



# Excel 2019

## Part 7: PivotTables

January 2020

PivotTable reports (or PivotTables) make the data in your worksheets much more manageable by summarizing the data and allowing you to manipulate it in different ways. PivotTables can be an indispensable tool when used with large, complex spreadsheets, but they can be used with smaller spreadsheets as well. *PivotTables in Excel 2019* covers the basics of creating and manipulating PivotTables.

### Overview of PivotTable Reports

#### Advantages of PivotTables

- Allows you to easily analyze and manipulate large sets of data
- With a PivotTable, you select only the fields that you wish to focus on
- You can quickly reposition any field on your PivotTable – e.g. change it from a Vertical to a Horizontal position
- PivotTables allow you to easily add multiple summaries – e.g. Sum, Average, Percentage of Total, etc without writing a formula!
- It is impossible to harm your original data when you work with a PivotTable because you are working with a “virtual snapshot” of your data.

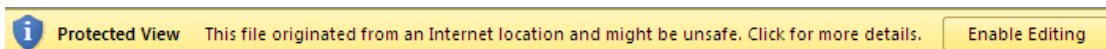
Sum of Order Amount	Column Labels		
Row Labels	2011	2012	Grand Total
Albuquerque, Kate	97623	19151	116774
Brennan, Michael	83924	74126	158050
Byington, Melissa	65467	47921	113388
Druschel, William	22158	71220	93378
Hale, Andrew	76746	27515	104261
Hayes, Shannon	75958	67147	143105
Isaacson, Tara	45106	109933	155039
Ventura, Genevieve	127493	60073	187566
Walsh, Chris	54943	169213	224156
<b>Grand Total</b>	<b>649418</b>	<b>646299</b>	<b>1295717</b>

### Getting Started

To create a PivotTable first enter the basic content into your Excel document or open an existing dataset.

1. Open **Microsoft Excel 2019**
2. Open the document **excel\_practice\_file** located in the **Documents** folder

If it appears, click on the yellow **Enable Editing** button at the top of the screen



3. Click on the **PivotTable** worksheet

## Formatting data for use in a PivotTable

Formatting data for use in a PivotTable is an important first step!

The best way to format data for a PivotTable is as a **list**.

- A list is a series of columns, with each column displaying a category.
- Each row of the data should display a fact.

The example below contains sales information for a fictional car dealership. The data set, also called **source data**, consists of 48 rows and 7 columns.

Each column displays a category of information: Salesperson, Brand, Year, Type, Model, Price and Date Received. Each row displays a fact. For example, row 2 shows that the salesperson Kate Albuquerque sold a 2012 Ford Focus car for \$19,151. The vehicle was received on August 4, 2012.

	A	B	C	D	E	F	G
1	<b>Salesperson</b>	<b>Brand</b>	<b>Year</b>	<b>Type</b>	<b>Model</b>	<b>Price</b>	<b>Date Received</b>
2	Albuquerque, Kate	Ford	2012	Car	Focus	\$ 19,151	8/4/2012
3	Albuquerque, Kate	Ford	2011	Car	Focus	\$ 18,151	8/4/2012
4	Albuquerque, Kate	Toyota	2011	Truck	Tundra	\$ 25,441	8/7/2012

**Source data should also not contain any gaps or extraneous information** that will not be included in the PivotTable. If a blank row or column is present, the complete data set will not be included in the PivotTable report.

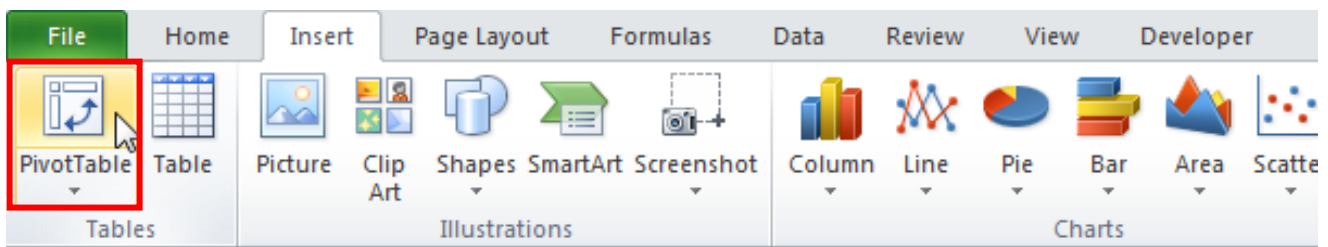
## Using PivotTables to answer questions

Creating a PivotTable is an interactive way to quickly summarize and understand data. Using the example above here are some questions about the data that a PivotTable can answer:

1. What is the amount sold by each salesperson?
2. What amount of car brand was sold by each salesperson?
3. What amount of product was sold in 2012 (or other year)?
4. How much of each car brand was sold?
5. How much of each car brand was sold in 2011 (or other year)?

## Create a PivotTable

1. Click any single cell inside the data set.
2. Go to **Insert** tab → **Tables** group → **PivotTable** command

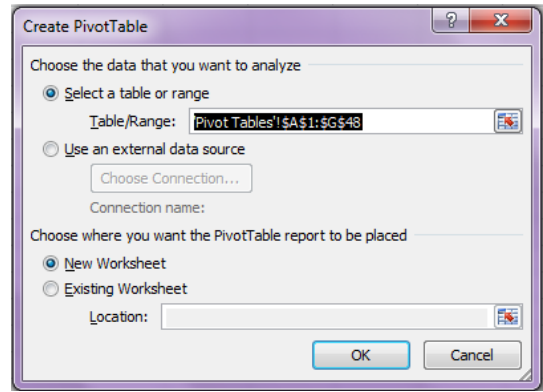


- The **Create PivotTable dialog box** appears. Excel automatically selects the data for you

**NOTE:** Always check that the correct data is selected. If it is not selected properly, **click and drag** over the correct data in the original data set.

When you click and drag over cells \$ symbols appear around the cell range. The \$ symbols indicate an absolute cell reference and are needed for the PivotTable to populate.

- Select the radio button next to **New Worksheet**
- Click **OK**



A new worksheet is created with a blank **PivotTable** on the left. The **Field List** and the **Layout Section** appear on the right side of the page.

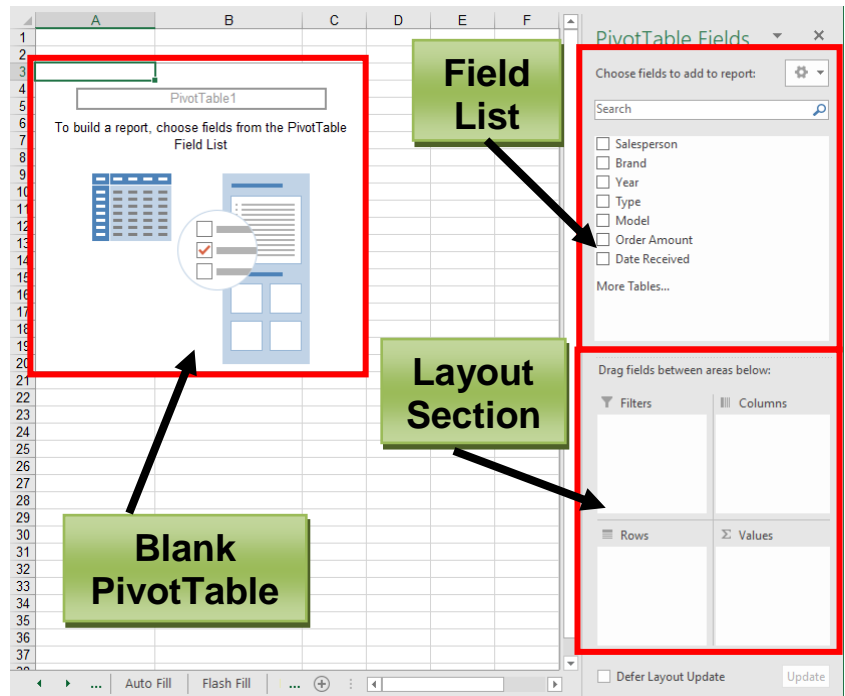
The **Field List** displays the fields available to you and mirrors the columns from the source data.

The layout section is used to build the PivotTable.

The **Columns** area displays column headings in the PivotTable.

The **Rows** area creates row headings in the PivotTable.

The **Values** area displays data as functions in the body of the PivotTable.



### Add Fields to the PivotTable Report

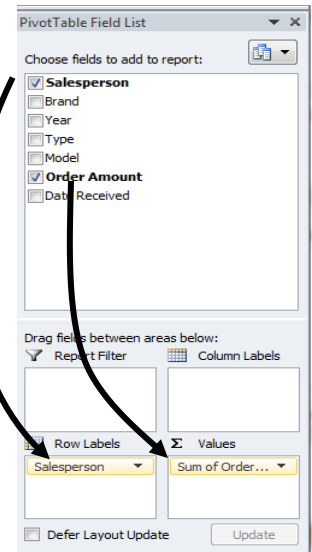
To determine which fields to add to the PivotTable, first think back to your question.

**Question 1:** What is the amount sold by each salesperson?

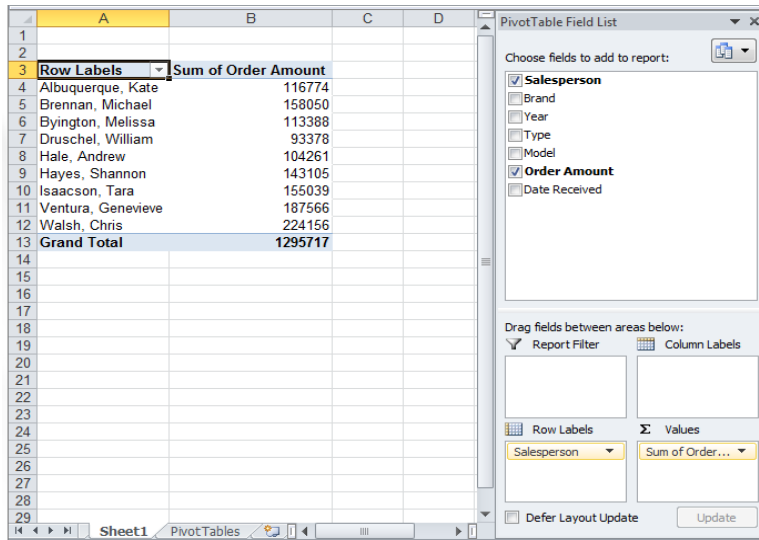
To view or summarize specific data, add the field that contains the data to your PivotTable.

- In the **Field List**, place a checkmark next to the **Salesperson** and **Order Amount** fields.

The selected fields will be added to one of the four boxes in the **Layout Section**. In this example, the Salesperson field is added to the **Row Labels** box, and the Order Amount is added to the **Values** box. If a field is not in the desired box, you can **click and drag** it to a different one.



The PivotTable now shows the amount sold by each salesperson.



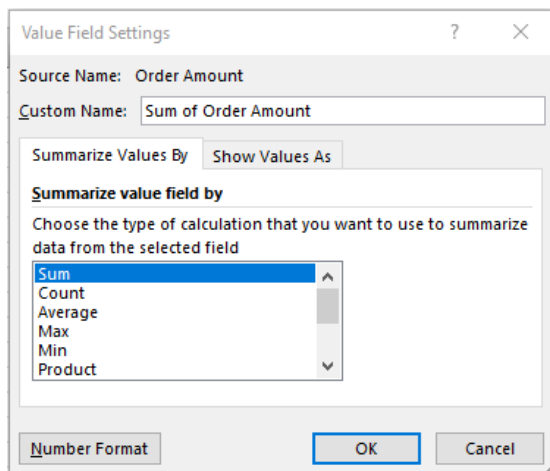
### Change Value Calculation

By default Excel performs the most appropriate mathematical calculation on the fields in the Values section of the PivotTable. In the example on the right, Excel totals the values of **Order Amount**, the field currently in the Values column, using the SUM function. Totaling values is not the only option. Fields in the Values can be changed to different functions such as COUNT, AVERAGE, MIN and MAX. Instead of writing formulas in calculated fields, use **Summarize Values By** command to quickly present values in different ways.

Row Labels	Sum of Order Amount
Albuquerque, Kate	116774
Brennan, Michael	158050
Byington, Melissa	113388
Druschel, William	93378
Hale, Andrew	104261
Hayes, Shannon	143105
Isaacson, Tara	155039
Ventura, Genevieve	187566
Walsh, Chris	224156
<b>Grand Total</b>	<b>1295717</b>

Change the **Value Calculation**:

1. In the PivotTable, click on the value field, cell **B3**
2. Click the **PivotTable Tools Analyze** tab → **Field Settings** (Active Field group) → **Field Settings** command → **Summarize Values By** tab
3. Select a function, such as **COUNT**, from the list and press OK



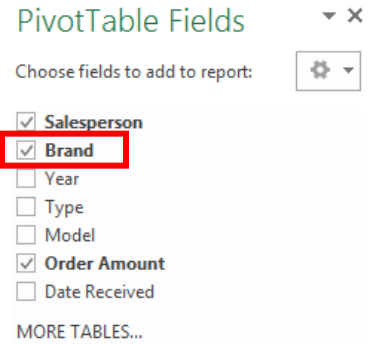
Row Labels	Count of Order Amount
Albuquerque, Kate	5
Brennan, Michael	5
Byington, Melissa	4
Druschel, William	4
Hale, Andrew	3
Hayes, Shannon	5
Isaacson, Tara	6
Ventura, Genevieve	7
Walsh, Chris	8
<b>Grand Total</b>	<b>47</b>

## Pivoting Data

One of the best things about PivotTables is the ability to change the structure of the PivotTable to "pivot" (rotate) the data. Pivoting data allows for the information to be viewed in many different ways.

### Add Fields

In the previous example the PivotTable was used to answer the question, "What is the total amount sold by each salesperson?" Additional fields can be added to the boxes in the **Layout Section** to answer additional questions.



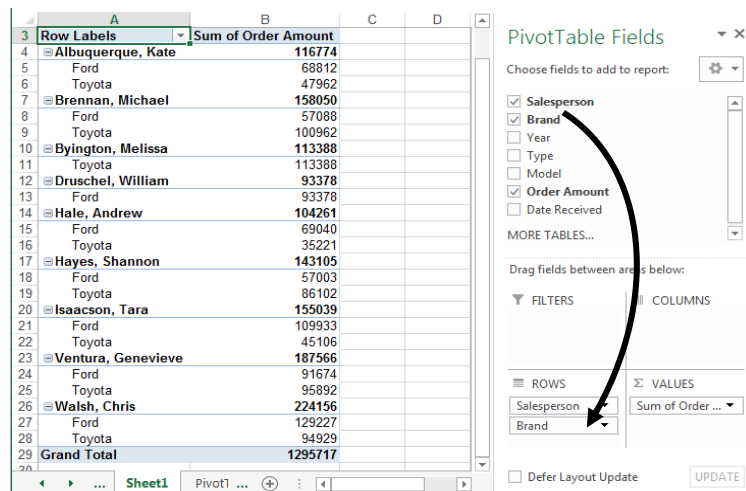
**Question 2:** What amount of car brand was sold by each salesperson?

To answer the new question, place an additional field in the **Row Labels** box.

1. In the **Field List**, place a checkmark next to the **Brand** field.

The selected fields will be added to one of the four areas below the Field List. In this example, the Brand field is added to the Row Labels area. If a field is not in the desired area, **click and drag** it to a different section of the layout section.

The PivotTable now shows the car brand amount sold by each salesperson.



### Practice Exercise: Add Column Labels

So far, the PivotTable has only shown one column of data; Sum of Order Amount. In order to show multiple columns, add fields to the **Column Labels** box.

1. On the sheet displaying your PivotTable, click and drag the **Year** field from the Field List into the Columns box.

A second column displaying the **Year** displays in the PivotTable.



	Sum of Order Amount	Column Labels	
Row Labels	2011	2012	Grand Total
Albuquerque, Kate	97623	19151	116774
Ford	49661	19151	68812
Toyota	47962		47962
Brennan, Michael	83924	74126	158050
Ford	24520	32568	57088

## Rearrange Field Order

Fields dropped into the boxes in the **Layout Section** appear in the order you placed them into the area. For example, the first field, **Salesperson** is the top-most field in the Rows area of the PivotTable. The second field, **Brand**, appears next in the hierarchy order and so on.

Row Labels	Sum of Order Amount
Albuquerque	116774
Ford	68812
Toyota	47962
Brennan, Michael	158050
Ford	57088
Toyota	100962
Byington, Melissa	113388
Toyota	113388
Druschel, William	93378
Ford	93378
Hale, Andrew	104261
Ford	69040
Toyota	35221
Hayes, Shannon	143105
Ford	57003
Toyota	86102
Isaacson, Tara	155039
Ford	109933
Toyota	45106
Ventura, Genevieve	187566
Ford	91674
Toyota	95892
Walsh, Chris	224156
Ford	129227
Toyota	94929

Change the field order to see the data in a different way

1. In the **Layout Section** click on the desired field
2. A menu appears, select one of the following options
  - *Move Up*: Moves the field one space up
  - *Move Down*: Moves the field one space down
  - *Move to Beginning*: Moves the field to the top spot in the box
  - *Move to End*: Moves the field to the bottom spot in the box

### Practice Exercise: Rearrange Field Order

1. On the sheet displaying your PivotTable click on the **Salesperson** field in the Row Labels box
2. A menu appears; click **Move Down**

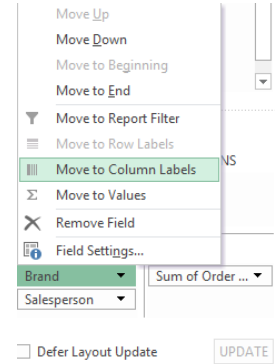
The hierarchy of rows in the PivotTable change and now display first by Brand and then by Salesperson.

## Change Field Location

Another way to see data from a different perspective is to turn Row Labels into Column Headings (or vice versa).

1. On the sheet displaying your PivotTable click on the **Brand** field in the Row Labels box
2. A menu appears; click **Move to Column Labels**

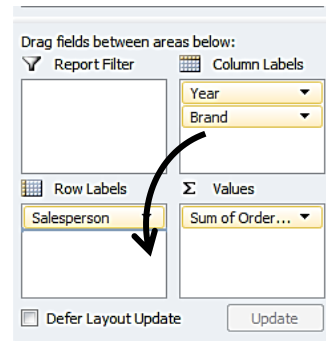
**NOTE:** Alternatively **drag and drop** headings from the Row Labels Box to the Column Labels Box



Sum of Order Amount	Column Labels		2011 Total		2012 Total		Grand Total
Row Labels	Ford	Toyota	Ford	Toyota			
Albuquerque, Kate	49661	47962	97623	19151		19151	116774
Brennan, Michael	24520	59404	83924	32568	41558	74126	158050
Byington, Melissa		65467	65467		47921	47921	113388
Druschel, William	22158		22158	71220		71220	93378
Hale, Andrew	41525	35221	76746	27515		27515	104261
Hayes, Shannon	57003	18955	75958		67147	67147	143105
Isaacson, Tara		45106	45106	109933		109933	155039
Ventura, Genevieve	63112	64381	127493	28562	31511	60073	187566
Walsh, Chris	25421	29522	54943	103806	65407	169213	224156
<b>Grand Total</b>	<b>283400</b>	<b>366018</b>	<b>649418</b>	<b>392755</b>	<b>253544</b>	<b>646299</b>	<b>1295717</b>

### Practice Exercise: Turn Column Label into Row Label

1. On the sheet displaying your PivotTable click and drag the **Brand** field from the Column Labels box to the Row Labels box



## Sorting PivotTable Data

In Excel, PivotTable data can be sorted by any field located in the Row Labels or Column Labels boxes. Sorting allows values to be sorted in alphabetic or numeric order.

### Sorting Data

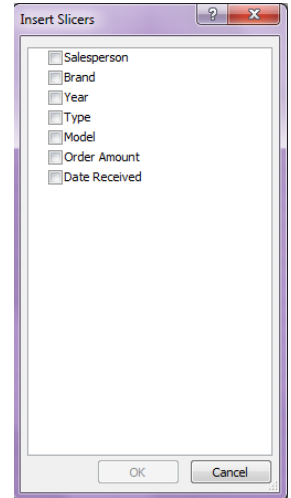
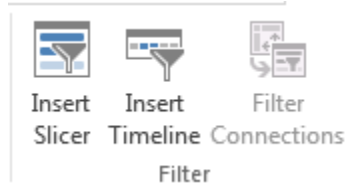
1. In the PivotTable report, click on the Row Labels or Column Labels header. For this example, click on the text *below* the **Row Labels Header**.
2. Go to **Data** tab → **Sort & Filter** group → **Sort** commands
  - Choose to perform an ascending sort (A to Z or smallest to largest number)
  - Choose to perform a descending sort (Z to A or largest to smallest number)

## Filtering Data with Slicers

Filtering allows for a portion of the data to be viewed while hiding other data temporarily. In Microsoft Excel 2019, slicers were introduced to make filtering data easier and more interactive. Slicers provide buttons that you can click to filter PivotTable data. In addition to quick filtering, the results are immediately visible with slicers. Slicers also indicate the current filtering state, which makes it easy to understand exactly what data is shown in a filtered PivotTable report.

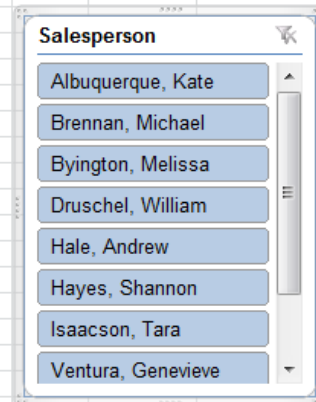
To Filter Data Using Slicers:

1. Click on any cell in the PivotTable report
2. Go to **Analyze** tab → **Filter** group → **Insert Slicer**
3. In the Insert Slicers dialog box, select the desired field to be filtered, **Salesperson**
4. Click OK



The slicer will appear next to the PivotTable. Each **selected item** will be highlighted in blue. In the example below, the slicer contains a list of all of the different salespeople, and all of them are currently selected.

Sum of Order Amount	Column Labels			
Row Labels	2011	2012	Grand Total	
Albuquerque, Kate	97623	19151	116774	
Ford	49661	19151	68812	
Toyota	47962		47962	
Brennan, Michael	83924	74126	158050	
Ford	24520	32568	57088	
Toyota	59404	41558	100962	
Byington, Melissa	65467	47921	113388	
Toyota	65467	47921	113388	
Druschel, William	22158	71220	93378	
Ford	22158	71220	93378	
Hale, Andrew	76746	27515	104261	
Ford	41525	27515	69040	
Toyota	35221		35221	
Hayes, Shannon	75958	67147	143105	
Ford	57003		57003	
Toyota	18955	67147	86102	
Isaacson, Tara	45106	109933	155039	
Ford		109933	109933	
Toyota	45106		45106	
Ventura, Genevieve	127493	60073	187566	
Ford	63112	28562	91674	
Toyota	64381	31511	95892	
Walsh, Chris	54943	169213	224156	
Ford	25421	103806	129227	
Toyota	29522	65407	94929	
<b>Grand Total</b>	<b>649418</b>	<b>646299</b>	<b>1295717</b>	

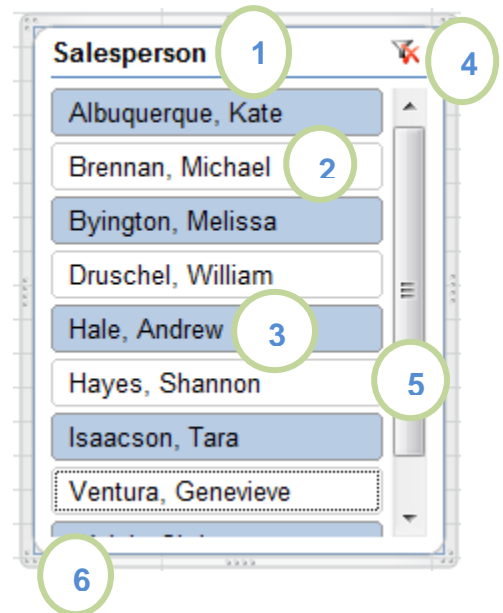




A slicer typically displays the following elements:

1. The **slicer header** indicates the category of the items in the slicer
2. A filtering button that is not selected displays in **white** and indicates that the item is not included in the filter
3. A filtering button that is selected displays in **blue** and indicates that the item is included in the filter.
4. The **Clear Filter button** removes the filter by selecting all items in the slicer.
5. The **scroll bar** enables scrolling when there are more items than are currently visible in the slicer.
6. **Border moving and resizing controls** allows the size and location of the slicer box to be changed

**NOTE:** The **Active Cell** must be located in the PivotTable for the slicer to be visible. If the slicer is not visible click on any cell in the PivotTable



#### Practice Exercise: Using the Slicer

Only **selected items** in the slicer are visible in the PivotTable. When items are selected or deselected items, the PivotTable will instantly reflect the changes. Try selecting different items to see how they affect the PivotTable.

- Click on a salesperson's name to select a single item
- To select multiple items, hold down the **Control (Ctrl) key** on your keyboard, click on multiple items, then release the Ctrl key
- To select contiguous (right next to each other) items, **click and drag** the mouse over various items
- To deselect a single item, hold down the **Control (Ctrl) key** on your keyboard, click on the item, then release the Ctrl key
- Click the **Clear Filter** button to remove the filter and display all items in the PivotTable

#### Delete a slicer

A slicer can be deleted in one of the following ways:

##### Method 1:

1. Click the **Clear Filter** button
2. Press the **delete** key on the keyboard

##### Method 2:

1. Click the **Clear Filter** button
2. **Right-click** the slicer
3. Click Remove <Name of slicer>

## Update the PivotTable

If changes are made to the source data the PivotTable does not automatically recognize the changes and update the PivotTable. The PivotTable must be refreshed in order for the data to update.

### Edit the Source Data

Follow the steps below if edits to the source data do **not** change the size of the PivotTable

1. In the **excel\_practice\_file** select the **PivotTables** worksheet
2. Click in cell **B2**, type **Volvo**; press **Enter** to jump to cell B3
3. In cell **B3**, type **Volvo**
4. Press **Enter**

### Refresh the PivotTable

1. In the **excel\_practice\_file** select the worksheet that contains the PivotTable (Sheet1)
2. Click in any cell in the PivotTable
3. Go to the **Analyze** tab → **Data** group → **Refresh** command

Albuquerque, Kate	97623	19151	116774
Ford	31510		31510
Toyota	47962		47962
Volvo	18151	19151	37302

The data in the PivotTable changes and now displays the revised information

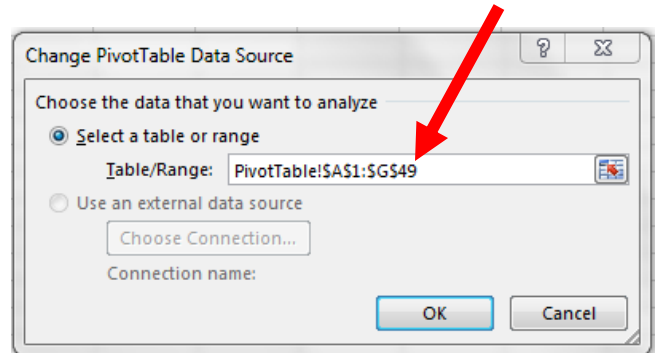
## Update and Change the Size of the Source Data

If the size of your source data changes (add/delete columns and rows) or to select a different data source use the **Change Data Source** command before refreshing the PivotTable

1. In the **excel\_practice\_file** select the **PivotTables** worksheet
2. Click in cell **A49**, type **Lovelace, Ada**; press **Tab** to jump to cell B49
3. In cell **B49**, type **Tesla**, press **Tab** to jump to cell C49
4. In cell **C49**, type **2020**, press **Tab** to jump to cell D49
5. In cell **D49**, type **Car**, press **Tab** to jump to cell E49
6. In cell **E49**, type **Model S**, press **Tab** to jump to cell F49
7. In cell **F49**, type **\$74,490**, press **Tab** to jump to cell G49
8. In cell **G49**, type **1/1/2020**, press **enter**

### Change Data Source

1. In the **excel\_practice\_file** select the worksheet that contains the PivotTable (Sheet1)
2. Click in any cell in the PivotTable
3. Go to the **Analyze** tab → **Data** group → **Change Data Source** command
4. The **Change PivotTable Data Source** dialog box appears
5. Click in the **Table/Range** box and change the cell range to **G49**



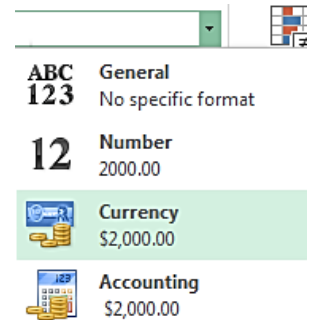
The data in the PivotTable changes and now displays the information in the added row

## Formatting

### Changing Number Format

The PivotTable contains financial information but the current number format does not display currency formatting. To change the number format on the spreadsheet:

1. Click and drag the mouse to select all of the cells in the PivotTable (**B5-D31**)
2. Go to the **Home** tab → **Number** group → **Number Format** drop down menu
3. Click on **Currency**



### ##### Error Message

#####, sometimes referred to as “railroad tracks”, is an Excel error message caused by several conditions:

- A number in a cell is too wide for the cell to display it.
- The formula in a cell produces a result that is too wide for the cell.
- There is a negative number in the cell that has been formatted for dates or times. Dates and times in excel must be positive values.

To fix the ##### error, place the cursor over the line between the two columns at the top of the worksheet. When the cursor changes to a two-headed arrow with a line in between, double-click the mouse.

For example, in this worksheet:

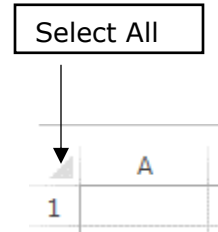
1. Place your cursor between the **C** and **D** columns at the top of the worksheet.
2. When the cursor changes to a two-headed arrow with a line in between, double-click the mouse

	A	B	C	D
1				
2				
3	Sum of Order Amount	Column Labels		
4	Row Labels	2011	2012	Grand Total
5	Albuquerque, Kate	\$97,623.00	#####	\$116,774.00
6	Ford	\$31,510.00		\$31,510.00
7	Toyota	\$47,962.00		\$47,962.00
8	Volvo	\$18,151.00	#####	\$37,302.00
9	Brennan, Michael	\$83,924.00	#####	\$158,050.00
10	Ford	\$24,520.00	#####	\$57,088.00
11	Toyota	\$59,404.00	#####	\$100,962.00
12	Byington, Melissa	\$65,467.00	#####	\$113,388.00
13	Toyota	\$65,467.00	#####	\$113,388.00
14	Druschel, William	\$22,158.00	#####	\$93,378.00

6. Repeat the steps above to widen the **any other** columns on the spreadsheet displaying the #####.

**To adjust the width of all the columns at once:**

1. To highlight the entire document (**Ctrl+A**) or Click the **Select All** button
2. Go to the **Home** tab → **Cells** group → **Format** command → **AutoFit Column Width**



**Apply a style to format a PivotTable report**

You can quickly change the look and format of a PivotTable by using a predefined PivotTable styles (or quick styles).

1. Click anywhere in the PivotTable report.
2. Go to the **Design** tab → **PivotTable Styles** group
3. Click on the **more** button at the bottom of the scroll bar to see the full menu of styles
4. Select the second thumbnail in the first row of the **Medium** format



Sum of Order Amount	Column Labels		
Row Labels	2011	2012	Grand Total
Albuquerque, Kate	\$97,623.00	\$19,151.00	\$116,774.00
Ford	\$31,510.00		\$31,510.00
Toyota	\$47,962.00		\$47,962.00
Volvo	\$18,151.00	\$19,151.00	\$37,302.00
Brennan, Michael	\$83,924.00	\$74,126.00	\$158,050.00
Ford	\$24,520.00	\$32,568.00	\$57,088.00
Toyota	\$59,404.00	\$41,558.00	\$100,962.00
Byington, Melissa	\$65,467.00	\$47,921.00	\$113,388.00
Toyota	\$65,467.00	\$47,921.00	\$113,388.00
Druschel, William	\$22,158.00	\$71,220.00	\$93,378.00
Ford	\$22,158.00	\$71,220.00	\$93,378.00
Hale, Andrew	\$76,746.00	\$27,515.00	\$104,261.00
Ford	\$41,525.00	\$27,515.00	\$69,040.00
Toyota	\$35,221.00		\$35,221.00
Hayes, Shannon	\$75,958.00	\$67,147.00	\$143,105.00
Ford	\$57,003.00		\$57,003.00
Toyota	\$18,955.00	\$67,147.00	\$86,102.00
Isaacson, Tara	\$45,106.00	\$109,933.00	\$155,039.00
Ford		\$109,933.00	\$109,933.00
Toyota	\$45,106.00		\$45,106.00
Ventura, Genevieve	\$127,493.00	\$60,073.00	\$187,566.00
Ford	\$63,112.00	\$28,562.00	\$91,674.00
Toyota	\$64,381.00	\$31,511.00	\$95,892.00
Walsh, Chris	\$54,943.00	\$169,213.00	\$224,156.00
Ford	\$25,421.00	\$103,806.00	\$129,227.00
Toyota	\$29,522.00	\$65,407.00	\$94,929.00
<b>Grand Total</b>	<b>\$649,418.00</b>	<b>\$646,299.00</b>	<b>\$1,295,717.00</b>

**NOTE:** Formatting may disappear when other changes are made to the PivotTable