

An Introduction to Excel

Learning the Basics

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This is the complete hand out for the Excel workshop series. I will be cover a lot of material through the lecture series to bring people from the basics to intermediate skill. The series progresses from (1) basic user-ship and navigation to (2) introducing some of the more unfamiliar basic features like drag-and-fill, text to columns, and formatting. (3) introduces students to sorting and filtering, named ranges and dropdown menus and (4) initiates students to basic functions and how excel operates them. Finally I use (5) to teach nested functions and (6) focuses on using and manipulating pivot tables.

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An Introduction to Excel: Learn the Basics

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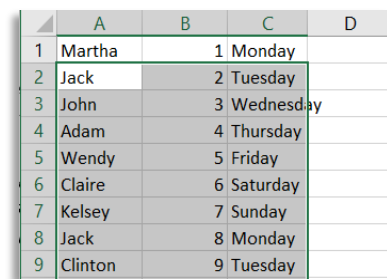
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1 Basics

At the risk of seeming condescending, I am going to simply start at the VERY beginning. If you already are familiar with the most basic operations of Microsoft Office programs, please gloss over this section and pick up later in this section or in the next section. I am going to quickly cover the most basics here. In case you have never had cause to open an excel document, this is a way of handling information. Normal use is to have each row be a topic or object and each column is information about that topic or object. An example might be a mailing list that has one person on each row with phone numbers, names of kids and spouse, address, or something else in each column of that row. Let's get started!

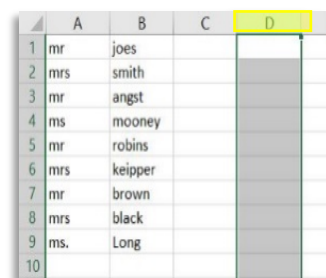
1.1 selecting cells

To select a single cell, click on it! it is that easy. You can now type any character on your keyboard into that cell. Shown here at figure 1 you can see that I have put some names, gender, and prefixes (Mr., Mrs., Ms.). I could just as easily put numbers or hashtags. Now, if you want to select more than one cell, simply click on a cell, and drag your mouse over until you have selected all the cells you want. You will notice that you must select cells in a rectangular shape this way.



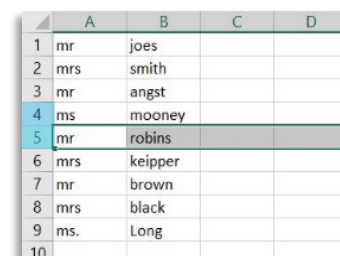
	A	B	C	D
1	Martha	1	Monday	
2	Jack	2	Tuesday	
3	John	3	Wednesday	
4	Adam	4	Thursday	
5	Wendy	5	Friday	
6	Claire	6	Saturday	
7	Kelsey	7	Sunday	
8	Jack	8	Monday	
9	Clinton	9	Tuesday	

You can also navigate by using the arrow keys to move up down left or right. You can also use the “tab” key to move one cell to the left and the “enter” key to move one cell down. You can also use “shift+tab” to go one to the right and “shift+enter” to move up one cell. If you



	A	B	C	D
1	mr	joes		
2	mrs	smith		
3	mr	angst		
4	ms	mooney		
5	mr	robins		
6	mrs	keipper		
7	mr	brown		
8	mrs	black		
9	ms.	Long		
10				

want to select all the cells in a given column, click once on the **label** of that column (eg. A,B,C). You can also select and entire row by selecting the **number** of that row. Any of these selection methods will let you copy, paste, delete,

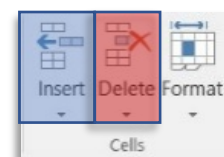


	A	B	C	D
1	mr	joes		
2	mrs	smith		
3	mr	angst		
4	ms	mooney		
5	mr	robins		
6	mrs	keipper		
7	mr	brown		
8	mrs	black		
9	ms.	Long		
10				

or move all the contents. You can also navigate within these selected range with the tab and enter commands but, if you use the arrows it will deselect the range. A way to select everything in your whole sheet is to click on the box between the “A” column and row number 1. This will highlight everything in your sheet and allow you to copy, or delete everything or adjust multiple columns / rows at once (see below in section 2.1)

1.2 Rows & Columns

You can add and remove rows and columns to your sheet. Using the tool bar of the “home” tab to **insert** a row just above the row that is currently selected. You can also insert a column to the right of whatever column you are currently



	A	B	C	D	E	F
1	1	1.51	1.06	18	Spanish	M
2	1	1.82	1.33	24	Spanish	F
3	1	1.21	1.17	31	Spanish	F
4	1	3.11	3.58	23	Spanish	M
5	1	2.68	2.98	19	Spanish	F
6	1	3.22	3.23	25	Spanish	F
7	1	3.83	3.26	24	Korean	F
8	3	4.01	4.39	28	Portuguese	F
9	3	4.17	3.41	17	Korean	F

information.

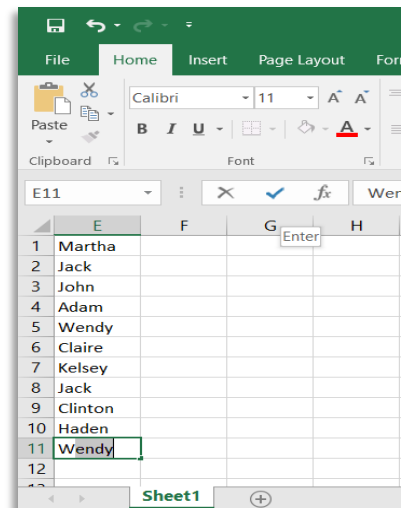
	A	B	C	D	E	F
1	Sub	LAT	Speak	Age	Lang	Sex
2	1	1.51	1.06	18	Spanish	M
3	1	1.82	1.33	24	Spanish	F
4	1	1.21	1.17	31	Spanish	F
5	1	3.11	3.58	23	Spanish	M
6	1	2.68	2.98	19	Spanish	F
7	1	3.22	3.23	25	Spanish	F
8	1	3.83	3.26	24	Korean	F
9	3	4.01	4.39	28	Portuguese	F

selecting. You can also **delete** a selected row or column in the same way. This also works with individual cells. If you insert or delete a single cell, it will move all the cells beneath it down or up depending on whether you used insert or delete. This is often useful for adding in information that you may have forgotten about. For instance, **adding in headers** after putting in

Also, the little triangle below the insert and delete buttons in the home menu will give you more options and control on what exactly what you want to do. All of this can also be accomplished by using the right click on your mouse to access a menu that gives the same options to insert or delete based on whatever you are selecting.

1.3 Auto-Complete

Let's create another column that includes where these people were born. Something Excel does for you is what's called *auto-complete* which is where it tries to help you out and saves you less typing. If you start typing something that has already been seen in the same column, fill it in for you, assuming you'll want to type it again. When your spreadsheets get bigger and there are multiple options that match, it'll have many more choices for you to select. You can "approve" autocomplete by hitting tab or enter like normal. If this feature bothers you, you can turn it off.



1.4 Drag and fill

When you have entered in some kind of data (dates, numbers, etc.), you can get excel to continue filling out the data for you. By selecting the cell you want to start with and dragging it over (or down) by the little square handle in the bottom right

	A	B
1	Martha	1
2	Jack	2
3	John	
4	Adam	
5	Wendy	
6	Claire	
7	Kelsey	
8	Jack	

of the cell. Series of numbers need at least two in a series before excel understands that you want it to keep the sequence going, otherwise it will just copy that number over and over again. It will do it's best to predict what you want. Dates and days of the week will be drag-filled but, letters or names will just be reduplicated in the pattern they appear in. This is a good way of getting something to repeat instead of having to manually type it in or repeat the copy & paste functions.

	A	B	C
1	Martha	1	Monday
2	Jack	2	Tuesday
3	John	3	Wednesday
4	Adam	4	Thursday
5	Wendy	5	Friday
6	Claire	6	Saturday
7	Kelsey	7	Sunday
8	Jack	8	Monday

1.5 Workbook vs Worksheet

For the purposes of clarity and in order to help keep the number of excel documents from exceeding your ability to manage them, let's look at the difference between workbook and worksheet. When you start a new excel document that is your "workbook". If you look down on the bottom left of your workbook, you will see that it is titled "sheet1". You can double click on that name, or right click to open a menu, to rename it to whatever you'd like. Just to the right of that, you will see a plus sign, if you click on it, you will see that excel creates another sheet for you to work on. This is great! You can now keep track of multiple sets of data in one file without over cluttering!!!

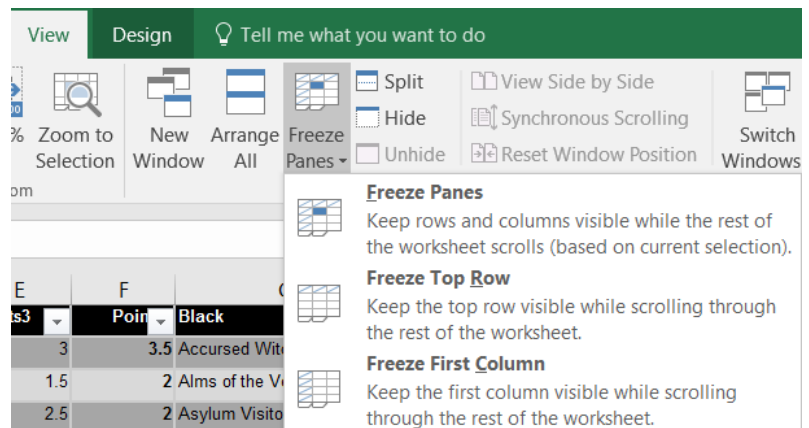
1.6 Hiding unwanted rows and columns

At this point I also want to point out that you are able to hide individual sheets. You might not want to show everyone your other projects or, you might data on those other sheets that are not part of your finished work. For me, I will have lots of my named ranges and formulas back there that allow me to do fancy things on the front pages (we will cover all of those things later). You may also hide individual rows and columns in a similar manner, by right clicking on the column(s) you want to hide and tuck them away. If you do, you will notice that the numbering will appear to skip the selection that you have hidden and jump from, in this case, "H" to "M". When you do this, you will also notice that the hidden section is marked by a [double line](#) in the numbering.



1.7 Freezing Views

For all those times when you will be working with large tables that are both longer than your screen and wider than your screen, it will become useful to freeze portions of your sheet. In the view tab, you can tell excel to keep either your top for, first column still while you move through your sheet. This is most often used in order to keep the headers in place as your scroll down so that you don't lose track of what data is in which column, especially if your data is all numbers. You can also "Freeze Panes". This takes some getting used to, but it keeps the top several rows and the left most few columns in place as your scroll around. Try it out for yourself to see if you like it.

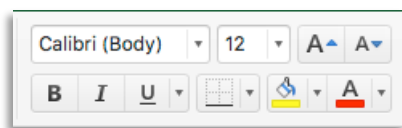


2 Formatting

This is the next step. From here we will start manipulating settings, small at first, to give you control of your workbooks. We will start with the basics of applying formatting to your work sheet and gradually move into applying dynamic, customizable formatting that is based on rules that you get to set and apply as you see fit to all or part of your sheets.

2.1 Fill, Color, & Size

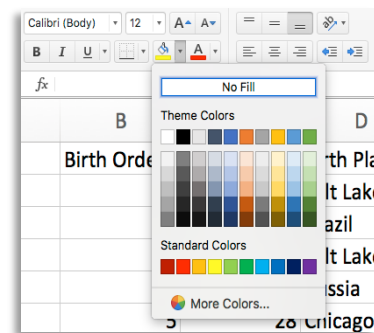
Now that we have some data entered, let's look at the ways you can format it as a whole. In the same "home" toolbar you can see where you can change the typeface, font size (using actual numbers or simply make it bigger or smaller), make things bold, italic, or underlined, add



borders to cells, fill the cell with a color, or change the color of the text. For each of these, there

is a dropdown menu that has further options, so if you're not a fan of the super bright yellow fill, you can click the little arrow and change the color to something less fluorescent. It can be fun to play around with these formatting options until you get something you like.

You are also able to change the width and height of each column and row by using the boundary between any two columns and dragging it right or left. You are also able to simply double click on this boundary to have it automatically adjust to the minimum distance required for all the text in that column to display in one line. The same holds true for rows.



2.2 Alignment, Merge

In addition to all of this, you can tell excel how you want the data to align within the cells. This can be

	A	B	C
1	Martha	1	Monday
2	Jack	2	Tuesday
3	John	3	Wednesday
4	Adam Zerkies Farmsworth II		
	Wendy Mclarin, dame of death		
5		5	Friday
6	Claire	6	Saturday
7	Kelsey	7	Sunday
8	Jack	8	Monday

useful for creating visual separation of data. By default, text will align to the left and numbers will align to the right. You can also tell excel to align text to the top, middle or bottom of a cell. This is most helpful if you have texts of several sizes or if you have an extra tall row. You can also tell excel if you want text that is longer than your cell to continue make another line with in that cell (or text wrap), or to keep going off the edge of the cell. If you choose to have it just keep going, the part that runs out side of the cell will be



hidden if you type anything into the next cell. You can always see it again if you click on the cell where it was typed. You can switch back and forth with the text wrap button.

Sometimes you want a single large cell for something, like a Title, or header for several columns. You can select all the cells you want to use and **merge** them together into one supercell. You can use the button again on the cell to re-divide it back into the cells that were used to make it. When you do this though, beware of how this might affect you. If you would sort, filter, insert, or delete columns and rows that go through this merged cell, excel will not like it and probably affect the entire cell.

2.3 Cursors shapes

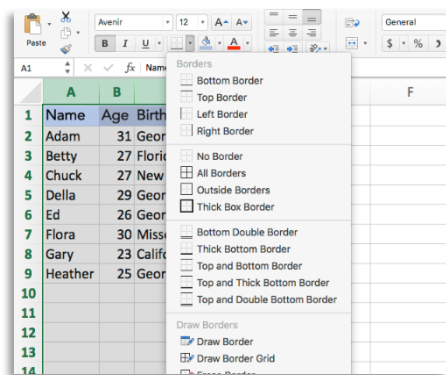
Please pay attention to the different cursor types. This will tell you what you command you can do. If you are trying to do a certain function, pay attention to what your cursor looks like.

	This is the general cursor. It means you are ready to select a cell
	This cursor means you are able to adjust the width of columns or rows
	This is the drag cursor. This is what you use to drag a cell's contents down or over
	This cursor means you are ready to edit the contents of a cell. This is what happens when you double click on a cell.
	This cursor means that you are moving a cell, or range of cells, to a new place. A short cut for copy & paste.

I know that it seems silly to spend time on which cursor you are using, but this can help you with many of the frustrations that you are likely to have. I have witnessed many a people throw their hands in the air declaring loudly that they will never again take up excel. This kind of outburst can be avoided if only you learn what kind of cursor you are seeing, because that will tell you if you are doing this correctly, or if excel has understood your intent.

2.4 Borders

You can add some visual structure to your spreadsheet by using borders, though they are a bit of a nuisance to use. In the dropdown menu by the border button, you can see all the various options for kinds of borders you can add. You can add borders to the left, right, top, and bottom, and then there are some shortcuts for some other common patterns and styles. I like to put a small border underneath my column headers, so I can highlight the entire first row and add a bottom border. On the very bottom, you can click on "More Borders..." which will open up a new window with lots of other options for the line type and color. Borders are great if you have a relatively small spreadsheet that will be seen by lots of people. But in this workshop, we're working on learning how to manage your data for a Digital Humanities project, so I wouldn't worry too much about them.

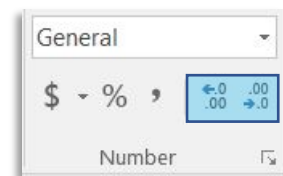


2.5 Number Formatting

The last portion of the toolbar that I want to introduce in this first section is the number format section. But this takes a bit of explanation beforehand.

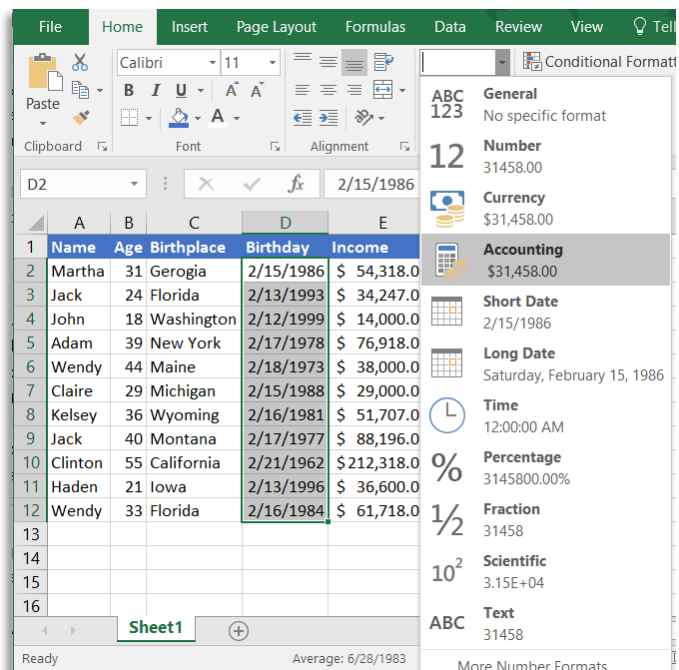
For a given cell, there are two ways of looking at it: there's the way it looks and then there's the underlying contents. I'll call these the "surface" and the "underlying" forms respectively. A lot of the time, what you see is exactly what the underlying contents are. But sometimes you'll want to display the information differently. Take a number like π (3.14159...). If you wanted to include this number in your spreadsheet, theoretically the cell would have to be much wider than you'd ever want it to be. You probably just want to round it to the nearest couple decimal points (3.14). With number formats, you can make it so that Excel remembers the full contents of the number, but only displays a portion of it.

To do that, you'd highlight the cell and hit the button that looks like a comma in the format portion of the toolbar. You can then use the [buttons](#) with the little zeros and blue arrows to change how many decimal places you want to display. If you want to display your numbers with a currency symbol, or as a percentage you can do that too. There are a couple reasons this is handy. Sometimes you just don't want to look at all the decimal points in your numbers. It can also save you a lot of typing: you don't need to keep putting in the dollar sign or the percent sign for every row.

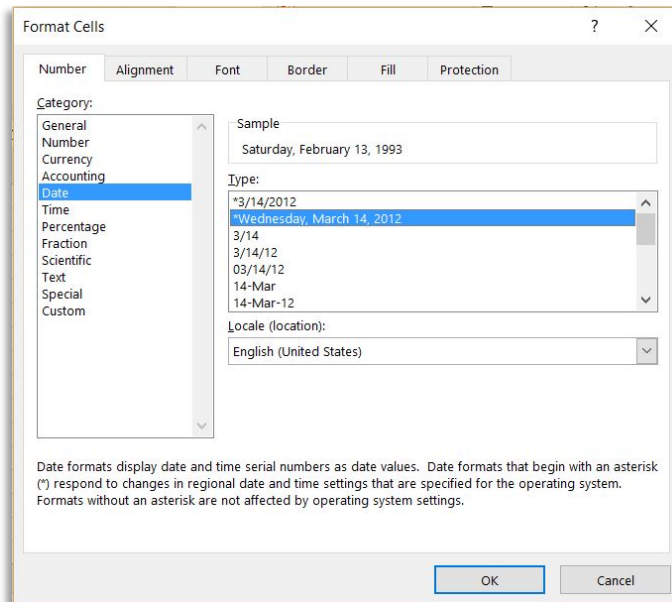


Probably most importantly though, it makes functions work better. If you want to divide "\$10" by three, Excel expects numbers when it does math, and the dollar sign throws everything off—if the dollar sign is in the surface form. But if the cell only contains "10" underlyingly, then it knows what to do. Also, after you've divided by three, it's pretty useless to see two decimal points after the dollar sign (\$3.333333), so you can only display two, though Excel keeps all the others in its memory. As proof that Excel retains that information, if you multiply that number by 1,000,000, the answer will be \$3,333,333.33, whereas if it multiplied it by the surface (rounded) form, the answer would be \$3,330,000.00.

There are many, many more formats available, including the option of creating your own. The only other one I want to bring up today is the date format. To practice, let's add birthdates to the table of friends. In the example, I entered this data with slashes, and that's fine. But what if I decide later on that I want to write out in full? With only eight dates, it wouldn't be unreasonable to do that ourselves, but if you had hundreds or thousands of rows, this would be a huge pain. Luckily, Excel is smart and knew to interpret a set of three numbers divided by slashes as a date. So if we highlight the cells we want to change and open up the drop down menu, we can select "Long Date" and see how they update. Now, under the hood, Excel still knows they're dates, so if you run a



function that calculates how long ago something was, it'll still work just fine. We'll get to that later though.



It is worth noting that if you use this drop down and select the last option, “More Number Formats” or open up the menu by right clicking on the highlighted cells and select “formatting” we can see that there a *lot* more options for us to choose from further increasing our control over our data and how it looks. Again, of the many reasons why this is helpful, the biggest one is that we can change how our data looks to us without changing the underlying format that we input in the first place.

Side note: Sometimes Excel tries too hard and formats things as dates when you don't want it to. If you put anything that looks remotely like a date, it'll interpret it as one. So

if you are putting in information about sections from a book or something (1-2 or something), it'll interpret it as “January 2, 2017”, which can get annoying. You'll have to go back and tell Excel to interpret it as Text, rather than Date, which is available as the last option in the dropdown menu.

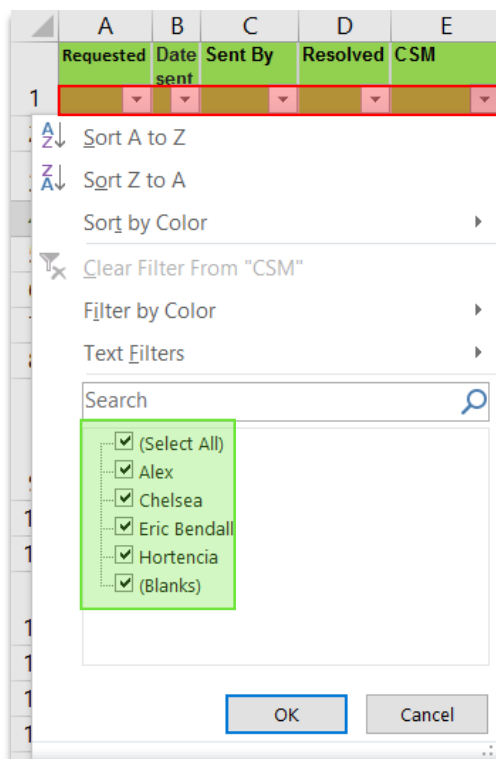
3 Next level Functions

So far, we have covered things that will help your data look cooler but won't really help you save time. In this section, we are going to start talking about features and functions that require a little more work but will also have a much more powerful impact on your worksheets. We will first go over sorting and filtering and then move on to ranges and dropdowns and finish with tables and graphs. You should consider this the first your first level of excel wizardry. Once mastered, these skills can provide some very valuable flexibility and power to your data.

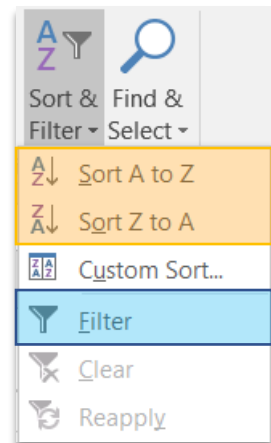
3.1 Sorting and Filtering

If you have a lot of rows of data it can be difficult to find the parts that you want to work on. They often get spread out and aren't grouped together very well. This is especially true when you want to switch back and forth between looking at a few different groups of data. In this example I'll be using a set of dummy data for a company to show that this is just as applicable in a company setting as it is in academia.

The first thing you need to do is select the range that you want filtered.



You won't always want it on every column and so you can pick and choose but, if you want to make it easy on yourself, just select everything by clicking the corner in the upper left of your sheet and then click the little "sort and filter" button in the top right of the "home" tool bar. This will open up a short drop down. From here you have a few things to choose from, each with its own purpose.



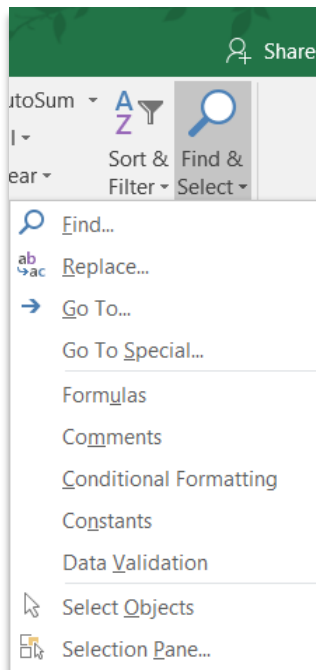
Simply clicking on **Filter** will apply a **drop down** to the top of each column of data that you have selected that will allow you to choose how you view your data. By deselecting these **boxes**, excel will remove all rows that contain that value. In this example if I kept only Alex and Chelsea selected, I could see only Alex's and Chelsea's data. You can also toggle the "select all" button to add or take away everyone. If you have 11 possible vales and you only want one, you can deselect every one and then just add the one or two you actually want to see.

These **first two** options of the sort and filter button are kind of self-explanatory; they will sort your data in descending or ascending order. If you have more than one column of data (extremely likely) then it will ask you if you want to include these other columns in the sorting so that the other cell stay relative to your selection. If you don't do that, then only the selected column will sort independent of everything else.

If you pick customer sort from the drop down, it will allow you to layer your sorting options. For instance, you can sort by the person in column E then by the yes/no in column B and finally by area in column H. This would give you all the data sorted first by the person's name, and then within each person's grouping the Yes would be on bottom and the No would be on top and finally within the Yes/No grouping it would be sorted by area (alphabetically). This is extremely useful for grouping data in different ways depending on what you are interested in seeing at the time.

Similarly, you can filter your data (i.e. removing parts) using the filter-dropdowns in a similar way to see *only* a Chelsea's Yes data in Nassau. If you have formatted some of these cells (make ones that are interesting to you in Green and ones that are problematic in Red) you can filter so you only one those kinds or everything except those. It is really a choose-your-own-adventure kind of tool to help you chunk your data into more visually manageable amounts. The real kicker is that you can use both of these in tandem from the drop downs you put in your columns with the Filter function to both isolate and sort the data you want.

3.2 Find and Replace



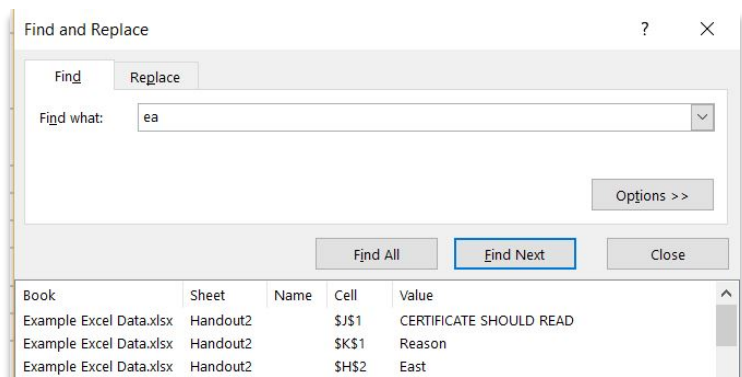
Now that you know how to sort and filter your data, you might have noticed that in one or more columns you have two different spellings of the same thing, like two options for Chelsea ("Chelsea" and "Chelse"). You can easily fix this by using the search and replace function. This is also helpful to find a single piece of data in a huge data set that you want to look at but can't remember where it is.

To do this use the search function, which is the magnifying glass next to the Sort & Filter function. This will give you the drop down you see to the left here. Simply clicking on the Find function will give you a window to find what you are looking for. It will always do it's best to find exactly what you are looking for which means that if you type "Jun" in an attempt to find the month of June – it will also find things like "Juno" and "Jungle".

It is *not* case sensitive so it will not care if you searched for something

as a capital or not.

You can also click on Find All instead of just find next to get a list of exactly where each of the things you were looking for appeared as well as the entire contents of the cell. In this case I searched for "ea" and it not only returned "East" but also "Chelsea" and "Certificate" because those also contained the item we searched for. You can double click on any of the items in the list to be taken there and see the entry. You can also click on replace to be given two fields for you to put in what you are looking for and then what you want to replace it with. You can decide if you want to

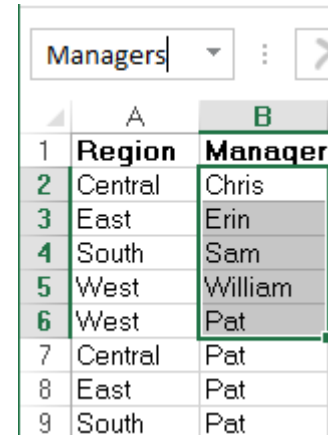


replace just one item at a time or if you want to replace all of them at once. This is great for changing the names of variables or names of people all at once.

3.3 Named Ranges

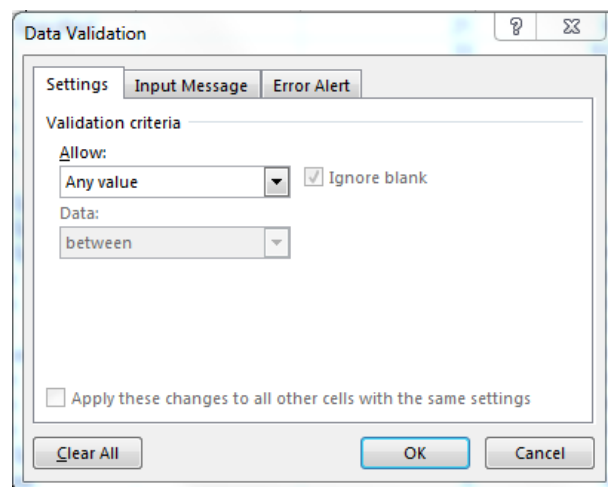
This is a very easy trick to learn that has used far and wide. The first thing to do is select a range of cells that you want to be able to easily reference and then type a name for this range into the dropdown menu above. In this case, I have chosen to select some of the managers and make a named range out of them calling it “Managers”. This does a few things for us, firstly you can always click on the dropdown menu where we typed in “Managers” and you can select that named range and you will instantly be taken there from anywhere in your work book. This is nice for making a little book mark for you to return to if you have a particularly large data set or many pages where you can get lost.

The other thing this does for us is provide the first step needed in creating a dropdown menu. The next step is to select somewhere for us to make a dropdown menu. Let’s



The screenshot shows an Excel spreadsheet with a named range 'Managers' selected in the top left corner. The spreadsheet contains a table with two columns: 'Region' and 'Manager'. The data is as follows:

	A	B
1	Region	Manager
2	Central	Chris
3	East	Erin
4	South	Sam
5	West	William
6	West	Pat
7	Central	Pat
8	East	Pat
9	South	Pat



go to another tab, “Orders” in this case, and insert a new column E and name it “Managers. Then select the column by clicking on the header, go to the “DATA” tool bar and click “Data validation”. This will bring up a sub menu. From here we can do a lot of things, but in this case we are going to use that first drop down menu to select “List” which will prompt you to put in a range (which you can do – like E5:E11) or type the equals sign and the name of the range you have already made “=Mangers”. Now the ‘E’ column will have a dropdown menu in each cell that will have options for each item in my named range!

3.4 Graphs

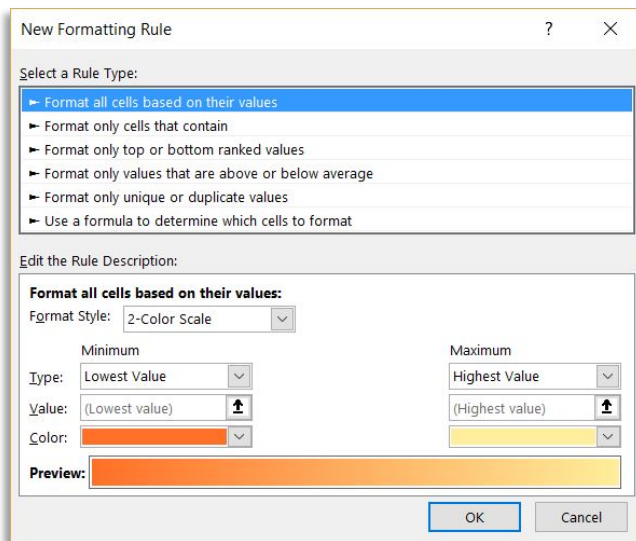
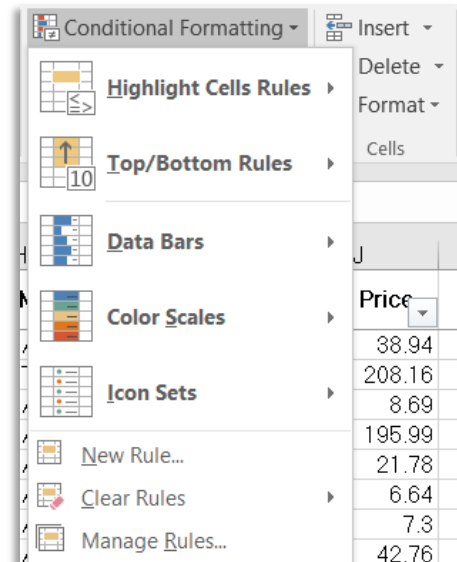
The best thing to do here, is select the set of data you want to represent and then click on the “Recommended Graphs”. Excel is pretty good at picking graphs that will help you. Once you pick the one you like, you can always adjust it so that it looks good and has the labels that you want. If you are looking to make substantially more complicated and customized graphs, you are better off going with a program like RStudio.

4 Conditional formatting

This section is dedicated to setting up formatting rules that are dependent on some kind of condition. This is great when you want to automatically highlight cells of certain values to alert you visually as soon as the change happens. You can also have color gradients and have one cell changed based on the value of another cell. This is a very flexible tool that makes tracking data much easier and works well with sort and filter measures. You can change the rules at any time but, they will always be in force and will dynamically change if you change the contents in the cell.

You start setting conditional formatting by selecting the drop down menu in the “styles” block on the Home tab. The many sub-menu options that are available in the drop down are just there to provide quick access to many of the more popular

choices,



grouped by operation. Of the three options at the bottom, “New rule” lets you make a new condition from scratch, while “clear rules” delete all conditional formatting from either your selected range or another sheet. Lastly, manage rules lets you see all the rules in one place so that you can edit them more easily.

NOTE: Making a rule from scratch still provides you the same options as the drop down, just from a single interface instead of selecting one of the sub fields to begin with. This gives you more control but, you can’t access the “Data Bars” “Color Scales” or “Icons” from this menu.

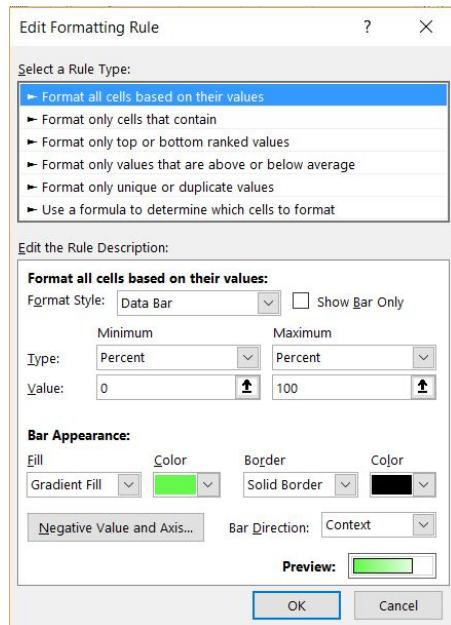
4.1 Highlight Cells Rules & Top / Bottom Rules

These are the first category of conditional formatting rules. These are based on values relative to some standard that you set. In BIGBOX, under the “orders” tab, I have set up a “greater than” rule in the C column for dates that are greater than (newer) than my target date of 2/14/2012. I have also put a conditional formatting rule based on text that contains “corporate” in column O. You’ll notice that this hits anything that has that name, it doesn’t limit to exact text, that is in the “equals too”.

As you can see in column G of the BIGBOX data, I have applied two rules here. The first one is to highlight text that is in the top 10% of values (relative to the selection of your range). The second on

is to change the background of the cells to a light green if they are above the average. This is to just show that you can layer these to show both bits of information.

4.2 Bars, Scales, & Sets



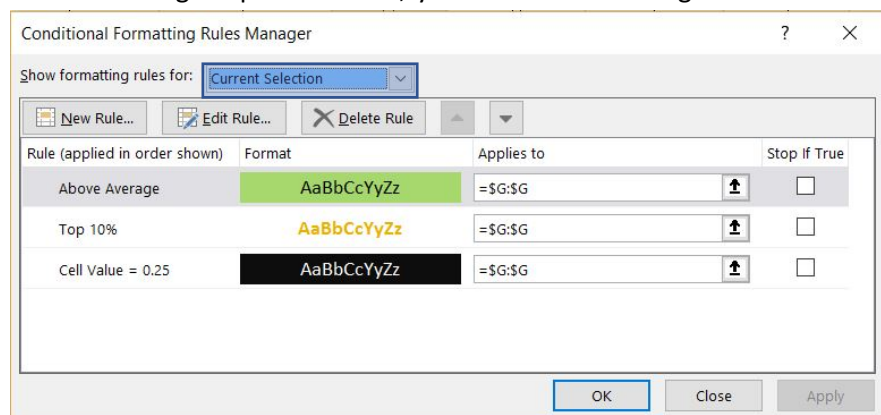
These are handy little tools for evaluating a selection of data visually at a glance. They all serve a similar purpose and since you can have all three apply at once you can have them represent different things. By default all of these will use the lowest value in the set and the highest value in the set as the caps and then make everything relative. However, each of these tools do have some differences as I will discuss below.

For the color bars, it is possible to set the bounds based on a value that you determine, a percent, percentile, or formula. This allows you a lot of flexibility in how you represent something. If you are interested in the absolute value then using percent from 0 to 100 will scale the bars accordingly. If you wanted a relative value to the scores available (for grades for instance) you could use highest and lowest number.

The color scales allows you to pick out the color you want to scale between and whether you want a two point, or three point scale. This really just allows you to have a midpoint if you feel that would be worthwhile for your data. Similarly, with icons, you can decide how to break up the categories. They can be evenly spaced in percentiles, or you can have 0-50, 50-90, 90-95, 95-99 and 99-100.

4.3 Managing Rules

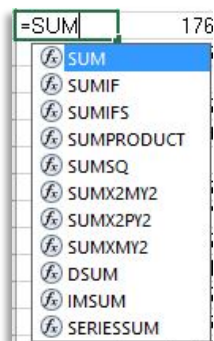
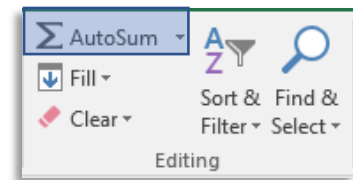
By opening the conditional formatting dropdown menu, you can select “manage rules”. This is where you can see what rules are active, edit their rules, manage the range they affect. To edit the rule, you can simply double click the rule (or select it and then click the “edit” button at the top). This is also where you decide which rule you want to have applied first. You can see this in column G of BIGBOX. If you reorder the rules to have the bottom one on top, then all cells that have “0.25” in them will be black with white text before any of the other rules apply. This will trump later rules. You can also choose if you want to look at all the rules in the work sheet you are on, the area you have selected, or any table or specific tab you have elsewhere in the workbook but using the [drop down](#) at the



top. If you want one rule to override another. You can do this by changing the order they are applied in. The ones at the top are the ones that get applied always and the further down you go, the less precedence it gets.

5 Formulas

The purpose of a formula is to make excel do something automatically for you or to somehow make your life easier. In this section, we will go over some of the most basic formulas. These are the building blocks for all formulas that come after and can do some amazing things on their own. Many of these simple [formulas](#) are in the far right of the Home toolbar.



The first thing to know about formulas is what rules they follow. To enter in a formula you must tell excel that that is what you want to do. So, you start every formula with an “=” sign to let excel know you are not just typing text. As you start to type the name of a formula excel will want to auto fill for you. You can accept one by using the arrows and then pressing “tab”. Before you select any of the formulas, excel will give a short description of what that formula does to help you choose the right one. As you can see, there are many, many more formulas that you will likely ever become familiar with.

Then it is time to put in the conditions of the formula that makes it work magic. Each formula has a set of “arguments” or conditions that make it work and knowing what to do with those arguments is very important. For the simple formulas you will be working (usually) with just one argument. There are only a few kinds of possible arguments and the two that are most common are a range (that you define or select at the time of the formula or a named range that you have pre-defined) or a number that you type in manually at the time of the formula. In the example to the right, I am using SUM, which adds things together that I list; in this case the value in cell G2 and the number 87. If you put in something that is in the wrong order or an unacceptable value (like text where a number should go) excel will yell at you. I’ll explain more below as I go through some of the most common formulas.

2		175
3	=SUM(G2,87)	

5.1 Simple Formulas

5.1.1 SUM

This formula is as simple as they come. The purpose of this is to simply add up all of values in a range for you. While this is a simple process it can be important when combined with other formulas or just with math processes. As you can see from the BIGBOX sample data set, there are several columns that would be helpful to simply SUM.

There are two main ways to do this. The first is to first highlight the range that you want to have summed up and then use the dropdown menu in the home toolbar and click SUM. The sum will be in the cell immediately beneath the range. The other way to do this is to click on the cell where you want the sum to be then enter the formula manually “=SUM(RANGE)”. This will return the sum of the range to the cell you put the formula in.

	A	B
1		Row ID
2		175
3	=SUM(G2:G8400)	
4		406

You can get fancy with this if you want by adding additional ranges to the formula by simply separating them with a comma. For example, in the BIGBOX sheet you could put “=SUM(G2:G8400,-K2:K8400)”. In this case, I added the first range to the second range (which I made negative). You can add as many rows together as you’d like.

5.1.2 AVERAGE

This is just like the SUM formula. You can use either of the same methods that are described above (quick menu or enter formula manually) to get the average of the selected range. Just like the SUM formula, you can have multiple ranges in the formula and will average them all together.

	A	B	C
		Row ID	Order ID
1			
2		175	1154
3	=AVERAGE(G2:G8400)		
4		406	2757

NOTE: AVERAGEA – This is a slight modification of the AVERAGE formula that will not try to include text that may be in the range that you have selected.

5.1.3 COUNT

This formula is simply used to count the number of cells in a given range. It may seem like a silly thing to use but, when looking at a selection of a sheet with 8400 rows it may be useful to know how many of an item you have. For example, if you sort the BIGBOX sheet by column E, you may want to know how many items that are classified as F. This will only count cells with numbers in them by default.

	A	B
		Row ID
1		
2		175
3	=COUNT(G2:G8400)	
4		406

NOTE: COUNTA – Like AVERAGE, this will count the number of cells that are not empty. This alternation will count ALL cells, not just numbers.

NOTE: COUNTBLANK – This will count ONLY blank cells. Again, useful if you want to count up blanks over thousands of rows.

5.1.4 VLOOKUP

This formula is one of the most used formulas in all of excel. The purpose is to give excel a value, a place to look up that value and then, once it is found, return a value from that row. This is great for dynamically finding information based on some kind of unique value. For example in the BIGBOX data, if I wanted to find the price of a particular order, I can look it up based on the row ID or even the order number. The formula works like this:

1. The item that you want to search for
2. The range where you are looking for something (the column you are using to search for the item in number 1 should be the left most column of this range in order for the VLOOKUP to work out).

D14	=VLOOKUP(D13,B2:E11,3,FALSE)				
	A	B	C	D	E
	Part				
1	Supplier ID	Number	Part Name	Part Price	Status
2	SP301	A001	Water pump	\$68.39	In stock
3	SP302	A002	Alternator	\$380.73	In stock
4	SP303	A003	Air filter	\$15.40	In stock
5	SP304	A004	Wheel bearing	\$35.16	In stock
6	SP305	A005	Muffler	\$160.23	In stock
7	SP306	A006	Oil pan	\$101.89	Out of stock
8	SP307	A007	Brake pads	\$65.99	In stock
9	SP308	A008	Brake rotors	\$85.73	Out of stock
10	SP309	A009	Headlight	\$35.19	In stock
11	SP310	A010	Brake cable	\$15.49	In stock
12					
13		Part Number		A008	
14		Part Price		\$85.73	5

3. The number of columns over you want to have returned. A number of 1 would return the first column (that you just searched by) and a column of 3 would be 2 more columns to the right of your selection – in this case column of “Part Price”.
4. If TRUE, will find an approximate match.

5.1.5 IF

This is a useful formula for simple if-then statements like, “ if the value in cell G12 > 200, say “YAY”, otherwise say “BOO”. What your doing is setting some kind of condition that returns one of two things depending on if it is true or not. You are even able to leave one of the options blank, or input a picture or value of another cell. By using “=IF(SET_CONDITION,TRUE VALUE, FALSE VALUE).

5.1.6 CONCAT / CONCATENATE

This simply puts the contents of two cells together. When we refer to the contents inside a cell we usually call them “strings” if it is text to distinguish from numbers. Your arguments can either be manually entered or a range of cell(s) or a mixture of them. This formula will NOT add numbers, it will treat anything you put in here as text so if you put =CONCAT(387, 91) YOU WOULD GET “38791”. Similarly, if you put =CONCAT(Carl Jackson, Corporate) you would get “Carl JacksonCorporate”). You can add a space in there by inserting a third argument in between them like the image to the side shows you.

	L	N	O	P
1	Customer Name	Region	Customer Segment	Product
7	Carlos Soltero	Nunavut	Consumer	Furniture
8	Carl Jackson	Carl Jackson Co	Corporate	Office
9	Carl Jackson	=CONCAT(L8," ",O8)		Office
10	Monica Federle	CONCAT(text1, [text2], [text3], ...)		
11	Dorothy Badde	Nunavut	Home Office	Office
12	Neola Schneide	Nunavut	Home Office	Office

NOTE: The longer “CONCATENATE” function is now an old, defunct version of the newer “CONCAT” function.

5.2 Nesting Formulas

The next level of formula usage is learning how to nest them. We will start by looking at combining the IF formula with others and will end with a multi nested formula. These can be powerful and specific in dealing with data. As with simple formulas, you can implement these to operate dynamically so that they will respond to changes of your data.

Nesting formulas always works on the same general format in that you just need to make sure that you are fulfilling all of the required fields. Excel is helpful with this as it [guides](#) you through each

	A	B	C	D	E	F	G	H	I	J
1	Service	Project	Office	Group	In Service Date	Assigned Agent	ID	Day		
2	S-4280263	SP-3418558	NY-02 Long Is	NY-02	7/28/2015	Alexander M	119457	SP-3418558		
3	S-4275023	SP-3416371	NY-01 Long Is	NY-01	9/1/2015	Alexander M	119457	SP-3416371		
4	S-4272760	SP-3415606	NY-01 Long Is	NY-01	9/1/2015	Alexander M	119457	=IF(DAYS(TODAY(),E4)<90,"Awesome",VLOOKUP(SA4,A4:F4,2))		
5	S-4184551	SP-3358801	NY-01 Long Is	NY-01	9/1/2015	Alexander M	119457	=IF(logical_test, [value_if_true], [value_if_false])		

argument of each formula and even tells you how you should separate them. Below is one example we can work through together.

1. This is how the formula looks in excel in its raw form.

```
=IF(DAYS(TODAY(),SUM(E4,10))<360,"Awesome",VLOOKUP($A4,A4:F4,2))
```

2. This is a breakdown of the outermost formula – the IF formula. I have shown the actual formula with the basic syntax of an IF formula to show you what part goes where.

```
"=IF(DAYS(TODAY(),SUM(E4,10))<360,"Awesome",VLOOKUP($A4,A4:F4,2))"
```

```
"=IF(LOGICAL_TEST,[VALUE_IF_TRUE],[VALUE_IF_FALSE])"
```

As you can see here, we are essentially taking a basic IF statement and replacing a part of it with another formula. This is the easiest way to look at nesting formulas. Let's digest it step by step.

STEP 1: LOGICAL_TEST

Here we are replacing a simple logical test like "A3<10" or "F6='Alexander'". In this case, we are using the "less than sign" with the 360 on the right side and a "DATE" function on the left side. The DATE function asks for a start and an end date, as shown below. As a note, the "TODAY()" function always returns, as its name would imply, the date for today. Let's take a look...

1. This is the actually formula that is nested in our main formula matching its arguments with the basic syntax of an IF formula.

```
"DAYS(TODAY(),SUM(E4,10))<360"
```

```
"DAYS(START_DATE,END_DATE)<360"
```

STEP 2: VALUE_IF_TRUE

This is simply what the formula will put in the cell if your LOGICAL_TEST returns true. In this case, I didn't do anything fancy with nested formulas, I just have it return "Awesome". When you are searching by cell text or having the formula return some kind of text (not the value of a cell) then it must always be in quotation marks. Otherwise, it will think that it is some kind of instruction to the formula.

STEP 3: VALUE_IF_FALSE

Here, we could also have simply put some other kind of text result like "Negative Commander", but in this case I have it doing something else if the result is false. I have it use a VLOOKUP formula to give me the Name of the person who is the assigned as the agent on the account.

FOLLOW-UP

Any argument of any formula can be replaced with another formula. And like Inceptions, you can nest formulas within formulas within formulas. And small list of recommended formulas that should be

on your short list to learn first so that you can get the most power and flexibility out of your data. I will put a few more examples down below to cover these recommendations. As a note, some of the most common formulas have an option with an IF formula built right in such as COUNTIF.

FORMULAS:

- IF(S)
- AND
- OR
- SUM
- TODAY()
- COUNT(A)
- VLOOKUP
- INDEX
- MATCH

EXAMPLE 2:

In this example, we are going to look at a different kind of nesting. We are going to put several different IF statements together.

```
=IF(F2="Jesus Ochoa (110865)" , "Zues" , IF(F2="Matt Wedgeworth (104677)" , "Expired" ,  
IF(F2="Shanda Bills (64825)" , "PAID" , IF(F2="Craig Petersen (119646)" , "TEST ACCOUNT" ,  
"Unknown "))))
```

What we have here are 4 different IF statements where the VALUE_IF_FALSE is another IF statement. This effectively works like this:

“Is it Jesus Ochoa, then show “Zues”,
If not, is it Matt Wedgeworth, then show “Expired”
If not, is it Shanda Bills, then show “PAID”, a
If not, is it Craig Petersen, then show “TEST ACCOUNT”,
If not, then show “Unknown”.

You can stack these any number of times as well as insert other formulas at any part.

STEP ONE:

The master (outermost) statement is the IF statement with its LOGICAL OPERATOR a TRUE and FALSE value.

```
=IF(OR(B2:B1000=INDEX(B2:B4438,(MATCH(I1,B2:B4000))), "FOUND_IT" , "SORRY_CAPTIAN")
```

STEP TWO:

Use the OR function to give a range for the following FORMULA to search.

```
(OR(B2:B1000=INDEX(B2:B4438,(MATCH(I1,B2:B4000))
```

STEP THREE:

Use the INDEX and MATCH formula to return a given value.

```
=INDEX(B2:B4438,(MATCH(L1,B2:B4000))
```

The result is to find a given value, and if it does to tell me either "FOUND_IT" or "SORRY_CAPTAIN". I could just have easily had this formula return the place of the value or another value based on the location of where I found it.

6 Pivot Tables

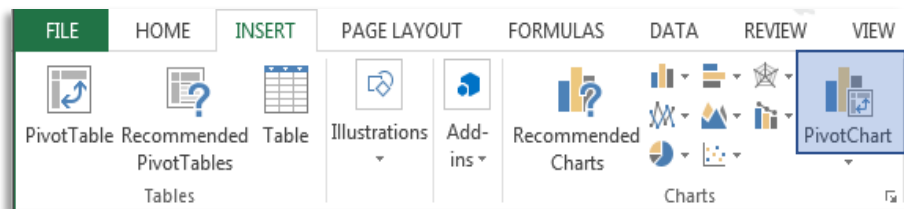
(The majority of this section was donated by Joey Stanley)

Now that you know how to nest formulas, make beautiful conditional formatting, and make graphs and charts, you might be thinking “what more could there possibly be”? Well, have you ever wanted to be able to create an amazing, dynamic, and concise chart of all or portions of your data? Have you ever wanted to see the averages or counts of your data sheet by fields and sub fields? Well, whether or not you wanted to, I am going to teach you how and you will love me for it!

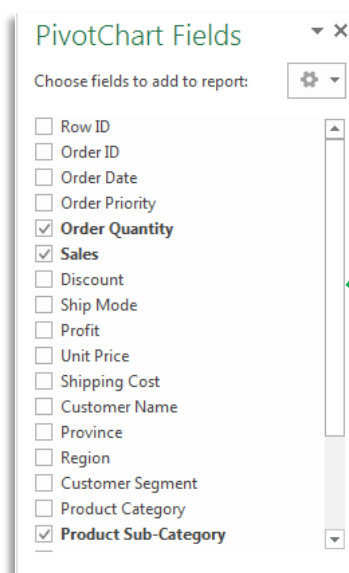
A pivot table is a separate table that can automatically sort, count, total, or average information from another spreadsheet. It has a drag-and-drop interface, allowing you to easily rotate, or pivot, the table in any way you want. Though Excel wasn't the first to implement pivot tables, it did make improvements to it and is probably the most well-known software that incorporates them.

6.1 Pivot Table Basics

So without further ado, let's make a pivot table. The first step is to highlight the data that you want to summarize, average, count, etc. This is pretty much always going to be your entire table, so go ahead and click the top left corner again and highlight the whole thing. In the “Insert tab”, on the far left, click the PivotTable button. You'll see a “Create PivotTable” window pop up, where it'll ask you what data you want to analyze. Since



you've highlighted your data already, you should be good. It's always good to put it in a new worksheet, so make sure that button is checked, and click “OK”. The first thing you might notice is that it looks like your data is all gone! Don't worry, Excel just created another spreadsheet for you called “Sheet2”. In the bottom left corner, you should see the tab that indicates we're on Sheet2. You can click back and forth



between this sheet and Sheet1 (which has all your data). Excel can store multiple spreadsheets within a single file, which can be very useful for things like pivot tables. Some spreadsheets hold data (like our “Sheet1”) and others summarize the data (like “Sheet2”). You can have as many of these sheets as you want, so it might be good to right click the name and rename it to something useful.

The next thing you might see is some image of table-like things actually on the spreadsheet. This is just a placeholder until we tell the pivot table what to do. The important new thing is this “PivotTable Builder window that has popped up. This is where all the magic happens. There are five windows, and we'll go through each one separately. The first is a list of all the columns in our data with the option to put a check by each one. From this window we will drag-and-drop columns into one of the other four windows (or simply check the box).

6.2 Adding Rows

The bottom left **window** is where you'll drag column names if you want the values of that column to be the rows in the pivot table. This makes more sense when we actually try it out. Go ahead and drag-and-drop one of the column names (perhaps "Product Sub-Catagory") to the Rows window and watch what happens. You see that instantly, a table is created with all the different colors in each row. This is already super useful, because you can what all the unique values are. This also good for quality control, because if there are typos, you'll see them here. To remove a variable from the pivot table, just drag-and-drop it off the PivotTable Builder window, and, at least on my Mac, it'll *poof!* And disappear. Alternatively you can uncheck the box in the top window.

You are able to remove individual entries from this or any other variable that is added to one of these boxes by clicking on the little



triangle that gives you a filter dropdown menu. You can also apply filters here to limit what you are able to see.

6.3 Columns and Values

Back to the PivotTable Builder (if you accidentally closed out of the window, you can click on the "PivotTable Analyze" tab and press the "Field List" button on the far right), let's put "city" in for the rows of our pivot table. But now, drag "Region" to the Column window. You'll now see the structure of a spreadsheet, complete with row and column headers. The pivot table also keeps track of any blank data, and includes that as a separate column as well. Let's do one more step and drag "Sales" from the top window, to the bottom right Values window. Boom. Instantly, you've got a pivot table, complete with tons of useful information. Based on the rows and columns in the pivot table, excel automatically finds how much each sub category generated in revenue by region. It also does a grand total column for the rows on the right and for the columns as well. This is already a lot of information that you just couldn't feasibly gather from 8,400 rows by yourself. And we've only just scratched the surface!

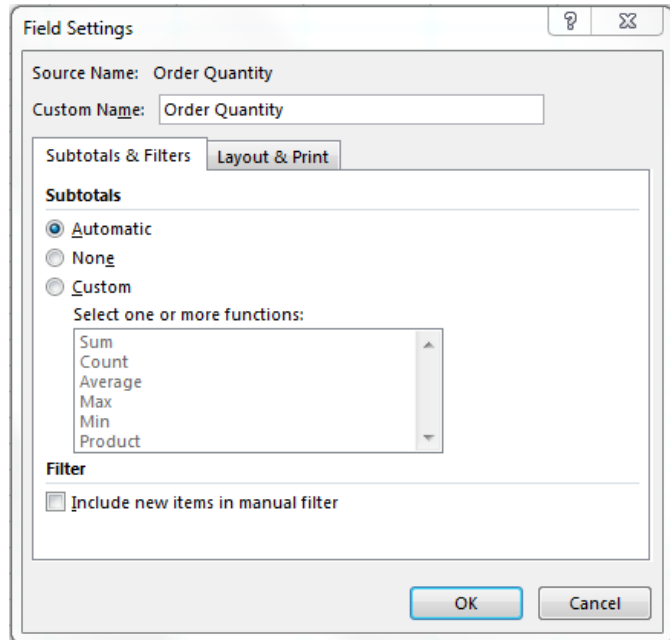
6.4 Averages

For counting things, it actually doesn't matter what variable you put in the "Values" window. In fact, you can put any variable in there and it'll work just the same. However, for numerical data, like profit and region, there are additional, powerful options. Click on the little triangle information button in the

Values window. This will take you to a new window where you can change how the pivot table summarizes your data. Right now, it's simply counting the number of sales that *have* a region. Which is all of them. Instead, you can change it to display the *average* Sale price, which is a lot more useful. Change that and then hit "OK".

Instantly, the pivot table updates. Now we have the average sale price for all the region, divided up by what the subcategory is with the grand total column showing the average overall. Admittedly, this is a little information-overload, because of all the decimal places, so we can just highlight all the numbers and, back on the Home toolbar, round those numbers to fewer decimal places like we did earlier.

While this is all fascinating, we have other things we can do that can give us an insight into what our data says. Go back to the PivotTable Field window and switch it from Average to Max. Looks like there are several very high profits for some of these regions. Change it to Min, and you can see the sale price of the smallest sales price of each product sub-category.

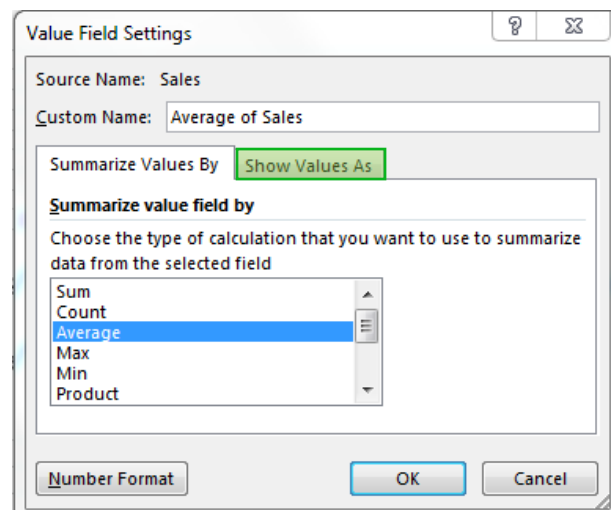


6.5 Adding More Variables

What if you want to display more information at once? No problem: just drag another column in the Values pane in the PivotTable Builder window. Let's do "Unit Price", but change it so we continue to see the average values. Now we see the table get wider because it has more information. The rows have stayed the same, but now there are column and sub columns. Now the columns show the averages of sales and unit prices. This process can be repeated to add more and more columns and rows to give us as much information as we want.

6.6 Percentages

Now, let's say we want to see the percentage of our data, rather than the raw count. Because right now it's hard to tell whether one item has a disproportionate amount compared to the rest. Go back to the PivotTable Builder and click the options for the "Sales" values again. Instead of the "Summarize by" option, click the "Show data as" option, and click on "% of column". When you view your pivot table now, you can see that it has updated as percentages, where each column equals 100%. Now it becomes



very clear which sub-categories are evenly split and which have an abnormally high average sales based on the cumulative average of the column.

6.7 Adding Filters

Awesome. We now have a table that is super useful if you need to know some general information about this store. But now that we see this information, what if we want to examine the data more closely. What if we wanted to see the information that went into giving us one of our cells? We could go back to the data and apply a filter like we did before, but with pivot tables, all you need to do is just double-click on the portion of the data you want to examine and it'll show it for you as a separate spreadsheet. Try this by double-clicking on the cell D11. You're instantly taken to a new sheet that shows this data with filters already applied. But, the one problem with this is that this new table isn't linked to the original spreadsheet. So if you want to merely examine the data, this is perfect, but if you want to modify anything, you won't be able to do it through the pivot table and you'll need to apply the filters to the main spreadsheet.

If this is a little too overwhelming, we can insert a local data filter, using that last top left pane in the PivotTable Builder window. Go ahead and drag "Shipping Mode" from the Rows pane to the Filters pane. Now we have a local data filter up in the top left, we can now filter the data based on sex. This filter works like any other filter that we've seen so far in Excel. You can check the boxes you'd like to include and uncheck others. It may also be useful to add multiple filters to the pivot table, for example if you wanted to see the distribution of favorite colors in each city by the female heads of households. You can do that by simply adding more variables to the Filters pane in the PivotTable Builder window.

6.8 Sorting

Finally, one more trick. Let's say you're not satisfied with the order of how things appear in the pivot table. For example, if you build a pivot table to see the population of each city (by keeping city as the row, no columns, and any variable as the Value), it'll sort them alphabetically. What if we want to order them from biggest to smallest? When you create the pivot table, in the "Row Labels" cell, click on the sort and filter button. Under the "Sort by:" menu, click "n" or whatever the other option is. Then click Descending. Now you'll see that Longview has the most people with 10,646 residents, followed by Kelso, Woodland, Castle Rock, and Kalama. Pivot tables are a beast. You can sort, count, total, and average a lot of information really quickly. Our main spreadsheet has tens of thousands of rows, but in just a few clicks we were able to extract a lot of useful information. I'll be the first to admit that it takes a lot of trial and error at first to build a good pivot table. But soon it will click, and you'll feel like a boss.