Sheet 1 – simple formulae and references

Online tutorials: http://www.excel-easy.com/functions/cell-references.html

Every cell in an Excel sheet has an address, based on its column letter and its row number. For example, on Sheet 1, the value "5" is sitting in cell **A2**: column A, second row. The value "7" is sitting in cell **A3**: column A, third row. Etc. The cell to the right of the one with "7" (a blank cell) is **B3**.

In any other cell, you can refer to the value of some cell by using "=" and its address. For example, click on cell **F4**. Then, within that cell, type "=A2". This will cause the cell to get filled in with whatever value is in A2; when you do this, after you press Enter, you should see "5" appear in cell F4. Now click on cell F4 again and instead type "=A4". Now you should see "3" appear in cell F4, because "3" is the value stored in A4.

This is called a *reference*. There isn't actually data in cell F4; cell F4 just points to whatever data is in another cell. This will update automatically whenever the actual data changes. For example, now that cell F4 contains a reference to cell A4, now try clicking on A4 and changing its data to some other value (e.g., "100"). After you do this and click Enter, cell F4 will also dynamically change to show 100, since cell F4 is just copying whatever is in cell A4. (After doing this, make sure to go change the value of A4 back to "3" again!)

These were some very simple references, just repeating a value from another cell. But you can also do mathematical operations (and other operations) on these values. For example, in F4, now type "=A2-A3". Now what you will see in cell F4 should be the value you get from subtracting A2 from A3: whatever value in is A2 (which should be 5) minus whatever value is in A3 (which should be 7) should yield a difference of "-2", which you should see in F4.

Sheet 2 – built-in functions

Online tutorial: http://www.excel-easy.com/functions.html

In addition to math operations like plus, minus, etc., Excel also has functions that can do other things. A function is something that takes in one or more values (a number or list of numbers, a word or list of words, etc.; these are called *arguments* of the function) and gives back a value. For example, a function called *average()* should take a list of numbers, and give back the average of those numbers.

The easiest way to find Excel functions is to search online. I usually just open a search engine like Google and search for something like "Excel function to find standard deviation". These pages also include instructions on how to use the function (e.g., what arguments to put inside the function). Another useful tool is

the "*fx*" button near the bottom of the Excel ribbon (see screenshot below). If you click on here, you can search for a function you want. Then when you double-click the function, a menu pops up which will help you put in the right arguments.
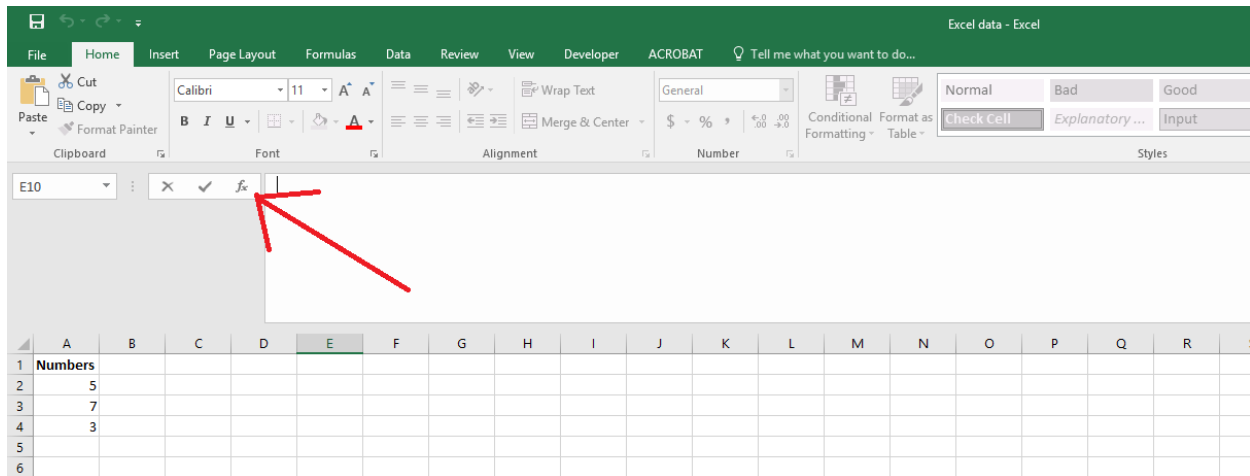
To use functions that take a list of numbers (like *average()*, which needs a list of numbers to average together), you need to know how to make a reference to a range of cells (i.e., a list of cells). Recall that you can refer to any cell by its address, e.g., "A2". You can use the colon operator (":") to create a range; the colon roughly means "to". So, while "=A2" refers to whatever is in cell A2, "=A2:A10" refers to whatever is in cells A2 to A10. Try selecting some empty cell in Sheet 2 and typing this formula to see it in action. You should see a long vertical box, selecting everything from A2 down to A10. You can reference any sort of range; for example, "=A5:F5" will create a long horizontal box, selecting everything from A5 right to F5. "=A5:C8" will select both multiple rows and multiple columns.

If you don't feel like typing, you can also reference using your mouse. Select some cell and type "=". Then, before typing anything else, just click on cell A3. You will see that the cell where you were typing has automatically been updated to say the reference "=A3". You can select ranges this way as well: select some cell, type "=", and then click and drag a bunch of cells. You should see a large range. Finally, you can do this within a function; for example, click on an empty cell, type "=average(", and then click and drag a range of cells.

Sheet 3 – dragging formulae down, sorting

Online tutorial: https://exceljet.net/lessons/whats-a-relative-reference

Now that you know how to use references and functions, you know how to get the average for each row on Sheet 3. For example, if you click on cell G2, you could type "=AVERAGE(", and then click and drag to select cells B2 to F2. You could then click on cell G3, enter the formula, and click and drag to select B3 to F3; you could

then click on cell G4, repeat, etc. etc. But this is very tedious. What you want is a way to automatically fill in each row in column G with the same formula, only referring to its own row.

This is actually very easy. Just click on cell G2 and write the formula you want to use. You should notice a thick green border drawn around the cell that you have selected, and on the lower right corner of that border there is a little green box. Click on the box, hold it, and drag it down to fill in all the cells you want. After you let go, you will see that each cell has been filled in with the same formula, but referring to its own row. For example, G3 will have an average for Row 3; G4 will have an average for Row 4, etc.

A faster way to do the same thing is to double-click the little box, instead of clicking and dragging it.

Sheet 4 – absolute (static) references

Online tutorial: https://www.techwalla.com/articles/how-to-make-a-cell-reference-absolute-in-excel

In some circumstances, you want to click and drag a formula down like you did in the previous sheet, but you want some part of the formula to stay the same, instead of changing as you drag down. For example, in this sheet, in the place where you want to adjust the ratings, each cell should take the same value from that row (e.g., rater 1's value for "circumstance" should come from cell B3, rater 1's value for "concert" should come from cell B4, etc.; this is easily accomplished by making one cell reference and then clicking and dragging it), but should then subtract the value from row 1. This should always be subtracting what's in Row 1, it shouldn't be going down as you drag the formula.

To do this, you need absolute references: a reference that keeps pointing to the same row and/or the same column, even when you drag the cell.

For example, click on cell O5 and enter "=A5", then click enter. You should see O5 showing whatever value was in cell A5 ("discuss"). Now click on the little square and drag this formula down several rows. You will see that each row shows a different word. If you click on some of these, you will see they have references with row numbers that have been updated, like "=A6", "=A7", etc.

Now, click on cell P5 and enter "=A$5". The dollar sign tells Excel that the row number is absolute: no matter how much you drag this around, it will keep pointing to row 5. Now, click the little square and drag this formula down several cells. You will see that each row still shows "discuss", and if you click on these various cells they will all have the same reference, "=A$5".

Now, click again on cell P5, where you have put a formula with an absolute row reference. Click on the little square and drag the formula *rightwards*. Now you will see different values appearing. That is because, while you made the row reference static, you didn't make the column reference static; as you drag that function, it keeps referring to different columns (=A$5, =B$5, =C$5, etc.).

Sheet 5 – graphing

Online tutorial: http://www.excel-easy.com/data-analysis/charts.html

Graphing in Excel is pretty flexible. Just select the range of cells you want to plot, then click "Insert" in the ribbon at the top, and select the kind of chart you want. If it looks very different than what you expect, you might need to click the "Switch Row/Column" button.

There are many more ways to customize the graphs; again, the best option is to search online for advice. You can also talk to me if you need help.