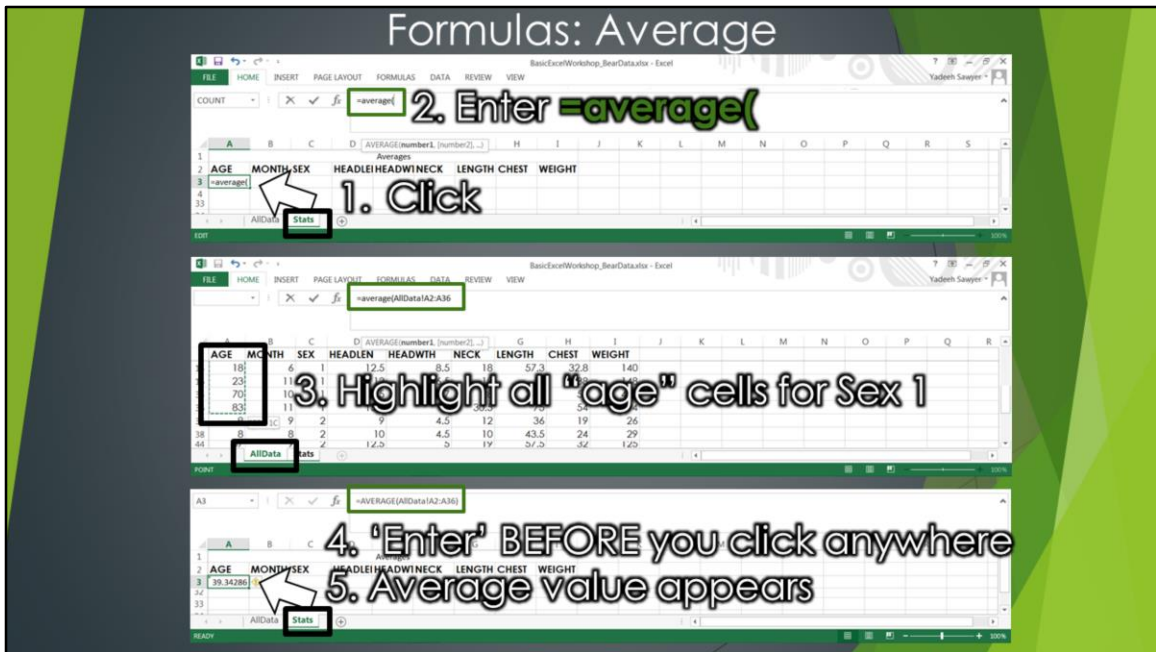
I'm going to walk you through how I did that for Bears of sex 1, and you'll repeat that process along with me for sex 2.

To determine the average values for each measurement category, you make sure your cursor is in the desire cell, which in this case is the yellow box under the "age" header within the "Averages" at the top of the worksheet, NOT in the table with boarders, that's for later. Then, type in =average(. The equal sign tells Excel you are giving it a command. If you don't have that, it will treat what you enter as text or values. The word 'average' guides excel as to which function you want it to perform, and the start parentheses indicates that you are now going to tell Excel which values you want averaged.

Once you open the parenthesis, click onto the AllData tab. You'll notice that when you clicked over to this worksheet, Excel added 'AllData!' to the formula. That is because it is now referencing a that specific sheet for the calculation. Now highlight all the cells for age for bears of sex 2. Once you've selected the desired cells, you have to close the command to end the function. Hit enter and the average value should appear. You need to do this BEFFORE clicking back to the stats worksheet or the function won't reference the correct cells, because it will switch the reference

from 'AllData!' to 'Stats!'.

Auto-fill

"grab" the corner and drag ("+" cursor)

⭐ Assessment
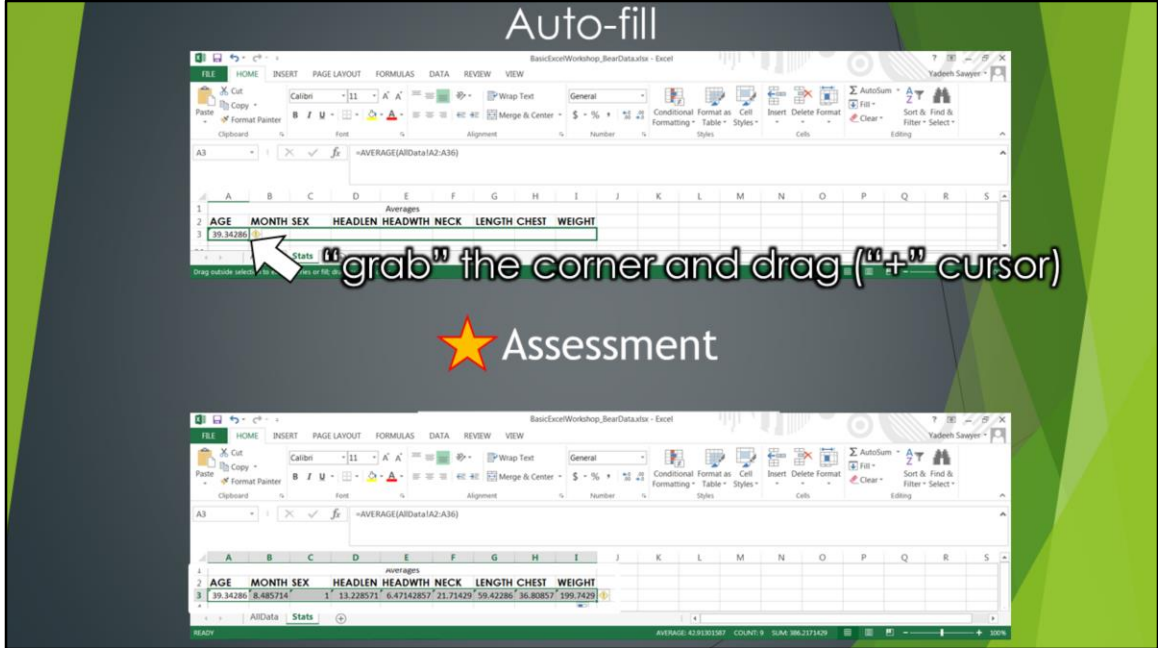
We need to get the average values for all of the other characters, but repeating the same process would be very redundant and take a lot of time. Instead, you can autofill the remainder of the values by dragging the function across all categories. Highlight the cell that has the formula you want, then move the curser over the bottom right corner onto the green square. When you see the black plus, with NO arrows, click that and drag the formula across the cells you want values entered into. What this is doing is shifting the references along with the formula. So, when you moved from column A, referencing column A in the AllData worksheet, it then moves into column B, and the associated column in the AllData worksheet.

(*) Once this is done, you can answer the first question on your assessment sheet.

For the standard deviation values, it's the same general procedure. Select the cell you want the value to appear in (Orange cell) and type =stdev.s(. The .s is for a standard deviation on a set of samples, rather than a population or the many other options available. We don't have time to go into the differences here since we are focused on how to use excel, not teaching the statistics you can do, but just know there are options and you can look into them on your own.

You fill in the rest like we did before by dragging and dropping. Remember, these are only a few of the function options. You can always take some time to play with more.
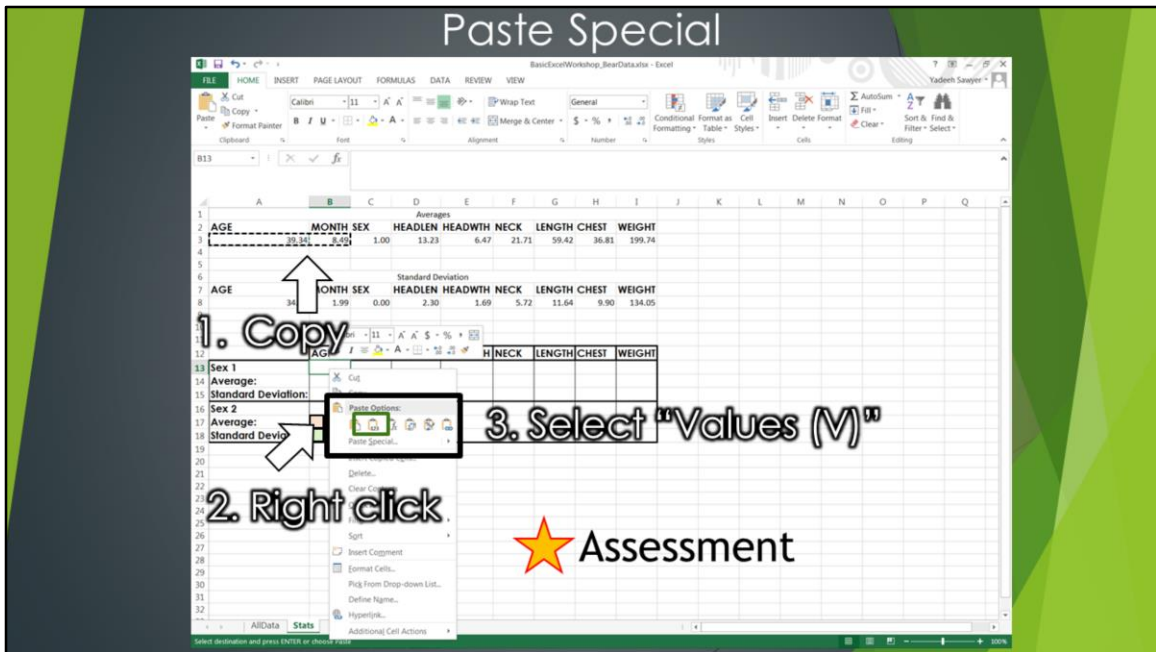
The paste special function is great when you only want the value and not the equation.

So, you copy like normal, but when you go to paste, you can right click and selection "values". If you mouse over the image, it will tell you what type of paste special option that is. You can also select Paste special and even more options show up. The reason we are not just doing a normal copy/paste is because, like when we did the autofill, the reference cell shifted, the same thing happens here. If I copied Average Age for Sex 1 from cell A3, and paste it into B24, the cells I'm averaging will also shift, which is NOT what I want.

Take a second and paste the correct values from your calculations of average for sex 2 into the corresponding cells of the table. I've already set it up for all other values. You'll need the values here for graphing in a minute. Pay attention to your table headers and which values you paste in, because SEX is in the upper tables, but not in the summary table you are pasting the values into. So, you'll have to copy and paste special in 2 sets for each calculation, age and month, then headlenght through weight.

To make sure you understand the purpose of this method, you'll also need to answer this (*) question on your assessment sheet.

Alright, onto graphing. There are many types of graphs you can generate. The main ones you'll run across are column or bar graphs, scatter plots, line graphs, and pie charts. We'll cover how to create a bar graph and a scatter plot in this workshop, but you can always play with the others on your own.

First determine

- What do you want your graph or chart to say?
- What type of data do you have?
- What type of graph is appropriate?

The first step to graphing is to determine the type of graph you need to use. To do this, first ask yourself what you want your graph or chart to say. Also, what type of data do you have, is it qualitative, categories, or quantitative, numbers? After you know that, you can then determine what type of graph is most appropriate for your needs.
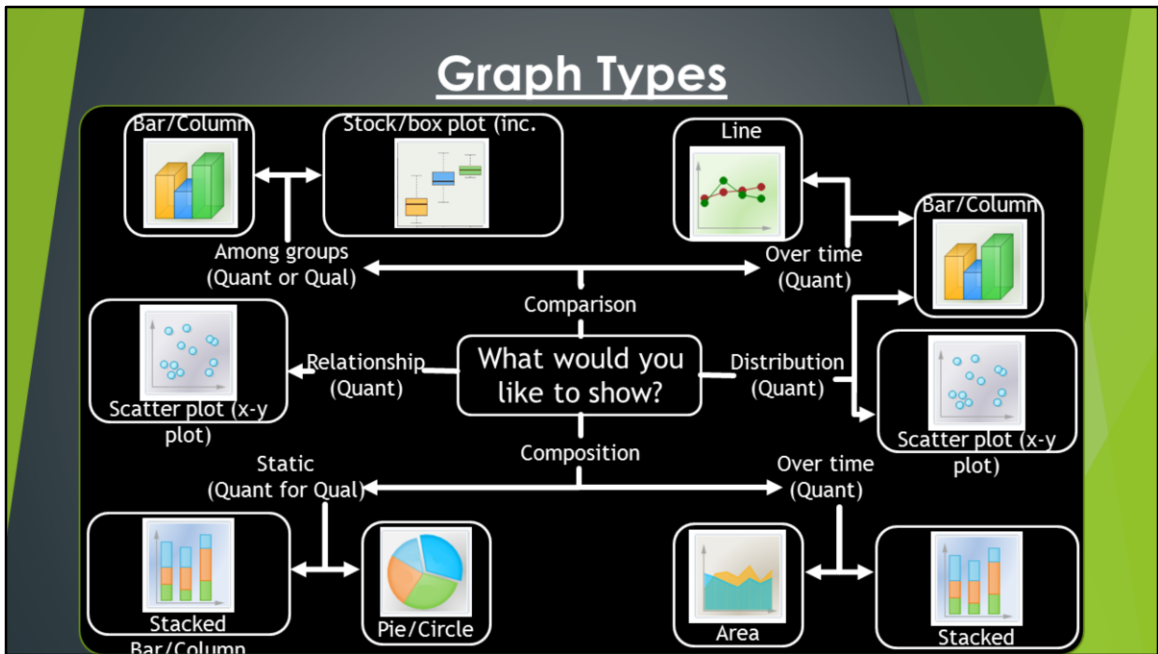
To help you out, I've created this graphic. So, first ask, what would you like to show. Do you want to look at comparisons between or among groups, relationships between two variables, distribution of values, or the composition of a whole.

For relationships, you have to have quantitative data because both the x and y axis require numerical values. For example, the relationship between size and heat loss.

If you want to compare parts of a whole, you can do it either among groups or over time. Over time is inherently quantitative, since time, the x axis, is numerical, and you can view it with either a line or a bar graph. For example, how does the average rainfall change by month in New Mexico compared to Florida.

For comparison among groups, you can have categories or values on the x axis, and if you want to include standard error of any kind, you can use a box plot. For example, how does food production differ between countries?

To look at the distribution of values, you can do either a column graph or a scatter plot. For example, number of people each year to use social media.

Lastly, for the composition of something, you can look at it as a point in time, or static setting, which will usually have quantitative data for qualitative categories and you can use either stacked bar graphs or pie charts. If you want to see the change of a composition over time, then an area graph or stacked bar graphs are best. For example, what is the composition of transportation for UNM students, what percentage use bikes, cars, buses, or other forms of transportation.

After you determine which type of graph you are going to make, there are a few other things you need to know before you can actually graph it. I'm going to focus on column graphs and scatter plots.

If you've chosen a column graph, then you need to know what your series is, what are your groups. In the case of our bear data, that will be sex 1 and 2.

You also need to know what your x-axis categories are. These can be numerical values or categories. We'll use body part measured.

For scatter plots, you also need to know the series, again sex 1 and 2, but also distinguish between your independent variable that goes on the x axis and your dependent variable for the y. In our case, you'll use age on the x, since there is nothing you can do about that, and weight on the y, since weight could dependent on age.
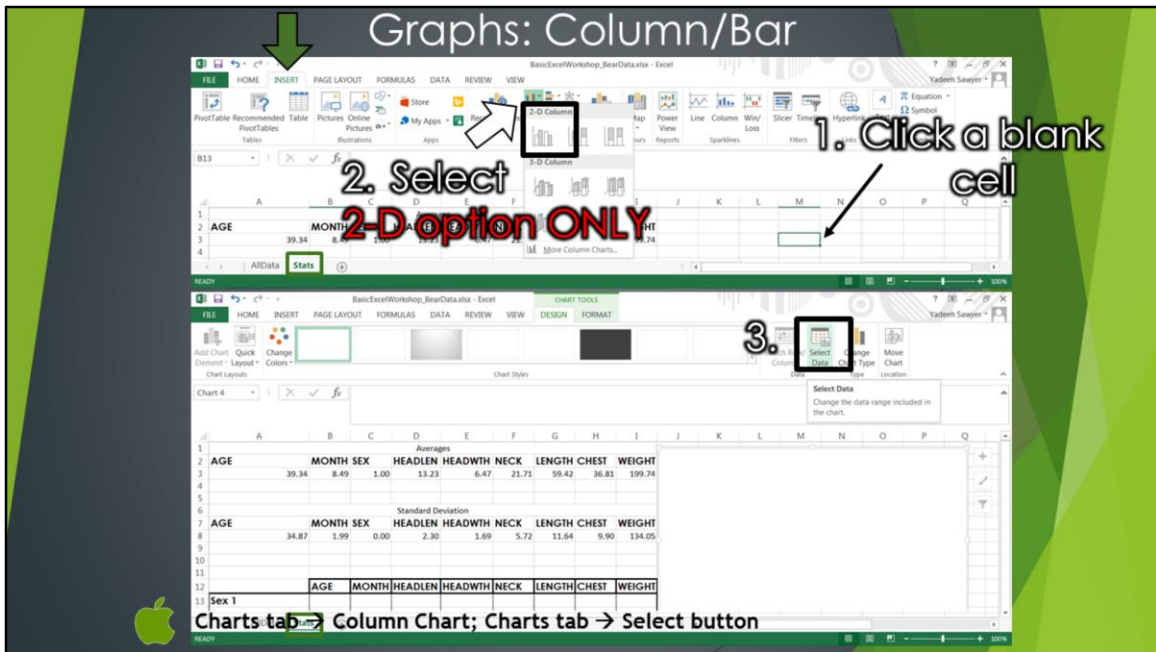
Ok, now I'll walk you through how to create a column graph. I'll walk you through the steps for sex 1 and you'll need to repeat it for sex 2.

First, make sure you click on a BLANK cell that is not adjacent to any values. If you don't do this, when you select a graph, Excel will attempt to predict the value range for your graph based on the cursor location and that can be a bit confusing.

Now, under the Insert tab, select the column chart type. Once you click on the visual setting you want, then a blank box should appear. Make sure you select the **2-D option**, because we are going to add error bars later, and the 3-D option doesn't allow for this.

Now we have to assign the data to appear on our graph, so under the Chart tools, design tab, we click select data.

This is one point where different versions of Excel may look different, so keep in mind that the Series are your Y values and the categories are your x values.

Click "add" to add a data series. First, we'll do it for sex 1. Enter the Series name, in this case, sex 1, then click the select data range box next to the Series value field. You can then highlight the cells with the values you want plotted, in this case the average body measurements for sex 1 from the formatted table. Then hit enter.

Now take a second and repeat the process for sex 2.
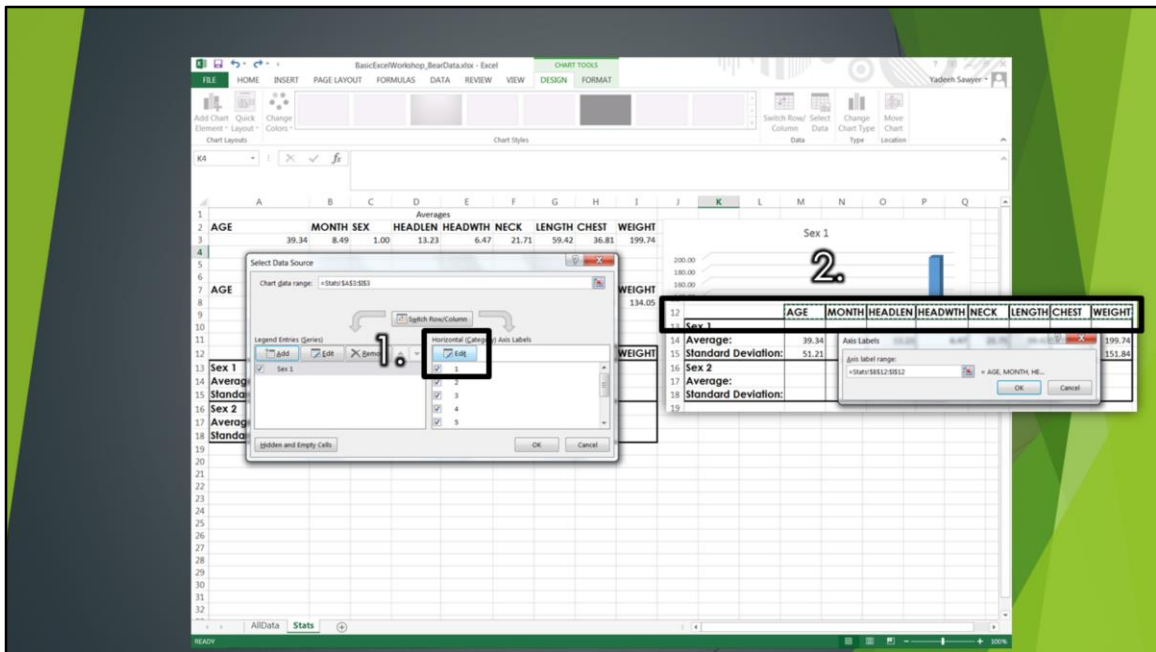
Now, we don't want the x-axis to show up as 1, 2, 3, etc, but instead as the body part measured. So, we click "edit" for the x-axis or horizontal values and do the same as before where we select the value range. In this case, it is the categories in our data table. You only have to do this for 1 of the 2 data sets for it to change the info on the graph.

Next, let's add error bars. Making sure your chart is still selected, under the Design Tab, locate the Add Chart Elements dropdown, then Error Bars, and more error bars options, and select Sex 1.

From here, you will make sure you use both directions, with an end cap, and "custom" values. Click "Specific Values", and highlight the Standard Deviation values from the formatted table for Sex 1 for both the positive and negative error values. Click Ok

Now you have to repeat this whole process for sex 2 by clicking "select data", and adding the information for sex 2. Once that is done, you can answer the question on your assessment regarding the column graph.

No graph is complete without a title and axis labels. To put those in, we again to into Chart tools and design and on the far left you see "add chart element". When you click that, there is a large dropdown of options. Select what you want to add, and enter the value in the function box.

Move data to a Word or Power Point Doc.

- Click the desired graph, table, etc. → copy → then paste into desired location

Additional Excel resources:

- http://www.excel-easy.com/
- http://goo.gl/xgWOLm - STEM Gateway EASE website for Bio 203L
  - Basic Excel: Supplementary Material
    - Entering Data; Filter; Sort; Formatting Cells

Before we move on to scatter plots, I want to go over how to move your tables and figures in to other platforms.

The final step in this entire process is now that you know how to make nice tables and figures, you need to do is move that information into your paper or report. The most common places you'll want them are in Word or Power Point. You just click or highlight what you want to move, copy it, and paste it where you want it to go. There are paste-special options, so play around with it.

Lastly, this is a great website that goes over a lot of the basics, and you always have the YouTube videos that you watched in your pre-assessment, and this power point through the STEM Gateway website, along with the supplementary material for sort, filter, format, and entering data.
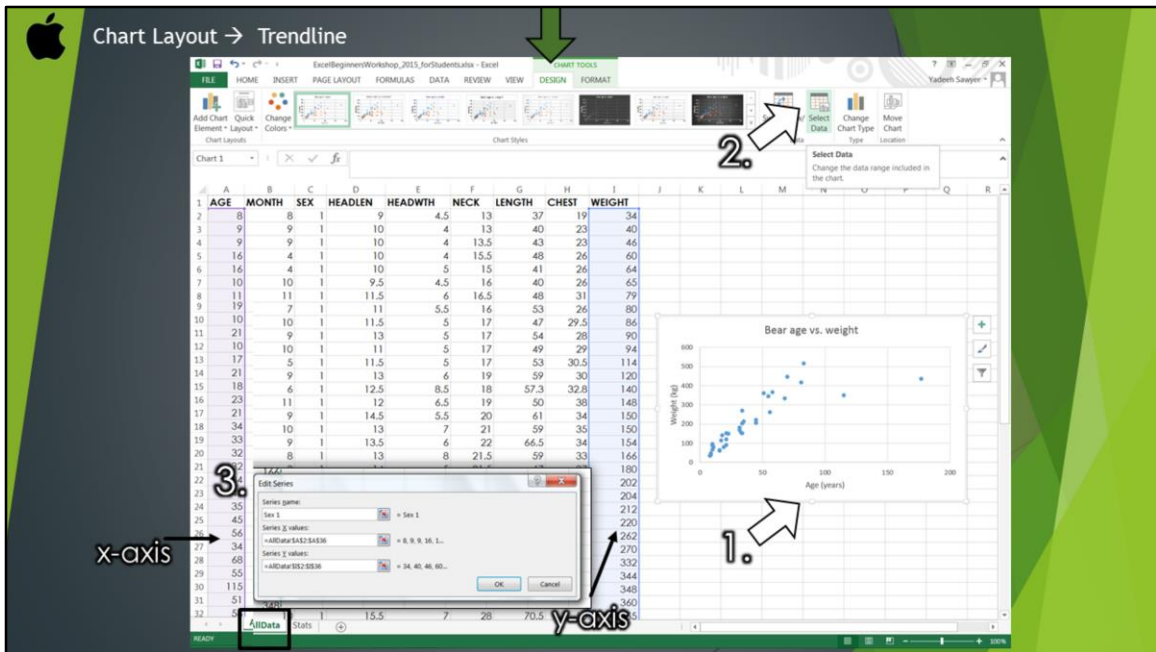
Graphs: Scatter Plots

Alright, let's back up a second and go through scatter plots. Once you are done with this section, you can click the final worksheet within your workbook to find the link to the exit Survey. This will help us improve the workshop if we give it again in the future.

We're going to do this on the "AllData" tab because we want to see how the individual values are distributed in relation to each other.

Some of the basics are the same as with the column graph, so I'm not showing you those detailed steps, but rather just pointing out where the steps are different.

I'll walk you through what I've already done for sex 1, as you see in the graph already. You'll just have to ADD sex 2, just like you did before, so that both sex 1 and 2 are on the same graph.

The first thing I did to graph To get to this point, I clicked a blank cell, then insert chart type and scatter plot.

Go add Sex 2, the first step is to make sure your graph is "highlighted", then under the Chart tools, design tab, select "select data". You can then ADD a series, just as you did for the column graph. The difference with scatter plots vs column graphs is that this time you have the option to select both x and y value ranges. For the X, we want the select all age values, and the y is all weight values. You can repeat this process for sex 2 by adding a series. In this case, you can't edit the horizontal values when you see the list of series plotted because you designated the values within each series.

And, like before, you can add labels – so make sure it says sex 2.
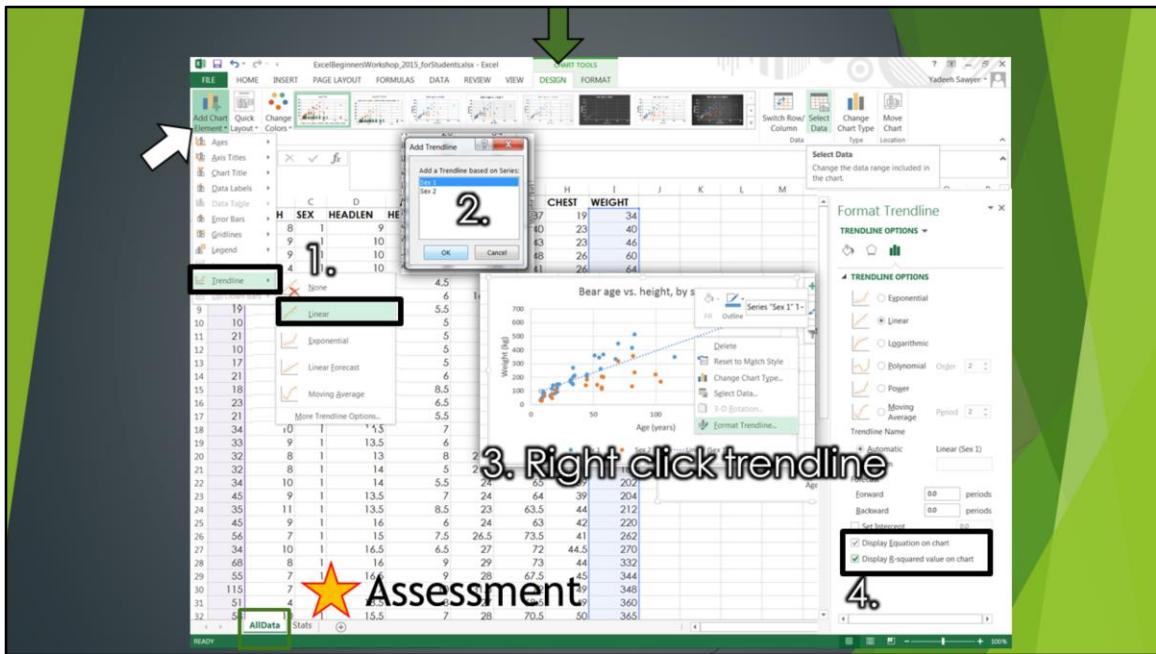
Alright, so, once you have both sexes plotted on your graph, you can add a trendline. Trendlines can be added to both column graphs and scatter plots. This will allow you to see the overall slope of the line and give you a visual as to the prevailing relationship among the plotted points. You can also see the R-squared value which gives you a quantitative assessment of how well the trendline represents the actual points, and an equation for the slope of the line. We don't have time to go into how to determine if there is a strong relationship between the variables or not.

To add a trendline, make sure the chart is selected from your chart tools, design tab is available and select add chart element, trendline. It will bring up an option for which series you want to add it. You'll select sex 2. In this case we're adding a linear line, but which type you choose depends on what your question is. Are you looking to see if the data is has a linear relationship, an exponential, logistic, etc.

After the Trendline is added, you can right click it and format the trendline. This is where you can select the options to display the equation and r-squared on the chart. Take a second to do this for Sex 2 and answer the last two questions in your assessment sheet. Then, as I said before, please complete the survey and you are free to go.

I'll go around and help you as necessary.