K2's Excel Best Practices And Features

Microsoft Office Excel is one of the most widely used applications by accounting and financial professionals. Yet, many remain unaware of new and improved features in Excel and, therefore, fail to reach the level of productivity and accuracy they desire. Further, with new features appearing in Excel provided through Microsoft 365 subscriptions and the forthcoming release of Excel 2024, it is more important now than ever to get up-to-speed on the world's most popular spreadsheet!

Make plans now to elevate your Excel skills by participating in this session. In it, you will learn about many of the newer features available to improve efficiency and accuracy. You will also learn about the importance of some of Excel's legacy features and how you can – and should – continue to use these tools to improve productivity.

Introduction

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Learning Objectives

Upon completing this session, you should be able to:

- List examples of new functions and features in Excel
- Differentiate between Excel 2024 and subscription-based versions of Excel
- Identify steps necessary to automate tasks in Excel
- Specify the actions required to integrate data from other sources into Excel

New And Forthcoming Features

Like most applications, Excel continues to evolve, and Microsoft continuously adds new and updated features. These new features appear in **Microsoft 365-based subscriptions** monthly or semi-annually, depending on the update cadence you or your IT staff select for your subscription. In addition, new features will undoubtedly appear in the upcoming **Excel 2024** release. As of the publication date of this material, Microsoft has not published a complete list of the new features it will add to Excel 2024. However, we can reasonably infer that features previously added to Microsoft 365 will appear in Excel 2024. Based on that assumption, the list provided in the appendix contains new features Microsoft will likely include in Excel 2024. Further, we demonstrate five of these features below.

Excel's LAMBDA Function

LAMBDA is a tool for creating custom functions in Excel. Once you create a custom function using LAMBDA, you can use it in any new Excel workbook if you save it in your default Excel template file, **book.xltx**.

Consider the following example. Each month, you must allocate corporate overhead expenses to the Finance, Manufacturing, and Executive departments. Further, the allocation percentages are 19%, 48%, and 33%, respectively. You create a formula like the one shown in **Figure 1** to perform the allocation.

```
=IF(B5="Finance",0.19*C2,IF(B5="Manufacturing",0.48*C2,IF(B5="Executive",0.33*C2)))
```

Figure 1 - Formula Used To Allocate Overhead Expenses

Of course, you must re-create this formula monthly because you use a different workbook each month to complete your close-out tasks.

Alternatively, you can use LAMBDA to store your formulas for future use, eliminating the need to re-create them repeatedly. Perform the following general steps to create a LAMBDA.

1. Create and test the formula you want to save as a LAMBDA so you know it performs as intended and provides accurate calculations.
2. When you're ready to save the formula as a LAMBDA, click **Name Manager** on the **Formula** tab of the Ribbon and then click **New**. This action initiates the process of creating a new defined name that the formula you will save as your LAMBDA.
3. Enter the required fields in the **New Name** dialog box and click **OK** to save your new LAMBDA.
4. Once you create and save your formula as a LAMBDA, you can use it just like any other Excel function.

A Specific Example

Returning to the example above, suppose you wanted to automate overhead allocations. You can do this by creating LAMBDAs and using them to distribute the expenditures. Specifically, assume you want a formula to charge 19% of overhead to the Finance team, 48% to the Manufacturing organization, and 33% to the Executive group.

To create a LAMBDA to allocate 19% of overhead to the Finance team, click **Name Manager** on the Ribbon's **Formulas** tab. Next, enter the following data in the formulas dialog box, enter the following data.

- **Name**: Enter the name you are assigning to your LAMBDA. You will use this name to call the function in your Excel workbook.
- **Scope**: Identify whether you can use the LAMBDA throughout the workbook in which you save it or whether you want to restrict its use to a specific worksheet within the workbook. In general, you will likely want to establish workbook-level scopes.
- **Comment**: If desired, add an optional comment describing your LAMBDA.
- **Refers to**: Enter the *parameters* for your LAMBDA and the formula used to calculate the result. A parameter is information you need to pass to your LAMBDA. Often, a parameter is a cell reference, but it could also be a string or a number.

To illustrate, consider the LAMBDA pictured in **Figure 2**. That user-defined function allocates 19% of the overhead to the Finance group. Specifically, in the **Refers to** box, the LAMBDA passes the Overhead parameter and a formula that multiplies that parameter by 19%.

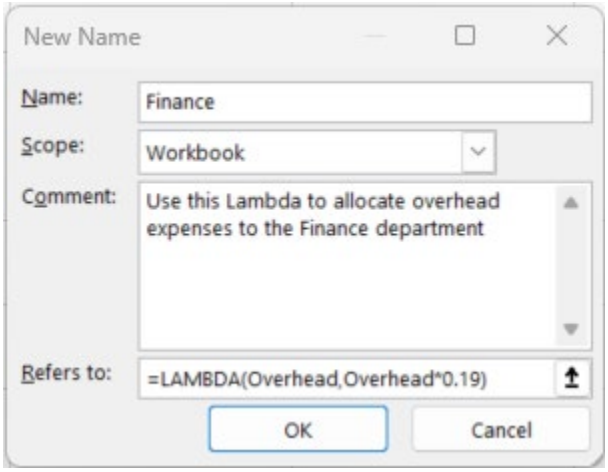


Figure 2 - Creating An Excel LAMBDA To Allocate Overhead

After creating a LAMBDA, you can view it by accessing Excel's **Name Manager**. To illustrate, consider the three LAMBDA visible in the Name Manager shown in **Figure 3**. Further, you can edit or delete a LAMBDA from the Name Manager.

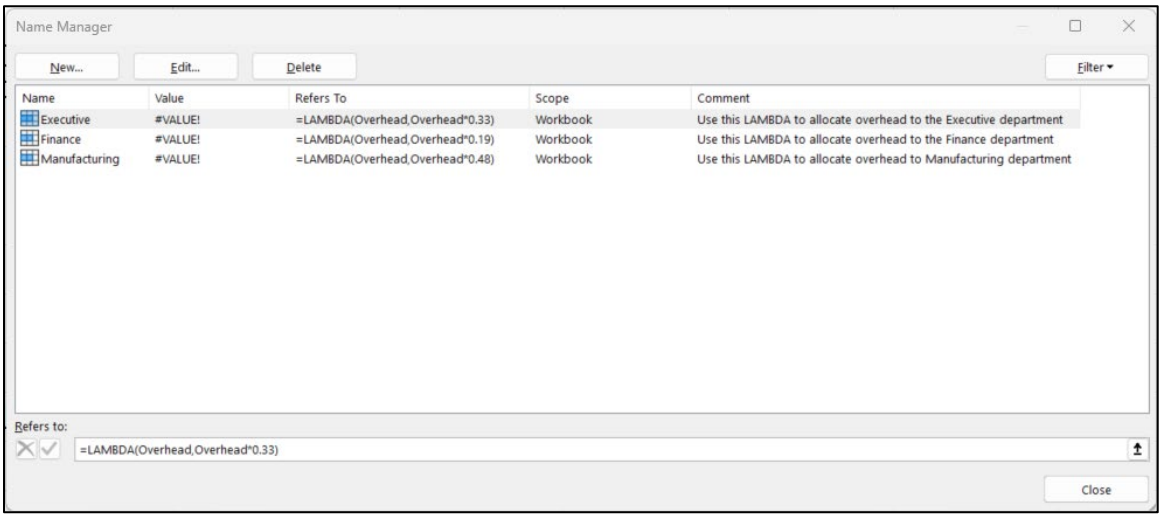


Figure 3 - Excel's Name Manager

Controlling Data Conversions

Many Excel users struggle with how the application converts data from one format to another. As a result, these users often spend time manually correcting the formats added to their data. Microsoft addresses this issue in Excel with the newly added set of data conversion options. As shown in Figure 4, these options allow users to control many types of data conversions. For instance, if you enter, paste, or import "Sep15" into Excel, the **Convert continuous letters and numbers to a date** option will automatically change the entry to a date.

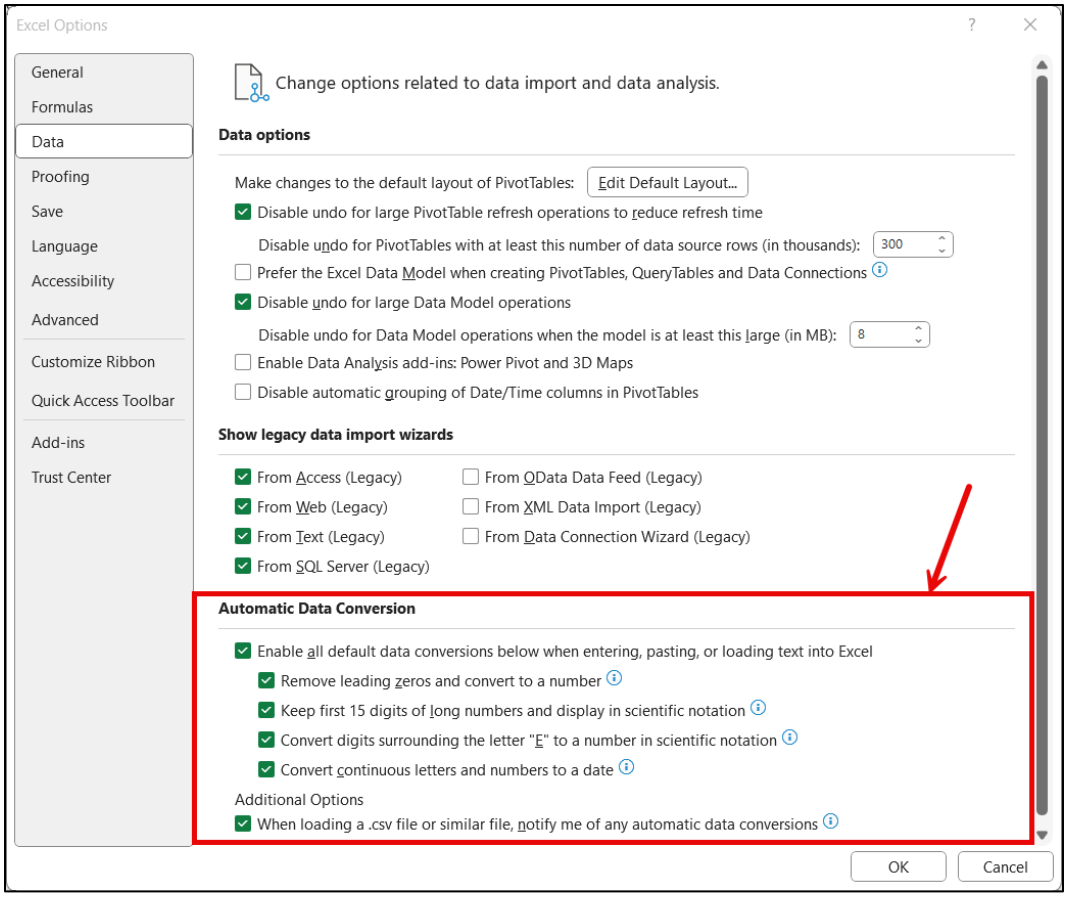


Figure 4 - Excel's New Data Conversion Options

PivotTable Overlap Improvements

Many Excel users consider PivotTables to be the application's best feature. PivotTables provide tremendous capabilities for users to summarize data – potentially vast volumes of data – without entering formulas. However, formatting options available to PivotTables have often lagged behind this tool's calculating and summarizing capabilities. When two or more PivotTables reside on the same worksheet, conflicts between the PivotTables can arise when one attempts to overlap another. You will see a message indicating **PivotTable Report Cannot Overlap** when this happens. To solve the problem, right-click anywhere in the PivotTable and choose Refresh. Then, you can use the **Move PivotTable** option on the Ribbon's **PivotTable Analyze**, **Actions** tab.

TEXTBEFORE, TEXTAFTER, and TEXTSPLIT Functions

Historically, when users needed to extract certain characters from text entries in Excel – for example, placing first names in one column and addresses in another – the methods for completing these tasks were sometimes challenging. For instance, although powerful, the formulaic approaches that use combinations of LEFT, MID, RIGHT, FIND, and other powerful functions are too demanding for many to complete. Further, the **Text-To-Columns Wizard** lacks flexibility. Additionally, Flash Fill requires users to run the routine repeatedly whenever the

underlying data changes. What is often needed is a formulaic approach that is simple and easy to implement. Excel users received such an approach when Microsoft introduced **TEXTBEFORE**, **TEXTAFTER**, and **TEXTSPLIT**; each of these functions does what their name implies – TEXTBEFORE extracts all data *before* a specific character, TEXTAFTER extracts all data *after* a particular character, and TEXTSPLIT splits text at the specified character. The following are introductory examples of each function.

- =**TEXTBEFORE(B3,"jumps")**
  - This formula extracts all the text in cell C3 before the word "jumps."
- =**TEXTAFTER(B6,"jumps")**
  - This formula extracts all the text in cell C3 after the word "jumps."
- =**TEXTSPLIT(B9,"jumps")**
  - This formula generates a *dynamic array* for its response by splitting the text into two cells. One cell contains all the text in cell C3 that appears before the word "jumps." The second cell of the formula results appears immediately to the right of the first cell and contains the remainder of the original string.

Desktop Action Recorder

Excel's **Desktop Action Recorder** is a relatively new feature that allows you to interact with Excel and record your keystrokes and mouse clicks for playback as a script. Like a macro, a script is a segment of executable code you can execute in Excel. Newer versions of Excel allow users to create, edit, and run scripts using. Scripts can access the Excel object model and interact with worksheets, ranges, tables, charts, and other objects. Scripts can also use external libraries and APIs to enhance the functionality of Excel.

Much like Excel's Macro Recorder, the Desktop Action Recorder captures your keystrokes and mouse clicks and converts them to a variant of JavaScript. You can then run your scripts at any point to automate routine tasks, such as hiding and unhiding rows and columns, entering passages of texts, applying formats, creating tables, and running commands from the Ribbon. Scripts can access the Excel object model and interact with worksheets, ranges, tables, charts, and other objects. Scripts can also use external libraries and APIs to enhance the functionality of Excel.

To use the Recorder, click **Record Actions** from the Ribbon's **Automate** tab. You will notice the **Record Actions pane** on the right side of the Excel window. Click **Record Actions** in this pane to start the Recorder. The Record Actions pane shows the status of your script, including whether you are recording in *relative* or *absolute* mode, as shown in **Figure 5**. These modes work much like relative and absolute modes when generating a traditional macro in Excel. That is if you are in relative mode when recording, all the actions in the script will occur relative to your cursor's location. On the other hand, if you are in absolute mode, the actions happen in the specific cells you designate, such as *B3*, *A7*, and *G52*. Figure 5 below illustrates moving between relative and absolute references.

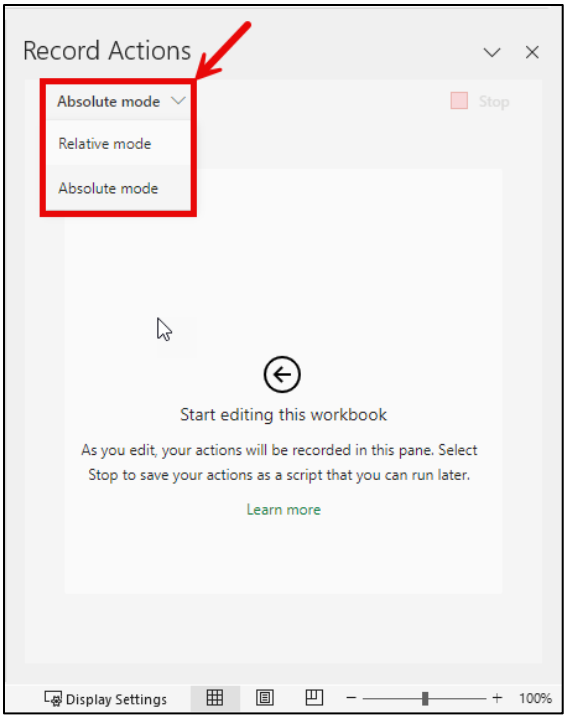


Figure 5 - Choosing Between Relative And Absolute References When Recording A Script

Suppose you wanted to automate the process of creating a workbook. Specifically, you want to write a script to create a new workbook with all the following characteristics.

- Your company's name in cell A1,
- The workbook's creation date in cell A2,
- Department names added as column headers – Sales, Production, Executive, and Admin as column headers, with cell borders below each label, and
- Chart of Accounts added as row labels.

To create the script, click **Record Actions** from the Ribbon's Automate tab. Next, set the recording mode to *absolute*. Then, proceed with the keystrokes and mouse clicks necessary to add each desired element to the worksheet. Upon completion, your new worksheet may resemble that pictured in **Figure 6**.

	A	B	C	D	E
1	Acme Widget Company				
2	12/31/2029				
3					
4		Sales	Production	Executive	Admin
5	Salaries				
6	Rent				
7	Utilities				
8	Office Supplies				
9	Travel				
10	Employee Benefits				
11					

Figure 6 - Worksheet Created While Creating A Script

Once you have added all desired elements to the worksheet, turn off the Recorder.

At this point, the task pane on the right side of the window has changed into the Code Editor pane, as shown in **Figure 7**.

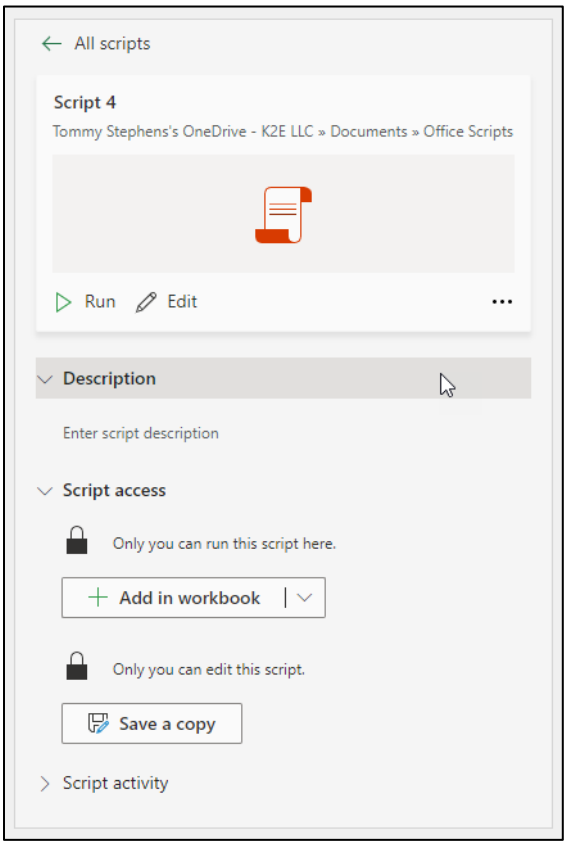


Figure 7 - The Code Editor Pane

Note that in the Code editor, you can choose from several actions:

- Run the script
- Edit the script
- Add a description for the script
- Add or remove a button to the workbook for running the script
- Save a copy of the script to SharePoint or OneDrive
- Monitoring all script activity

Scripts provide a modern, powerful alternative to macros. Of note, scripts can run in web-based versions of Excel, whereas macros cannot. Thus, if you use web-based versions of Excel extensively – such as running Excel from within Teams – scripts are your only option for automating tasks. Therefore, you may consider investing a little time to familiarize yourself with scripts.

Revisiting Power Query In Excel

Unlike scripts, which are relatively new to Excel, **Power Query** has been available in Excel for over a decade. Yet, most Excel users remain unaware of the strength of Power Query and how it can elevate accuracy and efficiency. Power Query allows users to *link* data from almost any data source into Excel. Once you link the data, you can use it just as you would data that you manually keyed into the application. Thus, you can create your reports, schedules, and analyses once and refresh the data on demand. Further, from a *practical* perspective, Power Query has no limits on the volume of data you can link into Excel.[1]

Power Query facilitates linking data from almost any source. For example, you can link data from other Excel workbooks, most common databases, text files, PDF documents, websites, and pictures. Further, you can simultaneously link data from multiple sources, as shown in **Figure 8**.

[1] From a technical perspective, if you use Power Query to link data directly to an Excel worksheet, you are limited to 1,048,576 rows of data. However, if you use Power Query to link data into Excel's data model, you are limited only by the resources available on your computer.

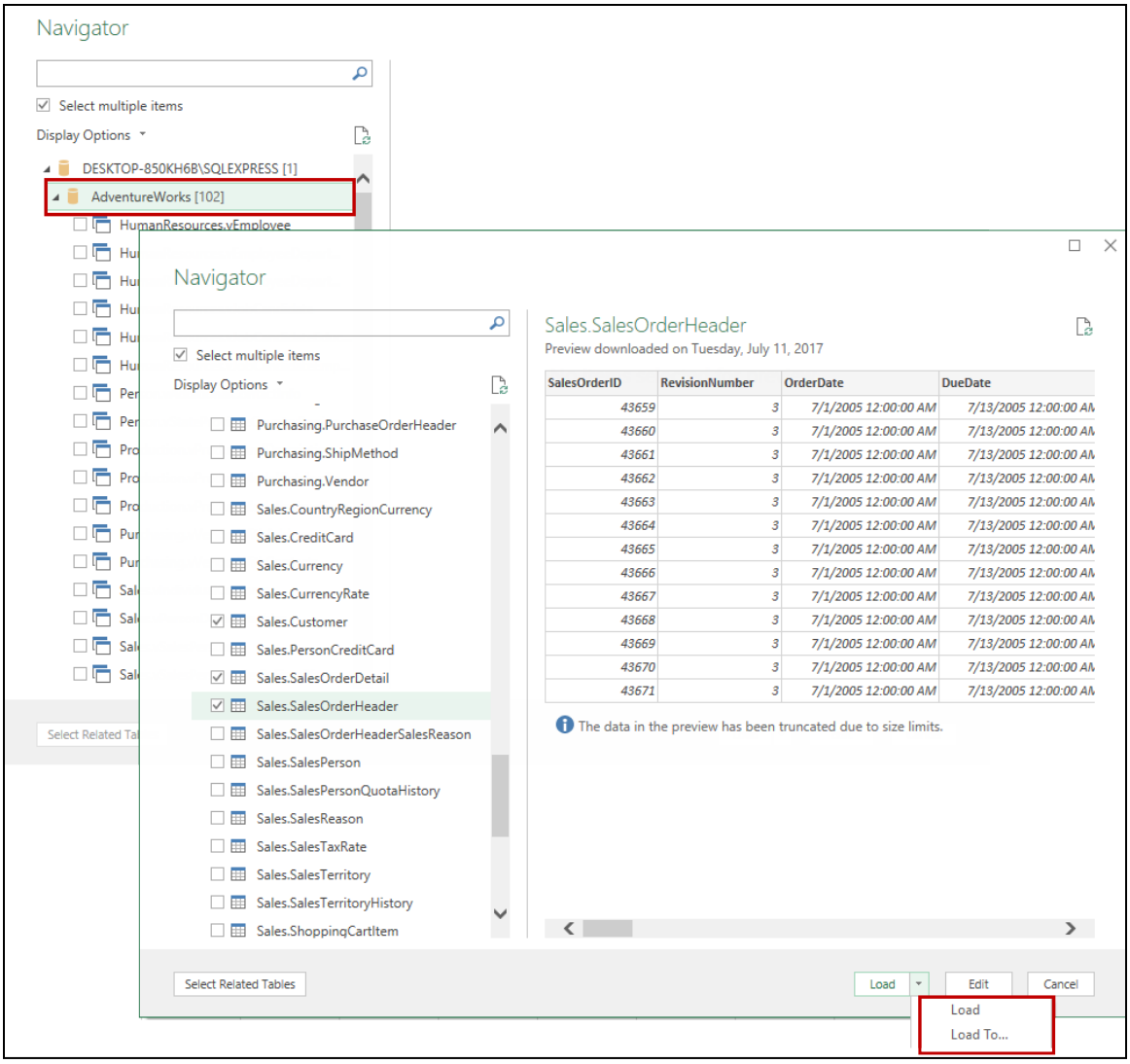


Figure 8 - Linking Data From Multiple Data Sources Simultaneously Using Power Query

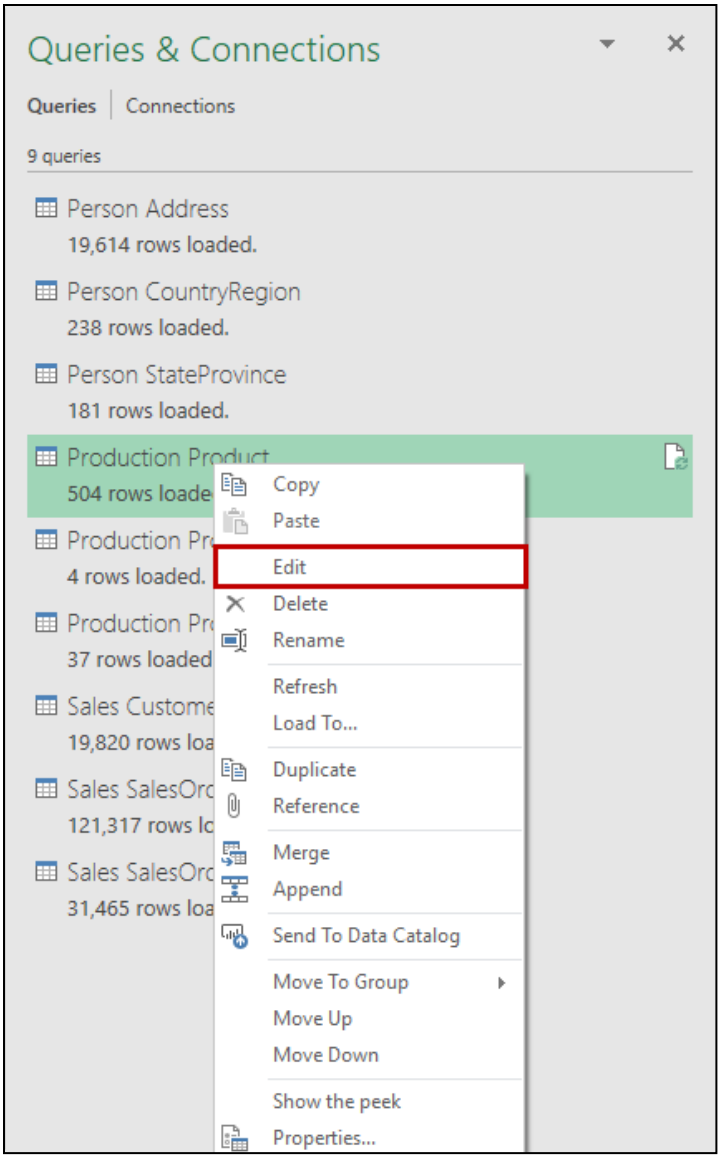


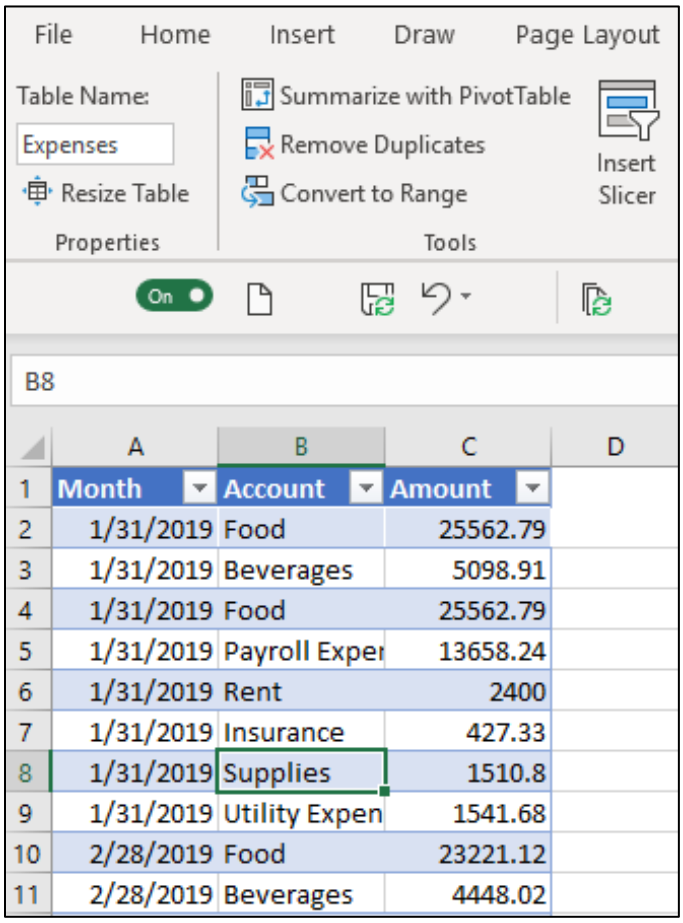
Figure 9 - Editing An Existing Query In Power Query

Transforming Data With Power Query

Notwithstanding the boundless capabilities associated with using Power Query to link data, perhaps the most valuable feature related to the tool is its ability to transform data to be more useful and meaningful. Indeed, it is far beyond the scope of this course to cover every possible type of transformation you can create with Power Query. However, we would be remiss if we did not provide several examples of transformations you may find helpful when manipulating your data.

Pivoting Data with Power Query

Often, the need to pivot data arises – for example, you have data in a tabular format and want to create a chart from that data. For this example, we will use the *Expenses* table shown in **Figure 10** as the basis for a chart.



	A	B	C	D
1	Month	Account	Amount	
2	1/31/2019	Food	25562.79	
3	1/31/2019	Beverages	5098.91	
4	1/31/2019	Food	25562.79	
5	1/31/2019	Payroll Exper	13658.24	
6	1/31/2019	Rent	2400	
7	1/31/2019	Insurance	427.33	
8	1/31/2019	Supplies	1510.8	
9	1/31/2019	Utility Expen	1541.68	
10	2/28/2019	Food	23221.12	
11	2/28/2019	Beverages	4448.02	

Figure 10 - Data For Power Query Pivot

The steps to transform the data by pivoting it and returning it to Excel are as follows:

1. Select any cell in the table and click **From Table/Range** on the Ribbon's **Data** tab to open the Power Query Editor.

2. With the **Month** column selected, click **Date** in the **Data Type** dropdown list on the Ribbon's **Home**. Then, select **Replace current** in the dialog box, as shown in **Figure 11.**

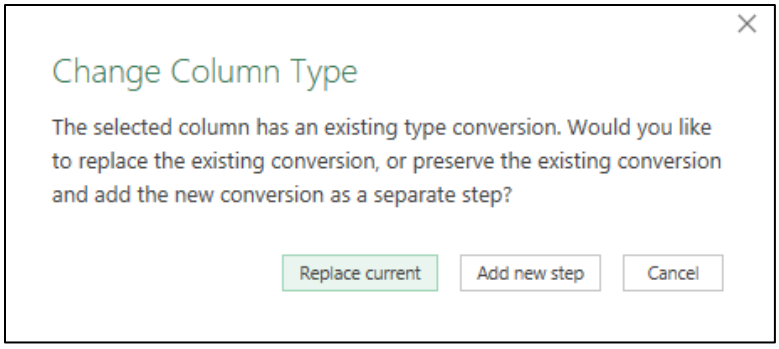


Figure 11 - Change Column Type

3. Select the **Account** column, which will provide the values to use across the chart's columns when the query completes. Then, on the Ribbon's **Transform** tab, click **Pivot Column**.

4. In the **Pivot Column** dialog box in **Figure 12**, select **Amount** as the **Values Column** and click **OK**.

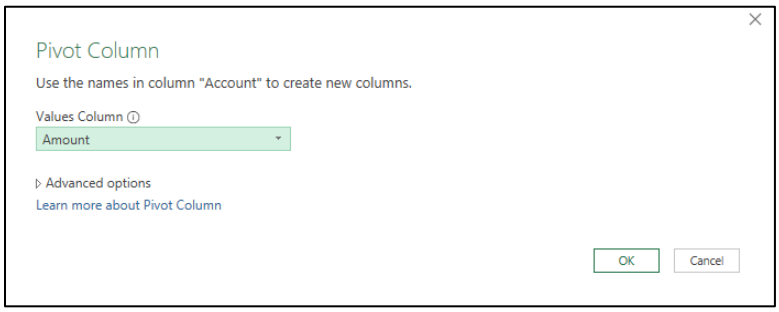


Figure 12 - Values Column

5. With the data pivot completed in Power Query, select **Close & Load** on the **Home** tab to return the data into Excel.

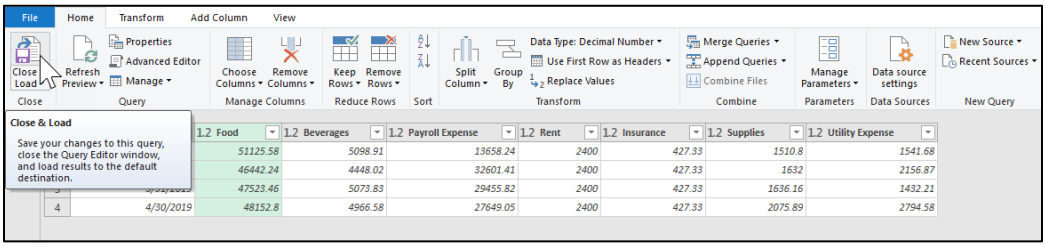


Figure 13 - Pivot Data Close & Load

Using the data in the Excel table, we can quickly create a chart similar to the one pictured in **Figure 14**. Notably, refreshing the query updates the chart automatically when users add new data to the Expense table.

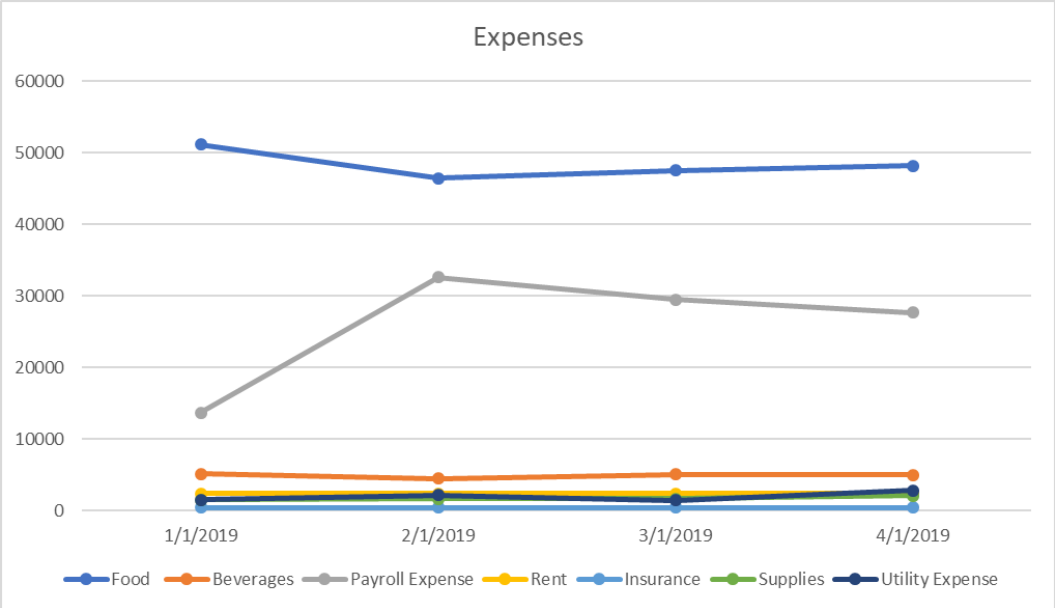


Figure 14 - Expense Chart Resulting From Transformed Using Power Query

Unpivoting Data

Exported reports often provide data in a format that requires us to unpivot it before using the information in our analyses. Using Power Query to unpivot the data will allow us to complete the steps quickly. Further, as new data appears, we can refresh the query to get updated, unpivoted results.

For this example, we will use data exported from Sage 50 US; specifically, we will use the *Customer Sales by Month* report, previously exported to Excel. The report provides monthly results in a single row for each customer. Instead, we need to have the single row – which provides a date dimension – separated into unique rows for each data point.

The steps to complete the unpivot are as follows.

1. Click any cell in the data and then click **From Table/Range** on the Ribbon's **Data** tab.

2. The **Create Table** dialog box opens. If the data is not already a table, click **OK**.

3. The Power Query Editor opens. Click the **Total** column's heading to select that column. Then click **Remove Columns** on the **Home** tab to delete the unnecessary column.

4. Double-click the heading for **Column1** and change the name to **Customer**.

5. On the **Home** tab, click the dropdown arrow in **Remove Rows** and select **Remove Bottom Rows**. For the number of rows, enter "**1**" and click **OK** to remove the total row.

6. With the **Customer** column highlighted, go to the **Transform** tab and click the dropdown arrow for **Unpivot Columns**; then click **Unpivot Other Columns. Figure 15** illustrates the results of these first steps.

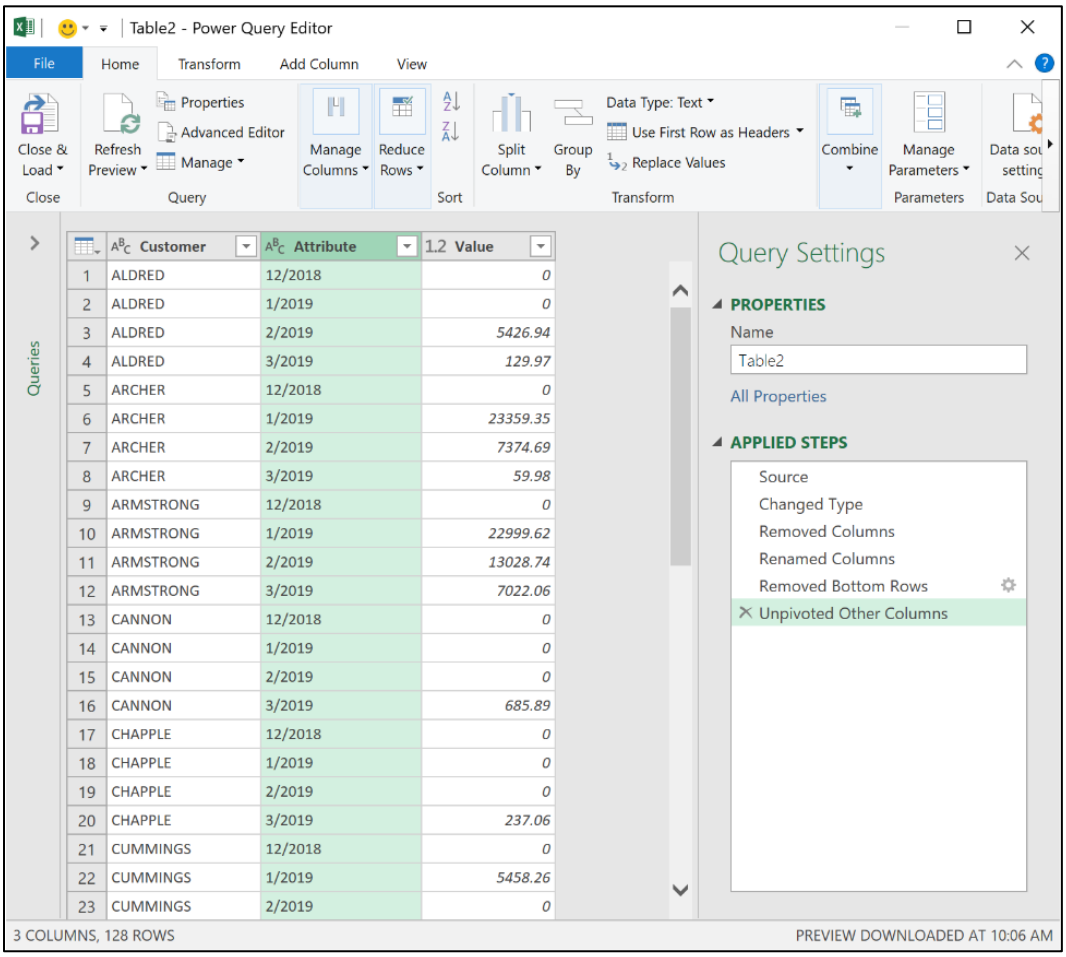


Figure 15 – Unpivoting Data In Power Query

7. Figure 15 illustrates small icons at the front of each header. These icons indicate the type of data present in each column. The header indicates that the data is textual for the date column, as shown by the icon  . Therefore, we must change it to the "date" data type by selecting the column and clicking the dropdown arrow for Data Type on the **Home** tab**.** Next, choose the **Date** option so that the icon in the header indicates the presence of date data  .

8. The final step is to click **Close & Load** on the Ribbon's **Home** tab to load the transformed data into Excel.

The list of **Applied Steps** in the Query Settings panel shown in Figure 15 provides an easy way to delete, reorder, and edit a step.

Any changes to the data appear in the results upon refreshing the query. To update the query results, click **Refresh All** on the Ribbon's **Data tab**. Alternatively, you can click the **Refresh** icon in the **Queries & Connections** panel, as shown in **Figure 16**.

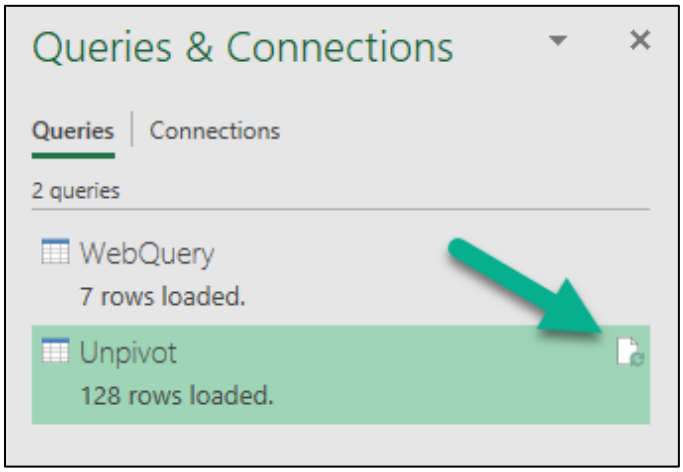


Figure 16 – Power Query's Refresh Icon

Splitting Data into Multiple Columns with Power Query

There are multiple ways to break data in a cell, including **Flash Fill**, **Text to Columns**, and functions such as **LEFT**, **MID**, **RIGHT**, and **LEN**. However, with both Flash Fill and Text to Columns, you must re-run these utilities each time your data changes – a process that may be impractical in some situations. In addition, although formula-based approaches update dynamically, formulas created using LEFT, MID, RIGHT, LEN, and other functions are challenging for many Excel users to construct. Fortunately, Power Query provides an easy and practical way to split data into multiple columns.

With our data in the table shown in **Figure 17**, we will use Power Query to split the *City*, *State*, and *Zip Code* into separate columns.

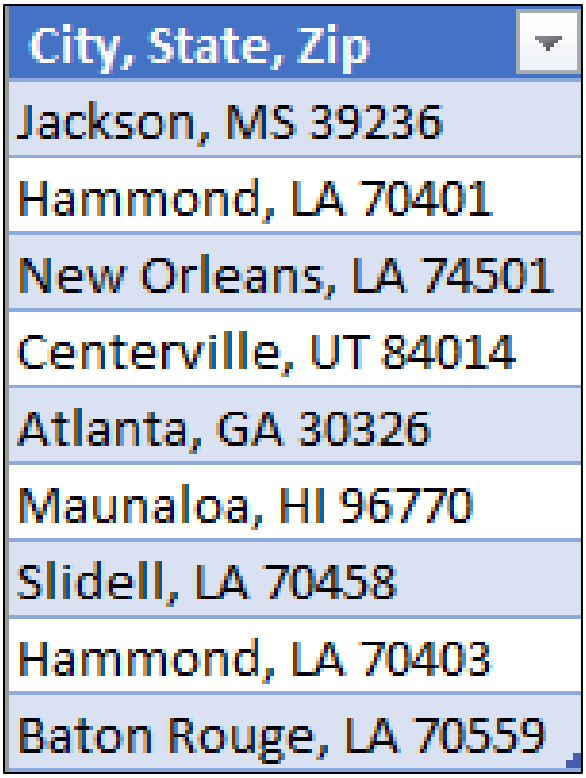


Figure 17 – Data For Split Data Example

The steps to complete the process are as follows.

1. Select any cell in the table/range of data, and click **From Table/Range** on the Ribbon's **Data** tab to open the **Power Query Editor**.

2. Click **Split Column** on the Ribbon's **Home** tab and select **By Delimiter**. For the first instance, use **Comma** and choose **Each occurrence of the delimiter**, as shown in **Figure 18.** Then, click **OK** to confirm your entry.

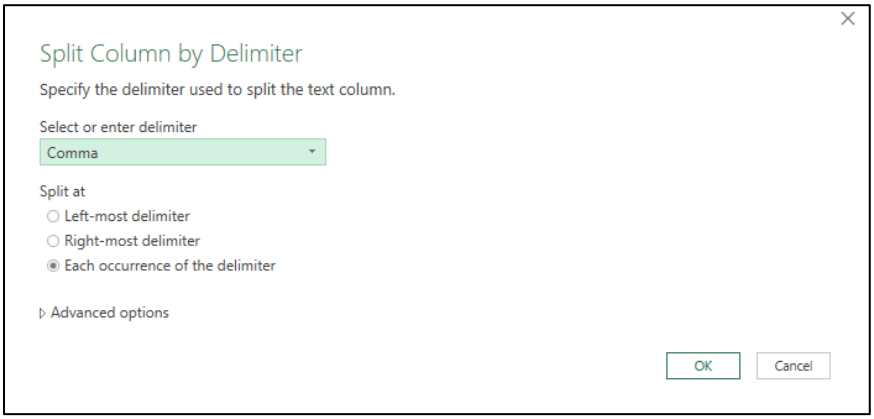


Figure 18 - Split Column By Delimiter

3. Repeat the **Split Column** process outlined above on the new column created and select **space** to split the State and Zip.

4. Select the blank column and click **Remove Columns** on the Ribbon's **Home** tab.

5. Double-click each header and rename them to *City*, *State*, and *Zip*, respectively.

6. Select the **Zip** column and select **Text** using the **Data Type** dropdown on the Ribbon's **Home** tab.

7. Click **Close & Load** to return the data as a table to Excel.

To include any new data added to the source table, right-click on the table created by the query and click **Refresh**.

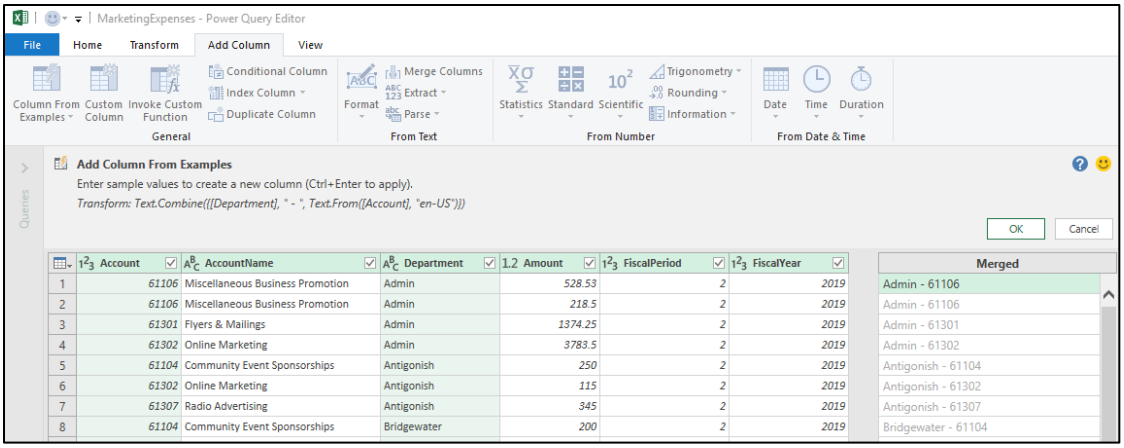
Transforming Data by Adding Columns

Power Query provides a simple interface for adding a column of data. In this illustration, we will use Power Query's **Column From Examples** feature to add a column of data to the data model. To add a column, follow the steps detailed below.

1. Click on any cell in range or table, and click **From Table/Range** on the Ribbon's **Data** tab to open the **Power Query Editor**.

2. **Click Column From Examples** on the **Add Column** tab of the **Power Query Editor's Ribbon**.

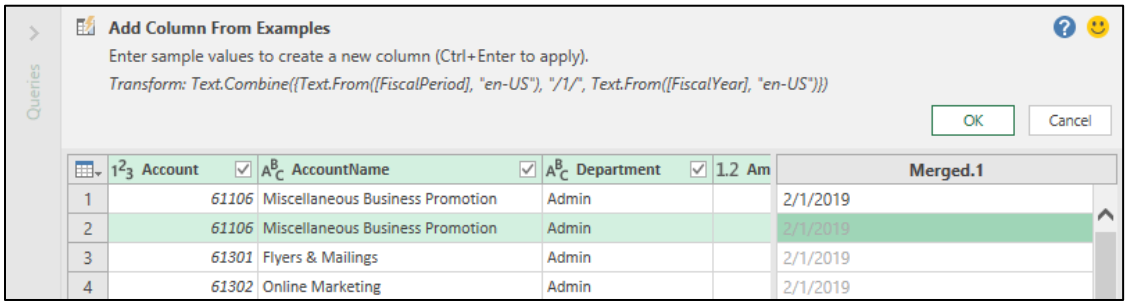
3. We will combine the *Department* and *Account number* for the first new column by typing the department name and account number on the first line in the new column and pressing **Enter**. This process resembles using **Flash Fill** in Excel; however, it completes an editable function shown in **Figure 19**. Review the results and click **OK**.



	Account	AccountName	Department	Amount	FiscalPeriod	FiscalYear	Merged
1	61106	Miscellaneous Business Promotion	Admin	528.53	2	2019	Admin - 61106
2	61106	Miscellaneous Business Promotion	Admin	218.5	2	2019	Admin - 61106
3	61301	Flyers & Mailings	Admin	1374.25	2	2019	Admin - 61301
4	61302	Online Marketing	Admin	3783.5	2	2019	Admin - 61302
5	61104	Community Event Sponsorships	Antigonish	250	2	2019	Antigonish - 61104
6	61302	Online Marketing	Antigonish	115	2	2019	Antigonish - 61302
7	61307	Radio Advertising	Antigonish	345	2	2019	Antigonish - 61307
8	61104	Community Event Sponsorships	Bridgewater	200	2	2019	Bridgewater - 61104

Figure 19 - Add Column From Examples

4. We will now add a second column using the same process to combine the **FiscalPeriod** (month) with the **FiscalYear**. Because no day of the week is specified, we will input the first day of the month, as shown in **Figure 20**. Click **OK** to complete the process, and then click the text icon  in the header for the column to change the type to *date.* Next, rename the column to *Date*.



	Account	AccountName	Department	Am	Merged.1
1	61106	Miscellaneous Business Promotion	Admin		2/1/2019
2	61106	Miscellaneous Business Promotion	Admin		2/1/2019
3	61301	Flyers & Mailings	Admin		2/1/2019
4	61302	Online Marketing	Admin		2/1/2019

Figure 20 - Adding A Second Column

5. To allow for reporting on a month-end basis, add another column using **Custom Column** on the Ribbon's **Add Column** tab. To do so, complete the dialog box, as shown in **Figure 21**, and click **OK**.

6. Change the column type to *date*.

7. Click **Close & Load** to complete the process on the Ribbon's **Home** tab.

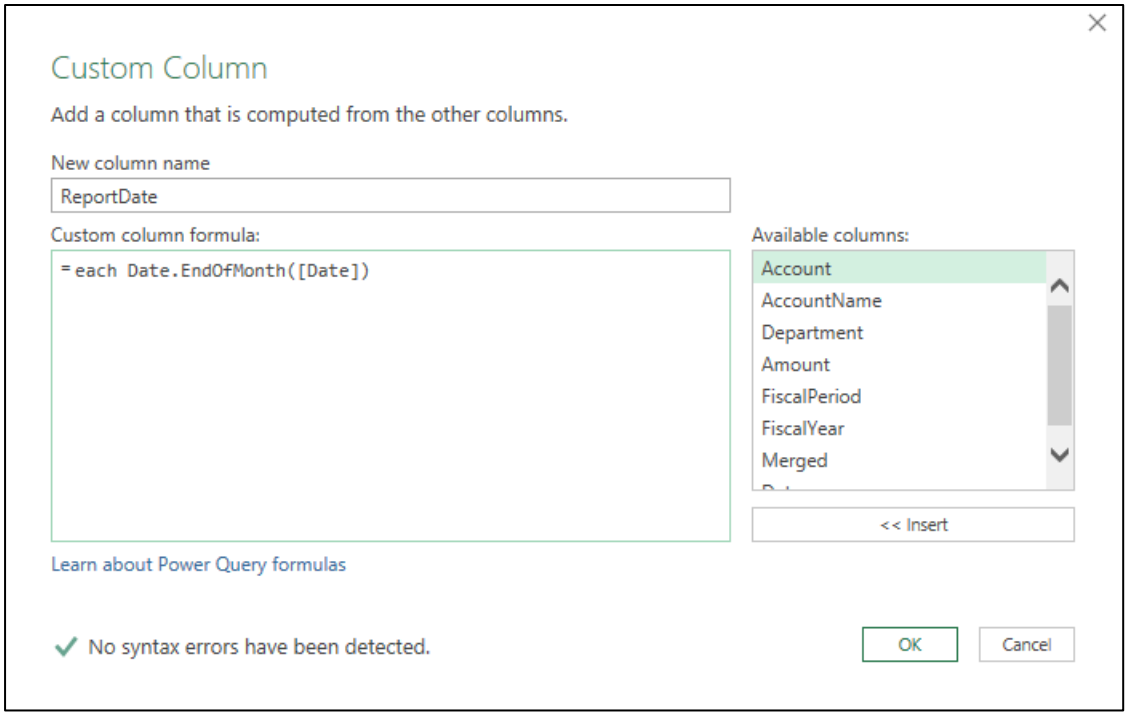


Figure 21 - Custom Column Created In Power Query

As with queries, the steps created automatically re-run when you refresh the query.

Creating a Transformation to Transpose Data

Excel provides the **Paste Special**, **Transpose** feature, and the **Transpose** function. Both these tools are helpful for transposing data by "rotating" it 90 degrees. However, **Paste Special, Transpose** is a one-time action, and the **Transpose** feature does not work if the range changes. These two issues severely limit the usefulness of these two tools. Fortunately, Power Query eliminates both limitations with its **Transpose** option.

The data is not in a table in this first example of using **Transpose** in Power Query. Choose **From Table/Range** on the Ribbon's Data tab to begin the process of transposing data. Next, you should uncheck the box labeled **My Table has Headers**, as shown in **Figure 22**.

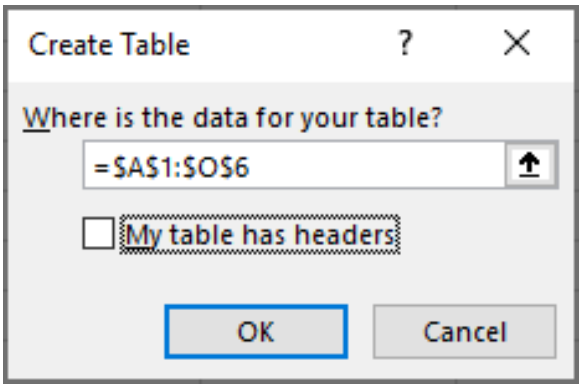


Figure 22 - Uncheck My Table Has headers

Complete the transpose process using the following steps with the data now in the Power Query Editor.

1. On the **Transform** tab of the Ribbon, click **Transpose**.

2. On the same tab, click **Use First Row as Headers**.

3. On the **Home** tab, select **Remove Rows**, **Remove Bottom Rows**, and choose to remove only one row. Click **OK**.

4. To complete the transpose, click **Close & Load**, and upon doing so, Power Query transposes the data. If the original data changes, right-click anywhere on the "results" data and choose the **Refresh** option to update the results.

Combining Excel Worksheets with a Power Query Transformation

We will combine expense data from one worksheet with budget data from another worksheet using Power Query in the following example. For both sets of data, use **From Table/Range** to create a connection to the data. Create the connection for the **Sales** data. Then, in the **Query Settings** panel of the **Power Query Editor**, change the query's **Name** to **Actuals**.

Next, repeat the previous process for the **Budget** data and name it **Budget**. Then, click the **Close & Load** dropdown arrow with each query and select **Close & Load To**. This action opens the **Import Data** dialog box. There, select **Only Create Connection**, as shown in **Figure 23**. Finally, complete these processes by clicking **OK**.

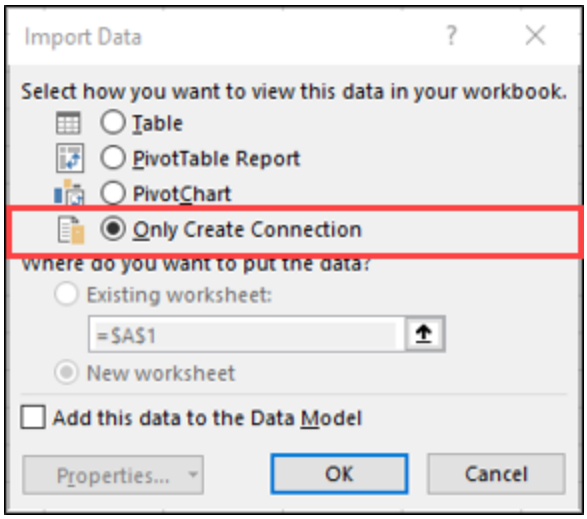


Figure 23 – Using Power Query To Create A Data Connection

With the two queries completed, you can combine the two worksheets using the following steps.

1. In the **Get Data** dropdown list, select **Combine Queries** followed by **Append**.

2. Configure the **Append** dialog box, as shown in **Figure 24,** and click **OK**.

3. Next, select the **Month** and **Product** columns and click **Group By** on the **Home** tab.

4. Configure the **Group By** to sum the **Sales** and **Budget** columns, as shown in **Figure 25**, and click **OK**.

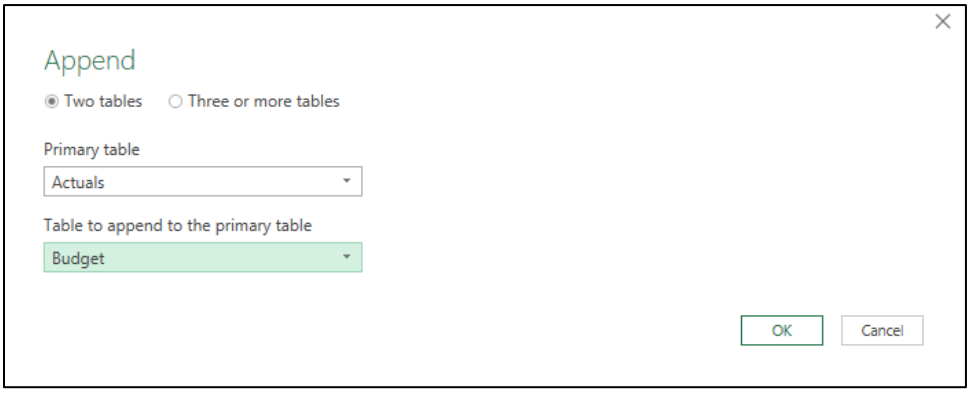


Figure 24 – Appending Query Results

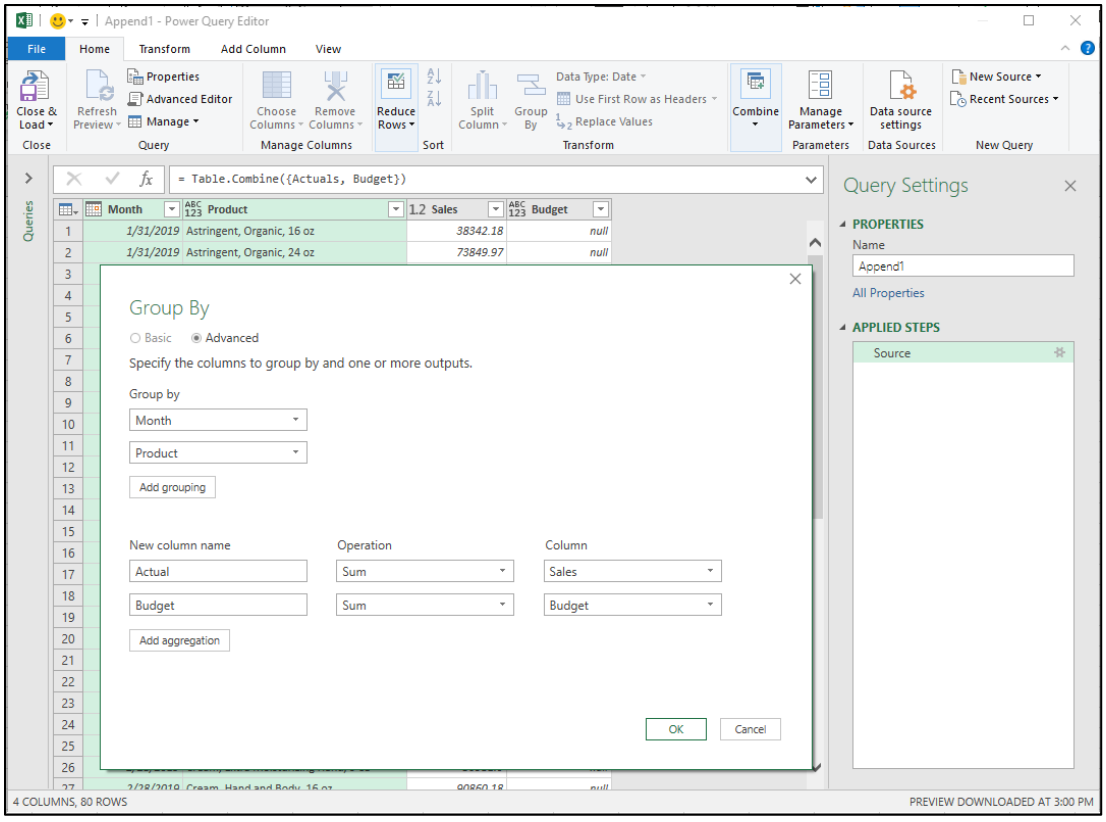


Figure 25 – Grouping Data From Query Results

5. In the **Query Settings** panel, change the query's name to **Actual vs. Budget**, review the data types, and make any changes required.

6. Click **Close & Load** to return the results of combining the worksheets to Excel.

Far from an exhaustive list of all the queries and transformations possible using Power Query, the examples presented above clearly illustrate many of the tools' features and benefits and should likely cause many to re-engineer some of their Excel workflows.

Calculations With PivotTables

In the opinion of many, PivotTables are Excel's most important and most powerful feature. As mentioned earlier, PivotTables offer extraordinary opportunities to summarize large volumes of data without entering formulas. However, that characteristic has led to the widespread perception that PivotTable can only sum data and that other calculations, such as averages and variances, are unavailable in PivotTables. Different calculations are available, but to use them, you must think a bit differently about PivotTables.

Perhaps the easiest way to see a different calculation in a PivotTable is to change the data's presentation. For instance, **Figure 26** illustrates changing a Value Field Setting to change the presentation of PivotTable data. Notably, this method does not involve changing any calculation

or adding any formula to the PivotTable. Further, you can add the same field to a PivotTable multiple times and choose a different presentation for each calculation instance. You can extend this technique to presenting the data as percentages of a column total or grand total by clicking on the **Show Values As** option in Figure 26.

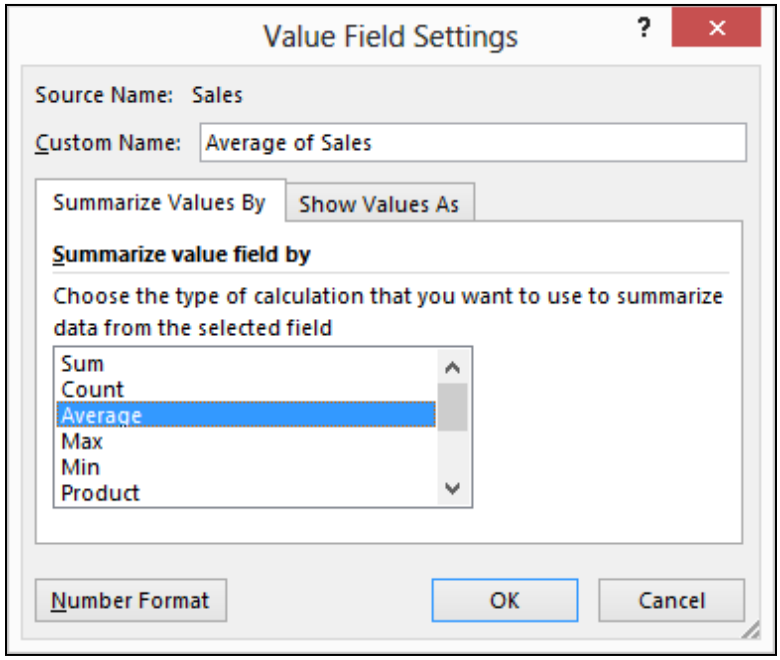


Figure 26 - Changing The Summary Function For A Value Field

Creating Calculated Fields

A *calculated field* is one form of a user-defined calculation you can add to a PivotTable. The other option for creating a user-defined measure is a *calculated item.* You will employ a calculated field to use data from different *fields* in your user-defined calculation. On the other hand, you will use a calculated item when you want your formula to use data from *one or more specific items within a given field*.

This example creates a simple PivotTable from a single table in Sage 100, the customer master file, **AR_Customers**. We will use Open Database Connectivity (ODBC) – an open standard for connecting applications to a database – to access the database. With the connection in place, Excel presents a list of tables. You can expand this list to display the fields contained in each table. First, expand the field list by clicking the plus **(+)** sign to the left of the table name in the left-hand pane. Then, choose the fields to display in the report and click the **(>)** button. This action will move them to the right-hand pane, as shown in **Figure 27.** Next, select the following fields: **CustomerNo**, **State**, **SalespersonNo**, **CurrentBalance**, **AgingCategory1**, **AgingCategory2**, **AgingCategory3**, and **Aging Category4**.

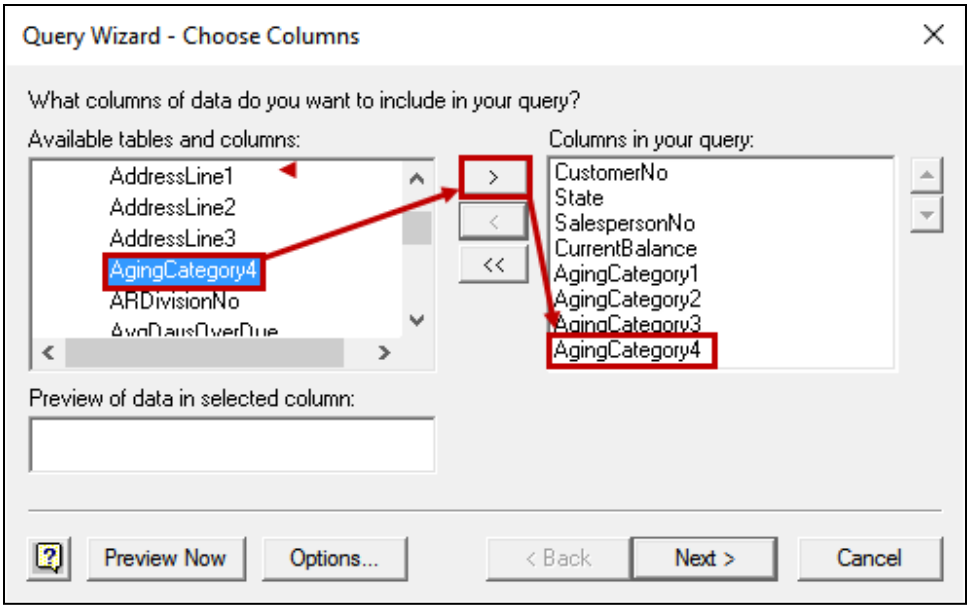
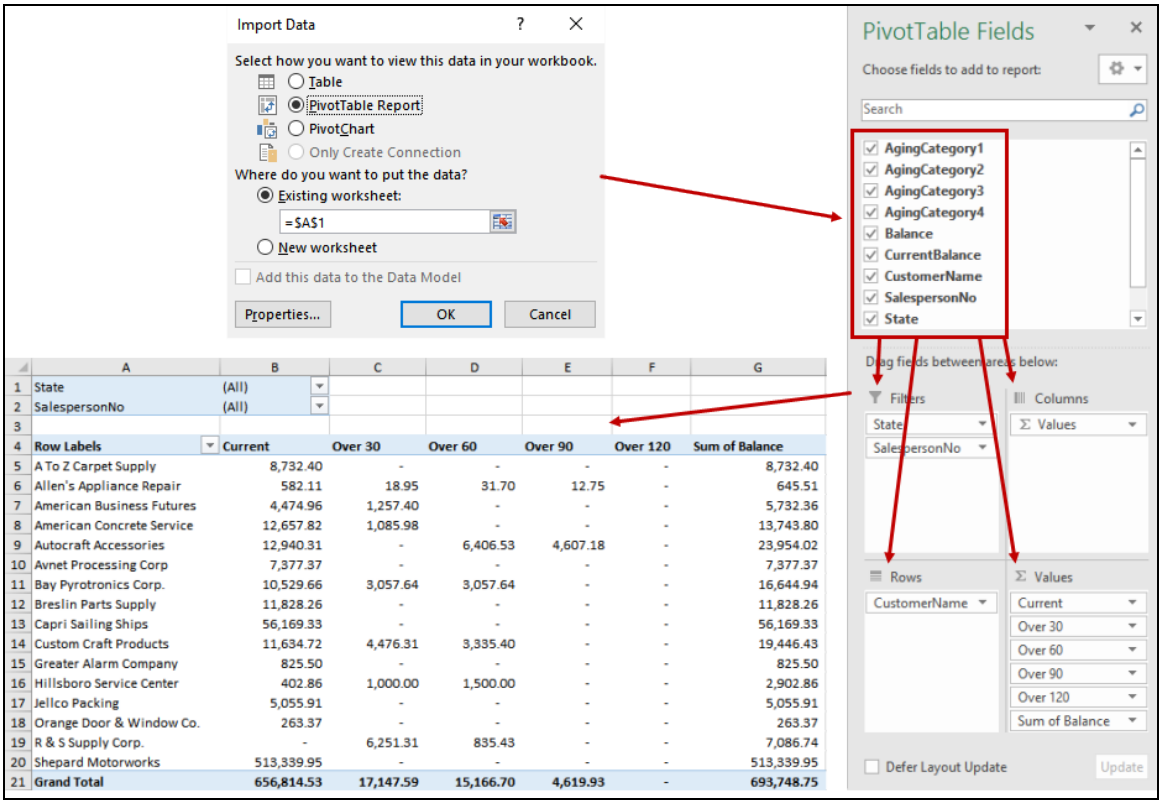


Figure 27 – Selecting The Fields For The Report

After selecting the required fields are selected, click **Next** several times. Select Ret**urn Data to Microsoft Office Excel** and click **Finish**. In the **Import Data** dialog box, select the **PivotTable Report**. Then, specify the location for the report and then click **OK**. Next, drag-and-drop the fields to the appropriate report quadrants in the **PivotTable Task Pane**, rename and format the column labels, choose a number format for the data, and complete the PivotTable just as with any other. The primary difference is that this PivotTable links dynamically to the underlying data in the database. If you need the same report next week or next month, you must retrieve the workbook, refresh the PivotTable, and print the updated version, which takes mere seconds to complete. **Figure 28** illustrates creating the initial PivotTable.



	A	B	C	D	E	F	G
1	State	(All)					
2	SalespersonNo	(All)					
3							
4	**Row Labels**	**Current**	**Over 30**	**Over 60**	**Over 90**	**Over 120**	**Sum of Balance**
5	A To Z Carpet Supply	8,732.40	-	-	-	-	8,732.40
6	Allen's Appliance Repair	582.11	18.95	31.70	12.75	-	645.51
7	American Business Futures	4,474.96	1,257.40	-	-	-	5,732.36
8	American Concrete Service	12,657.82	1,085.98	-	-	-	13,743.80
9	Autocraft Accessories	12,940.31	-	6,406.53	4,607.18	-	23,954.02
10	Avnet Processing Corp	7,377.37	-	-	-	-	7,377.37
11	Bay Pyrotronics Corp.	10,529.66	3,057.64	3,057.64	-	-	16,644.94
12	Breslin Parts Supply	11,828.26	-	-	-	-	11,828.26
13	Capri Sailing Ships	56,169.33	-	-	-	-	56,169.33
14	Custom Craft Products	11,634.72	4,476.31	3,335.40	-	-	19,446.43
15	Greater Alarm Company	825.50	-	-	-	-	825.50
16	Hillsboro Service Center	402.86	1,000.00	1,500.00	-	-	2,902.86
17	Jellco Packing	5,055.91	-	-	-	-	5,055.91
18	Orange Door & Window Co.	263.37	-	-	-	-	263.37
19	R & S Supply Corp.	-	6,251.31	835.43	-	-	7,086.74
20	Shepard Motorworks	513,339.95	-	-	-	-	513,339.95
21	**Grand Total**	**656,814.53**	**17,147.59**	**15,166.70**	**4,619.93**	**-**	**693,748.75**

Figure 28 – Creating A PivotTable Connected To An External Data Source

Our initial PivotTable contains an accounts receivable aging report but does not have a column for the total outstanding balances owed by our customers. To create a column for the outstanding balances, we need to create a *calculated field* because we must include the values from other fields in the formula.

To insert a calculated field, follow the procedure described below.

1. Position the cursor anywhere in the **Over 120** column.

2. Click **Fields**, **Items, & Sets** followed by **Calculated Field** on the **PivotTable Tools, Analyze** contextual tab.

3. Type a name for the added field in the **Insert Calculated Field** dialog box. In this case, enter **Balance**.

4. Then, build the formula. Position the cursor in the **Formula** box, click and highlight **CurrentBalance** in the **Fields** box, and click **Insert Field**. Next, type in the plus sign (**+**) and click and highlight **AgingCategory1** in the **Fields** box. Again, click on **Insert Field**. Repeat this process until you include all fields through **AgingCategory4** in the **Formula** box. Click **OK** to complete the process, as shown in **Figure 29**.

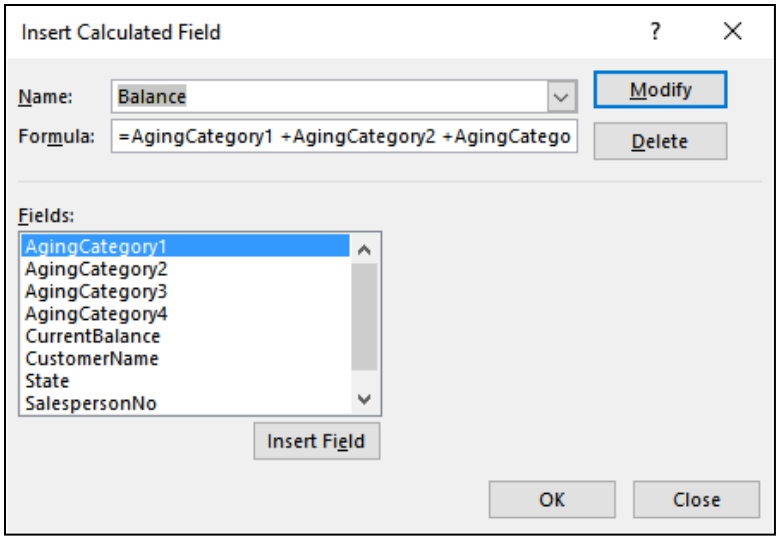


Figure 29 – Entering A Formula For A Calculated Field

5. Excel adds the new field in a separate column to the right of the **Over 120** column.

To complete the table, drag **SalespersonNo** to the **Rows** quadrant and the **CustomerName** field to the **Filters** quadrant. The reconfigured PivotTable helps users examine and understand their staff's sales and collection performance. Similarly, we could have replaced **SalespersonNo** in the **Rows** quadrant with **State** to produce an accounts receivable aging of accounts by state, which could help users manage the risk of non-collection in specific locations. **Figure 30** displays the completed PivotTable.

	A	B	C	D	E	F	G
1	State	(All)					
2	CustomerName	(All)					
3							
4		**Current**	**Over 30**	**Over 60**	**Over 90**	**Over 120**	**Balance**
5	0100	$ 16,303.22	$ 1,257.40	$ -	$ -	$ -	$ 17,560.62
6	0200	$ 521,120.18	$ 7,251.31	$ 2,335.43	$ -	$ -	$ 530,706.92
7	0300	$ 30,719.81	$ 4,476.31	$ 9,741.93	$ 4,607.18	$ -	$ 49,545.23
8	0400	$ 88,671.32	$ 4,162.57	$ 3,089.34	$ 12.75	$ -	$ 95,935.98
9	**Grand Total**	**$ 656,814.53**	**$ 17,147.59**	**$ 15,166.70**	**$ 4,619.93**	**$ -**	**$ 693,748.75**

Figure 30 – Aging of Accounts Receivable By Salesperson

Remember, our PivotTable links dynamically to the underlying data in Sage 100. So, to use this report in the future, retrieve the workbook and click **Refresh** to produce an updated summary based on the transactions and postings as they exist in the underlying database at the time of refresh.

Creating Calculated Items

Now, let us turn our attention to the task of creating a *calculated item*. Remember, we will use calculated items to incorporate the values associated with other items into our formulas. In our first example, we will create a calculated item to compute the gross margin from the PivotTable pictured data in **Figure 31**.

	A	B	C	D	M	N
1	Page1	(All)				
2						
3	**Sum of Value**	**Column Labels**				
4	**Row Labels**	**1/1/2021**	**2/1/2021**	**3/1/2021**	**12/1/2021**	**Grand Total**
5	Revenue	344,000	377,000	414,000	1,032,000	7,481,000
6	Cost of Sales	173,000	183,000	193,000	285,000	2,748,000
7	Distribution	35,000	45,000	55,000	148,000	1,095,000
8	Facilities	17,000	17,000	17,000	17,000	204,000
9	SG&A	35,000	45,000	55,000	148,000	1,095,000
10	Total Expense	87,000	107,000	127,000	313,000	2,394,000
11	Net Income	84,000	87,000	94,000	434,000	2,339,000
12	**Grand Total**	**775,000**	**861,000**	**955,000**	**2,377,000**	**17,356,000**

Figure 31 – Simple Consolidation PivotTable

To insert a calculated item, use the following procedure.

1. Select any one of the row items, such as *Revenue*, *Cost of Sales*, or *Distribution*.

2. In Excel, on the **Ribbon's PivotTable Tools, Analyze tab**, click **Fields**, **Items, & Sets** followed by **Calculated Item**, as shown in **Figure 32**.

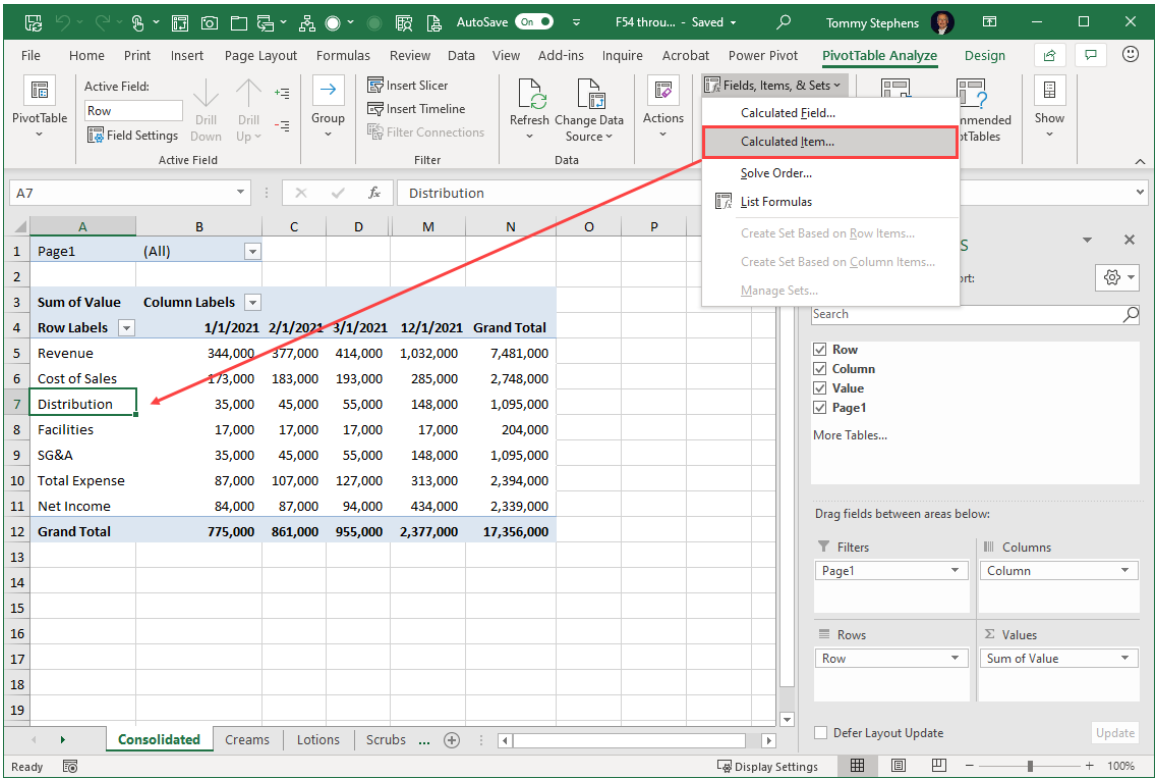


Figure 32 - Creating Formulas From The PivotTable Analyze Tab Of The Ribbon

3. In the **Insert Calculated Item** dialog box, enter a name for the added item. Enter **Gross Margin**.

4. Now, build the formula. First, position your cursor in the **Formula** box, click and highlight **Revenue** in the **Items** box in the lower right-hand corner, and click **Insert Item**. Next, type in the minus sign (-) and click and highlight **Cost of Sales** in the **Items** box. Finally, click **Insert Item** and **OK** to complete the process, as shown in **Figure 33**.

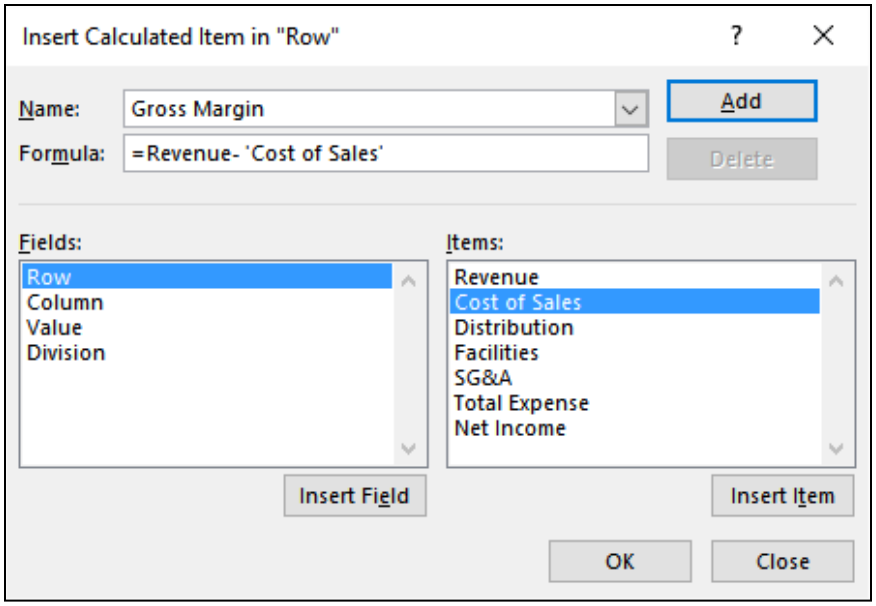


Figure 33 – Entering the Formula For A Calculated Item

5. Excel will create an item at the bottom of the column. Use your mouse to drag the item to the correct position in the report.

> Excel will display an error message if you now attempt to group months into quarters in the PivotTable report because the built-in date and number grouping are not allowed across calculated items in PivotTables.

Summary

Excel is a fantastic tool that continues to evolve. New features such as LAMBDA, data conversion options, a powerful scripting language, and functions such as TEXTBEFORE, TEXTAFTER, and TEXTSPLIT are welcome additions to an already powerful application. But, leveraging legacy tools in Excel such as Power Query and various PivotTable techniques can also contribute significantly to improved accuracy and efficiency. Take advantage of the tools and features discussed in this session to maximize your return on investment with Excel.

Appendix – Summary of New and Updated Excel Features

Adapted from Microsoft's Website

Date Released	Current Channel Version Number	Function Name	Function Description
1/4/2024	2312	Sensitivity Toolbar	The sensitivity bar is now available in Word, Excel, and PowerPoint when users are creating copies of their documents in File / Save As. This helps users understand the security policies that apply to their document.
1/4/2024	2312	New Default Theme	We've updated the default font and colors of the Office theme to be more modern and accessible.
11/29/2023	2311	Automatically insert image captioning for Excel's images	Excel's spreadsheet and accessibility image captioning is automatically generated for you.
10/25/2023	2310	Efficient reading in Excel using Narrator	Announcements through the Windows inbox screen reader, Narrator, will be much more succinct and efficient.
10/28/2023	2309	Control your data conversions	You've been asking for more control over how Excel automatically converts your data to specific formats. We delivered! You now have the ability to disable specific types of automatic data conversions; this way, you won't need to worry about Excel converting your data to a format that you didn't want and weren't expecting.
8/28/2023	2308	Data Validation dropdown list autocomplete	Dropdown lists are a handy way to make data entry and validation more efficient in Excel. We've now added AutoComplete functionality, which automatically compares the text typed in a cell to all items in the dropdown list and displays only the items that match. You'll spend less time scrolling through lists, dealing with data validation errors, or writing complex code to handle this task.
8/28/2023	2308	Paste values directly into your workbook using a keyboard shortcut	The keyboard shortcut CTRL+SHIFT+V lets you quickly Paste Values rather than having to choose Paste Values from the menu.
8/28/2023	2308	Updated encryption for Microsoft Purview Information Protection	Advanced Encryption Standard (AES) with 256-bit key length in Cipher Block Chaining mode (AES256-CBC) is now the default Microsoft Purview

			Information Protection encryption mechanism for Microsoft 365 Apps documents and emails.
8/28/2023	2308	Protect your most sensitive content with double key encryption	Double Key Encryption (DKE) provides organizations with a second encryption key for your most sensitive content.
7/26/2023	2307	PivotTable overlap improvements	We have improved the experience when PivotTables overlap other content in your workbook.
7/26/2023	2307	Performance improvement related to fonts	If you do not use printer fonts or have not heard of printer fonts, unchecking the setting in File/Options/Advanced/[Include fonts that are stored on the printer] can help speed up font related operations such as choosing a font from font drop down, or formatting a cell by bolding/italicizing a cell's font, etc.
6/1/2023	2305	Faster filtering when cells contain unique or duplicate rules	When your workbook contains many unique or duplicate conditional formatting rules, it can often slow down the app's performance. No longer! By optimizing the underlying comparison algorithm, we've enhanced the performance and sped up the filtering process.
6/1/2023	2305	Desktop Excel Action Recorder	You can now record Office Scripts in Desktop Excel! Perform the actions you want in Excel, and the Recorder will create an Office Script to replay those actions for you.
3/28/2023	2303	Reducing unwanted fragmenting of conditional formatting rules	Check out the speed up in workbooks with lots of unwanted fragmented conditional formatting rules. When a workbook is opened this feature will merge those fragmented conditional formatting rules that are identical, within a contiguous range of cells, and with unchanged priority ordering. It excludes rules whose evaluation relies on a selection range like Above or Below average, Unique or Duplicate, Gradients, etc. and rules in PivotTables.
3/28/2023	2303	Assign a sublabel as the default when a parent label is selected	When using built-in sensitivity labels in Microsoft 365 Apps, admins can specify a sublabel to get applied automatically when a parent label is selected. This takes effect only when users select a parent label manually.
3/28/2023	2303	Sensitivity Label scoping between files, emails and meetings	Office applications can now filter out sensitivity labels based on the document type. For example, Outlook email will no longer show labels that only apply to Word, Excel, and PowerPoint documents.

3/28/2023	2303	Blocking XLL add-ins from the internet	To address the increasing number of malware attacks in recent months, we are implementing measures that will block XLL add-ins coming from the Internet.
3/28/2023	2303	Track tasks with @mentions	Use @mentions in comments to create, assign and track tasks within your workbook
3/28/2023	2303	Formula evaluation tooltips	Select a part of your formula and you'll see a tooltip showing the current value of just the part you've selected.
3/14/2023	2302	Disable the Azure Information Protection Add-in by default	Office apps will now automatically disable the legacy Azure Information Protection add-in and use the built-in sensitivity labels to view and apply labels powered by Microsoft Purview Information Protection.
3/14/2023	2302	Prevent data leaks more easily with the new Sensitivity toolbar	Sensitivity labels powered by Microsoft Purview Information Protection are now displayed alongside the filename in the app's title bar, allowing you to easily recognize and adhere to your organization's policies. The sensitivity toolbar is also available while saving new documents or renaming existing ones, helping you keep information security at your fingertips.
2/28/2023	2302	Reducing slowness and freezes when multiple workbooks are open	This feature reduces slowness and freezes experienced when working in a workbook due to calculations occurring in other unrelated workbooks also open at the same time and in the same Excel.exe instance. It achieves this by optimizing global automatic recalculation to the workbook being worked in, and its interdependent workbooks also open at the same time.
2/28/2023	2302	User-defined permissions now support domain name restrictions	When you choose a sensitivity label configured for user-defined permissions, domain names can now be used to restrict file access to all individuals from that domain. For example, you can specify "someone@example.com" or "@example.com," and permissions will be restricted based on either the individual or all individuals within the example domain.
1/26/2023	2301	PivotTable overlap improvements	We have improved the experience when PivotTables overlap other content in your workbook.
1/26/2023	2301	Excel PivotTable version compatibility user messaging	Excel now gives alerts about PivotTable compatibility issues and provides informative documentation and workarounds. When your version of Excel is unable to read data in a workbook, we present users with documentation that provides options to proactively troubleshoot and

			resolve the issue. In addition, we also allow users to upload their Excel document to OneDrive so they can seamlessly open the file in Excel for the web.
1/26/2023	2301	Date support for PivotTables Connected to PowerBI	In PivotTables that are connected to Power BI datasets, dates are now supported for analysis as the data type is no longer a string. For example, filtering data on specific timeframes is now possible.
12/6/2022	2211	Insert in-cell images with the new IMAGE function	Your images can now be part of the worksheet, instead of floating on top. You can move and resize cells, sort and filter, and work with images within an Excel table.
12/6/2022	2211	Touch Improvements to Ribbon	We've improved the spacing of buttons in the Ribbon when the device is being used in Tablet posture.
10/27/2022	2210	Get data for your workbooks by importing an image	Turn images with text into content you can edit in Excel. With the Data from Picture feature, you can convert the information in an image to data on a worksheet.
8/31/2022	2208	Supercharge your worksheets with fourteen new text and array functions	Use fourteen powerful new functions to easily split your text and rearrange your data. Try using TEXTSPLIT to split your text or VSTACK to combine multiple arrays.
8/31/2022	2208	Protect your PDFs	Sensitivity labels are now available to protect your PDFs from unauthorized access. Applies to files created in Word, Excel, or PowerPoint.
8/3/2022	2207	Optimized Excel recalculation on devices with constrained resources	On resource-constrained devices (two cores or less and eight gigabytes of RAM or less), Excel has now by default made recalculation more optimal by running calculation on a single thread. In most cases, users should see noticeably faster calculation on these devices. Note that in some cases that require compute-intensive calculation, users may want to consider overriding this default by setting Number of calculation threads to "2."
6/29/2022	2206	Copy data from the status bar	Quickly copy information from aggregations like "Sum," "Average," and "Count" from the status bar.
6/29/2022	2206	Find your data faster	The Auto-Filter function is now noticeably faster! These improvements were achieved by reducing memory usage and optimizing the calls made by the filter's comparison algorithm. The optimizations are especially noticeable on low-end devices that have less memory or slower CPU-memory throughput.

6/29/2022	2206	Speeding up Formula Entry	Excel has sped up entering a formula in a cell noticeably by reducing memory usage, making more efficient use of allocated memory, and optimizing redrawing. These optimizations are more noticeable on devices with slower Memory or slower CPU-Memory throughout for larger cell ranges.
4/26/2022	2204	Reducing unwanted fragmenting of conditional formatting rules	We're reducing fragmenting of conditional formatting rules across a contiguous cell range when pasting copied cells into that cell range.
4/26/2022	2204	Power BI Dataset Request Access Improvements	This update presents users with a way to request access to Power BI datasets when attempting to refresh PivotTables in Excel that are connected to a dataset they don't currently have access to.
3/30/2022	2203	Want your workbook to take you places?	Understand the layout of your workbook, see what elements exist, and navigate around quickly using the Navigation pane.
2/28/2022	2202	Excel 4.0 (XLM) macros will be disabled by default to improve security for Microsoft 365 customers	To help protect customers, Excel 4.0 (XLM) macros will be disabled by default in Microsoft 365. We encourage you to migrate these macros to the latest version of Microsoft Visual Basic for Applications (VBA).
2/28/2022	2202	Office apps now support Open Document Format (ODF) 1.3	ODF 1.3 brought many improvements to the OpenDocument format and these are now supported in Word, Excel, and PowerPoint (file extensions .odt, .ods, and .odp).
02/28/2022	2202	Lambda: Helper Functions	7 new functions, which make use of lambdas and provide help when authoring LAMBDA solutions
02/28/2022	2202	Lambda: Custom Functions Without Code	The LAMBDA function allows you to take any existing formula or expression and turn it into a custom function with a name. Easily reuse and update logic in your spreadsheet with the LAMBDA function.
10/25/2021	2110	DLP policy tips in Word/Excel/PowerPoint	Other sensitive information types configured as part of OneDrive and SharePoint data loss prevention (DLP) policies can now be detected by the app to show a policy tip. This update also brings accuracy improvements and globalization support.
9/28/2021	2109	A new way to reach the Accessibility tools	The Accessibility ribbon puts all the tools you need to create accessible content in one place.

05/21/2021	2105	AutoSave and coauthoring on sensitive encrypted documents	Don’t trade off productivity for security. With Microsoft Purview Information Protection, documents that are encrypted with sensitivity labels can now be AutoSaved and co-authored with others in real time just like unencrypted documents can. Requires tenant opt-in.
4/29/2021	2104	Linked data types: Real data for real life	New linked data types bring you facts and data on hundreds of subjects to help you accomplish your goals right in Excel.
3/30/2021	2103	Government customers: Apply sensitivity labels to your documents and emails	Sensitivity labeling features are now available for customers in the DoD environments.
3/1/2021	2102	Unhide many sheets at the same time	No need to unhide one sheet at a time anymore -- unhide multiple hidden sheets at once.
3/1/2021	2102	Improved Conditional Formatting dialogs	Conditional Formatting dialogs are now resizable, and now you can duplicate the rule with a single click.
3/1/2021	2102	Require users to apply sensitivity labels	Users will be prompted to apply a sensitivity label if their organization’s policy requires it.
1/26/2021	2101	Send audit data about sensitivity labeling to M365 administrators	When users apply, change, or remove sensitivity labels on their documents and emails, Office will send up audit data to the M365 audit backend for administrators to see. This is a silent functionality (no UI) for administrator benefit.
1/26/2021	2101	Government customers: Apply sensitivity labels to your documents and emails	Sensitivity labeling features are now available for customers in the GCC and GCC-H environments.
11/26/2020	2011	SVG Clipboard Support	You can now paste SVG content from Office into 3rd party apps.
11/26/2020	2011	Switch Office themes automatically	Office can automatically switch themes to match your Windows 10 theme settings. Go to File > Account and choose “Use system setting” under the Office Theme dropdown.
11/26/2020	2011	Name the new sheet after the source query	When the data is loaded into the new sheet, the sheet will be named based on the name of the source query.
11/26/2020	2011	Use the Advanced Dialog to Create Data Types	When the data is loaded into the new sheet, the sheet will be named based on the name of the source query.
10/27/2020	2010	Create Data Types with Power Query	Create rich data types with Power Query from any data source.

10/27/2020	2010	Insert your iPhone photos directly into Office	HEIC pictures from your phone now insert seamlessly into Office. No conversion required.
10/27/2020	2010	Make quick edits using the action pen	With the action pen, you can write by hand directly in the cells, jot down data with ink that gets automatically converted to Excel data.
9/28/2020	2009	Save shapes as pictures	In just a few clicks, save a shape, icon, or other object as a picture file so you can reuse it elsewhere.
9/28/2020	2009	Get Organization Data from Power BI using Data Types	Excel data types from Power BI are now rolling out to Insiders in organizations with Office 365 / Microsoft 365 and the Power BI Pro service plan. Getting the information you need and easily refreshing it's critical to many everyday workflows. We're giving you access to your company or organization information from Power BI as a data type in Excel, which expands your ability to bring in linked information in your spreadsheets.
9/28/2020	2009	Create variables to use in formulas	Improve performance, readability, and composability with the LET function. This function allows you to create named variables in new or pre-existing formulas.
8/31/2020	2009	Save to Pinned Folders	Pin your folders makes saving Office files easier. We received feedback that users want more control over the folders available when a new file is saved. We're excited to bring a new capability to you: pin your folders in the Save dialog. This new capability will make saving your Word, Excel, and PowerPoint files easier.
8/31/2020	2009	Make polished Visio diagrams in Excel	Create a flow chart or organizational chart by putting data on a worksheet.
7/30/2020	2007	Make a PDF connection	Connect to, import, refresh data from a PDF.
7/30/2020	2007	Filter and sort without disrupting others	You can now sort and filter your Excel file while collaborating with others with Sheet View. This new feature prevents you from being impacted by other user's sorts and filters while coauthoring the document.
7/30/2020	2007	Auto-apply or recommend sensitivity labels	Office can recommend or automatically apply a sensitivity label based on the sensitive content detected.
7/30/2007	2007	Create PivotTables from Datasets in Power BI within Excel;	You can create PivotTables in Excel that are connected to datasets stored in Power BI with a few clicks. Doing this allows you get the best of both PivotTables and Power BI. Calculate, summarize, and analyze your data with PivotTables from your secure Power BI datasets.

6/30/2020	2006	Longer file names	Excel for Windows desktop now supports OneDrive/SharePoint files with names and paths of up to 400 characters.
6/30/2020	2006	Realtimedata (RTD) improvements	In Office 365 version 2002 monthly channel and later, Excel's RealTimeData (RTD) function is much faster than Excel 2010 calculating data in the spreadsheet. We removed bottlenecks in its underlying memory and data structures as well as made it thread-safe to allow it to be calculated on all available threads of Multithreaded recalculation (MTR).
6/92020	2005	Lasso eraser in Ink Toolbox	When using the drawing tools, the lasso and the eraser are now available in the Ink Toolbox.
6/2/2020	2005	Automatically use new data types	When you type a data value that resembles a stock or a geographic location, Excel offers to convert it to the right connected data type - Stocks or Geography.
6/2/2020	2005	Tell your stories with animated GIFs	Animated GIFs are now supported in the Office editor - your documents just got snazzier
4/29/2020	2004	Facebook connector support is ending	Starting in April 2020, Excel will no longer support external data connections that use the Facebook connector.
4/29/2020	2004	Have a question? Ask Excel	Now Excel Ideas allows you to ask questions about your data - no need to spend time writing formulas
4/29/2020	2004	New images to bring your workbooks to life	Thousands of royalty-free stock images, icons, and stickers you can use in your workbooks. Go to Insert > Pictures > Stock Images to get started.
3/25/2020	2003	Your favorite Excel functions just got faster.	The SUMIFS, AVERAGEIFS, COUNTIFS, MAXIFS, and MINIFS functions are much faster than ever before. Get to the bottom line more quickly.
2/25/2020	2002	Workbook statistics	Cells, formulas, charts, tables... We count them so you don't have to.
2/25/2020	2002	Data Profiling in Query Editor	Get at-a-glance analysis of the data in your columns, identify error and empty values, see distribution histograms and more.
1/30/2020	2001	Read and reply on the fly	Respond to comments and mentions right from email without opening the workbook.
1/30/2020	2001	XOOKUP is here!	Row by row, find anything you need in a table or range with XLOOKUP