

Excel 2016 – Data Manipulation



Table of Contents

- Text Functions 2**
 - Left Formula 2
 - Right Formula 2
 - Find Formula 2
 - Len Formula 2
- Combining Text Functions 3**
- Date Functions 3**
 - Day Function 4
 - Month Function 4
 - Year Function 4
- Importing Text Files to Excel 4**
 - Text Import Wizard 5
- Massaging the Data 6**
 - Social Security Number 6
 - Additional Number Formats 7
 - The Proper Function 7
 - The Lower Function 8
 - Trim Function 9
 - Upper Function 9
- Cell References 9**
 - Relative Cell References 9
 - Absolute Cell References 10
- IF Statements 10**
- Dropdown Lists 11**

Text Functions

Formulas are normally associated with numbers, however there are formulas that can aid with text too.

Left Formula

The LEFT function will look into a specific cell and pull out text starting from the left hand side of the cell and counting a certain number of characters over.

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	=LEFT(A2,4)
3	Angelina Jolie	6/4/1975	
4			

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	Brad
3	Angelina Jolie	6/4/1975	
4			

Right Formula

The RIGHT function will look into a specific cell and pull out text starting from the right hand side of the cell and counting a certain number of characters over.

	A	B	C	D
1	Name	DOB	FirstName	LastName
2	Brad Pitt	12/18/1963	Brad	=RIGHT(A2,4)
3	Angelina Jolie	6/4/1975		
4				

	A	B	C	D
1	Name	DOB	FirstName	LastName
2	Brad Pitt	12/18/1963	Brad	Pitt
3	Angelina Jolie	6/4/1975		
4				

Find Formula

The FIND function will locate one text string within a second text string, and return the number of the starting position of the first text string from the first character of the second text string.

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	=FIND("d",A2,1)
3	Angelina Jolie	6/4/1975	
4			

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	4
3	Angelina Jolie	6/4/1975	
4			

Len Formula

The LEN function returns the number of characters in the specified string.

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	=LEN(A2)
3	Angelina Jolie	6/4/1975	
4			

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	9
3	Angelina Jolie	6/4/1975	
4			

Note: Spaces count as a character with this formula

Combining Text Functions

While the functions mentioned above are useful, they become powerful when used together. In the above example, the formula produced for the first person would not work for the second person.

Combining the text functions mentioned above allows for the creation of a robust formula that can separate first and last names.

First Name

The trick to pull out just the first name is to utilize the “space” between the first and last name. The following two functions will be used for the first name:

- LEFT
- FIND

	A	B	C	D
1	Name	DOB	FirstName	LastName
2	Brad Pitt	12/18/1963	=LEFT(A2,FIND(" ",A2,1)-1)	
3	Angelina Jolie	6/4/1975		

	A	B	C
1	Name	DOB	FirstName
2	Brad Pitt	12/18/1963	Brad
3	Angelina Jolie	6/4/1975	

Last Name

The same trick for last name is utilized, however this will require use of the LEN function:

- RIGHT
- FIND
- LEN

	A	B	C	D	E	F
1	Name	DOB	FirstName	LastName	Day	Month
2	Brad Pitt	12/18/1963	Brad	=RIGHT(A2,LEN(A2)-FIND(" ",A2,1))		
3	Angelina Jolie	6/4/1975	Angelina			

	A	B	C	
1	Name	DOB	FirstName	LastName
2	Brad Pitt	12/18/1963	Brad	Pitt
3	Angelina Jolie	6/4/1975	Angelina	

Date Functions

Excel also has functions that pull out information of dates. If information is in the mm/dd/yyyy format or any other date format, each section of the date can be pulled out with the following functions:

- DAY
- MONTH
- YEAR

Day Function

This function returns the day of a date. The day is given as an integer ranging from 1 to 31.

	A	B	C	D	E	F	
1	Name	DOB	FirstName	LastName	Day	Month	E
2	Brad Pitt	12/18/1963	Brad	Pitt	=DAY(B2)		Day
3	Angelina Jolie	6/4/1975	Angelina	Jolie			18

Month Function

This function returns the month of a date. The month is given as an integer, ranging from 1 (January) to 12 (December).

	A	B	C	D	E	F	G	
1	Name	DOB	FirstName	LastName	Day	Month	Year	F
2	Brad Pitt	12/18/1963	Brad	Pitt	18	=MONTH(B2)		Month
3	Angelina Jolie	6/4/1975	Angelina	Jolie				12

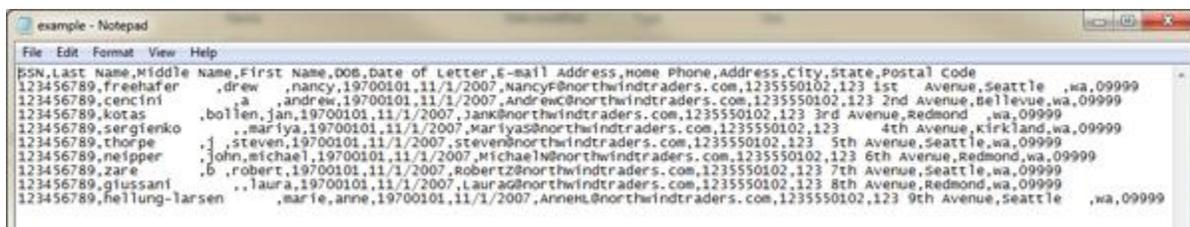
Year Function

This function returns the year corresponding to a date. The year is returned as an integer in the range 1900-9999.

	A	B	C	D	E	F	G	H	
1	Name	DOB	FirstName	LastName	Day	Month	Year	G	
2	Brad Pitt	12/18/1963	Brad	Pitt	18	12	=YEAR(B2)	Year	
3	Angelina Jolie	6/4/1975	Angelina	Jolie				1963	

Importing Text Files to Excel

There are instances when data is collected and the information is in text format as in the example below:

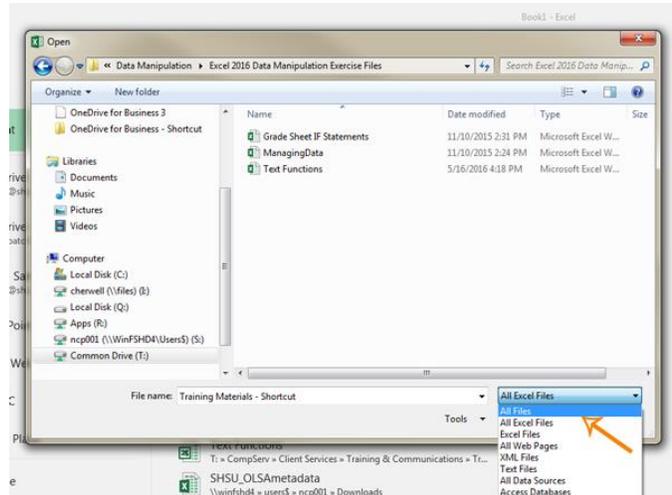


Excel has an automatic feature that allows for the import of data separated by delimiters (in this case the data is separated by commas).

In order for this to work, the data must be opened from within Excel.

If you do not see your data file, select the dropdown menu that says **All Excel Files** and change it to **All Files**.

Double click the text file.



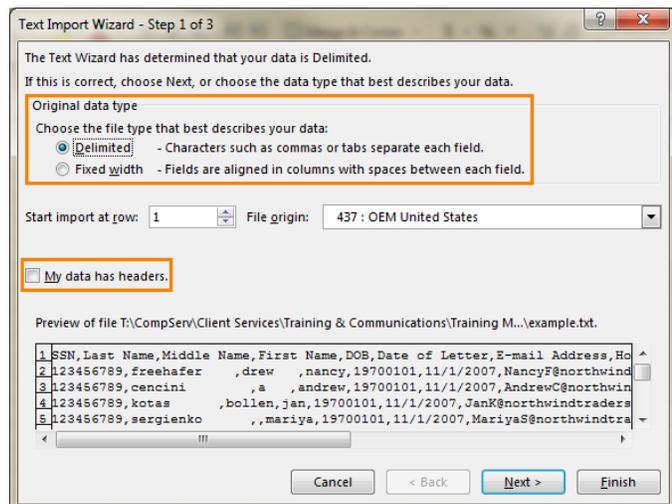
Text Import Wizard

Excel recognizes that this file is not the standard Excel format. Because of this, Excel opens up the Text Import Wizard.

The first option is to determine the how the data is arranged. In this case, the data is **Delimited** by commas. In other words, each column is separated by commas.

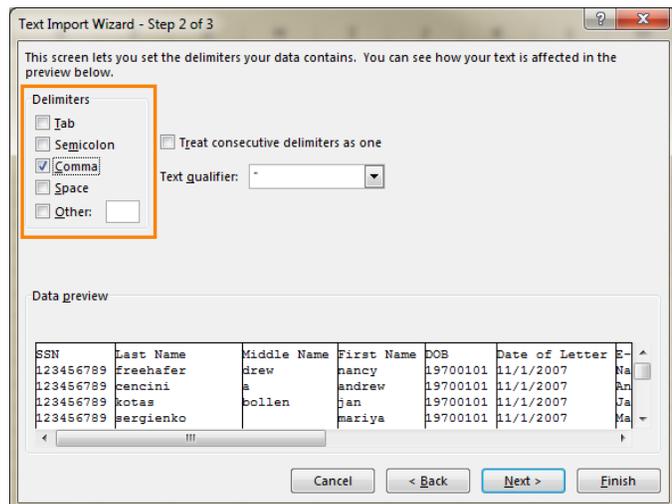
The next option is to select the checkbox that says **My data has headers**.

Select **Next**.

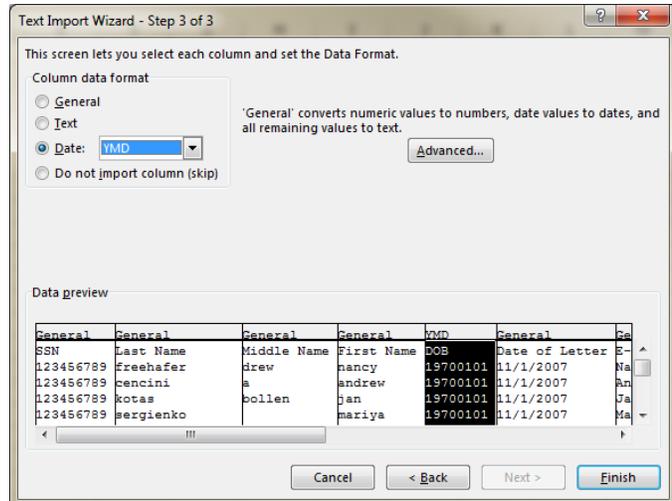


The delimiter must now be set. The data in this example is delimited with commas.

Once the proper delimiter has been selected, click "Next".



Before the import wizard will import your data, the option is available to set the formatting of each column. Simply click the column to be formatted and select the proper radio button at the top. A column can also be ignored should it not need to be imported.



Once everything is properly formatted, click **Finish**.

The data should now be separated into columns. However, the data has some problems.

	A	B	C	D	E	F	G	H	I	J	K	L
1	SSN	Last Name	Middle Name	First Name	DOB	Date of Letter	E-mail Address	Home Phone	Address	City	State	Postal Code
2	1.23E+08	freehafer	drew	nancy	1/1/1970	#####	NancyF@	1.24E+09	123 1st A	Seattle	wa	9999
3	1.23E+08	cencini	a	andrew	1/1/1970	#####	AndrewC@	1.24E+09	123 2nd A	Bellevue	wa	9999
4	1.23E+08	kotas	bollen	jan	1/1/1970	#####	JanK@nor	1.24E+09	123 3rd Av	Redmond	wa	9999
5	1.23E+08	sergienko		mariya	1/1/1970	#####	MariyaS@	1.24E+09	123 4th	Kirkland	wa	9999
6	1.23E+08	thorpe	j	steven	1/1/1970	#####	steven@r	1.24E+09	123 5th A	Seattle	wa	9999
7	1.23E+08	neipper	john	michael	1/1/1970	#####	MichaelN	1.24E+09	123 6th Av	Redmond	wa	9999
8	1.23E+08	zare	b	robert	1/1/1970	#####	RobertZ@	1.24E+09	123 7th Av	Seattle	wa	9999
9	1.23E+08	giussani		laura	1/1/1970	#####	LauraG@r	1.24E+09	123 8th Av	Redmond	wa	9999
10	1.23E+08	hellung-la	marie	anne	1/1/1970	#####	AnneHL@	1.24E+09	123 9th Av	Seattle	wa	9999
11												

Massaging the Data

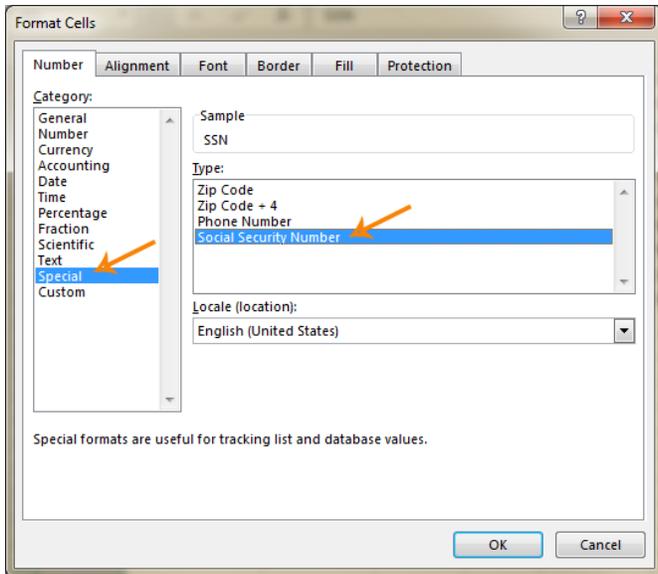
The data that was just imported needs to be formatted still. Excel comes with tools to help make the data look more presentable.

Social Security Number

The Social Security Number field is not formatted properly. This can be fixed by:

1. Highlighting the data
2. Right clicking the data
3. Select **Format Cells**
4. Select **Special**
5. Choose **Social Security Number**
6. Select **OK**

The data should now be formatted properly.



	A	
1	SSN	Last
2	123-45-6789	free
3	123-45-6789	cenc
4	123-45-6789	kota
5	123-45-6789	serg
6	123-45-6789	thor
7	123-45-6789	neip
8	123-45-6789	zare
9	123-45-6789	gius:
10	123-45-6789	hellu

Additional Number Formats

There is a variety of number formats that are available. Using the instructions above, format the Home Phone and Postal Code columns.

The Proper Function

The **Proper** function to correct the data that is imported as all lower case or upper case.

A column can be inserted to create the equation.

	A	B	C	
1	SSN	Last Name		Mi
2	123-45-6789	freehafer	=PROPER(B2)	dre
3	123-45-6789	CENCINI		a
4	123-45-6789	kotas		bo
5	123-45-6789	sergienko		

After this equation is entered, it is copied down to the cells below using auto-fill.

	A	B	C	
1	SSN	Last Name		Mi
2	123-45-6789	freehafer	Freehafer	dre
3	123-45-6789	CENCINI	Cencini	a
4	123-45-6789	kotas	Kotas	bo
5	123-45-6789	sergienko	Sergienko	
6	123-45-6789	thorpe	Thorpe	j
7	123-45-6789	neipper	Neipper	joF
8	123-45-6789	zare	Zare	b
9	123-45-6789	giussani	Giussani	
10	123-45-6789	hellung-larsen	Hellung-Larsen	ma

Copying Over the Data

The data that was just created must replace the original information.

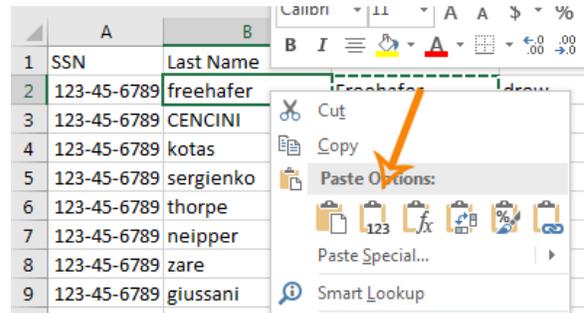
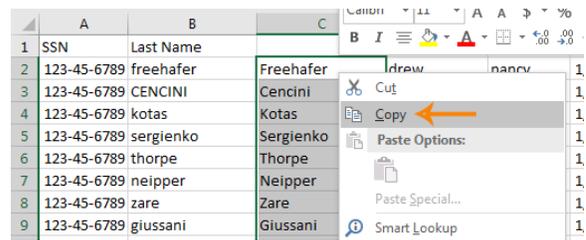
To do this highlight the information and right-click to display the quick access menu and select **Copy**.

In the original Last Name column, place the cursor where the first cell for names is, right-click and select the **Paste Values** option (should be the second icon with a clipboard and 123).

This places the formula responses, without the formula, into the cells.

Repeat this method with the Middle Name and the First Name columns using the column that was inserted for last name.

Once the values of the columns have been pasted to the original location, the column with the formula can be deleted.



	A	B	C
1	SSN	Last Name	
2	123-45-6789	Freehafer	Freehafer
3	123-45-6789	Cencini	Cencini
4	123-45-6789	Kotas	Kotas
5	123-45-6789	Sergienko	Sergienko
6	123-45-6789	Thorpe	Thorpe
7	123-45-6789	Neipper	Neipper
8	123-45-6789	Zare	Zare
9	123-45-6789	Giussani	Giussani
10	123-45-6789	Hellung-Larsen	Hellung-Larsen

The Lower Function

If there are capital letters that need to be in lower case, the **Lower** function will convert the data. Like the Proper function, insert a new column for this formula.

Copy the information to the rest of the cells

Move the information as in the previous section using the **Copy** and **Paste Values** functions.

	H	I
	E-mail Address	
	NancyF@northwindtraders.com	=LOWER(H2)
	AndrewC@northwindtraders.com	
	Jank@northwindtraders.com	

	I
	nancyf@northwindtraders.com
	andrewc@northwindtraders.com
	jank@northwindtraders.com
	mariyas@northwindtraders.com
	steven@northwindtraders.com
	michaeln@northwindtraders.com
	robertz@northwindtraders.com
	laurag@northwindtraders.com
	annehl@northwindtraders.com

Trim Function

If there are extra spaces in the text field, the Trim function will get rid of them.

J	K	
Address		City
123 1st Avenue	=TRIM(J2)	Sea
123 2nd Avenue		Bell

J	K	
Address		City
123 1st Avenue	123 1st Avenue	Sea
123 2nd Avenue		Bell

Copy the information to the rest of the cells

Move the information as in the previous section using the right mouse button.

J	K	
Address		City
123 1st Avenue	123 1st Avenue	Sea
123 2nd Avenue	123 2nd Avenue	Bell
123 3rd Avenue	123 3rd Avenue	Rec
123 4th Avenue	123 4th Avenue	Kirk
123 5th Avenue	123 5th Avenue	Sea
123 6th Avenue	123 6th Avenue	Rec
123 7th Avenue	123 7th Avenue	Sea
123 8th Avenue	123 8th Avenue	Rec
123 9th Avenue	123 9th Avenue	Sea

Upper Function

The **Upper** function converts text to uppercase.

Copy the information to the rest of the cells.

Move the information as in the previous section using the right mouse button.

M	N	O
State		Postal Code
wa	=UPPER(M2)	
wa		

Cell References

Relative Cell References

By default, all cell references are **relative references**. When copied across multiple cells, they change based on the relative position of rows and columns.

	A	B	C	D	E	F
1	Employee	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
2	Jack Fiddle	\$87,791.00	\$32,564.00	\$46,246.00	\$62,582.00	=SUM(B2:E2)
3	Anne Begone	\$42,260.00	\$51,246.00	\$92,624.00	\$65,123.00	
4	Ho Sin	\$90,253.00	\$84,275.00	\$85,293.00	\$67,168.00	
5	Clara Bell	\$48,574.00	\$6,519.00	\$41,694.00	\$38,786.00	
6	Dereck Hungi	\$12,456.00	\$45,678.00	\$62,944.00	\$50,661.00	
7						

When copied down, the formula now references the corresponding cells.

C	D	E	F
Qtr 2	Qtr 3	Qtr 4	Total
\$32,564.00	\$46,246.00	\$62,582.00	\$229,183.00
\$51,246.00	\$92,624.00	\$65,123.00	\$251,253.00
\$84,275.00	\$85,293.00	\$67,168.00	\$326,989.00
\$6,519.00	\$41,694.00	\$38,786.00	\$135,573.00
\$45,678.00	\$62,944.00	\$50,661.00	\$171,739.00

Absolute Cell References

There may be times when the cell reference must be absolute. Unlike relative references, **absolute references** do not change when copied or filled. Use an absolute reference to keep a row and/or column **constant**.

An absolute reference is designated in a formula by the addition of a **dollar sign (\$)**. The F4 key can be used to make a cell absolute as well.

Right now, the G2 cell is relative. To make it absolute, highlight the **G2** text and press **F4**. Press **Enter** to complete the formula.

	G	H
2	Total Points	Percentage
10	76	
18	71.9	=G3/G2
18	52.6	
16	66.7	

	G	H
2	Total Points	Percentage
10	76	
18	71.9	=G3/\$G\$2
18	52.6	
16	66.7	

Copying the formula down will apply it to the rest of the cells. However, the G2 cell reference remains the same for each copy.

=G8/\$G\$2

	F	G	H
1	Exam 2	Total Points	Percentage
10	100	76	
96	98	71.9	94.61%
68	68	52.6	69.21%
92	86	66.7	87.76%
98	73	64.05	84.28%
70	41	43.85	57.70%
71	92	60.15	79.14%
48	76	46.2	60.79%

IF Statements

If statements are another function in Excel. They return one value if a condition specified evaluates to TRUE and another value if it evaluates to FALSE.

For example, a grade sheet is placed in excel and formulas are used to calculate final percentages. Excel can look at the percentages and tell us whether an individual passed or failed a class.

The formula reads: If the contents in cell H3 are greater than 70%, then return a value of "Pass" and if the contents of cell H2 are not greater than 70% return a value of "Fail".

	H	I	J	K
1	Percentage	Pass/Fail		
2	76			
1.9	94.61%	=IF(H3>.7,"Pass","Fail")		
2.6	69.21%			Exam

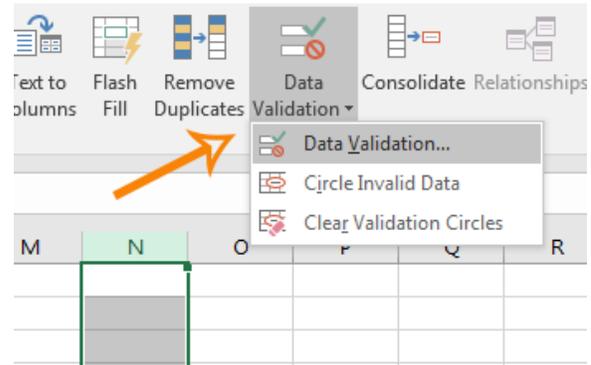
Copying the formula down will apply the formula to the other cells.

	H	I
1	Percentage	Pass/Fail
2	76	
3	94.61%	Pass
4	69.21%	Fail
5	87.76%	Pass
6	84.28%	Pass
7	57.70%	Fail
8	79.14%	Pass
9	60.79%	Fail

Dropdown Lists

Sometimes it is easier to have users select from a list of options as opposed to typing freely in a cell.

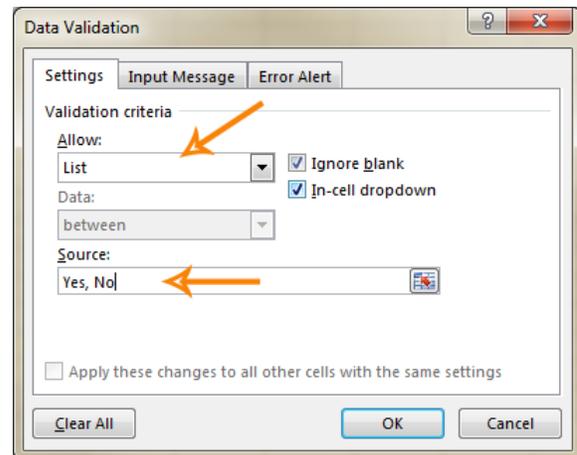
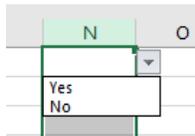
With a cell selected, go to the **Data Validation** options in the **Data** tab.



For the **Allow** section, select **List** option from the dropdown menu.

In the Source field, type "Yes, No". This is what populates the dropdown list.

Press **OK**.



Excel 2016 – PivotTables and Charts

Table of Contents

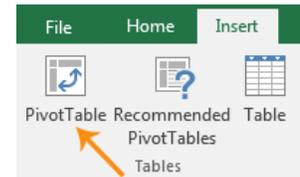
What is a PivotTable?	2
Creating a PivotTable	2
Pivoting a PivotTable	3
Formatting the PivotTable	4
Changing the Data Appearance.....	4
Viewing the Data.....	4
Analyze the Data	5
Filters.....	5
Slicers	5
Timelines.....	6
Data Details	7
Updating PivotTable	7
Additional PivotTable Options	8
Clear	8
Select.....	8
Creating a PivotChart	8
Formatting a PivotChart	9
Changing Chart Type	10
Analyzing the PivotChart	10
Filters.....	11
Slicers and Timelines	11
Chart Templates	11
PowerPivot	11
Data Sources	13
Formatting Data Sources.....	14
Creating Relationships	14
Creating a PivotTable in Power in PowerPivot.....	14

What is a PivotTable?

A PivotTable allows data to be summarized and more manageable and also provides a variety of ways to manipulate the data. It can instantly calculate and summarize data in a way that is easy to read and re-arrange (also known as pivoting) to provide answers to different questions.

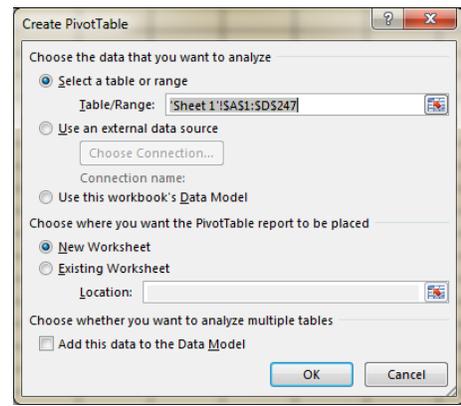
Creating a PivotTable

In order to create a PivotTable, the data in the spreadsheet does not need to have any gaps or blank rows or columns in it. Place the cursor in a cell that will be included in the PivotTable and select **PivotTable** from **Tables** group of the **Insert** tab.



The Create PivotTable box appears.

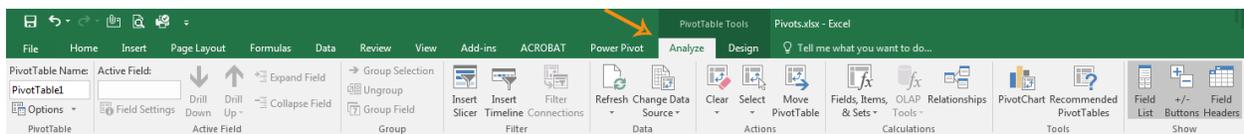
The first section is the data range that should be included in the PivotTable. Excel typically will select the entire range of data; however, if not or if a different range needs to be selected, the arrow to the right of the selection can be clicked and a different range highlighted.



The next section is where the PivotTable is to be placed: in a new worksheet or the existing worksheet. It is usually recommended to place a PivotTable in a new worksheet so the PivotTable can be standalone for any rearranging that may be done to it and ensure the original data is not disturbed.

One these selections have been made, select **OK**.

As with many other options in Excel, a PivotTable Tools tab is added to the Ribbon with an **Analyze** and a **Design** tab.

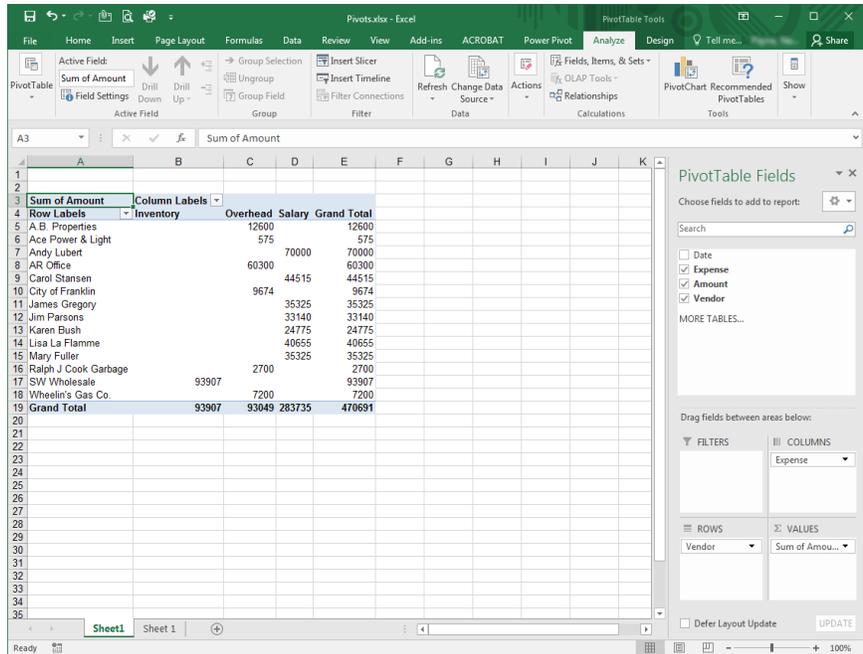
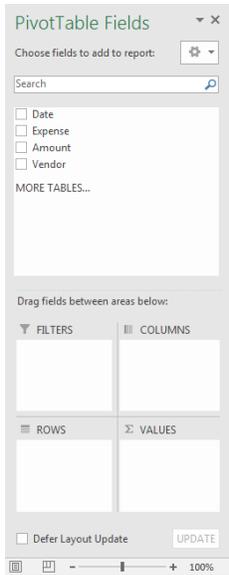


On the right side of the screen is the **PivotTable Fields** Pane. This pane is where the PivotTable will be created and pivoted (rearranged).

The top section is the fields available to include in the PivotTable.

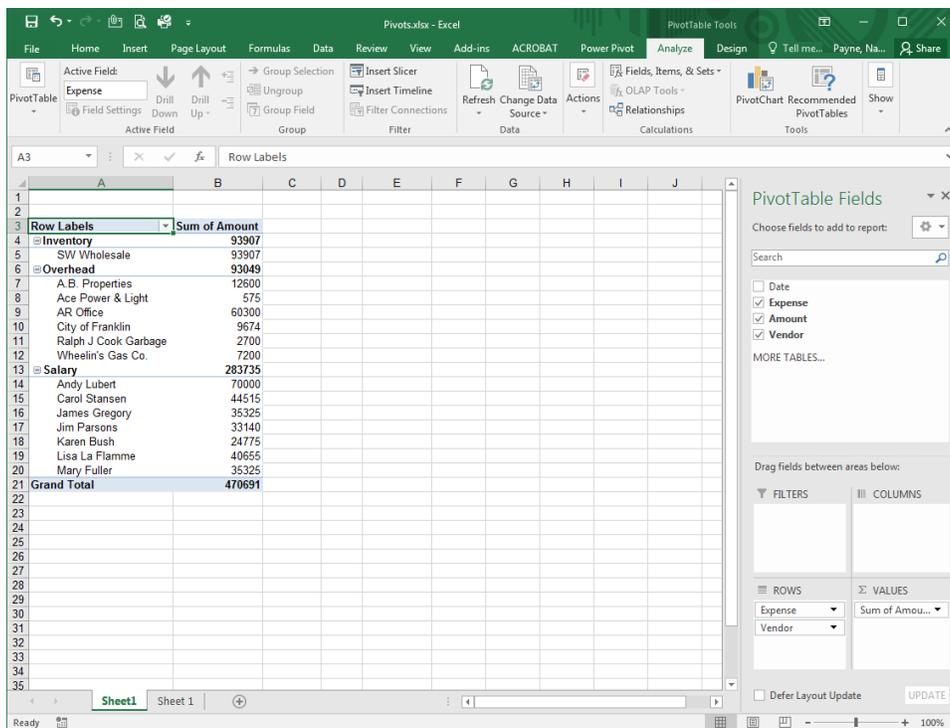
The bottom section is where the fields are arranged to produce the PivotTable.

The fields can be moved to the areas of the PivotTable in the bottom section of pane until the desired view/report is received.



Pivoting a PivotTable

The fields can be moved to the different sections of the PivotTable to create a different look or even a new PivotTable. To do this, click and drag the field from one section to another.



Formatting the PivotTable

Changing the Data Appearance

With the data in the PivotTable, there are a variety of options available for the data by right-clicking on a cell within the PivotTable. For example, numbers can be formatted and information can be sorted. Using the **Summarize Values By** option produces additional options other than **Sum**, such as **Count**, **Average**, **Minimum**, and **Maximum**. **Show Value As** provides options for displaying the information such as using percentages, ranking the information, and differences from other information in the table.

Sum of Amount	Column Labels	Overhead	Salary	Grand Total
A.B. Properties	Inventory	12600	126	12600
Ace Power & Light		575	5	575
Andy Lubert		70000	70000	70000
AR Office		60300	603	60300
Carol Stansen		44515	445	44515
City of Franklin		9674	96	9674
James Gregory		35325	353	35325
Jim Parsons		33140	331	33140
Karen Bush		24775	247	24775
Lisa La Flamme		40655	406	40655
Mary Fuller		35325	353	35325
Ralph J Cook Garbage		2700	27	2700
SW Wholesale		93907	939	93907
Wheelin's Gas Co.		7200	72	7200
Grand Total		93907	93049	283735

Sum of Amount	Column Labels	Overhead	Salary	Grand Total
A.B. Properties	Inventory	12600	126	12600
Ace Power & Light		575	5	575
Andy Lubert		70000	70000	70000
AR Office		60300	603	60300
Carol Stansen		44515	445	44515
City of Franklin		9674	96	9674
James Gregory		35325	353	35325
Jim Parsons		33140	331	33140
Karen Bush		24775	247	24775
Lisa La Flamme		40655	406	40655
Mary Fuller		35325	353	35325
Ralph J Cook Garbage		2700	27	2700
SW Wholesale		93907	939	93907
Wheelin's Gas Co.		7200	72	7200
Grand Total		93907	93049	283735

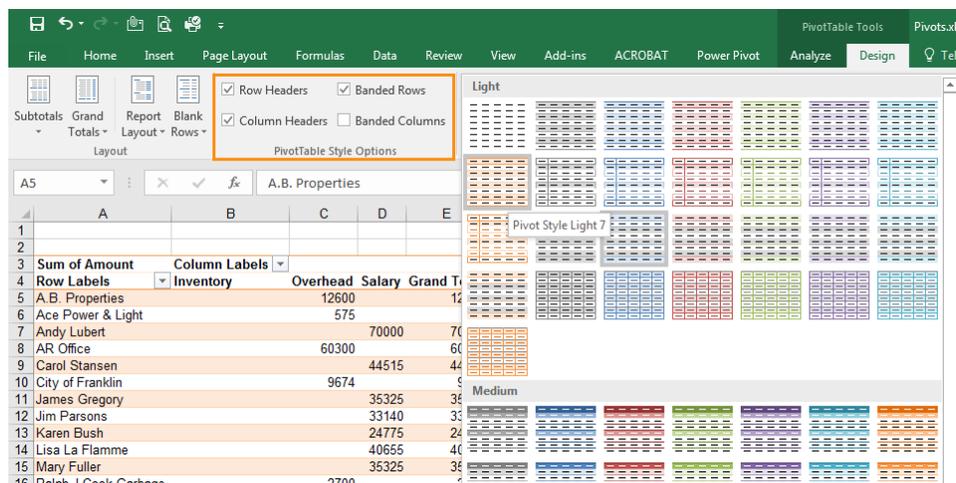
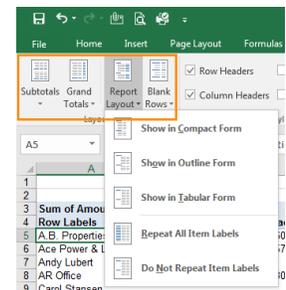
Viewing the Data

Excel provides a couple of options for the way the information is viewed. These options can be found in the **Layout** group of the **Design** tab.

The way **Subtotals** and **Grand Totals**, as well as the **Report Layout** and **Blank Rows** can be changed based on user preference. These options can be found in the **Layout** group of the **PivotTables Design** tab.

Row and Column headers, as well as banded rows and columns can also be selected if desired from the **PivotTable Style Options** group.

There are also a variety of other PivotTable Styles that can be selected.

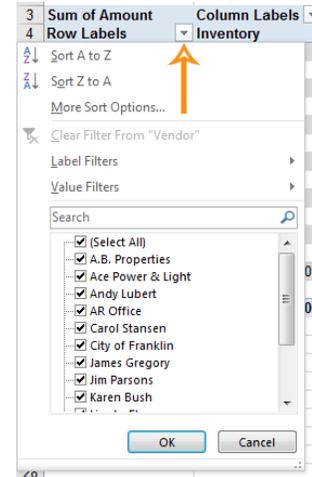


Analyze the Data

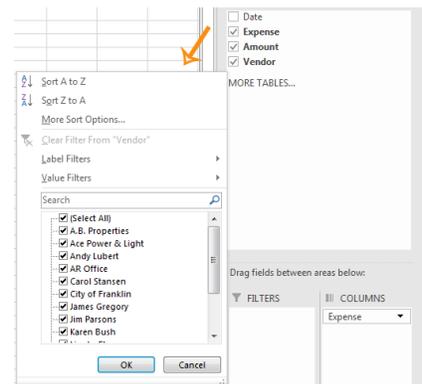
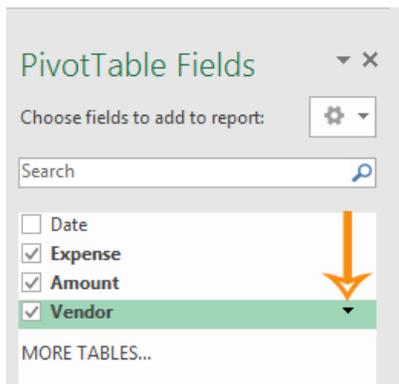
Filters

Just like in a normal Excel worksheet, PivotTables can be filtered to view only selected data. Filtering can be done a couple of ways.

The first way is similar to a normal worksheet, using the drop down arrows for the row and column headers. Just place a checkmark in the selection(s) for that field to be viewed. When done using the filters, select the drop down arrow by the field name again, and choose **Clear Filter from....**



The other way to filter data is in the PivotTable Fields pane. There is a small drop down arrow when you hover over the field name.

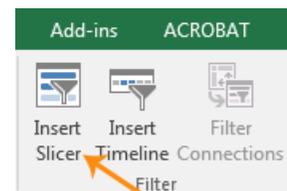


You can clear the filter in a similar way as the previous method, select the drop down arrow next to the field, and select **Clear Filter from....**

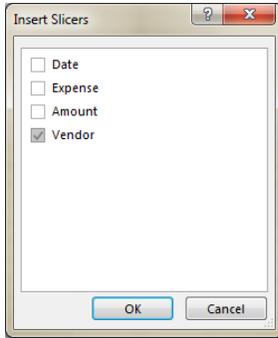
Slicers

Slicers provide another way to filter the data, but do it in a way that is friendlier to the viewer and can be used to demonstrate information to others. To insert a slicer, select **Insert Slicer** from the **Filter** group on the **PivotTable Tools Analyze** tab.

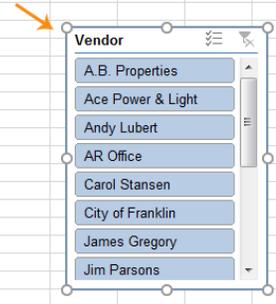
The **Insert Slicers** dialogue box open and a check should be place in each field to be sliced (filtered).



A **Slicer** box appears on screen, as well as a new **Slicer** tab with formatting options for the Slicer.

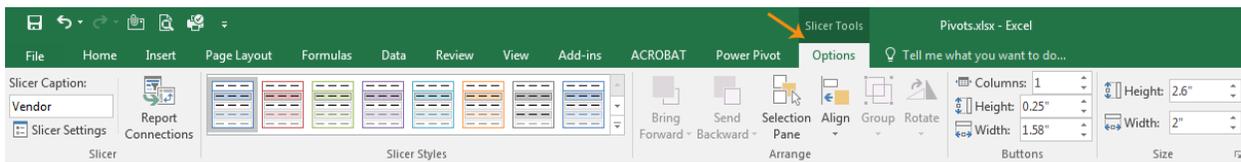


Sum of Amount	Column Labels	Overhead	Salary	Grand Total
Row Labels	Inventory			
A.B. Properties		12600		12600
Ace Power & Light		575		575
Andy Lubert			70000	70000
AR Office		60300		60300
Carol Stansen			44515	44515
City of Franklin		9674		9674
James Gregory			35325	35325
Jim Parsons			33140	33140
Karen Bush			24775	24775
Lisa La Flamme			40655	40655
Mary Fuller			35325	35325
Ralph J Cook Garbage		2700		2700
SW Wholesale		93907		93907
Wheelin's Gas Co.			7200	7200
Grand Total		93907	93049	283735
				470691



To view a particular selection of the slicer, just click that selection and only that selection's information will be viewed in the PivotTable. You can view more than one by holding the shift button and selecting each option to be viewed. More than one slicer can be selected at a time also.

Slicers have their own settings and formatting options. They can have their own styles and be resized, as well as have more than 1 column if preferred. Slicers also have their own settings under

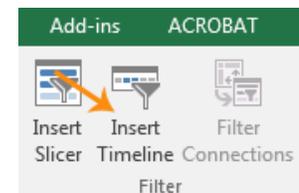


Slicer Settings or by right clicking on the slicer and selecting **Settings**. Settings include caption, sorting order, as well as how to handle items with no data.

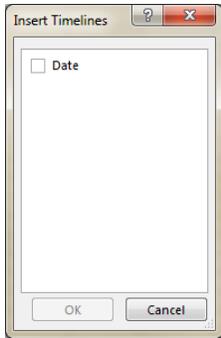
When the individual selections are no longer needed, click on the **X** on the filter in the upper right corner of the slicer and when the slicer is no longer needed, select the border of the slicer and select **Delete**. Also, right-clicking on the slicer and selecting **Remove Slicer** will remove it.

Timelines

A Timeline allows the information in the PivotTable to be viewed based on a timeframe, if the date is included in the data for the PivotTable. A timeline is also a tool that is great for visual purposes. To use a timeline, select **Insert Timeline** from the **Filter** group of the **PivotTable Tools Analyze** tab. An Insert Timelines box will appear with the field options with dates to select from. Check the appropriate field and select **OK**.



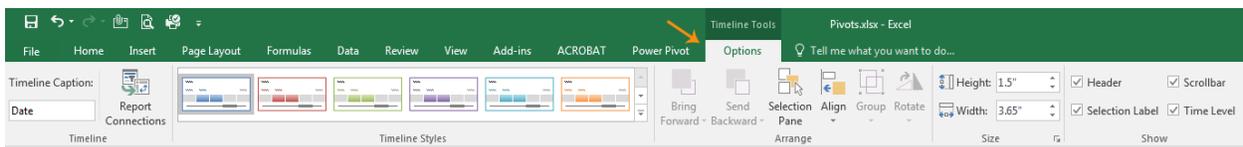
Once that is done, the Timeline appears. Like slicers, you can click to select and de-select timeframes to review and the PivotTable will update with information for timeframe selected.



Sum of Amount	Column Labels	Overhead	Salary	Grand Total
A.B. Properties	Inventory	12600		12600
Ace Power & Light		575		575
Andy Lubert			70000	70000
AR Office		60300		60300
Carol Stansen			44515	44515
City of Franklin		9674		9674
James Gregory			35325	35325
Jim Parsons			33140	33140
Karen Bush			24775	24775
Lisa La Flamme			40655	40655
Mary Fuller			35325	35325
Ralph J Cook Garbage			2700	2700
SW Wholesale		93907		93907
Wheelin's Gas Co.			7200	7200
Grand Total		93907	283735	470691

Using the **Shift +** option, multiple dates can be selected; however, the dates have to be consecutive.

Like the slicer, the Timeline also has its own tab with various options such as styles, labels, and sizes.



When the individual selections are no longer needed, click on the **X** on the filter in the upper right corner of the timeline and when the Timeline is no longer needed, select the border of the timeline and select **Delete**. Also, right-clicking on the timeline and selecting **Remove Timeline** will remove it.

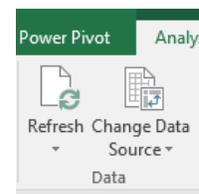
Data Details

In the event it is necessary to view the information that makes up a particular area of a PivotTable, double-clicking on the cell will create a new worksheet that shows what rows or columns made up that particular cell of the PivotTable.

	A	B	C	D	E
1	Date	Expense	Amount	Vendor	
2	1/1/2015	Overhead	1050	A.B. Properties	
3	12/1/2015	Overhead	1050	A.B. Properties	
4	11/1/2015	Overhead	1050	A.B. Properties	
5	10/1/2015	Overhead	1050	A.B. Properties	
6	9/1/2015	Overhead	1050	A.B. Properties	
7	8/1/2015	Overhead	1050	A.B. Properties	
8	7/1/2015	Overhead	1050	A.B. Properties	
9	6/1/2015	Overhead	1050	A.B. Properties	
10	5/1/2015	Overhead	1050	A.B. Properties	
11	4/1/2015	Overhead	1050	A.B. Properties	
12	3/1/2015	Overhead	1050	A.B. Properties	
13	2/1/2015	Overhead	1050	A.B. Properties	
14					

Updating PivotTable

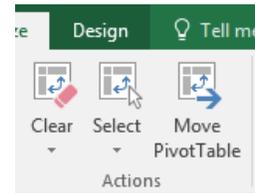
In the event the source data for a PivotTable changes, the PivotTable can be updated using the **Refresh** option in the **Data** group of the **PivotTable Tools Analyze** tab.



Additional PivotTable Options

Clear

If there comes a time when a particular PivotTable is no longer needed, the PivotTable can be cleared using the **Clear** option in the **Actions** group of the **PivotTable Tools Analyze** tab.

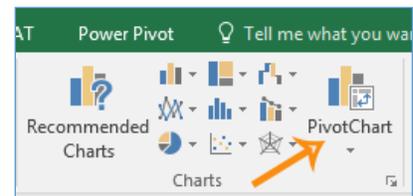


Select

In the event the PivotTable needs to be selected, you can select the entire table by using the **Select** option, also found in the **Action** group of the **PivotTable Tools Analyze** tab. This can be used to copy and paste the PivotTable if need be.

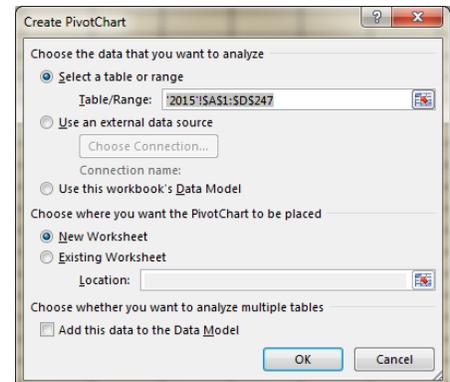
Creating a PivotChart

Similar to standard charts in Excel, PivotCharts are an image that represents data in a PivotTable. They are created very similar to a PivotTable. To create a PivotChart, select a cell within the data and select **PivotChart** from the **Charts** group on the **Insert** tab.

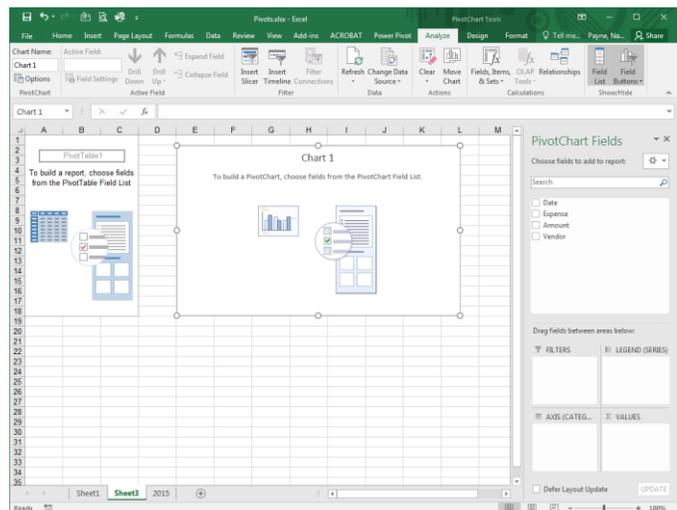


Similar to a PivotTable, a **Create PivotChart** dialogue appears with options for data range and location for the PivotChart.

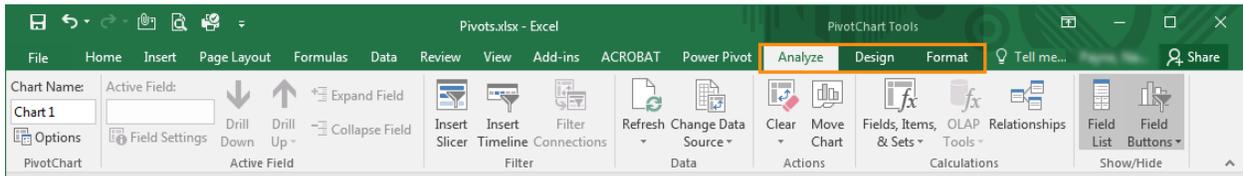
Once those selections are made, click **OK**.



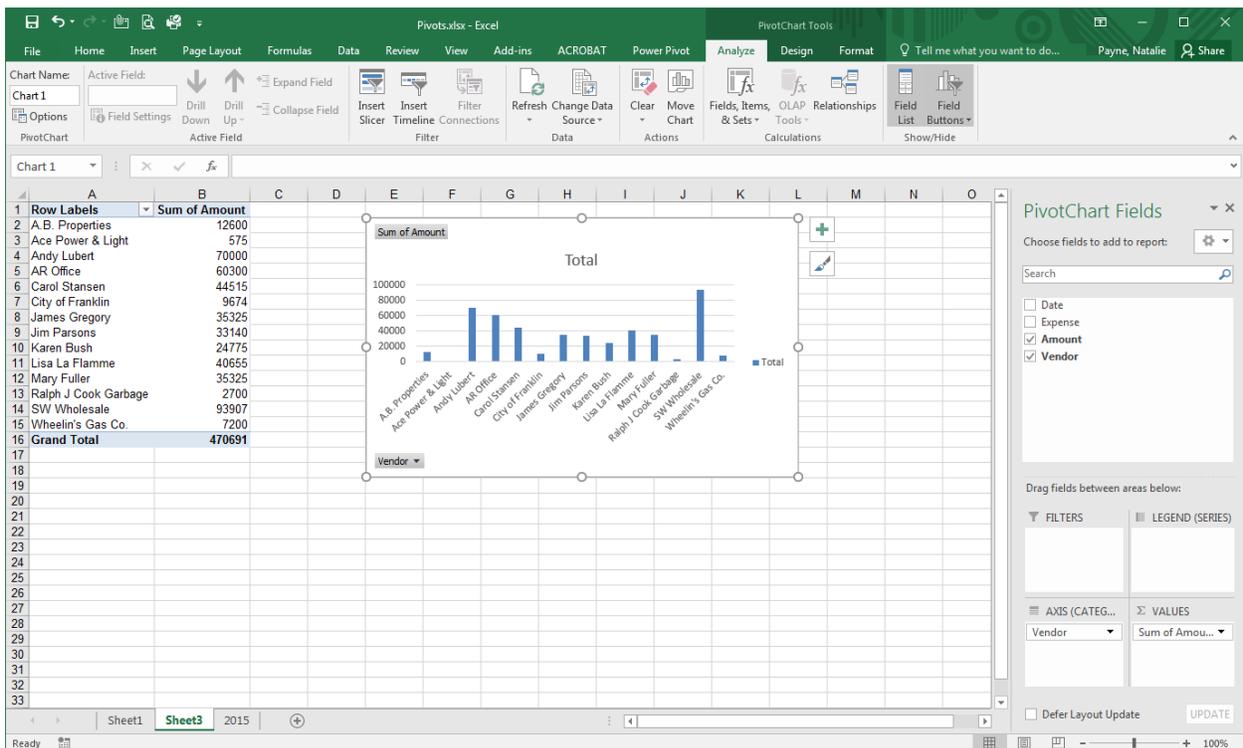
In the location selected for the chart, a **PivotChart Fields** pane, which looks very similar the pane for PivotTables will appear, along with an area for a PivotTable and Chart. As with the PivotTable, the fields can be moved to the areas of the chart in the bottom portion of the Fields pane.



Also, a **PivotChart Tools** tab with an **Analyze**, **Design** and **Format** tab is now available to help format the chart.



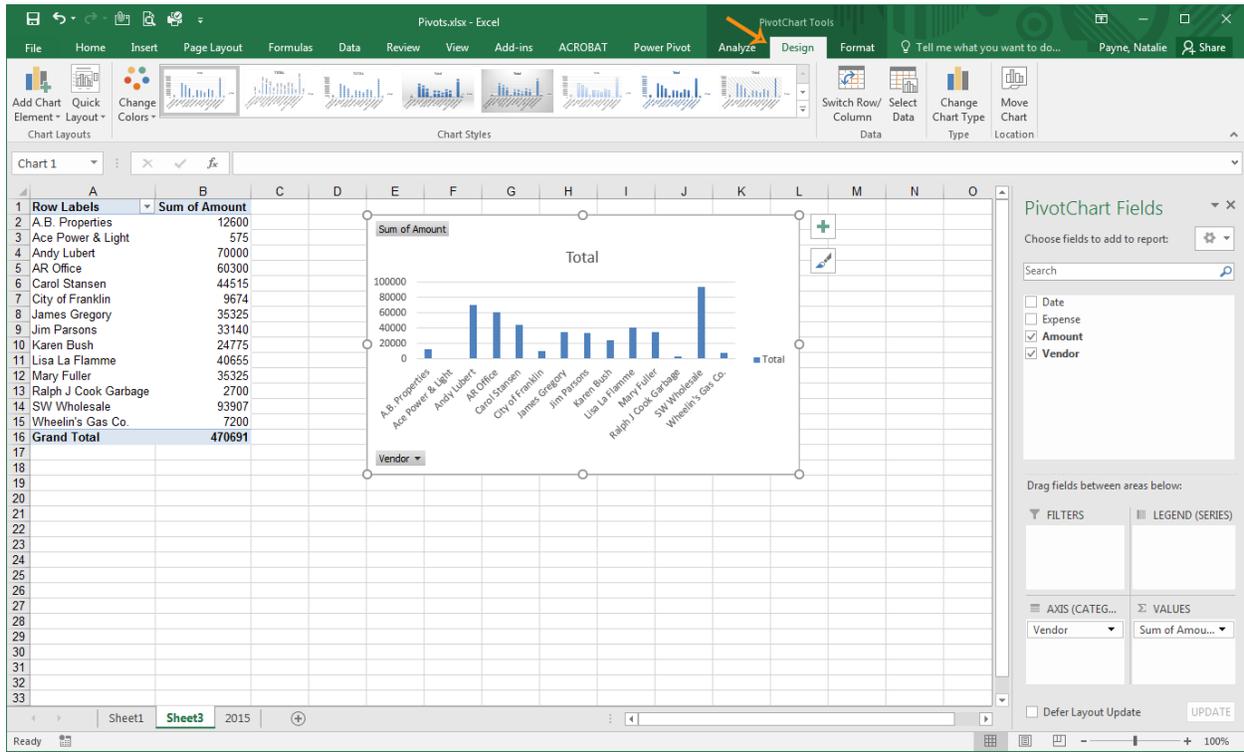
As fields are moved to the chart areas, the PivotChart is created, as well as a PivotTable that coordinates with the chart.



Formatting a PivotChart

Similar to the regular charts in Excel, using the **Design** tab of the **PivotChart Tools** tab allows the charts colors and styles to be changed. Also, by clicking inside the chart, additional options become available on the right side of the chart. Double-clicking on various elements of the chart also opens up additional formatting panes on the right side of the screen.

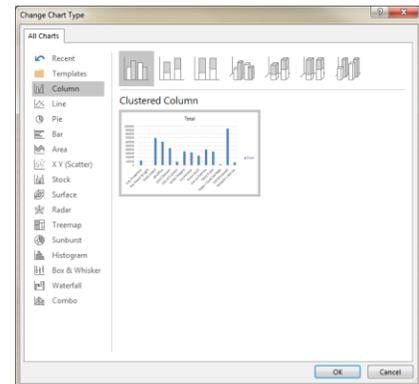
The **Format** tab of the PivotChart Tools tab provides formatting options for the various areas of the chart as well.



Changing Chart Type

The Chart Type can be changed by selecting the **Change Chart Type** option from the **Design** tab of the **PivotChart Tools** tab.

Again, similar to regular charts in Excel, there are a variety of options and the Change Chart Type dialogue box provides previews of each chart type.



Analyzing the PivotChart

Like PivotTables, PivotCharts have options such as **Filters**, **Slicers**, and **Timelines**.

Filters

The filter feature can be utilized in the **PivotChart Fields** pane or the chart using the dropdown arrows beside the field name.

Slicers and Timelines

Slicers and Timelines can be used as well. Like PivotTables, they are great for visual aids and can be found in the **Filter** group of the **Analyze** tab of the **PivotTables Tools** tab.

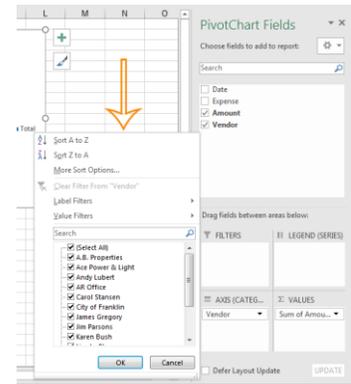
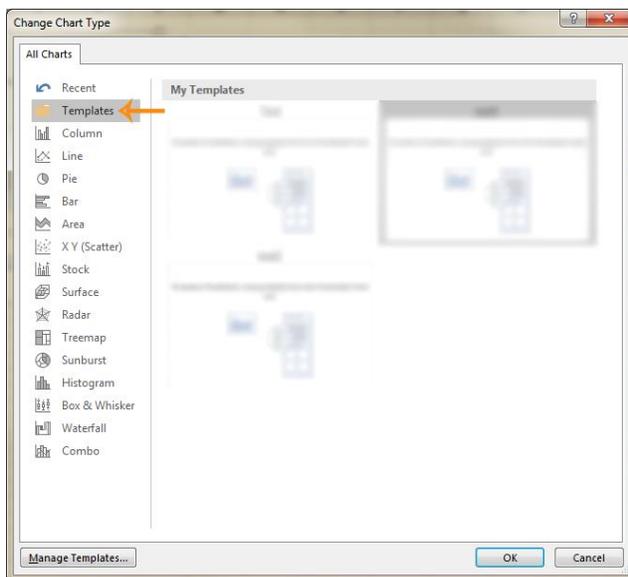
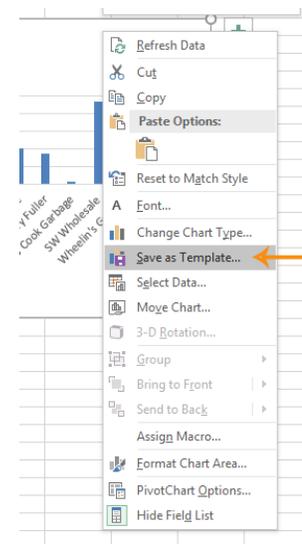


Chart Templates

Once a chart is created, that design can be saved as a template to be used at a later time. To do that, right click on the chart and select **Save as Template**.

A **Save Chart Template** dialogue box appears and the chart can be named and saved.

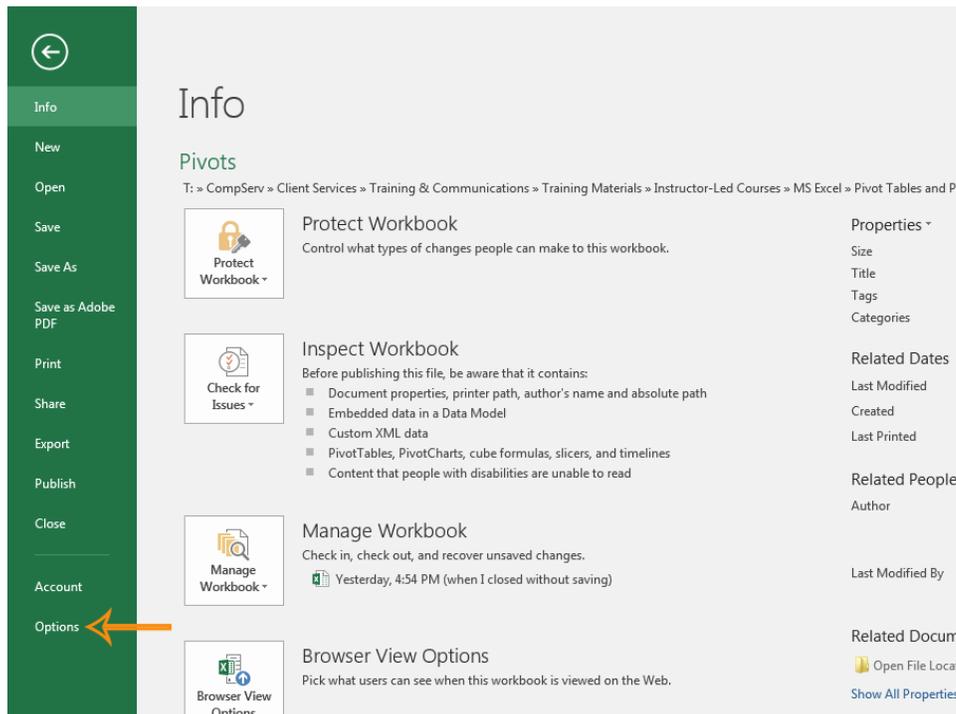
To access the template in the future, select **Change Chart Type** from the **Design** tab of the **PivotChart Tools** tab. In the **Change Chart Type** dialogue box, there is a **Templates** option, and the saved template should be in that folder.



PowerPivot

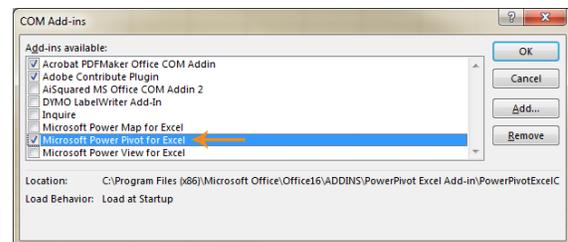
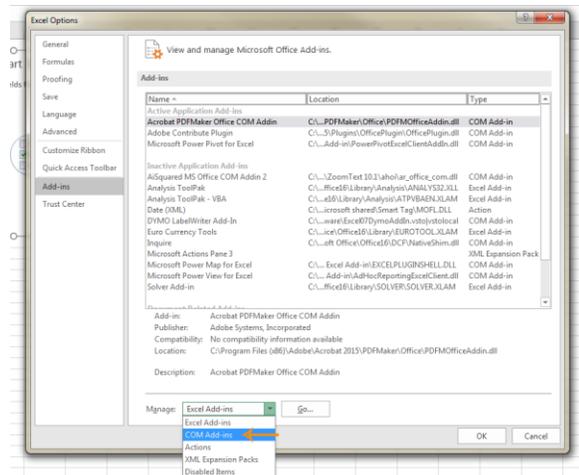
Historically, PivotTables only allowed data sources to come from only one worksheet or table; however, with Office Professional 2013, that changed! PowerPivot now allows multiple data

sources to be used for PivotTables by using relationships between the data sources. PowerPivot must first be turned on. To do that, go to the **Backstage** view and choose **Options**.

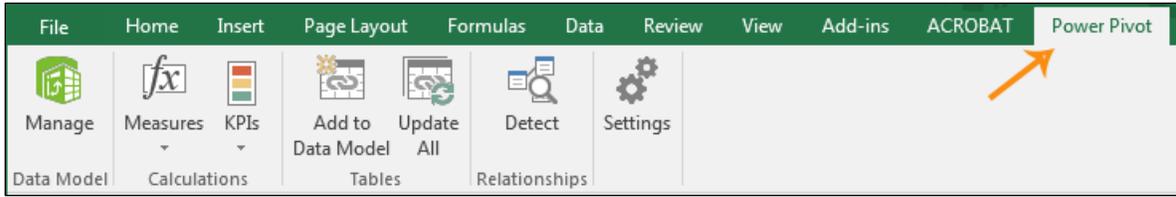


From the Options dialogue box, select **Add-Ins**. At the bottom of the box, there is a Manage drop down menu. Select **COM Add-ins** and **Go**.

From the COM Add-Ins, a check needs to be placed in the check box for **Microsoft Office PowerPivot for Excel 2013** and select **OK**.

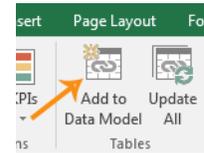


Excel has now placed a PowerPivot tab on the ribbon.



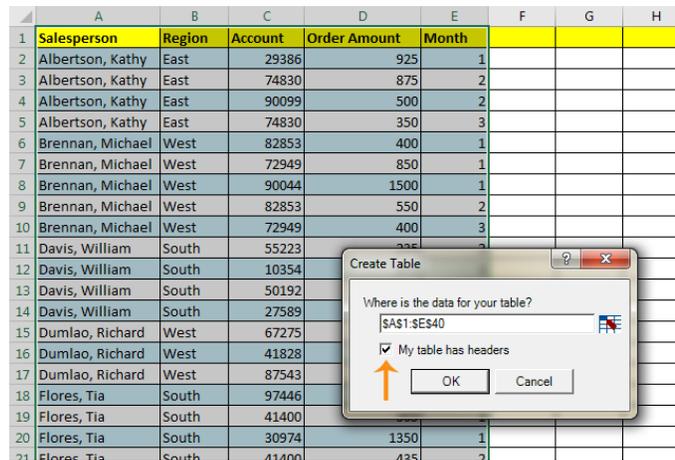
Data Sources

There are multiple ways to add data sources to PowerPivot. If working with an existing Excel spreadsheet, select a cell that contains data and simply select **Add to Data Model** from the **Tables** group on the **PowerPivot** tab.



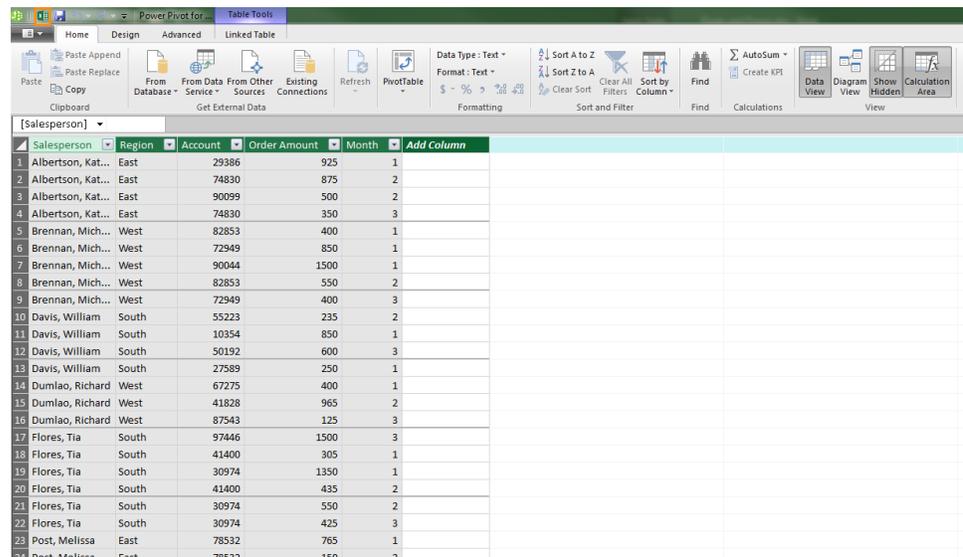
The **Create Table** dialog box appears with the location of the source data.

Confirm that that location is inclusive of all the data to be included and if there are column headings, make sure and check the box for “My table has headers” and select **OK**.



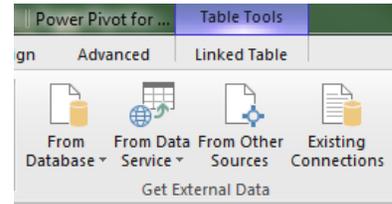
Excel places that data in a new table in a PowerPivot window that looks very similar to Excel. There are fewer tabs, and some tabs and options are different than Excel.

To go back to the data source to add the other worksheet to PowerPivot, select the small Excel icon at the upper left part of the screen.



PowerPivot offers a variety of options of adding data sources to the data model.

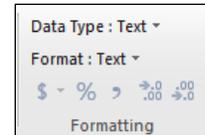
To add from other sources, select which option is needed using the options in the **Get External Data** group in the **Home** tab of the **PowerPivot** window.



As other data sources are added to PowerPivot, more tables will be added, similar to worksheets being added in Excel.

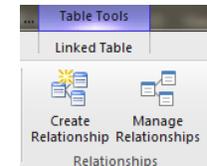
Formatting Data Sources

Once the data sources have been added, columns can be formatted if need be. There are not as many formatting options in the PowerPivot view. The formatting options are in the **Formatting** group on the **Home** tab of the **PowerPivot** window.

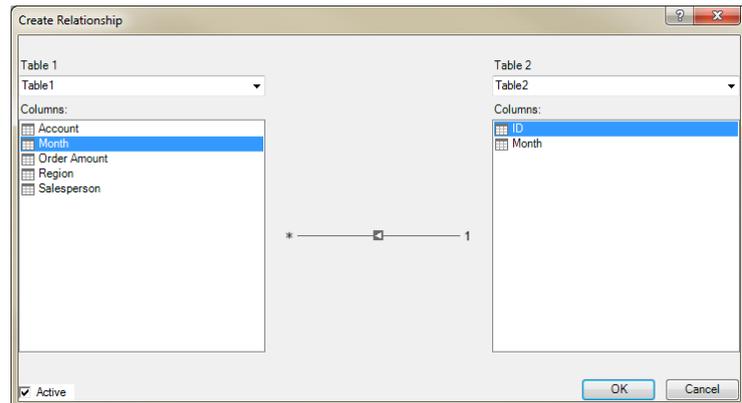


Creating Relationships

In order for the data sources to “talk” to each other for a PivotTable, a relationship between the tables has to be created. To create a relationship, select **Create Relationship** from the **Relationships** group of the **Design** tab. The Create Relationship dialogue box appears.



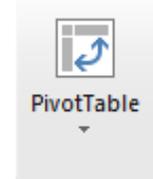
In this box, identify what columns from each table relate to each other. In this example, the Month column in Table 1 needs to relate to the ID column in Table 2. Select **Create** when done.



At the top of the column, a new icon appears on the Month column indicating that column has a relationship.

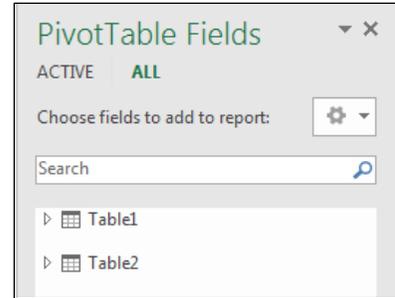
Creating a PivotTable in Power PowerPivot

Once the relationships have been created, the PivotTable with the multiple data sources can be created. To create a PivotTable in PowerPivot, select **PivotTable** from the **Home** tab. There are several options for creating Pivot objects using the drop down option also. When PivotTable is selected, it will transition back to Excel and ask if the PivotTable should be created in a New Worksheet or Existing Worksheet.



Once the selection is made, the Excel window will look very similar to creating standard PivotTables, but in the **PivotTable Fields** pane, the tables from PowerPivot will be listed now.

As with standard PivotTables, fields can be moved to the different sections of the PivotTable until the desired layout is achieved. The difference now is that with the relationship created between the two tables, fields from two or more tables can be integrated into the PivotTable.



The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is titled 'Sum of Order Amount' and is located in the range B3:G32. The PivotTable fields are: Row Labels (Salesperson), Column Labels (Region), and Values (Sum of Order Amount). The data is summarized by month (February, January, March) and region (East, North, South, West, Grand Total). The PivotTable includes data from two tables: Table1 (Salesperson, Region, Order Amount, Month) and Table2 (Month, ID). The PivotTable is set to show 'Month' as a filter and 'Region' as a column label. The 'Defer Layout Update' checkbox is checked.

Month	Region	Albertson, Kathy	Brennan, Michael	Davis, William	Dumlao, Richard	Flores, Tia	Post, Melissa	Thompson, Shannon	Walters, Chris	Grand Total
February	East	\$1,375.00								\$1,375.00
February	North			\$235.00						\$235.00
February	South				\$965.00					\$965.00
February	West					\$985.00				\$985.00
February	Grand Total	\$1,950.00	\$1,720.00	\$3,975.00	\$1,515.00					\$9,160.00
January	East	\$925.00								\$925.00
January	North			\$1,100.00						\$1,100.00
January	South				\$400.00					\$400.00
January	West					\$1,655.00				\$1,655.00
January	Grand Total	\$1,690.00	\$1,140.00	\$3,110.00	\$3,150.00					\$9,090.00
March	East	\$350.00								\$350.00
March	North			\$600.00						\$600.00
March	South				\$125.00					\$125.00
March	West					\$1,925.00				\$1,925.00
March	Grand Total	\$700.00	\$300.00	\$3,790.00	\$525.00					\$5,315.00
Grand Total	East	\$4,340.00	\$3,160.00	\$10,875.00	\$5,190.00					\$23,565.00

All the tools available previously in PivotTables and Charts are still available with the PowerPivot table.

Excel 2016 – Advanced

Table of Contents

- Charts 3**
- Column Chart/Bar Chart 3
 - Creating the Chart*.....3
 - Chart Styles and Colors*.....4
 - Other Options*.....5
- Pie Charts 7

- Arranging Data 8**
- Moving the Data 8
- Entering the Formulas..... 9
 - Total Sales*.....9
 - Total Income*.....9
 - Total Revenue*.....10
 - Total Expenses*.....10
 - Profit/Loss*10

- Other Formulas 10**
- Sum10
- Average10
- Count.....11
- Max11
- Min11
- Round11
- IF.....12
- CountIf.....12

- Absolute Cell References 12**

- Conditional Formatting..... 13**
- Color Scales13
- Top/Bottom Rules.....13
- Custom Conditional Formatting14

- Vlookup 15**

- Arrays 16**
- Array Example17
- Array Formulas.....17
- Advanced Array Formulas17

Array Formulas with IF Statements	18
Using Dropdown Menus with Advanced Array Formulas	18
Creating A Dropdown Menu.....	18
Updating Your Array Formula.....	19

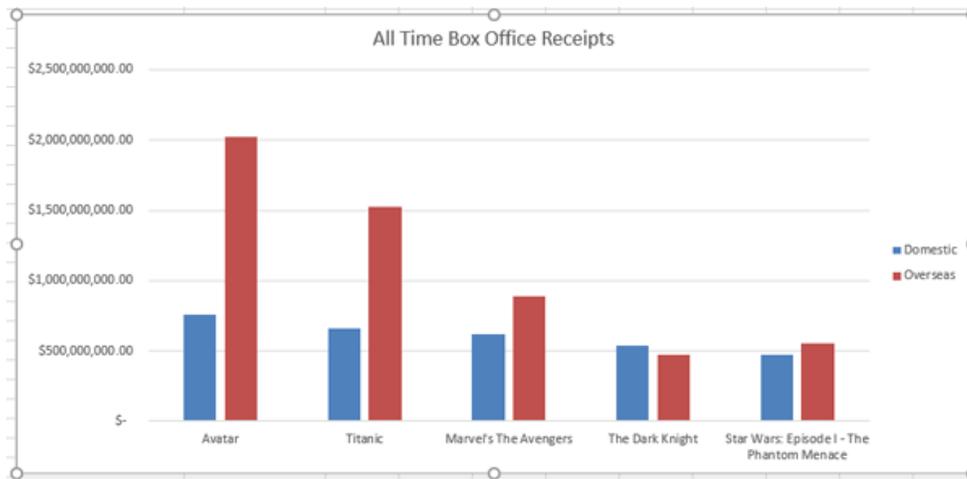
Charts

Charts are visual representations of data. Charts allow the audience to see numbers in graphic form. This makes conveying information easier if done properly. There are many types of charts.

Column Chart/Bar Chart

Bar graphs or "column charts" as they are known in Excel are most often used to show amounts or the number of times a value occurs.

The amounts are displayed using a vertical bar or rectangle. The taller the column, the greater number of times the value occurs.



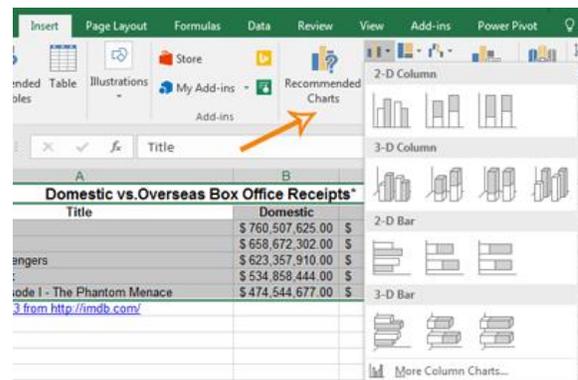
No matter what type of chart is used, data is required as a reference for the measurements

Creating the Chart

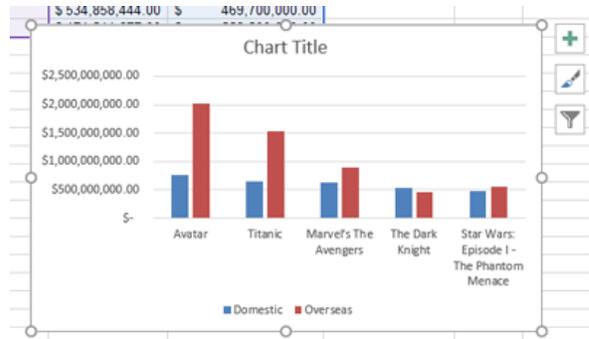
First, highlight all data that will be referenced in the chart

Title	Domestic	Overseas
Avatar	\$ 760,507,625.00	\$ 2,021,800,000.00
Titanic	\$ 658,672,302.00	\$ 1,526,700,000.00
Marvel's The Avengers	\$ 623,357,910.00	\$ 888,400,000.00
The Dark Knight	\$ 534,858,444.00	\$ 469,700,000.00
Star Wars: Episode I - The Phantom Menace	\$ 474,544,677.00	\$ 552,500,000.00

Then, go to the **Insert** tab. Under the **Charts** group there will be an icon with vertical bars. When clicked, there will be more options available. Select the first option under 2-D column.



The chart will look like the chart to the right initially.



Double-click on the title and change the name to “All Time Box Office Receipts”.



Chart Styles and Colors

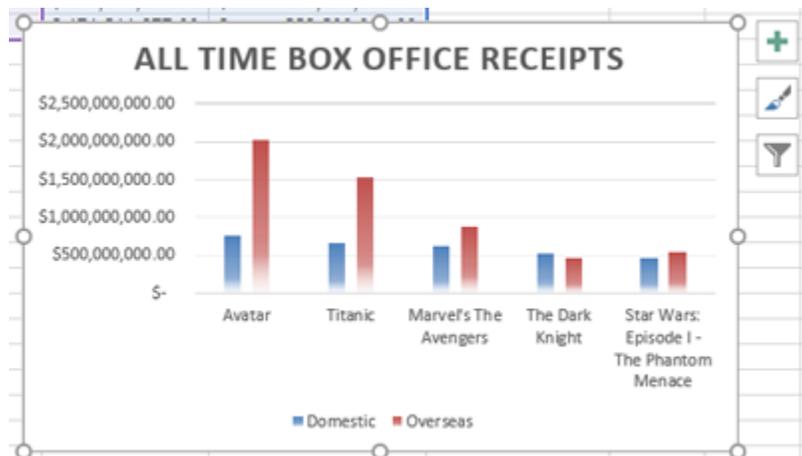
The initial design of the chart can be altered. Excel comes with several different styles for charts.

To access these Styles do the following:

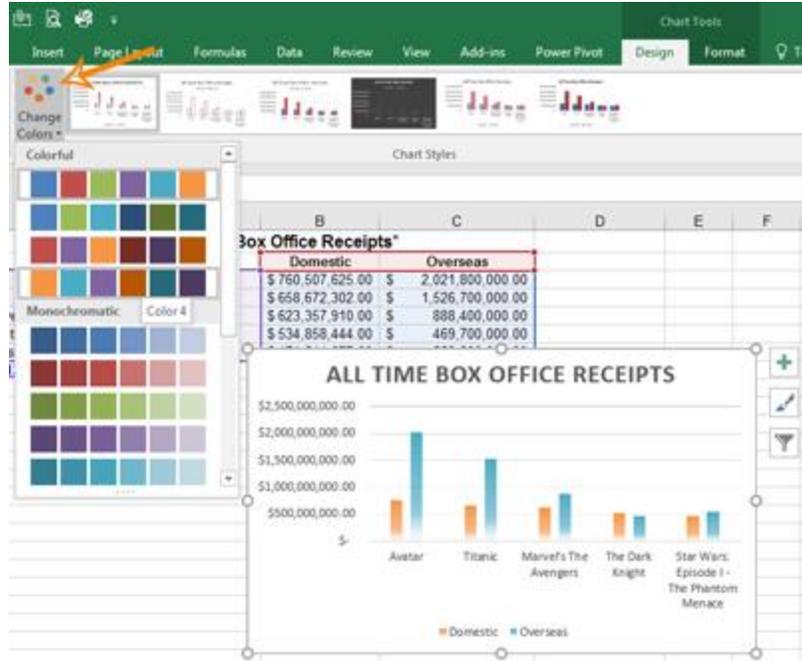
1. Click on the chart
2. Go to the **Design** tab under **Chart Tools**
3. Under the **Chart Styles** group, select the chart style and watch the chart change



In this example, Style 9 has been selected.



To change the color scheme of the bars, go to **Change Colors** under the **Design Tab** and select the desired color scheme.



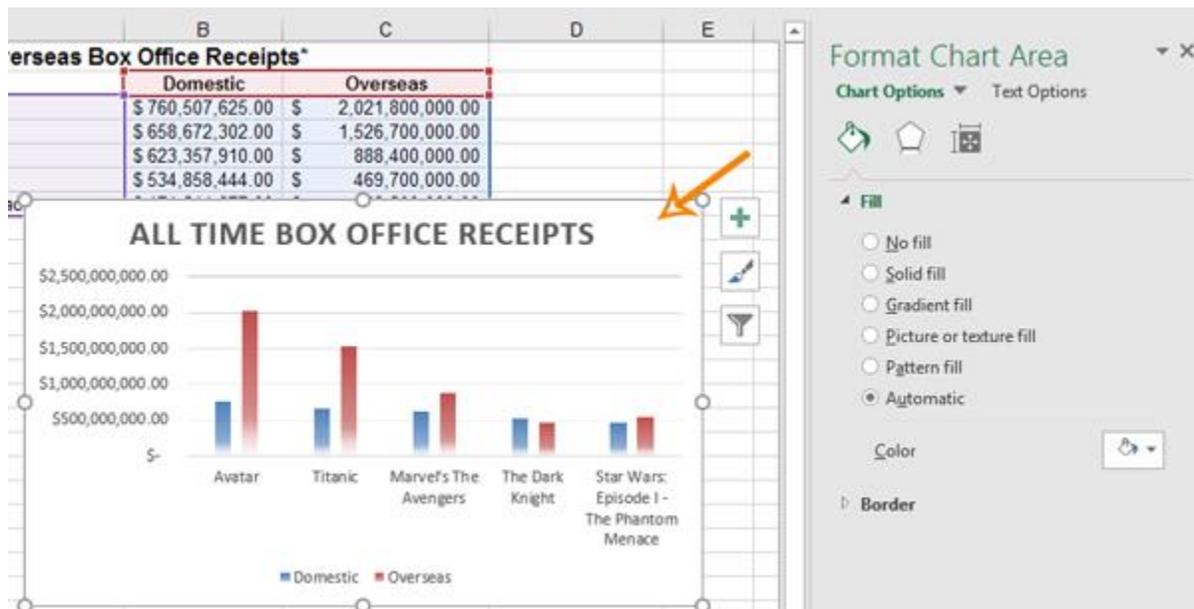
Other Options

There are other chart options that can be adjusted.

Chart Area

If the chart area (chart background) needs to be updated, double-click on the area underneath the bars

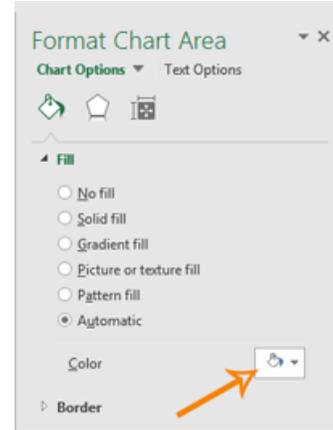
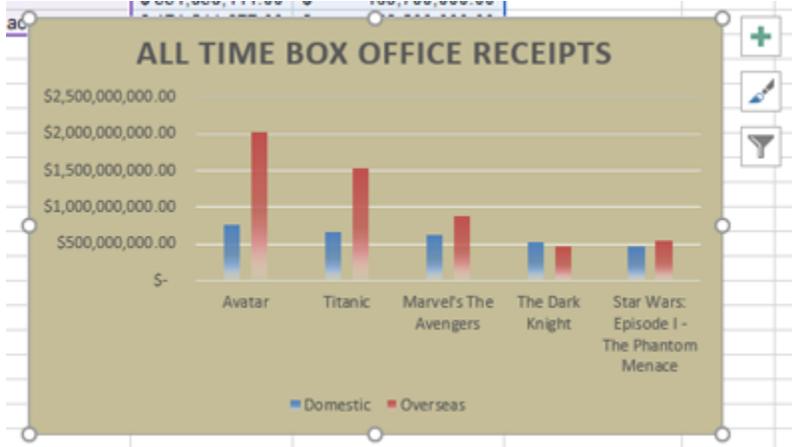
When this is done, the right hand side of Excel will change to display Chart Area Options.



To change the background, select the Solid Fill radio button.

Under **Color**, select the desired color.

Here is what the chart now looks like.

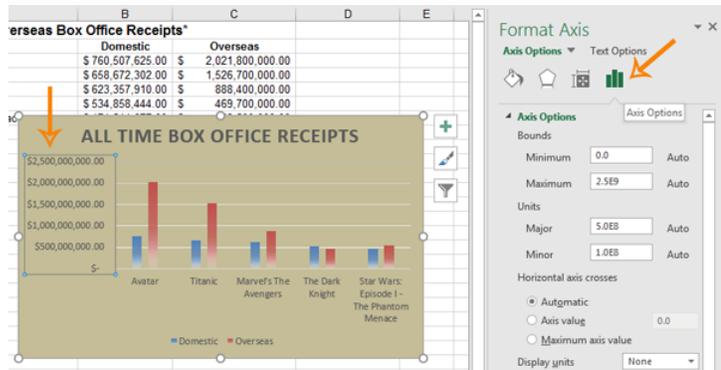


Axis Options

The axis of the chart can also be updated in the same way.

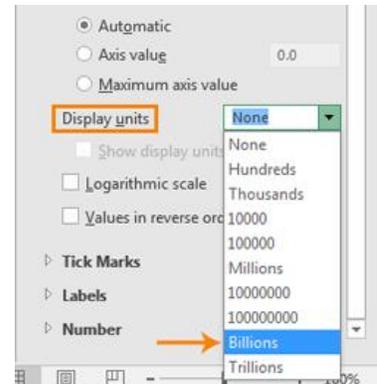
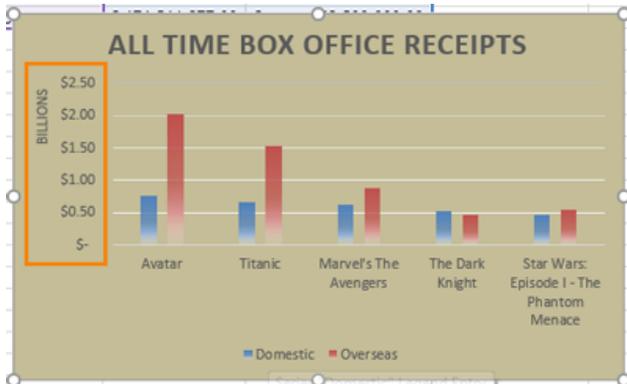
Select the axis to be formatted double-clicking.

Underneath the **Axis Options** (icon looks like a bar graph) the above options are shown.



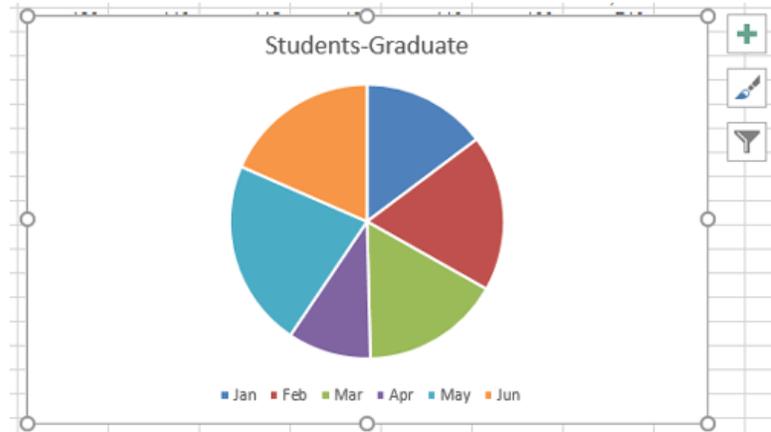
Change the display units to "Billions".

The chart will now show the vertical axis in billions.



Pie Charts

Pie charts show the size of items in one data series, proportional to the sum of the items. The data points in a pie chart are displayed as a percentage of the whole pie.

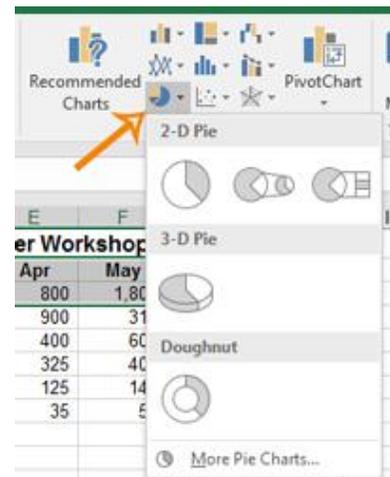
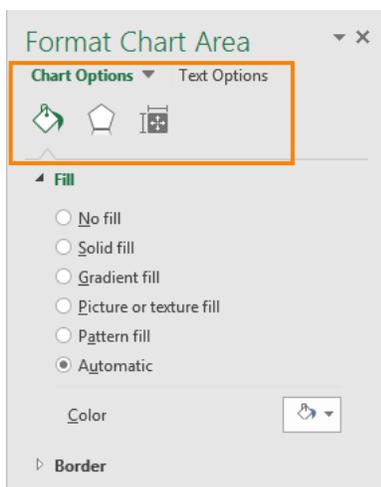


Pie charts can only plot one set of data at a time. In this case, only Graduate Students are selected.

Participants Who Took Computer Workshops							
	Jan	Feb	Mar	Apr	May	Jun	Total
Students-Graduate	1,200	1,500	1,335	800	1,800	1,500	8,135
Students-Undergraduate	900	800	1,200	900	310	500	4,610
Staff	800	825	700	400	600	300	3,625
Faculty	300	225	200	325	400	200	1,650
General Public	120	110	115	125	140	100	710
Non-Profit	45	35	20	35	55	65	255

Then, go to the **Insert** tab. Under the **Charts** group there will be an icon that looks like a circle. When clicked, there will be more options available. Select the first option under 2-D pie.

Similar to the bar chart, the elements of the pie chart, as well as any other chart can be formatted.



Arranging Data

Data is good, but if it is unorganized it will not benefit anyone. In this example, the data is jumbled and hard to read.

	A	B	C	D	E	F	G
1	Weird Al's Cinema Chair						
2	Half Yearly Profit & Loss Report						
3		Jan	Feb	Mar	Apr	May	Jun
4	Sales						
5	Adult Ticket Sales	11000	13000	16000	18000	27000	18000
6	Child Ticket Sales	5950	6000	15000	13000	9500	10500
7	Total Sales						
8	Income						
9	Adult Ticket Revenue	101000	121000	123000	175000	181000	165000
10	Child Ticket Revenue	26000	41000	61000	46000	43500	48500
11	Shop Net Revenue	1800	1900	2200	5000	1850	2500
12	Total Revenue						
13	Fixed Expenses						
14	Rent	4500	4500	4500	4500	4500	4500
15	Franchise Fee	16000	16000	16000	16000	16000	16000
16	Cleaning	3000	3000	3000	3000	3000	3000
17	Variable Expenses						
18	Usher Wages	32000	42500	54000	50000	56000	53000
19	Projector Running Costs	61000	81000	109000	101000	107000	107000
20	Total Expenses						
21	Profit/Loss						

Moving the Data

Move the "Profit/Loss" cell to cell A30. This is done by clicking on the cell and hovering over the edge of the cell until the cursor changes. Once it changes, click and drag to cell A30.

The "Total Expenses" columns will be moved to cell A29.

The section pertaining to variable expenses will be moved next. Highlight everything from "Variable Expenses" to the final cell in the "Projector Running Costs" row.

Move the entire selection to cell A25.

	A	B	C	D	E	F	G
5	Adult Ticket Sales	11000	13000	16000	18000	27000	18000
6	Child Ticket Sales	5950	6000	15000	13000	9500	10500
7	Total Sales						
8	Income						
9	Adult Ticket Revenue	101000	121000	123000	175000	181000	165000
10	Child Ticket Revenue	26000	41000	61000	46000	43500	48500
11	Shop Net Revenue	1800	1900	2200	5000	1850	2500
12	Total Revenue						
13	Fixed Expenses						
14	Rent	4500	4500	4500	4500	4500	4500
15	Franchise Fee	16000	16000	16000	16000	16000	16000
16	Cleaning	3000	3000	3000	3000	3000	3000
17	Variable Expenses						
18	Usher Wages	32000	42500	54000	50000	56000	53000
19	Projector Running Costs	61000	81000	109000	101000	107000	107000
20	Total Expenses						
21							
22							
23							
24							
25							
26							
27							
28							
29							
30	Profit/Loss						

Continue to move the data until it looks like the example below.

	A	B	C	D	E	F	G
1	Weird Al's Cinema Chain						
2	Half Yearly Profit & Loss Report						
3		Jan	Feb	Mar	Apr	May	Jun
4	Sales						
5	Adult Ticket Sales	11000	13000	16000	18000	27000	18000
6	Child Ticket Sales	5950	6000	15000	13000	9500	10500
7	Total Sales						
8							
9	Income						
10	Adult Ticket Revenue	101000	121000	123000	175000	181000	165000
11	Child Ticket Revenue	26000	41000	61000	46000	43500	48500
12	Shop Net Revenue	1800	1900	2200	5000	1850	2500
13	Total Income						
14							
15	Total Revenue						
16							
17							
18							
19							
20	Fixed Expenses						
21	Rent	4500	4500	4500	4500	4500	4500
22	Franchise Fee	16000	16000	16000	16000	16000	16000
23	Cleaning	3000	3000	3000	3000	3000	3000
24							
25	Variable Expenses						
26	Usher Wages	32000	42500	54000	50000	56000	53000
27	Projector Running Costs	61000	81000	109000	101000	107000	107000
28							
29	Total Expenses						
30	Profit/Loss						

Entering the Formulas

This spreadsheet is now ready for formulas

Total Sales

In cell B7, enter the following equation: =B5+B6

4	Sales	
5	Adult Ticket Sales	11000
6	Child Ticket Sales	5950
7	Total Sales	=B5+B6
8		

Copy the formula over by dragging the fill handle (little cross at the bottom right corner of the cell).

Yearly Profit & Loss Report						
	Jan	Feb	Mar	Apr	May	Jun
Adult Ticket Sales	11000	13000	16000	18000	27000	18000
Child Ticket Sales	5950	6000	15000	13000	9500	10500
Total Sales	16950					

Total Income

Enter the following formula in cell B13: =SUM(B10:B12)

Copy the formula over by dragging the fill handle across the other cells in the row.

9	Income		
10	Adult Ticket Revenue	101000	121000
11	Child Ticket Revenue	26000	41000
12	Shop Net Revenue	1800	1900
13	Total Income	=SUM(B10:B12)	

Total Revenue

In cell B15, enter the following formula: =SUM(B7, B7)

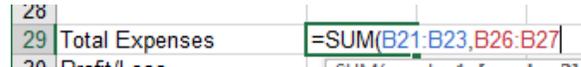


14							
15	Total Revenue						=SUM(B7, B13)
16							

Copy the formula over by dragging the fill handle across the other cells in the row.

Total Expenses

Enter the following formula in the cell B29:
=SUM(B21:B23, B26:B27)

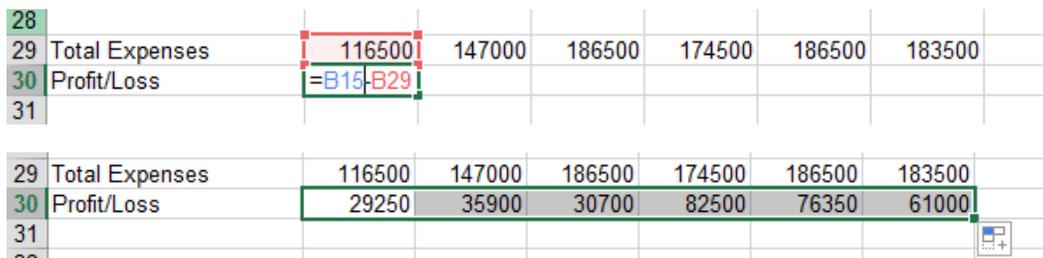


28							
29	Total Expenses						=SUM(B21:B23, B26:B27)
30							

Copy the formula over by dragging the fill handle across the other cells in the row.

Profit/Loss

In cell B30 type this formula: =B15-B29



28							
29	Total Expenses	116500	147000	186500	174500	186500	183500
30	Profit/Loss	=B15-B29					
31							

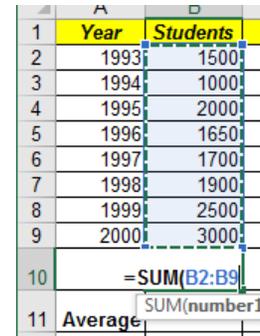
29	Total Expenses	116500	147000	186500	174500	186500	183500
30	Profit/Loss	29250	35900	30700	82500	76350	61000
31							

Other Formulas

Sum

The **SUM** function adds all the numbers that you specify as arguments. Each argument can be a range, a cell reference, an array, a constant, a formula, or the result from another function. For example, =SUM(A1:A5) adds all the numbers that are contained in cells A1 through A5. For another example, =SUM(A1, A3, A5) adds the numbers that are contained in cells A1, A3, and A5.

Enter the formula: =SUM(B2:B9)

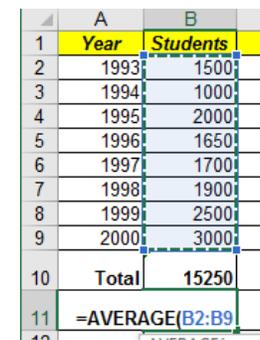


	A	B
1	Year	Students
2	1993	1500
3	1994	1000
4	1995	2000
5	1996	1650
6	1997	1700
7	1998	1900
8	1999	2500
9	2000	3000
10		=SUM(B2:B9)
11	Average	SUM(number1

Average

Returns the average (arithmetic mean) of the arguments. For example, if the range A1:A20 contains numbers, the formula =AVERAGE(A1:A20) returns the average of those numbers.

Enter the formula: =AVERAGE(B2:B9)



	A	B
1	Year	Students
2	1993	1500
3	1994	1000
4	1995	2000
5	1996	1650
6	1997	1700
7	1998	1900
8	1999	2500
9	2000	3000
10	Total	15250
11		=AVERAGE(B2:B9)
12		AVERAGE(

Count

The **COUNT** function counts the number of cells that contain numbers, and counts numbers within the list of arguments. Use the **COUNT** function to get the number of entries in a number field that is in a range or array of numbers.

Enter the formula: =COUNT(B2:B14)

	A	B	C	D	E
1	Name	Mark			
2	Tony	35			
3	Frank	72			
4	Corina	61			
5	Linda	38	No of Students	=COUNT(B2:B14)	
6	Daniel	96			
7	Andrew	98	Highest Mark		
8	Stephen	94			
9	Greg	60	Lowest Mark		
10	Margaret	51			
11	Susan	45			
12	Rob	47			
13	Lindy	75			
14	Jeff	85			

Max

The **MAX** function returns the largest value in a set of values.

Enter the following formula:

=MAX(B2:B14)

	A	B	C	D	E
1	Name	Mark			
2	Tony	35			
3	Frank	72			
4	Corina	61			
5	Linda	38	No of Students		13
6	Daniel	96			
7	Andrew	98	Highest Mark	=MAX(B2:B14)	
8	Stephen	94			
9	Greg	60	Lowest Mark		
10	Margaret	51			
11	Susan	45			
12	Rob	47			
13	Lindy	75			
14	Jeff	85			

Min

The **MIN** function returns the smallest number in a set of values.

Enter the following formula:

=MIN(B2:B14)

	A	B	C	D	E
1	Name	Mark			
2	Tony	35			
3	Frank	72			
4	Corina	61			
5	Linda	38	No of Students		13
6	Daniel	96			
7	Andrew	98	Highest Mark		98
8	Stephen	94			
9	Greg	60	Lowest Mark	=MIN(B2:B14)	
10	Margaret	51			
11	Susan	45			
12	Rob	47			
13	Lindy	75			
14	Jeff	85			

Round

The **ROUND** function rounds a number to a specified number of digits. Since it is not a formula for a range of cells, the auto-fill feature can be used to copy the formula to other cells.

=ROUND(B2,0)

	A	B	C
1	Name	Mark	Rounded Mark
2	Tony	35.26	=ROUND(B2,0)
3	Frank	72.68	ROUND(number,
4	Corina	31.36	
5	Linda	38.45	
6	Daniel	96.72	
7	Andrew	98.24	
8	Stephen	94.25	
9	Greg	60.21	
10	Margaret	51.78	
11	Susan	45.65	
12	Rob	47.80	
13	Lindy	75.12	
14	Jeff	85.24	

IF

The **IF** function returns one value if a condition you specify evaluates to TRUE, and another value if that condition evaluates to FALSE. The auto-fill feature can be used to copy the formula to other cells in the column.

Enter the following formula: =IF(B4>=50, "Pass", "Fail")

	A	B	C	D	E
1	Name	Mark	Pass / Fail		
2	Tony	35	=IF(B2>=50, "Pass", "Fail")		
3	Frank	72	IF(logical_test, [value_if_true], [value_if_false])		
4	Corina	61			
5	Linda	38			
6	Daniel	96			
7	Andrew	98			
8	Stephen	94		No. of Students to Pass	
9	Greg	60			
10	Margaret	51			
11	Susan	45			
12	Rob	47			
13	Lindy	75			

	A	B	C	D	E
1	Name	Mark	Pass / Fail		
2	Tony	35	Fail		
3	Frank	72			
4	Corina	61			
5	Linda	38			
6	Daniel	96			
7	Andrew	98			
8	Stephen	94		No. of Students to Pass	
9	Greg	60			
10	Margaret	51			
11	Susan	45			
12	Rob	47			
13	Lindy	75			

Countif

The **COUNTIF** function counts the number of cells within a range that meet a single criterion that you specify. For example, you can count all the cells that start with a certain letter, or you can count all the cells that contain a number that is larger or smaller than a number you specify.

Enter the following formula:
=COUNTIF(C2:C13, "Pass")

	A	B	C	D	E	F	G
1	Name	Mark	Pass / Fail				
2	Tony	35	Fail				
3	Frank	72	Pass				
4	Corina	61	Pass				
5	Linda	38	Fail				
6	Daniel	96	Pass				
7	Andrew	98	Pass				
8	Stephen	94	Pass	No. of Students to Pass	=COUNTIF(C2:C13, "Pass")		
9	Greg	60	Pass		COUNTIF(range, criteria)		
10	Margaret	51	Pass				
11	Susan	45	Fail				
12	Rob	47	Fail				
13	Lindy	75	Pass				

Absolute Cell References

The autofill option in Excel provides a way to copy formulas in a column, without the need for copy and paste. The formula adjusts as it moves down the column to incorporate the values of the row in the formula.

There may be times when the cell reference must be absolute. Unlike relative references, **absolute references** do not change when copied or filled. Use an absolute reference to keep a cell reference constant.

An absolute reference is designated in a formula by the addition of a **dollar sign (\$)** to the cell reference. The F4 key can be used to make a cell absolute as well.

Enter the following formula:
 $=G3/\$G\2

	A	B	C	D	E	F	G	H
1	Student	Lab 1	Lab 2	Lab 3	Exam 1	Exam 2	Total Points	Percentage
2	(max)	20	20	20	100	100	76	
3	Andrew	14	16	10	96	98	71.9	$=G3/\$G\2
4	Ben	20	12	18	68	68	52.6	
5	Cory	14	15	15	92	86	66.7	
6	Debra	19	8	15	98	73	64.05	
7	Fva	18	16	16	70	41	43.85	

Conditional Formatting

By applying conditional formatting to your data, you can quickly identify variances in a range of values with a quick glance. Conditional formatting can also be used to format cells based on the contents entered into the cell.

Color Scales

Color scales will format all of the data that is selected. Smaller numbers will be closer in color and the gradient will begin to shift as numbers get higher

	A	B	C	D	E	F	G	H	I	J	K	L
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	40	38	44	46	51	51	56	72	70	59	45	41
3	34	33	38	41	45	45	48	55	54	45	41	38
4	61	69	79	83	95	95	97	101	95	87	72	66
5	0	2	9	24	28	28	32	36	35	21	12	4

Select the data to format.

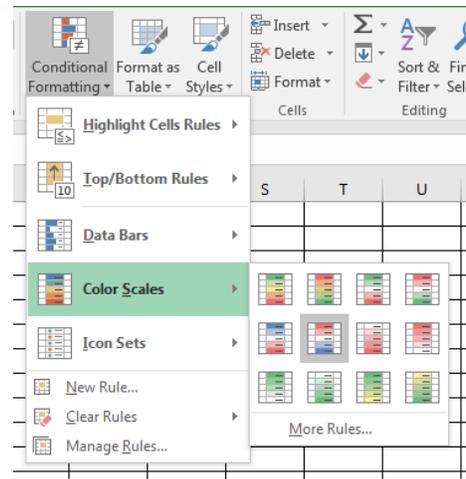
Apply the conditional formatting under:

Home Tab > Styles Group > Conditional Formatting

Apply the “Red, White and Blue Color Scale”

Here is the result:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	40	38	44	46	51	51	56	72	70	59	45	41
3	34	33	38	41	45	45	48	55	54	45	41	38
4	61	69	79	83	95	95	97	101	95	87	72	66
5	0	2	9	24	28	28	32	36	35	21	12	4



The colors will update as the numbers are changed.

Top/Bottom Rules

Conditional formatting can also be used to detect the highest or lowest set of numbers in a dataset.

Select the data to format.

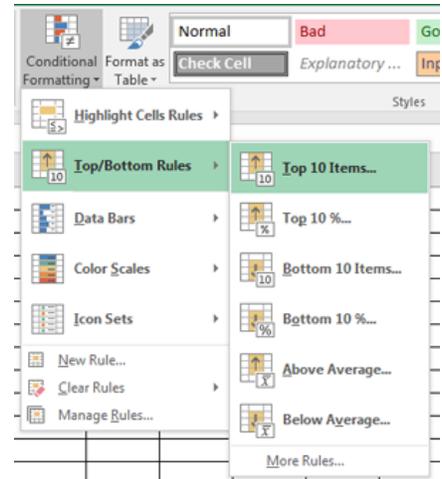
Apply the conditional formatting under:

Home Tab > Styles Group > Conditional Formatting > Top/Bottom Rules

Apply the “Top 10 Items...” format

The following pop up will result:

The formatting can be changed as well as the number of cells to highlight.



Select OK.

The cells with the 10 highest numbers will be highlighted.

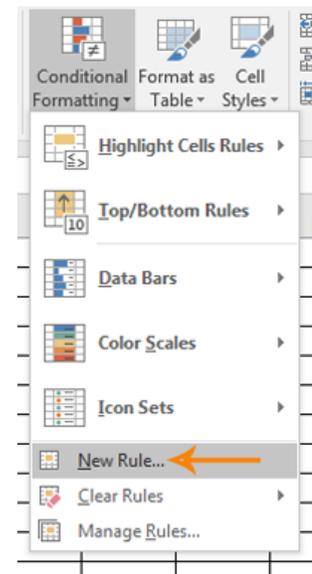
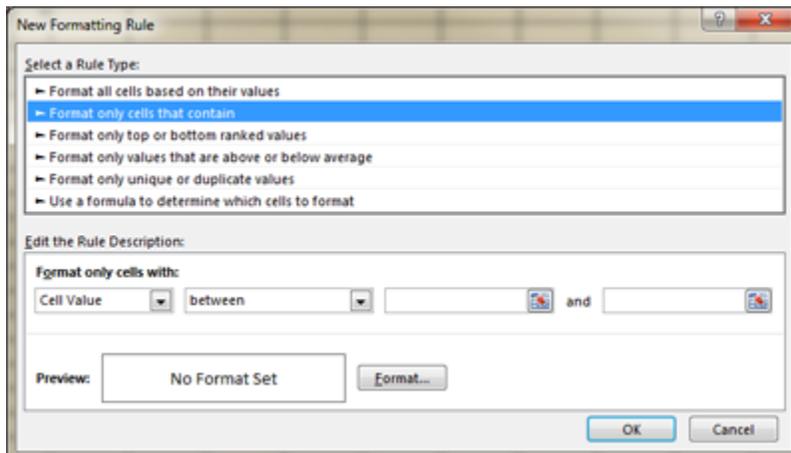
	A	B	C	D	E	F	G	H	I	J	K	L
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	40	38	44	46	51	51	56	72	70	59	45	41
3	34	33	38	41	45	45	48	55	54	45	41	38
4	61	69	79	83	95	95	97	101	95	87	72	66
5	0	2	9	24	28	28	32	36	35	21	12	4

Custom Conditional Formatting

Custom rules can be created. To create a new rule, go to

Home Tab > Styles Group > Conditional Formatting > New Rule

The following pop up will appear.



Options can then be created based on cell contents and how cells should be formatted. Rules can be created for an entire column prior to cell input to allow the cell to format as soon as input is entered into the cell.

Vlookup

VLOOKUP is a fantastic tool that can turn a spreadsheet into a database. The VLOOKUP function searches the first column of a range of cells, and then returns a value from any cell on the same row of the range.

Syntax

```
VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])
```

As with any formula, to start a VLOOKUP, enter the equals signs (=) and follow it with VLOOKUP

- **lookup_value** – Required. The value to search in the first column of the table or range. The lookup value can be a cell reference or an actual value
- **table_array** – Required. The range of cells that contains data. You can use a reference to a range (for example, **A2:D8**), or a range name. The values in the first column of **table_array** are the values searched by **lookup_value**. These values can be text, numbers, or logical values. Uppercase and lowercase text are equivalent.
- **col_index_num** - Required. The column number in the **table_array** argument from which the matching value must be returned. A **col_index_num** argument of 1 returns the value in the first column in **table_array**; a **col_index_num** of 2 returns the value in the second column in **table_array**, and so on.
- **range_lookup** - Optional. A logical value that specifies whether you want **VLOOKUP** to find an exact match or an approximate match

Finds largest value less than or equal to the lookup value.
Table Array must be sorted in ascending order for TRUE to result.

Units	Price	Gross	% Discount	Discount	Net	# Units	% Discount
1,000	14.99	14,990.00		-	14,990.00	1	0%
230	14.99	3,447.70		-	3,447.70	25	2%
9,000	14.99	134,910.00		-	134,910.00	100	4%
98	14.99	1,469.02		-	1,469.02	250	6%
24	14.99	359.76		-	359.76	1,000	8%
1	14.99	14.99		-	14.99	5,000	10%
5,000	14.99	74,950.00		-	74,950.00	10,000	13%
						50,000	16%
						100,000	20%

Lookup Value

Table Array

Pull result from column 2 in the table array

In the example above, the discount table on the right can be used to fill in the data in the % Discount column. The formula should look like this:

Enter the following formula: =VLOOKUP(A8,\$H\$8:\$I\$16,2,True)

	Units	Price	Gross	% Discount	Discount	Net		# Units	% Discount
8	1,000	14.99	14,990.00	=VLOOKUP(A8,\$H\$8:\$I\$16,2,True)				1	0%
9	230	14.99	3,447.70	VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])				25	2%
10	9,000	14.99	134,910.00		-	134,910.00		100	4%
11	98	14.99	1,469.02		-	1,469.02		250	6%
12	24	14.99	359.76		-	359.76		1,000	8%
13	1	14.99	14.99		-	14.99		5,000	10%
14	5,000	14.99	74,950.00		-	74,950.00		10,000	13%
15								50,000	16%
16								100,000	20%

After the formula is copied down, it will pull the corresponding percentage into each cell according to how many units were purchased.

	Units	Price	Gross	% Discount	Discount	Net		# Units	% Discount
8	1,000	14.99	14,990.00	8%	1,199.20	13,790.80		1	0%
9	230	14.99	3,447.70	4%	137.91	3,309.79		25	2%
10	9,000	14.99	134,910.00	10%	13,491.00	121,419.00		100	4%
11	98	14.99	1,469.02	2%	29.38	1,439.64		250	6%
12	24	14.99	359.76	0%	-	359.76		1,000	8%
13	1	14.99	14.99	0%	-	14.99		5,000	10%
14	5,000	14.99	74,950.00	10%	7,495.00	67,455.00		10,000	13%
15								50,000	16%
16								100,000	20%

The VLOOKUP formula can be used to populate grades too.

Here is an example of a gradesheet. The students will get a grade depending upon the scale on the right.

Be sure to freeze the reference table and press "Enter".

	A	B	C	D	E	F
1	Student	Score	Grade		Simple Grade Scale	
2	Osami Abe	60	=VLOOKUP(B2,\$E\$2:\$F\$6,2,True)			F
3	Romelio Arce Alva	92			60	D
4	Bela Cedillo Amador	84			70	C
5	Valderrama Cazares Armijo	69			80	B
6	Constella Arriba	83			90	A

Copy the information to every cell below to have the formula to each person.

Arrays

An array is a collection of data. These can also be referred to as tables. Array formulas are explored in this section.

Array Example

This can be classified as an array.

9	ARRAY: Addition	
10		
11	122	99
12	145	65
13	77	74
14	89	100
15		

Array Formulas

Formulas can be used on arrays. If the sum of all the items is desired, enter the SUM formula and select the array.

This same procedure can be used for multiplication.

9	ARRAY: Addition		
10			
11	122	99	=SUM(A11:B14)
12	145	65	SUM(number1,
13	77	74	
14	89	100	
15			

Advanced Array Formulas

Suppose that the average change between pre and post tests for an entire class is desired. This would normally be a multistep process. However, with arrays this can be done in one step.

	A	B	C	D	E	F	G	H
1	Name			Pre-Test	Post-Test	Change		
2	Osami Abe	Freshman	Male	61	87	=AVERAGE(E2:E62-D2:D62)		
3	Romelio Arce Alva	Sophomore	Male	66	80			
4	Bela Cedillo Amador	Junior	Female	92	92			
5	Valderrama Cazares Armijo	Senior	Female	93	95			
6	Constella Arriba	Freshman	Female	71	93			
7	Kiyotaka Asai	Sophomore	Female	88	86			
8	Lorujama Anguiano Barraza	Junior	Female	99	100			
9	Billy Black	Senior	Male	66	65			
10	William Bloch	Freshman	Male	74	84			
11	Teseo Ceballos Caldera	Sophomore	Male	70	97			
12	Louise Carmel	Junior	Female	83	84			
13	Jovianne Benavidez Cervántez	Senior	Female	71	83			
14	Jacob Chang	Freshman	Male	81	81			
15	April Connor	Sophomore	Female	70	88			

This formula is not complete. If Enter is pressed at this point, the above will result which is incorrect. Prior to hitting Enter, press CTRL + SHIFT + ENTER. This will tell Excel that this is an array formula. When CTRL + SHIFT + ENTER is pressed, the formula will be surrounded by brackets *{formula}*.

F2					={AVERAGE(E2:E62-D2:D62)}	
	A	B	C	D	E	F
1	Name			Pre-Test	Post-Test	Change
2	Osami Abe	Freshman	Male	61	87	12.787
3	Romelio Arce Alva	Sophomore	Male	66	80	
4	Bela Cedillo Amador	Junior	Female	92	92	

Array Formulas with IF Statements

Array formulas can be quite robust when combined with IF statements. Suppose that a specific demographic average is required, such as the average change in male freshman.

	B	C	D	E	F	G	H	I	J	K	L
			Pre-Test	Post-Test	Change						
	Freshman	Male	61	87	12.787	=AVERAGE(IF(B2:B62="Freshman", IF(C2:C62="Male", E2:E62-D2:D62)))					
	Sophomore	Male	66	80							
	Junior	Female	92	92							
	Senior	Female	93	95							
	Freshman	Female	71	93							
	Sophomore	Female	88	88							

This formula is averaging the difference between the post-test and the pre-test. But it is only doing so for individuals who are male freshman.

Pressing CTRL+SHIFT+ENTER will give us the following result:

9.1818182

If the average change for female freshman is desired, change the "Male" to "Female" in the formula.

=AVERAGE(IF(B2:B62="Freshman", IF(C2:C62="Female", E2:E62-D2:D62)))

24.8

Using Dropdown Menus with Advanced Array Formulas

In the previous example, the data was changed when the formula was edited. However, the formula results can be changed more quickly if dropdown menus are used.

Creating A Dropdown Menu

On the **Data** tab, go to **Data Validation** in the **Data Tools** group. A Data Validation dialogue will appear.

Change the "Allow" dropdown menu to "List"

Select the button to the right of the **Source** text entry box.

Select a set of classification names (Freshman, Sophomore, Junior, Senior) and press **Enter**. The options can also be typed into the Source area.

Press OK

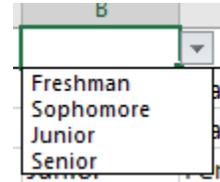
The screenshot shows the Data Validation dialog box with the following settings:

- Settings: Input Message, Error Alert
- Validation criteria: Allow: List, Ignore blank (checked), In-cell dropdown (checked)
- Data: between
- Source: SBS2:SB\$5

The spreadsheet below shows the following data:

	B	C	D	E	F	G
			Pre-Test	Post-Test	Change	
	Freshman	Male	61	87	12.787	24.8
	Sophomore	Male	66	80		
	Junior	Female	92	92		
	Senior	Female	93	95		

A dropdown list has now been created in that cell.



Updating Your Array Formula

The array formula must now be updated

With the old formula open, delete the word “Freshman” and “Male” and select the cell that has the dropdown menu.

	B	C	D	E	F	G	H	I	J	K	L
			Pre-Test	Post-Test	Change						
	Freshman	Male	61	87	12.787	24.8	=AVERAGE(IF(B2:B62=B1,IF(C2:C62=C1,E2:E62-D2:D64)))				
	Sophomore	Male	66	80							
	Junior	Female	82	82							

Press CTRL+SHIFT+ENTER

Now, selecting the classification will automatically update the average!

	B	C	D	E	F	G	H
	Senior	Female	e-Test	Post-Test	Change		
	Freshman	Male	61	87	12.787	24.8	6.6
