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Microsoft 365 Excel: Part 2

Microsoft 365 Training

Microsoft® 365 Excel®: Part 2

Courseware Release Version 4.0

Microsoft® 365 Excel®: Part 2

Contents

ABOUT THIS COURSE

Course Prerequisites

This manual assumes the user has completed the first part of the Microsoft 365 Excel courseware or has an understanding of the information presented in that course, including:

- Getting started with the app
- Working with formulas and functions
- Modifying worksheets
- Printing workbook contents
- Managing workbooks
- Customizing the Excel environment

Course Overview

Welcome to the second part of our Microsoft 365 Excel courseware. This version of Excel incorporates some new features and connectivity options in efforts to make collaboration and production as easy as possible.

This course is intended to help all users become familiar with the more advanced selection of features of Excel. We will cover how to create and use advanced formulas, analyze data, organize worksheet data with tables, visualize data with charts, work with graphical objects, and enhance workbooks.

Course Objectives

By the end of this course users should be comfortable in creating advanced formulas, analyzing data with functions, analyzing data using functions and PivotTables, working with tables, visualizing data with charts, working with graphical objects, and enhancing workbooks.

How to Use This Book

This course is divided into seven lessons. Each lesson focuses on several key topics, each of which are broken down into easy-to-follow concepts. At the end of each topic, you will be given an activity to complete. At the end of each lesson, we will summarize what has been covered and provide a few review questions for you to answer. Supplemental learning for selected topics is provided in the form of Lesson Labs at the end of this book.

Before you begin, download the course's Exercise Files to a convenient location. They will be referenced throughout this course and are a key part of your learning experience.

LESSON 1: CREATING ADVANCED FORMULAS

Lesson Objectives

In this lesson you will learn how to:

- Apply range names
- Use specialized functions

TOPIC A: Apply Range Names

To help ensure that everyone who works on the same workbook can understand the formulas and calculations, one option is to use cell and range names. While cell references can be used to identify where formulas are getting information to calculate data, it is not always obvious. Excel allows you to give names to individual cells and cell ranges, and then use those names in formulas and functions. Then, at a glance you can understand what data is being used in a formula or function.

Topic Objectives

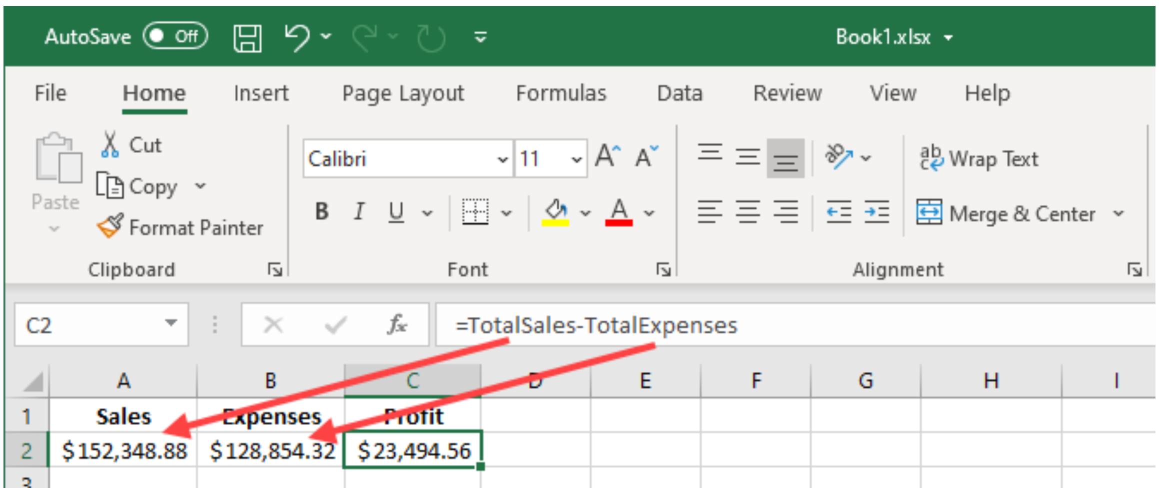
In this session, you will learn:

- About cell and range names
- How to add range names using the Name box and the New Name dialog box
- How to edit and delete range names
- How cell and range names are used in formulas

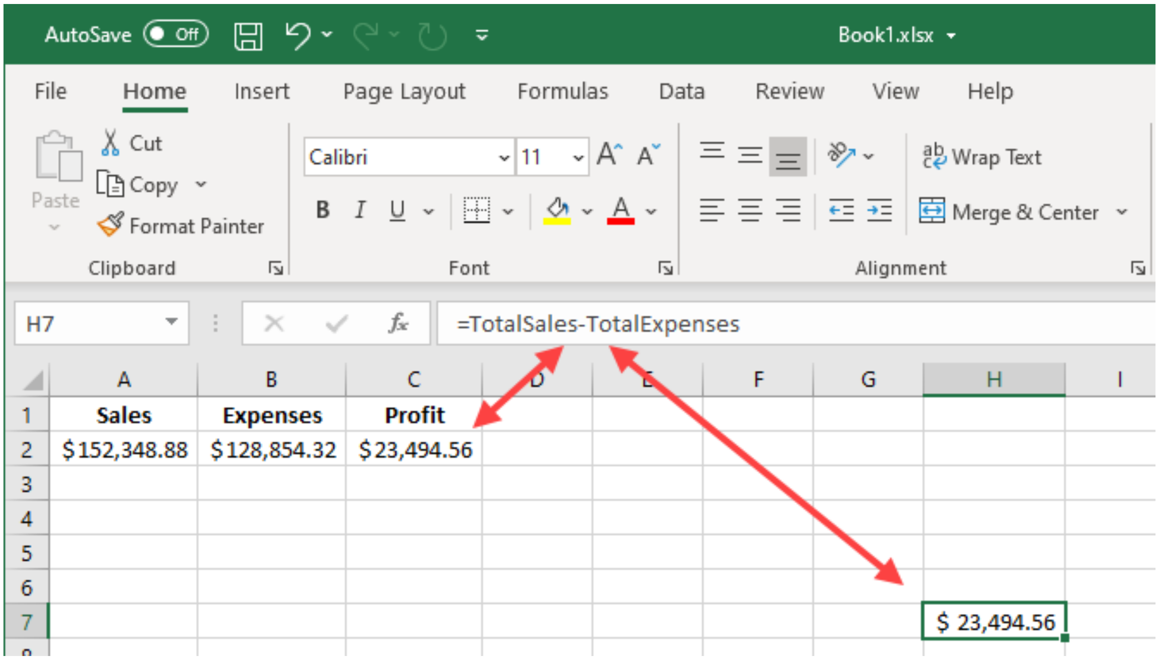
Range Names

Range names are meaningful labels that you can assign to individual cells or cell ranges. You can use a range name anywhere you would use a cell reference or cell range reference. This means you can use a name such as “Employees” to describe a range of cells rather than their reference (such as C2:C55).

For example, consider the following worksheet. Cells A2 and B2 have been given names (TotalSales and TotalExpenses, respectively) and those names have been used in a formula in cell C2 (=TotalSales-TotalExpenses):



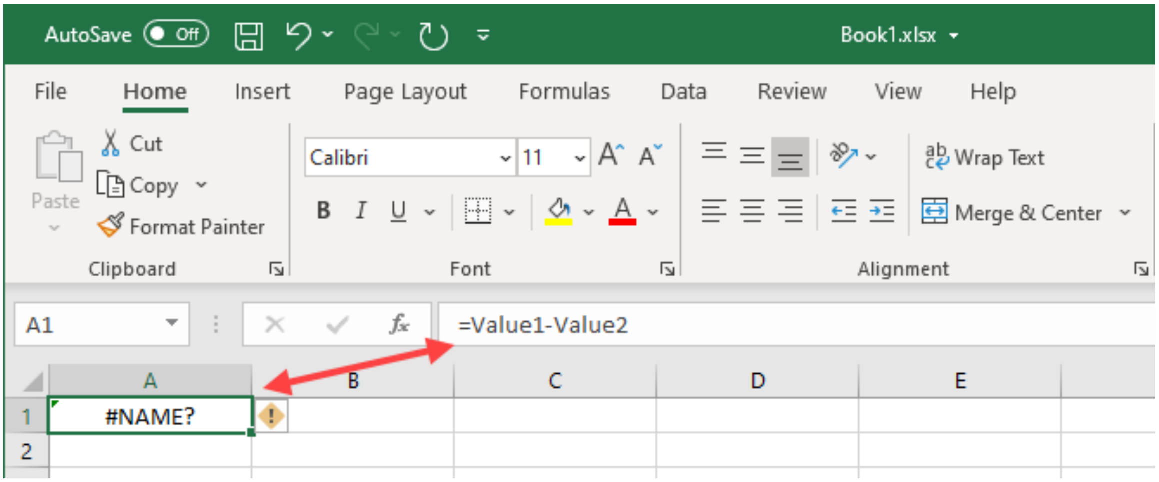
As an added bonus, range names are **absolute references**. This means that if you copy a formula or use AutoFill while using named ranges, the formula will maintain its original cell references:



Range names make formulas much more readable, improve worksheet clarity, and greatly improve worksheet organization. Range names can even help in the overall design of your worksheet.

Most small worksheets are usually constructed by filling a sheet with data and then performing calculations. However, range names enable you to create a worksheet by doing the opposite: constructing formulas and then adding the data. When you are designing your worksheet, you can create formulas using names instead of traditional cell references, and then define the names for the corresponding ranges as data becomes available.

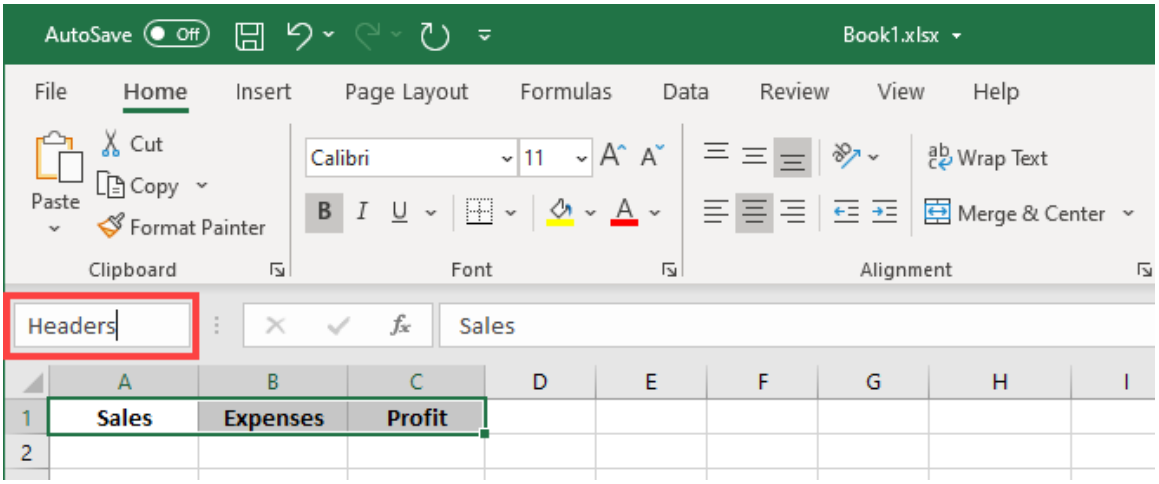
For example, below is an empty worksheet with a defined formula but no defined names, which results in a #NAME error. This error will remain visible until both “Value1” and “Value2” have been defined:



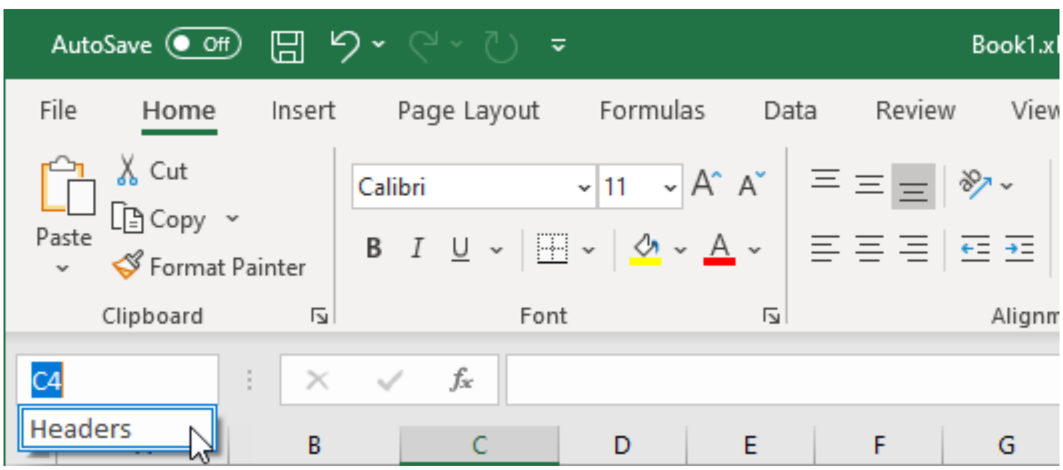
Keep in mind when choosing cell or range names that all names must start with a letter, underscore, or backslash. Beyond the first character, you can add any letter or number you wish. Additionally, names cannot contain any spaces, nor can they contain cell references. Finally, it is important to know that cell and range names are **not** case-sensitive.

Adding Range Names Using the Name Box

To apply a cell name or range name, first use your cursor to select the cell(s) that you want to name. Next, type the name that you would like to use into the **Name Box**:

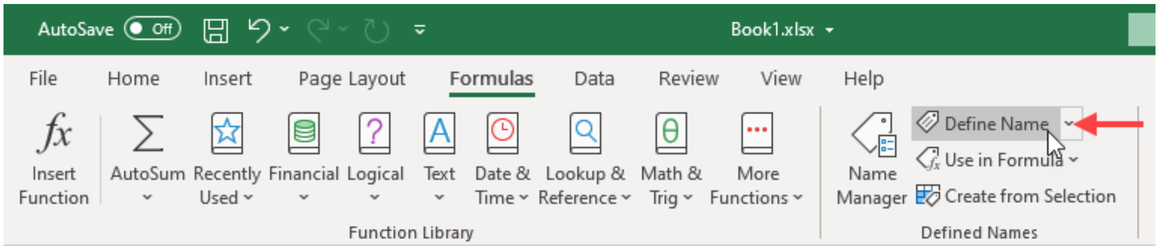


Pressing **Enter** will apply this name. From then on, you will be able to select this range by clicking the Name Box drop-down menu and clicking on the range name that you set:

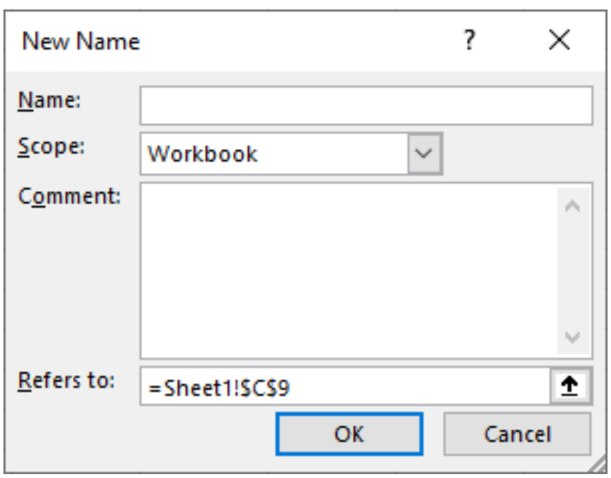


Adding Range Names Using the New Name Dialog Box

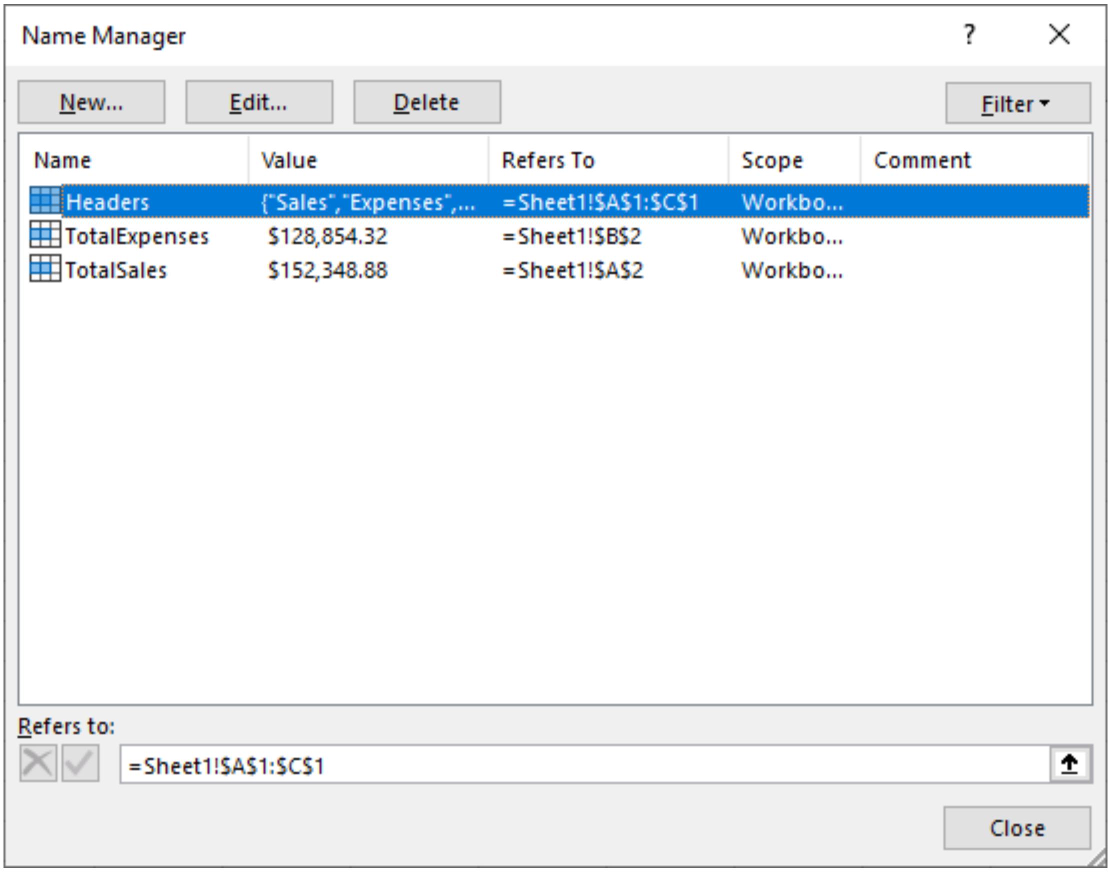
Cells and cell ranges can also be named using the **New Name** dialog box. While this technique takes a little bit longer, you have more control over what cells the name refers to. To open the New Name dialog box, click **Formulas → Define Name:**



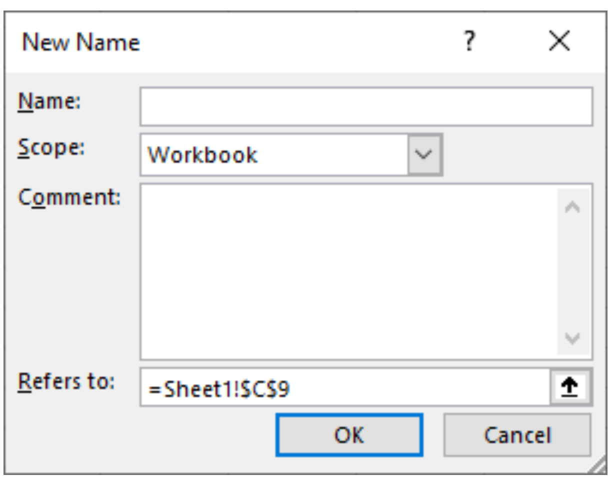
When the New Name dialog box is displayed, you will see that the **Name** field appears at the top. The **Scope** drop-down menu allows you to choose if this new name will be applied to only the current worksheet or the entire workbook. Inside the **Comment** text area, you can enter a brief description of the named cell or range. By default, the cells that were selected when the Define Name command was clicked will already be filled into the **Refers to** field. If you wish, you can change this selection by clicking on the cell selector ( ):



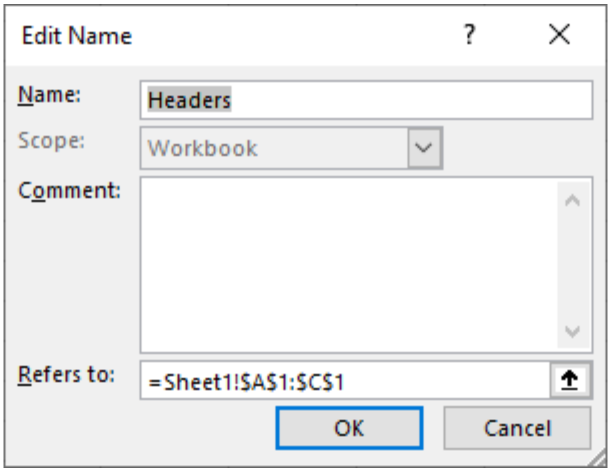
Once you enter your options and click **OK**, the named range will be created.



Clicking the **New** button will open the **New Name** dialog box, which you can use to create a new range name:

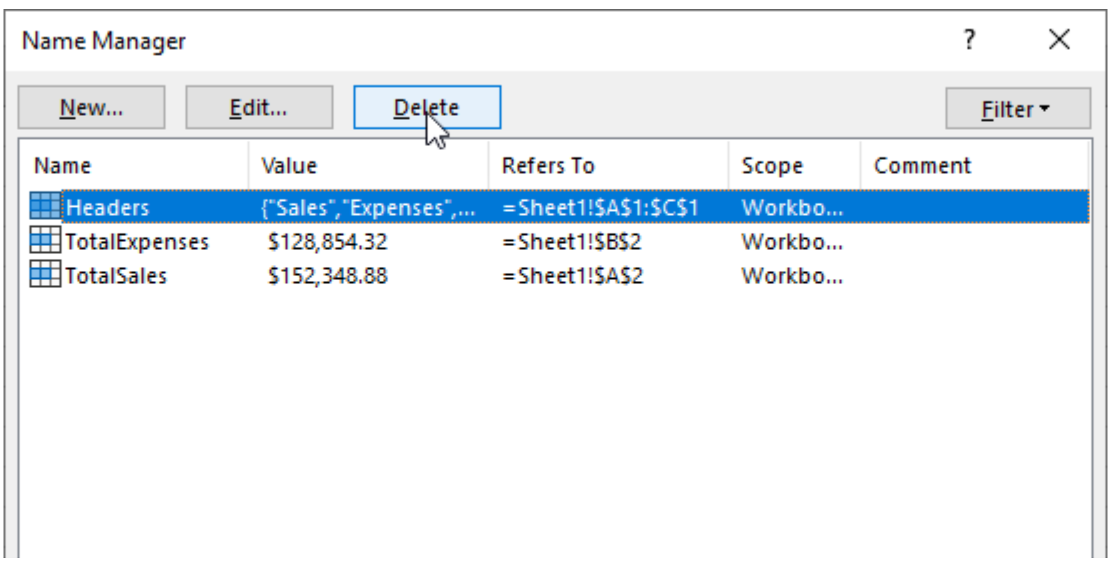


If you select a name from the list in the Name Manager dialog box and then click the **Edit** button, the **Edit Name** dialog box will be shown:



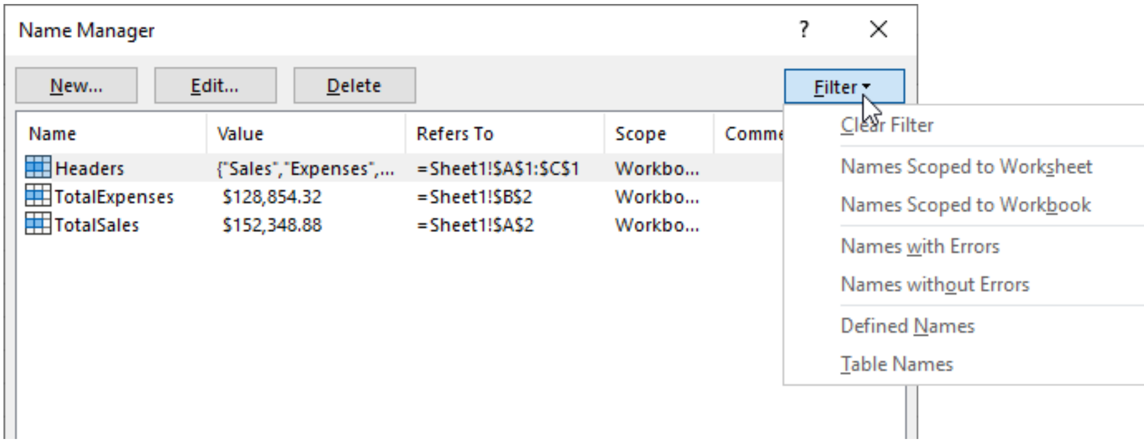
This dialog box is identical to the New Name dialog box; the only difference is that it will be prepopulated with information from the selected range name.

To delete a range name, click to select the range name in question and then click the **Delete** button:



A dialog box will then open to ask you to confirm this action. Click **OK** to complete the deletion process.

Finally, the **Filter** command is used to show only certain ranges based on specified criteria:

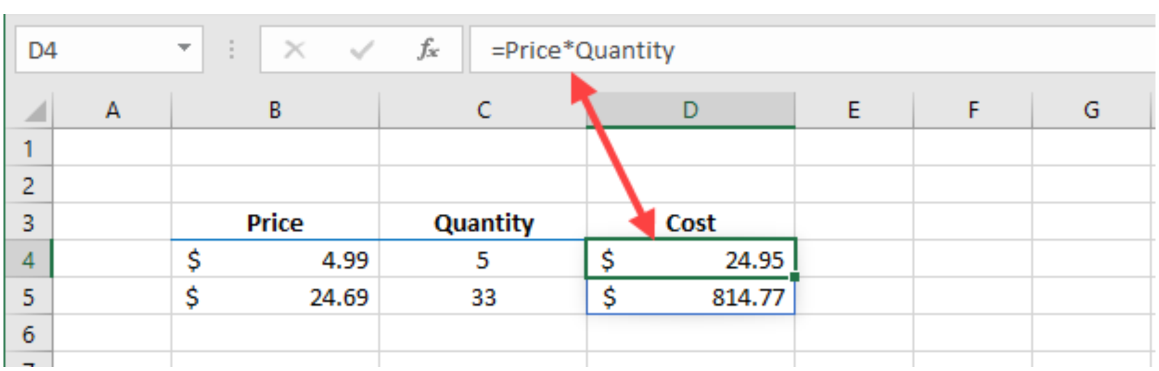


This is particularly useful when working with a workbook that contains a large amount of range names, as you can quickly narrow down the list to only those ranges that you would like to work with.

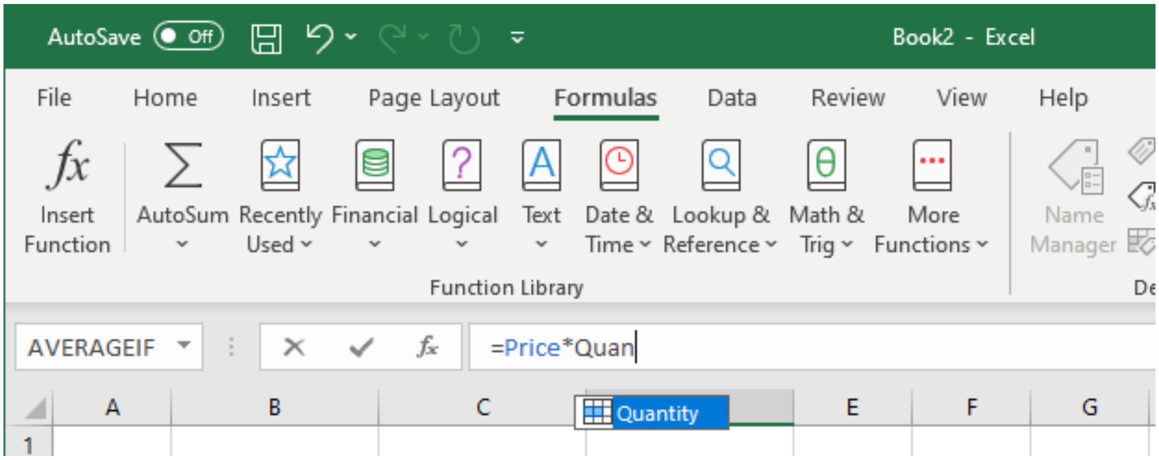
Using Range Names in Formulas

Cell and range names are not just useful in keeping your workbooks more organized; they can also help immensely in the creation of formulas. This is because after you have defined a cell or range name, you are able to use that name in place of the usual cell reference. This makes formulas much more readable.

For example, below you can clearly and quickly see what this formula does. If it used standard cell references, it would be more difficult to understand:

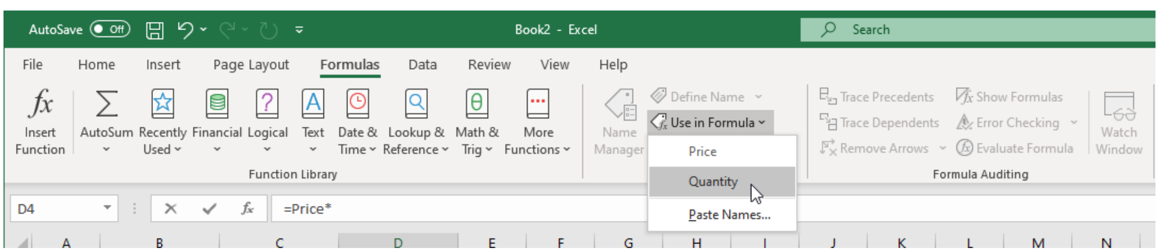


Perhaps one of the easiest methods to enter cell and range names into a formula is to use the **Formula AutoComplete** feature. In the same way the AutoComplete feature suggests function names based on the first few characters that you type into the Formula Bar, it will also suggest cell and range names in a small menu. Double-clicking on a suggestion in this menu will insert it into the formula:



You can differentiate names from functions and other objects suggested by the small tag icon that appears by each name (- function, - named cell or range, - table).

In addition to manually entering cell and range names, you can also utilize the **Use in Formula** command to insert existing cell and range names into formulas. To access this command, click **Formulas → Use in Formula:**

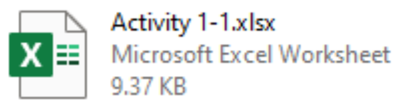


This action will display a drop-down menu listing all of the existing cell and range names. Clicking on an option will insert its reference into the Formula Bar.

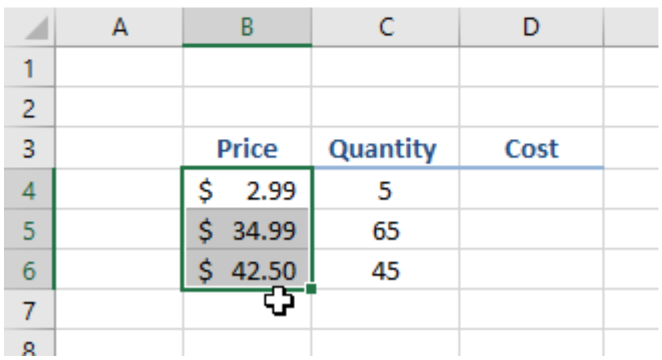
Activity 1-1: Using Range Names in Formulas

Using the features that you learned about in this topic, you will complete a small sales worksheet.

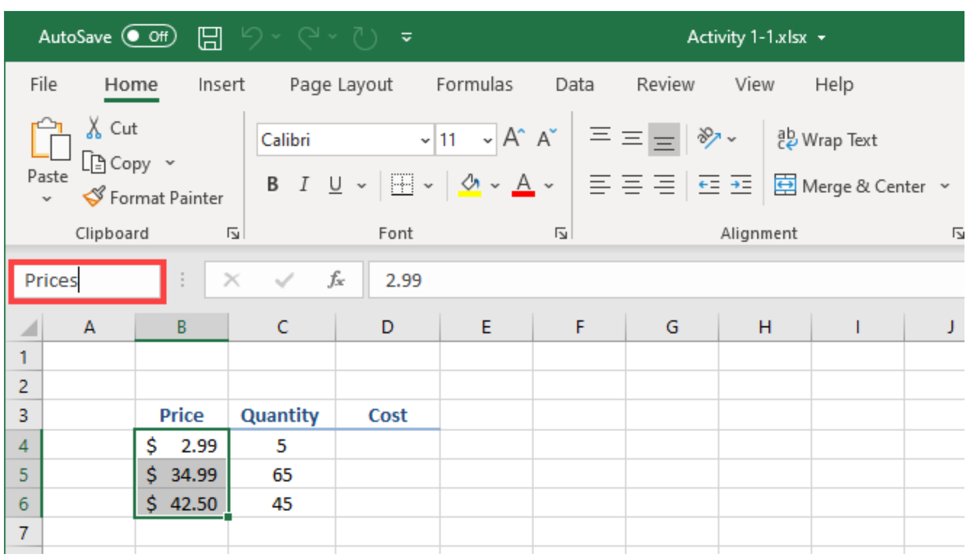
1. To begin, open Activity 1-1 from your Exercise Files folder:



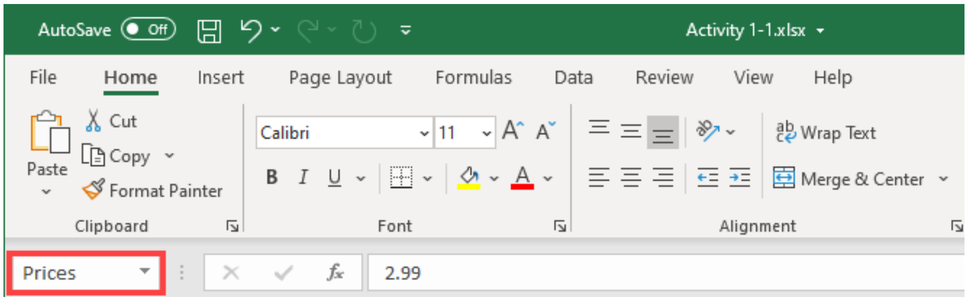
2. To create the first range name, use your cursor to select cells **B4:B6**:



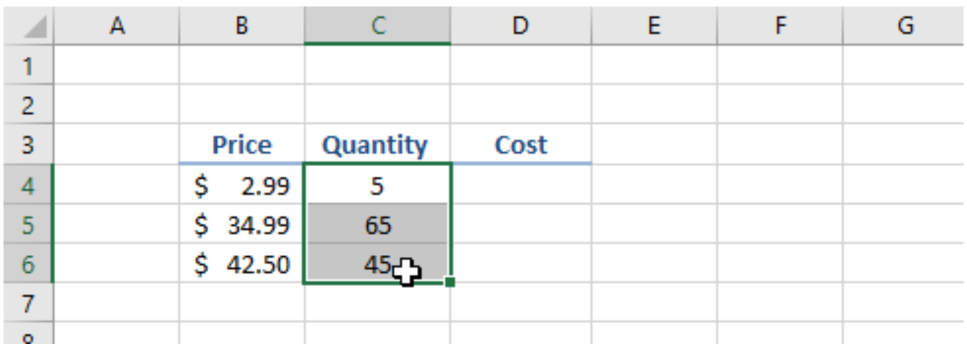
3. Next, type "**Prices**" inside the Name Box. Press **Enter:**



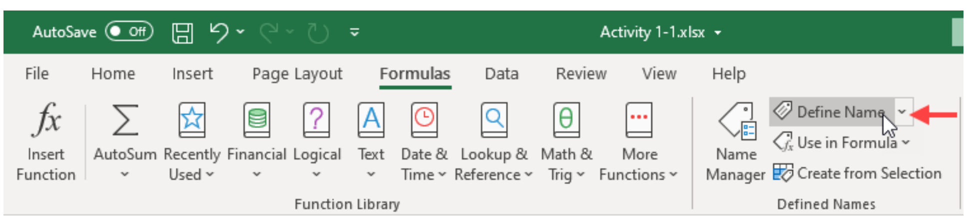
4. The selected range now has “Prices” as a range name:



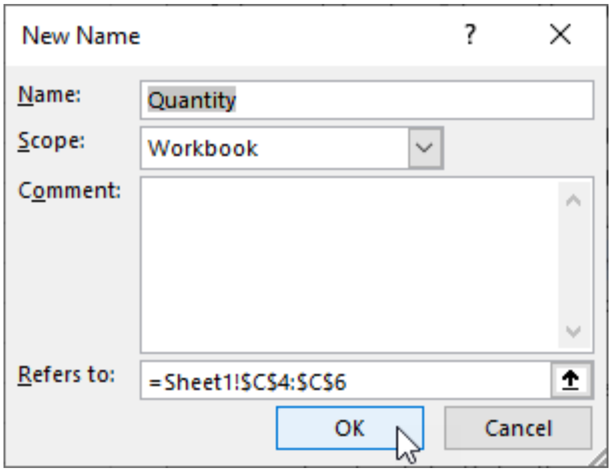
5. Now, let’s try another method to create another range name. First, use your cursor to select cells **C4:C6**:



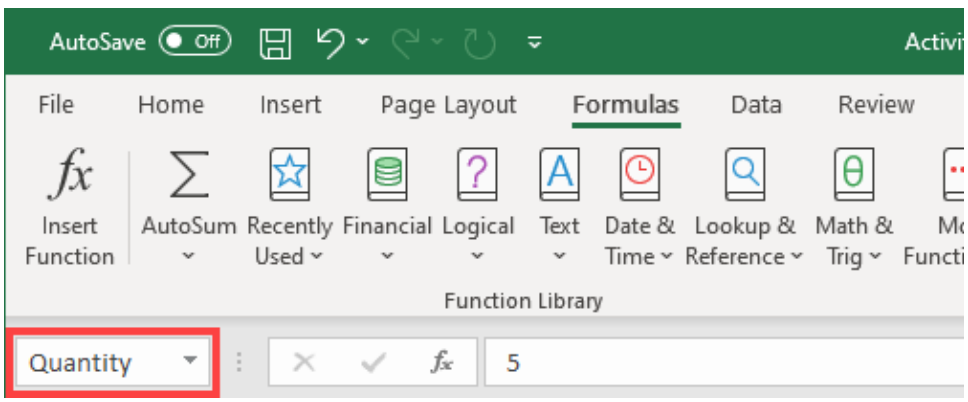
6. Next, click **Formulas → Define Name:**



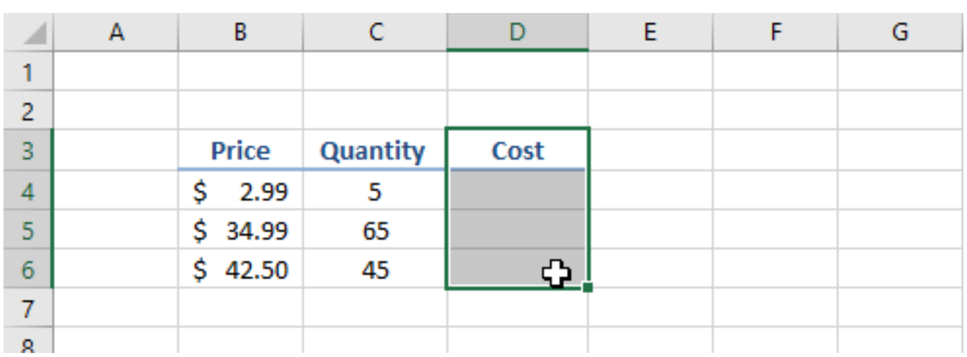
7. The New Name dialog box is now displayed. Ensure that "**Quantity**" appears inside the Name text box and that the Scope drop-down menu is set to **Workbook**. Click **OK:**



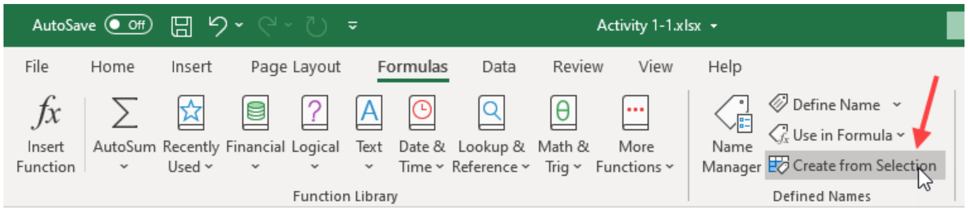
8. The selected range now has "**Quantity**" as a range name:



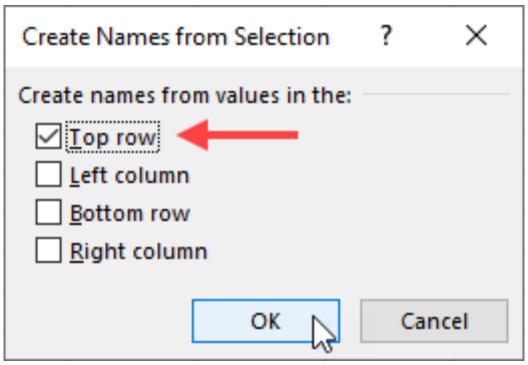
9. You have one more range name to create. Use your cursor to select cells D3:D6:



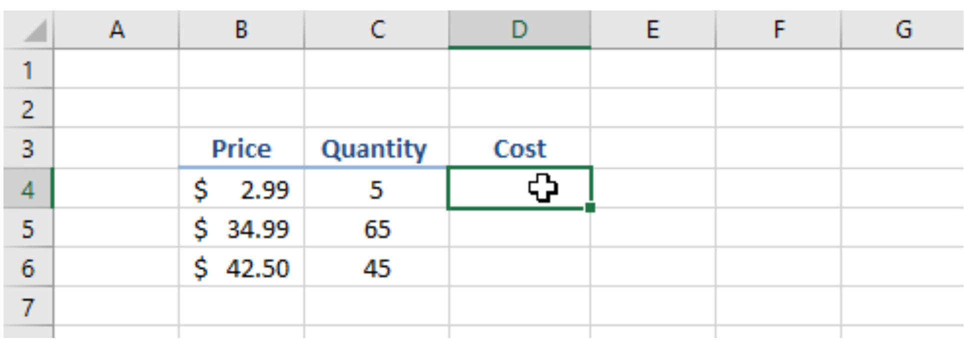
10. Click **Formulas → Create from Selection:**



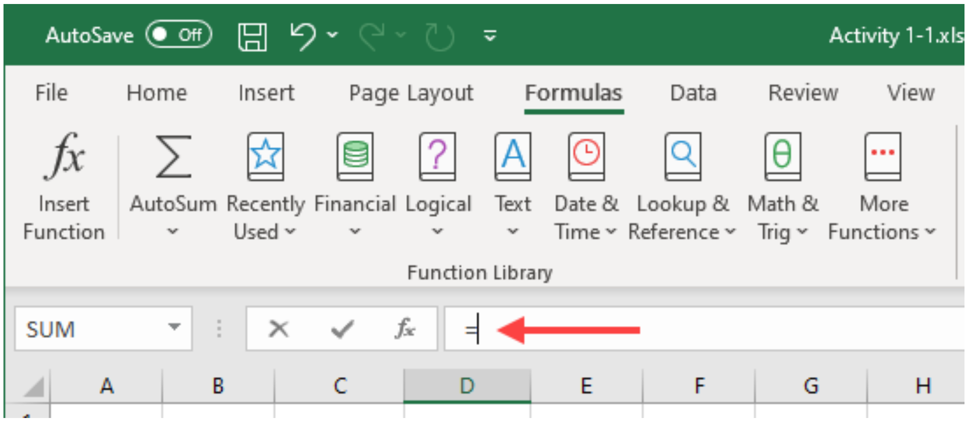
11. In the Create Names from Selection dialog box, ensure that the "**Top row**" checkbox is selected and click **OK:**



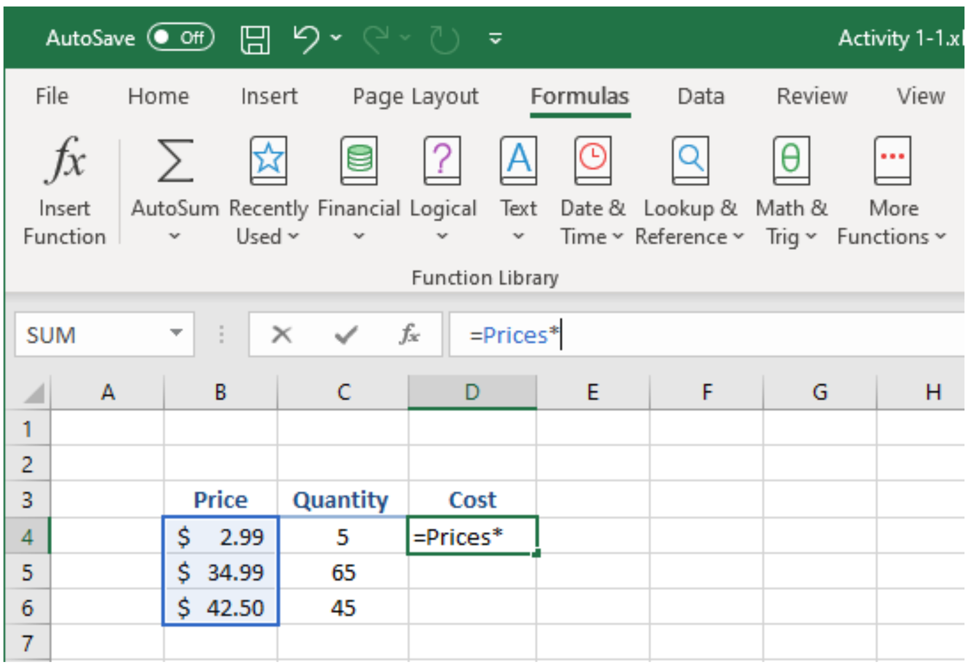
12. Next, you need to create a formula that will calculate the cost of the items (Quantity*Prices). Select cell **D4**:



13. Click inside the Formula Bar and type "**=**":

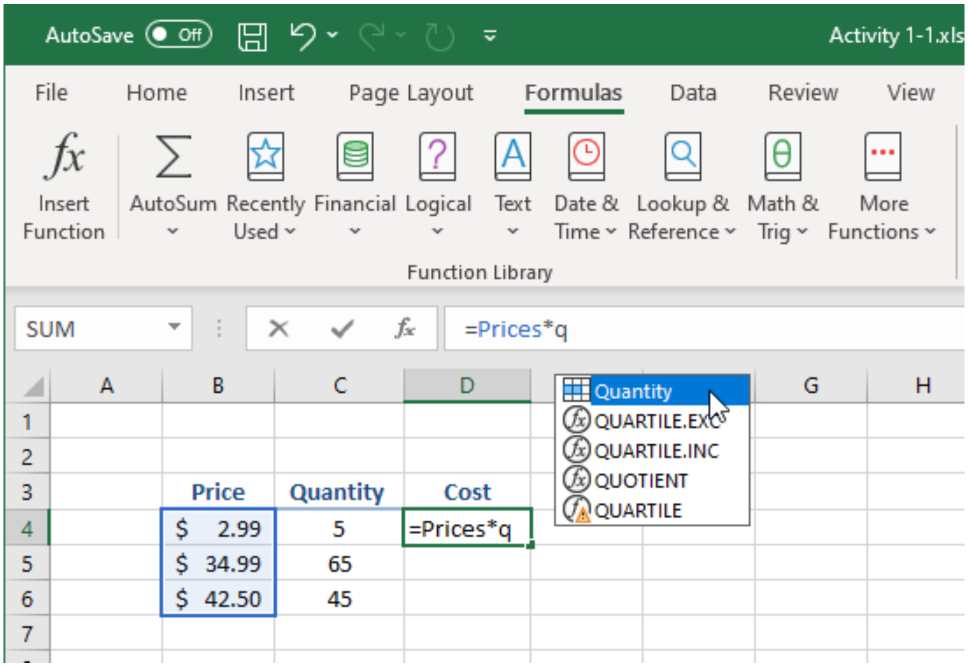


14. Next, type "**Prices**" followed by an **asterisk**:

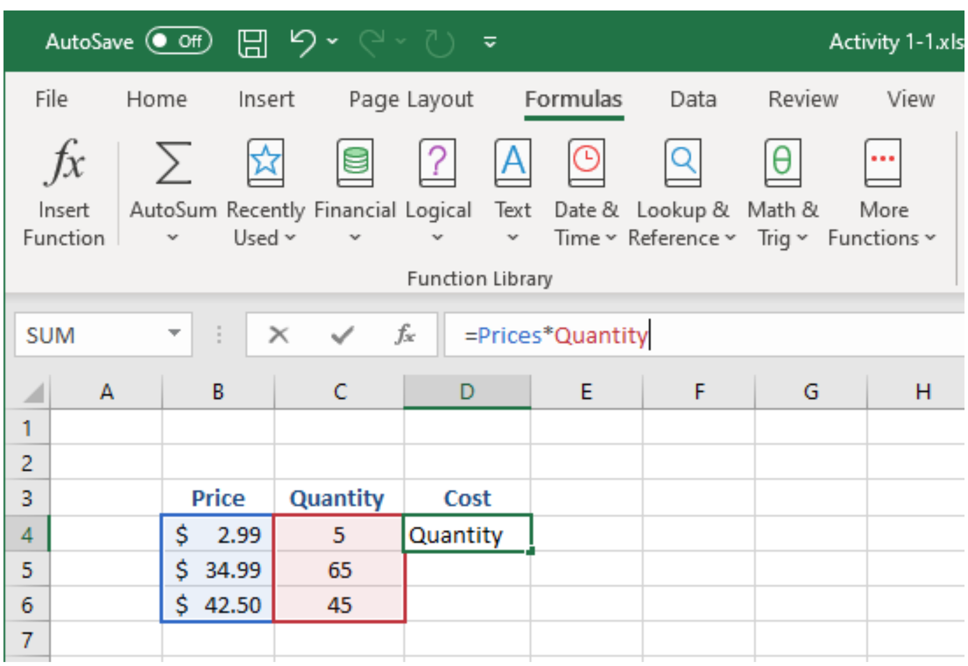


Note that because Prices is a range name, its text will appear blue in the Formula Bar and blue shading will appear around that range of data on the worksheet.

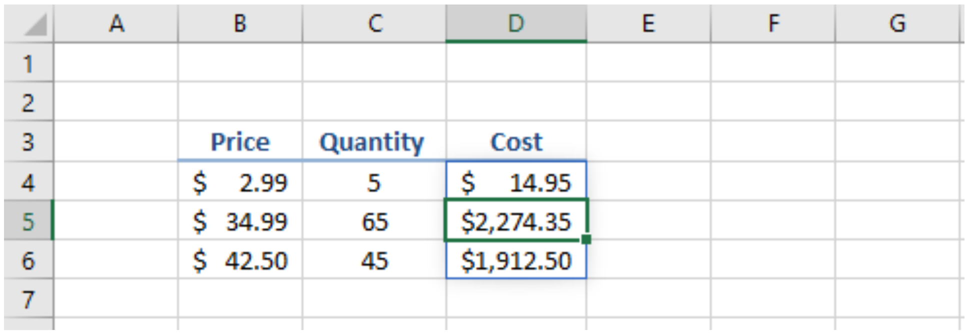
15. Still inside the Formula Bar, type "**Q**" and then **double-click the Quantity result** from the small menu that appears:



16. The Quantity name now appears within the Formula Bar in red text, with its associated range shaded in red in the worksheet:



17. Press **Enter** to apply the formula. You will see the results appear in cells D4 through D6:



(You may receive a "Formula Spilled" alert, indicating that the formula returned multiple values, so they were spilled into the neighboring blank cells. Because each of the named ranges contains more than one value, Excel must predict the correct calculation for each value.)

18. Save the current workbook as Activity 1-1 Complete and then close Microsoft 365 Excel to complete the exercise.

TOPIC B: Use Specialized Functions

A function is a predefined formula that is available in Excel and performs a specific calculation based on specified values, called arguments. While the basic functions in Excel cover the majority of use cases, there are some situations where a specialized function is more appropriate. To find and use specialized functions, you must be familiar with their syntax and understand how they work on a fundamental level.

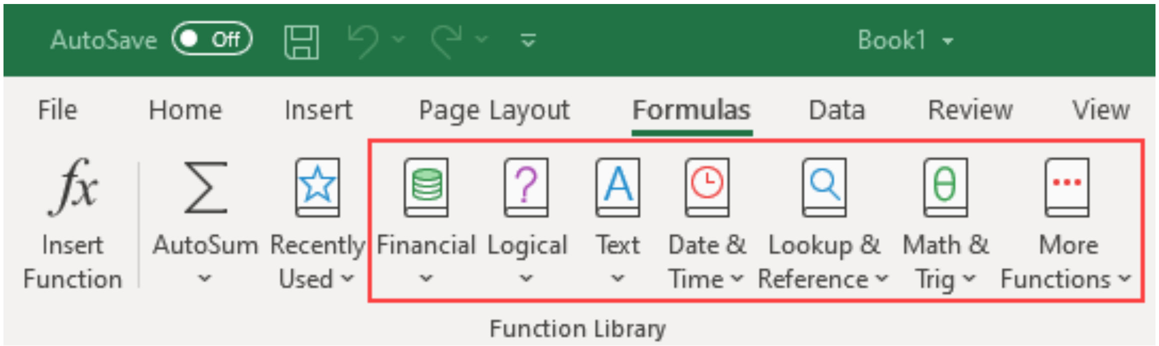
Topic Objectives

In this session, you will learn:

- About function categories
- About function syntax
- About function entry dialog boxes
- How to use nested functions
- About automatic workbook calculations
- How to show and hide formulas
- How to enable iterative calculations
- About finding Excel Functions

Function Categories

Every built-in **function** that is available in Excel has been categorized into one of 12 standard categories. These categories are available on the **Formulas** tab, with some categories available under the More Functions drop-down menu:



(Note that you can expand the number of standard categories using add-ons.)

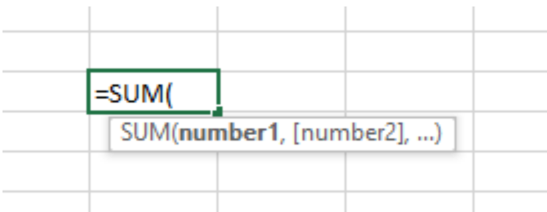
Here is a list of what types of functions each of the available categories contains:

Financial	This category contains dozens of functions that can be used to calculate financial data such as compound interest, rates of return, and depreciation.
Logical	The functions in this category are used to return values that are either true or false. Typically, these functions are used in conjunction with other formulas.
Text	Functions in this category are used to manipulate text. For example, you will find functions that will replace text or convert text to uppercase.
Date & Time	These functions can be as simple as calculating the current date to calculating the number of workdays in a year.
Lookup & Reference	The functions in this category are used to find specific values in a specified range or table.
Math & Trig	This category includes a variety of common mathematical functions.

Statistical	The functions in this group are used to perform a variety of statistical analysis tasks. For example, you will find functions to calculate mean and median data.
Engineering	This category includes functions that are commonly used in engineering settings.
Cube	The functions in this category are used to perform complex data analysis using OLAP (Online Analytical Processing) cubes.
Information	Functions in this category give you information about the worksheets in your workbook and the data that they contain. For example, one function has the ability to determine the type of data in a cell.
Compatibility	The functions in this category are unique in that they are actually older versions of functions that are still available. Such functions are useful if you are working with workbooks that were created in older versions of Excel.
Web	The functions found in this category are used to return data from web services, return data from XML content, and return URL-encoded string data.

Function Syntax

To successfully use functions in Excel, you must first understand the required values for the function, and the order in which they are used. This is known as **syntax**. Excel displays the syntax of a function by first stating the function, then, in brackets, listing the required arguments. Any argument enclosed in square brackets ([]) is optional, where all other arguments are required. Whenever you are entering a function, either in a cell or in the Formula Bar, Excel will display the function syntax in a **ScreenTip**, and the current argument will be bold:



Functions are a major part of what makes Excel so popular, so now we will explore some different types of functions and learn some tricks that you can use to perform complex calculations. Just keep in mind that even the most complex of formulas can be broken down into simple parts. Remember to pay attention to the order of precedence (using the **BEDMAS** acronym) and the number of parentheses you use.

The SUMIF Function

=SUMIF(range, criteria, [sum_range])

The **SUMIF** function is used to calculate the sum of values in a specified **range** if they meet a specified **criteria**. For example, you could calculate total sales figures and only include numbers that are less than a specified value. The **sum_range** argument is optional; you can use it if you want to add cells to the sum other than those specified in the argument. If you choose to leave out this argument, the function will only calculate the sum of the values from the previous **range** argument.

Below are some example of the SUMIF function in action:

Function	Description
=SUMIF(A1:C10, “<5”)	Only numbers in the range A1:C10 that are under 5 will be added together.
=SUMIF(A1:C10, “December”, D1:D10)	Only numbers in the range D1:D10 will be added together where they correspond with the text entry of “December” in the range A1:C10.
=SUMIF(A1:A10, 5)	All numbers with the value of 5 that fall within the A1:A10 range will be added together.

The AVERAGEIF Function

=AVERAGEIF(range, criteria, [average_range])

The **AVERAGEIF** function will return the average of every cell within a range if the specified criteria are met. For example, if you want to calculate the average sale amount in a set range of sales data only for sales below a certain amount you could use this function. The **average_range** argument is optional; it can be used if you want to add cells to the sum other than those specified by the **range** argument. If you choose to leave out this argument, the function will only calculate the average of the values from the **range** argument.

Below are some AVERAGEIF functions in action:

Function	Description
=AVERAGEIF(A1:C10, “<5”)	The average of all numbers in the range A1:C10 that are under 5 will be calculated.
=AVERAGEIF(A1:C10, “December”, D1:D10)	The average for the numbers in the range D1:D10 will be calculated where they correspond with the text entry of “December” in the range A1:C10.

The COUNTIF Function

=COUNTIF(range, criteria)

The **COUNTIF** function will count the number of cells in a specified **range** if the **criteria** are met. For example, this function could be used to count the number of sales associates who have sold X number of products.

Function	**Description**
=COUNTIF(A1:C10, “<5”)	This function will count all cells within the A1:C10 range where the value is 5 or lower.
=COUNTIF(A1:A10, 5)	This function will count all cells within the A1:A10 range only where the value is 5.

IFS Functions

The functions that have been covered so far (AVERAGEIF, COUNTIF, and SUMIF) all have an equivalent **IFS** function that allow you to perform those respective calculations on data that requires more than just one specified criteria.

With a few exceptions, such functions have very similar syntax:

=SUMIFS(sum_range, criteria_range1, criteria1, [criteria_range2], [criteria2], …)

=AVERAGEIFS(average_range, criteria_range1, criteria1, [criteria_range2], [criteria2], …)

=COUNTIFS(criteria_range, criteria1, [criteria_range2], [criteria2], …)

The COUNTA Function

=COUNTA(value1, [value2],...)

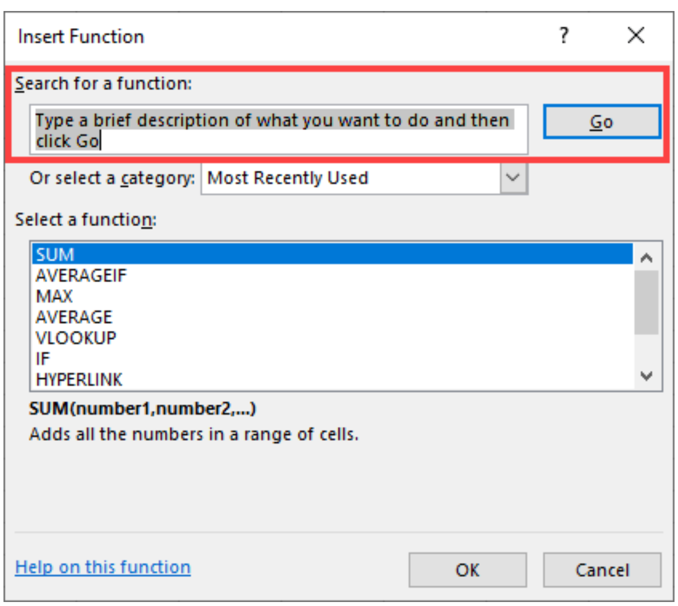
The **COUNTA** function is used to count the number of cells specified by the argument (**value1**, **value2**, etc.) that are not empty.

Function	Description
=COUNTA(A1:A10)	All cells that contain data within the A1:A10 cell range will be counted.
=COUNTA(A1:A10, B1, C1)	All cells that contain data within the A1:A10 range, as well as cells B1 and C1, will be counted.

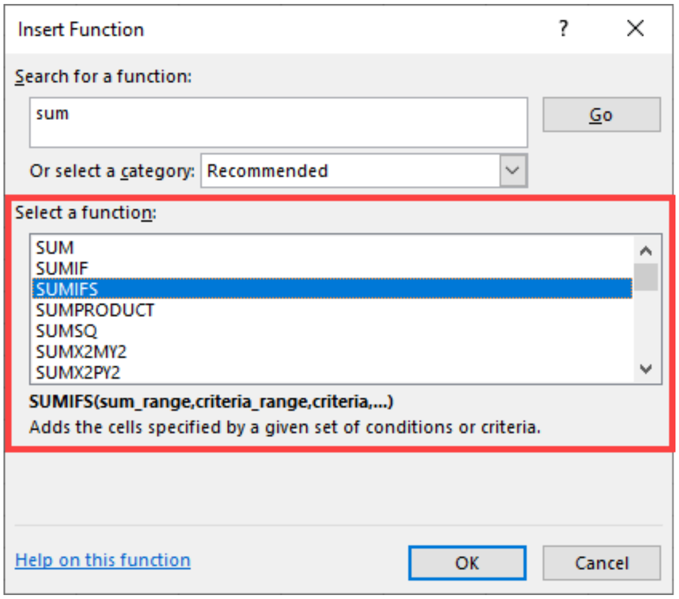
Finding Excel Functions

While you become familiar with Excel functions, you may find it challenging to know which function to use in specific situations. In such cases tools are available to help you identify an appropriate function for your purpose.

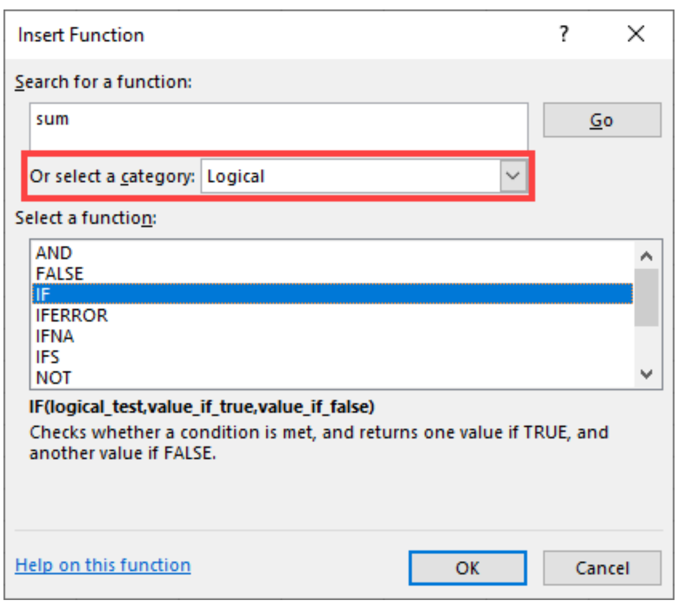
One option is the **Search for a function** feature in the **Insert Function** dialog box:



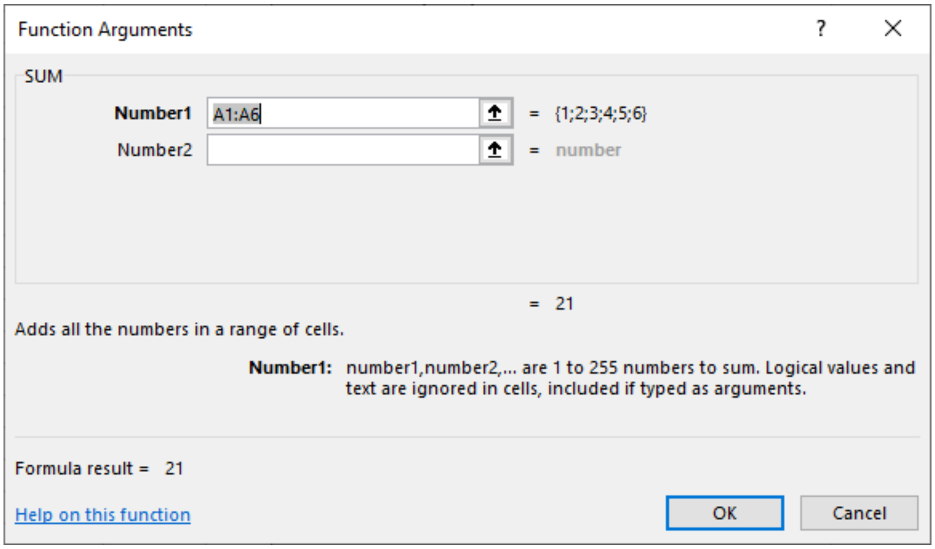
As the Search for a function textbox suggests, type a brief description of what you want to do and then click **Go**. Excel will offer matching suggestions in the **Select a function** list. Clicking a function will display the syntax and provide a brief description:



You can also select a function category from the **Or select a category** drop-down list. This will display a list of available functions in that category, in alphabetical order, in the **Select a function** list:

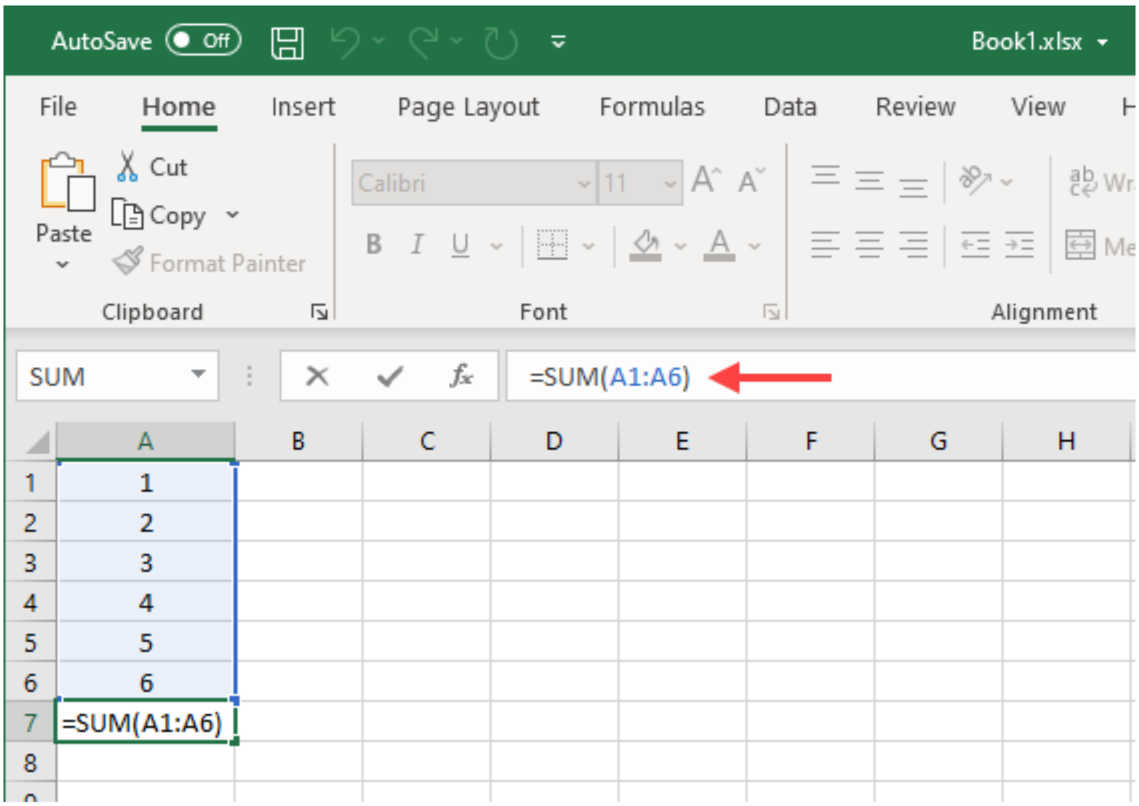


Once you have selected the appropriate function, click **OK** to open the **Function Arguments** dialog box, where you can define the required parameters:

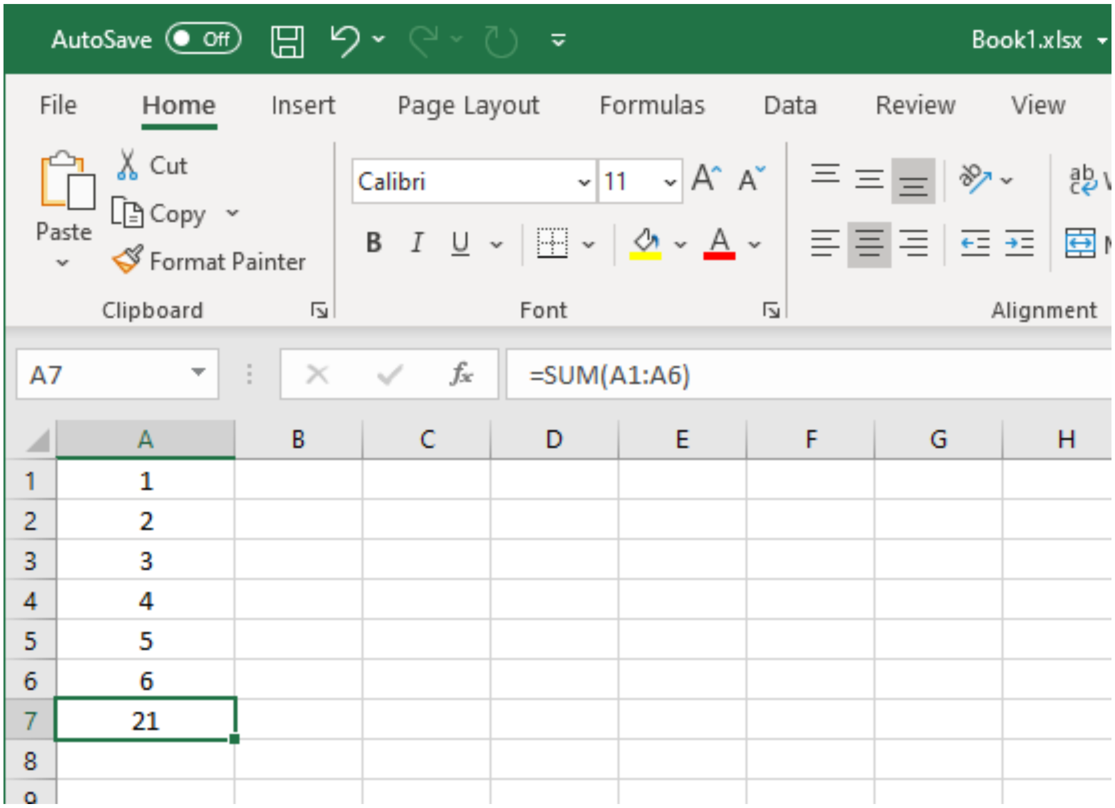


Function Entry Dialog Boxes

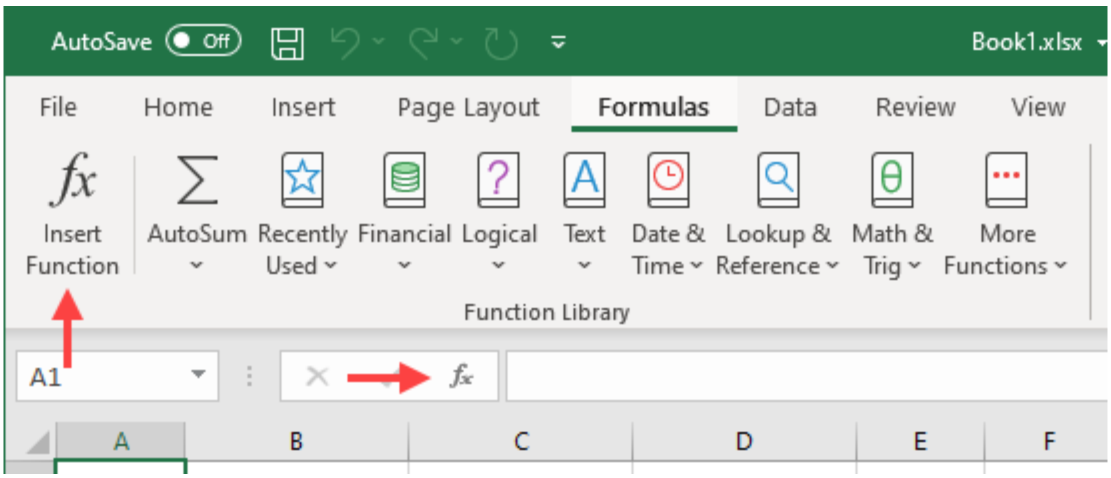
Functions can be entered into a worksheet using a number of different methods. Perhaps the most straightforward way is to type the function directly into the Formula Bar – in the same way that you would type a regular formula. For example, if we want to use the SUM function to calculate the sum total of the values inside the A1:A6 range, we would select the cell where the result will be displayed and type "=SUM(A1:A6)" into the formula bar:



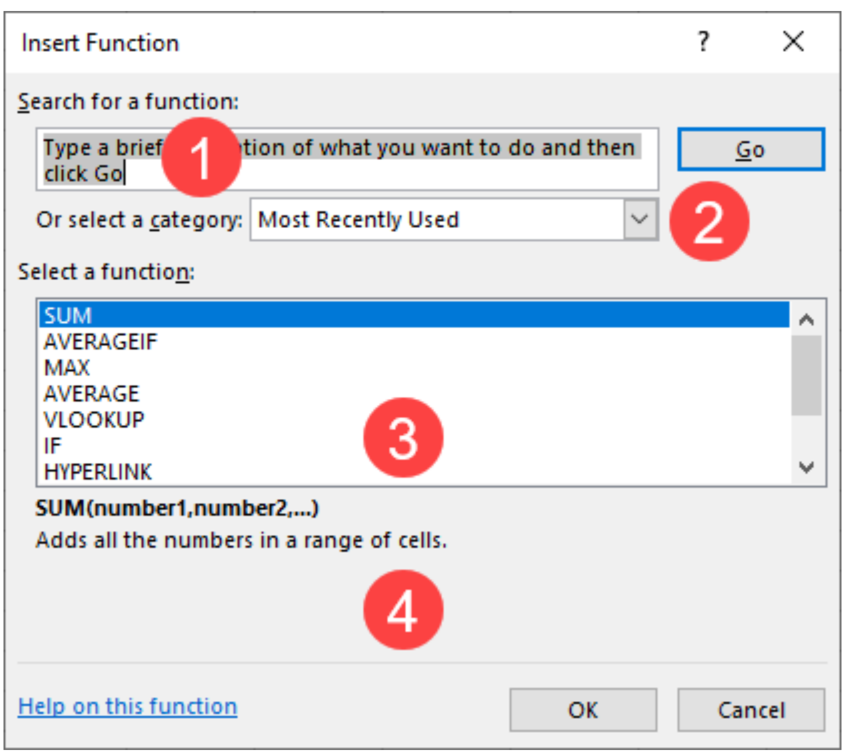
Pressing Enter or clicking the Enter button will then enter the function into your worksheet and then produce the result:



While manually entering a function into the Formula Bar can often be the fastest way to enter a function, it is sometimes a difficult method to take advantage of when you are unsure of a function's syntax. In such cases, you want to open the **Insert Function** dialog box. To open this dialog box, first select the cell in which you want the result of the function entered and then click **Formulas → Insert Function**, or click the Insert Function button that is beside the Formula Bar:

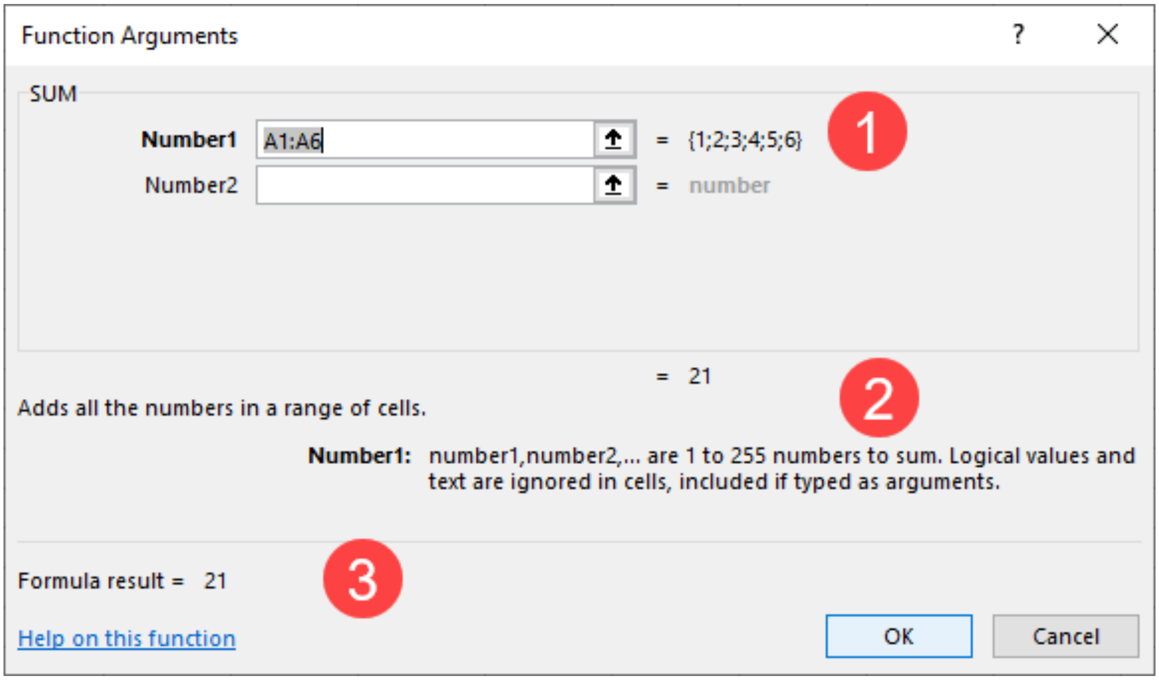


The Insert Function dialog box provides you with a **search area (1)** that you can use to find a particular function that you need, as well as a **category drop-down menu (2)** that displays all of the functions that belong to a specified category:



Near the bottom of this dialog box you will see a **list of functions (3)** that are shown based on your search or the category that you selected. Clicking any of the functions that are listed here shows you a **preview (4)** of what the syntax for the selected function is and a brief description of what that function is used for.

Once you find and select a function, click **OK** to enter it into your worksheet. This action typically displays the **Function Arguments** dialog box:



Using the controls in this dialog box, you are able to **(1) add arguments** to the function that you selected. For this example, as we are working with the SUM function, we are able to choose data ranges that will be entered into the function for us. You will also see **(2) a description of the current argument** and the result in the middle section of the dialog box. You will also see **(3) the formula result** and have access to a link at the bottom of the dialog box to get help on the function.

Clicking the **OK** button will enter the function into the worksheet using the arguments that you selected.

Using Nested Functions

Some situations require that a function be **nested** inside of another function. This means that you are using the results of the nested function as arguments. For example, here is an example of a nested function:

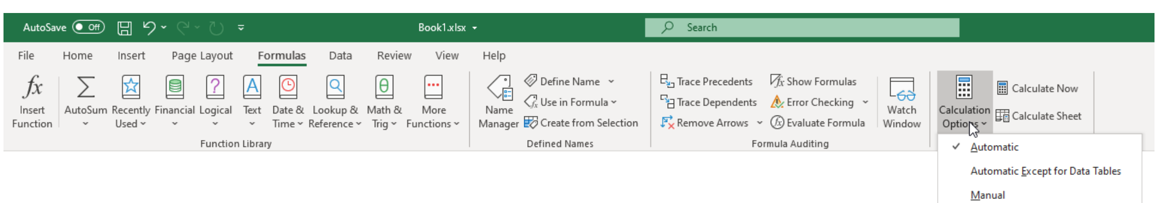
=IF(SUM(A1:A5)>10, SUM(A6:A10), 0)

In this example, two SUM functions have been nested inside of a single IF function. The way this example works is that IF the SUM of data in cells A1:A5 is greater than 10, then this formula will SUM the values of cells A6:A10 and display that result. IF the SUM of data in cells A1:A5 is less than 10, then “0” will be displayed instead.

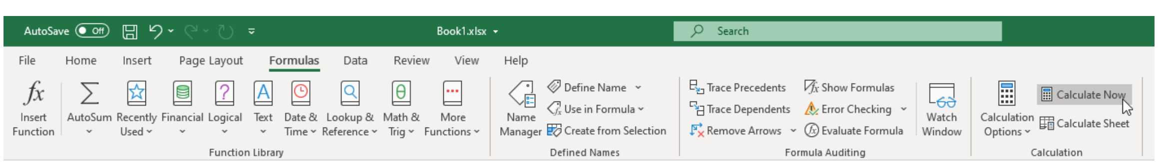
Automatic Workbook Calculations

By default, Excel workbooks will calculate the results of formulas automatically. Occasionally, you may want to switch your workbook calculations to manual recalculation so that you have more control over when formulas are calculated. Typically you would do this if you are working with a particularly large workbook and the response times in Excel are slowed when you change a value and numerous formulas calculate the results of this change at the same time.

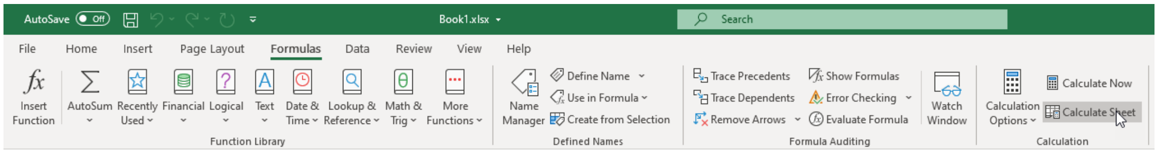
To change the calculation options, click **Formulas → Calculate Options.** This drop-down command includes the Automatic (default), Automatic Except for Data Tables, and Manual options:



If you switch to the Manual option, you can then calculate formulas in your workbook manually by clicking **Formulas → Calculate Now:**

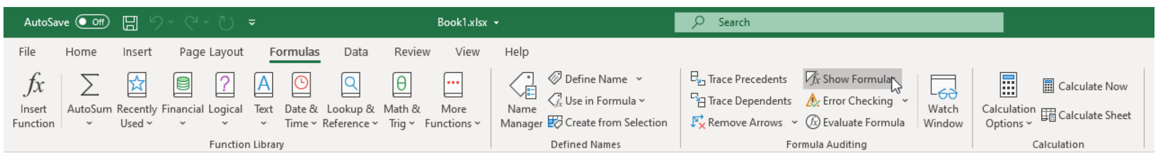


Alternatively, you can also choose to calculate only those formulas on the current worksheet by clicking **Formulas → Calculate Sheet:**

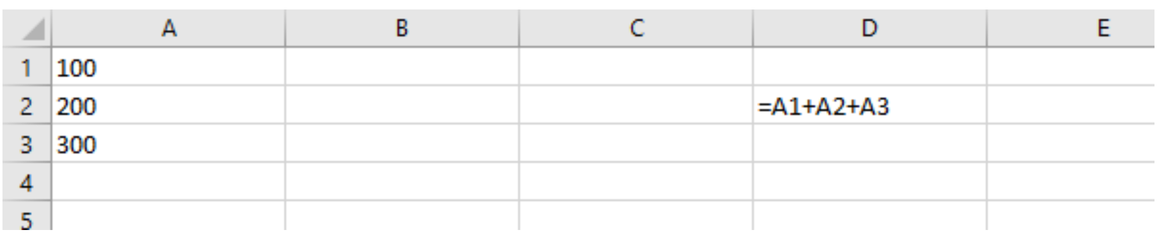


Showing and Hiding Formulas

To make creating and reviewing worksheets a bit easier, you can show the formulas (instead of the result) on the worksheet and the printed page. To do this, click **Formulas → Show Formulas:**



This action shows formulas within the sheet instead of the calculated results:

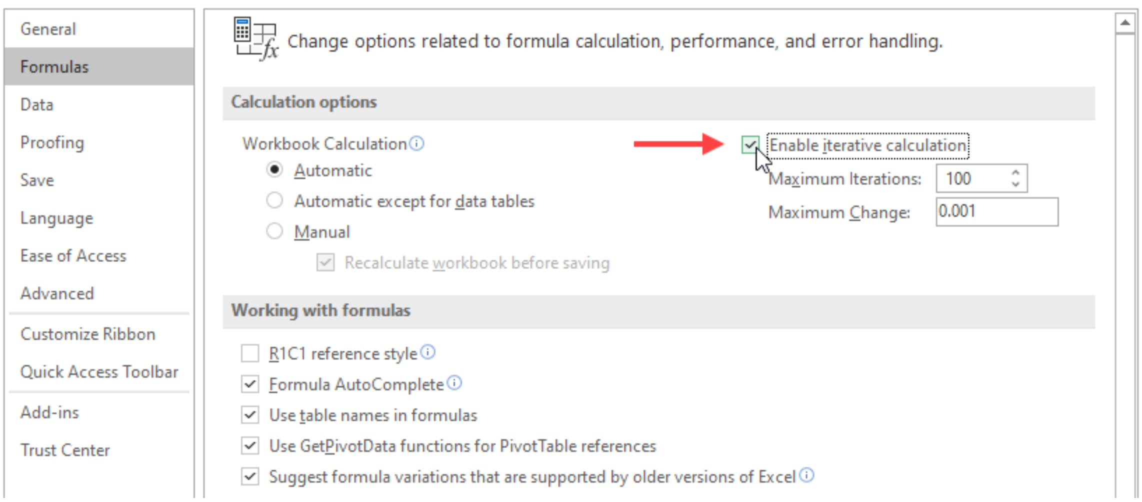


	A	B	C	D	E
1	100				
2	200			=A1+A2+A3	
3	300				
4					
5					

Enabling Iterative Calculations

While you would typically want to avoid circular references (formulas that refer to cells that contain the same formula), there are situations where this is desirable. In Excel, you are able to accommodate such situations by enabling **iterative calculations** and choosing the exact number of iterations required. Iterative calculations are those calculations that repeat until a desired condition is reached. Typically, these are used when building more complex calculations, such as those used to calculate tax accrual.

To enable iterative calculations, first open the Excel Options dialog box by clicking **File → Options.** Next, display the **Formulas** category. Finally, check the **Enable iterative calculation** check box:

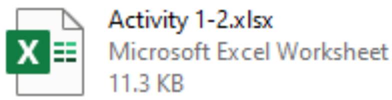


With iterative calculation enabled, any formulas that contain circular references will calculate up to the value found in the Maximum Iterations increment box (100 by default). The Maximum Change text box contains the maximum change value (.001 by default) to control how much the results change.

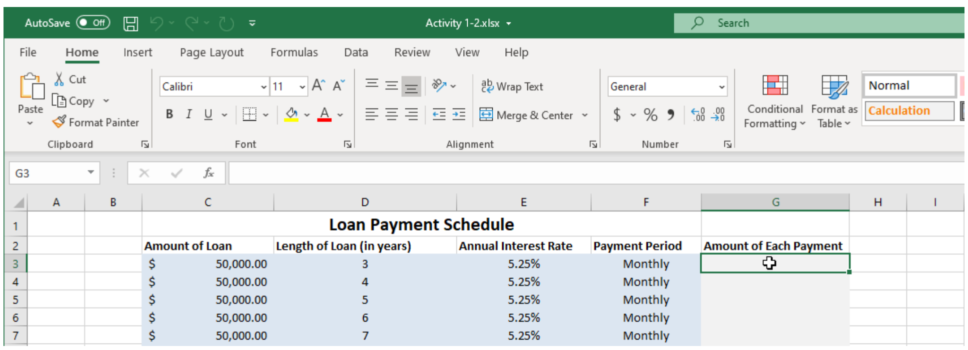
Activity 1-2: Using Specialized Functions

You have a large worksheet that contains the details of dozens of loans. A payment rate for each loan must be calculated according to the terms that have been provided for each. You will use the PMT function and the Function Arguments dialog box to complete this task.

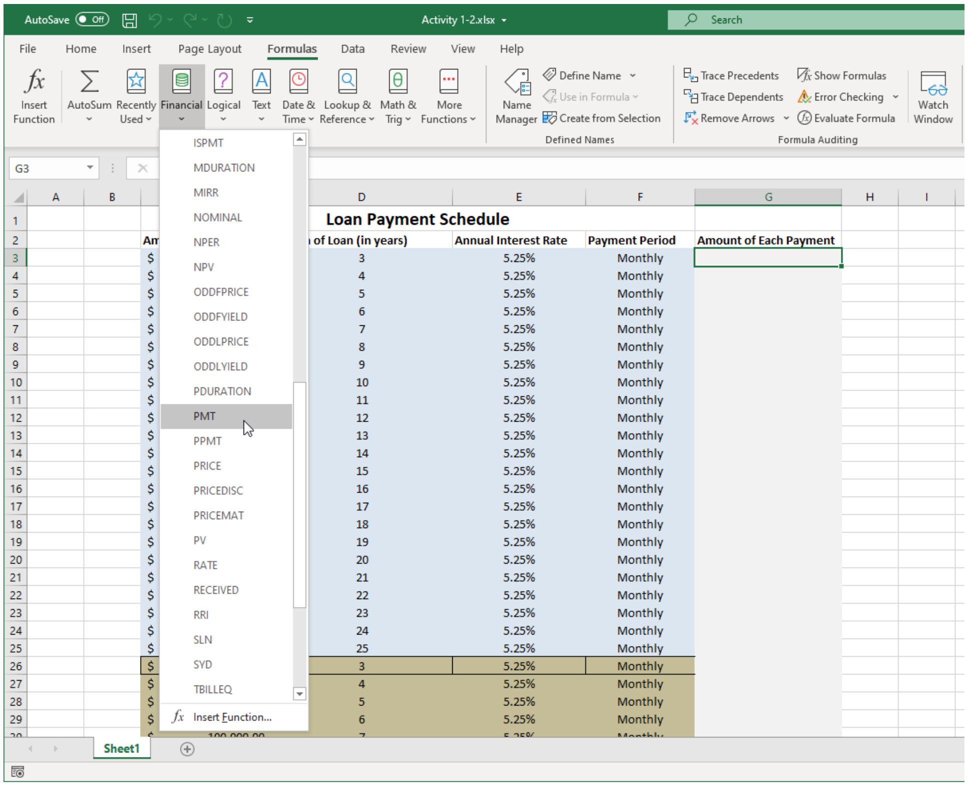
1. To begin, open Activity 1-2 from your Exercise Files folder:



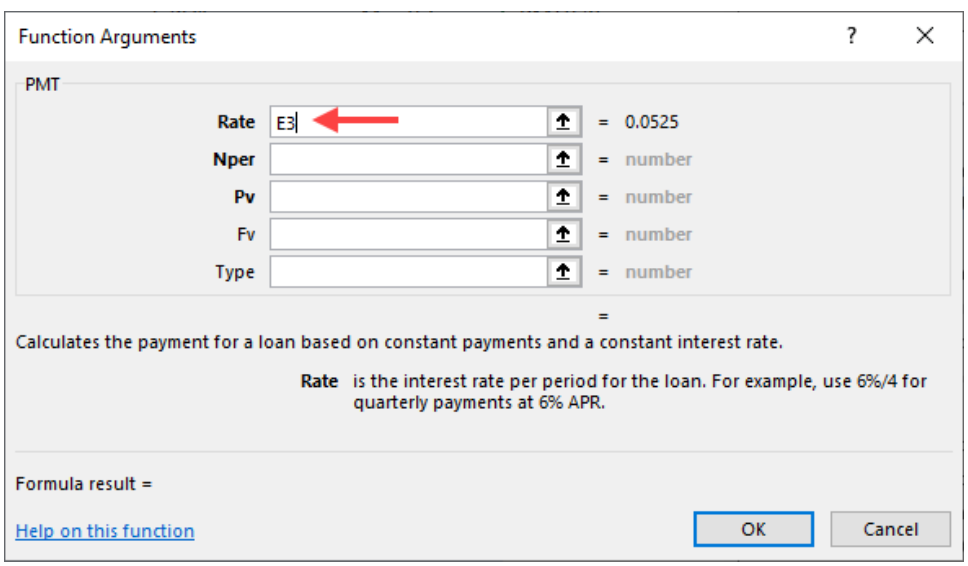
2. First, click to select cell **G3**:



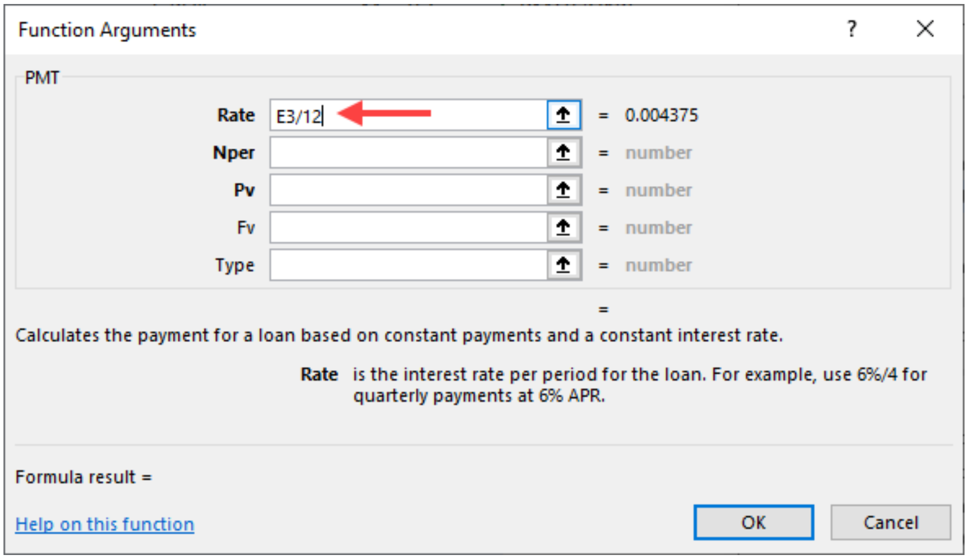
3. Next, click **Formulas → Financial → PMT:**



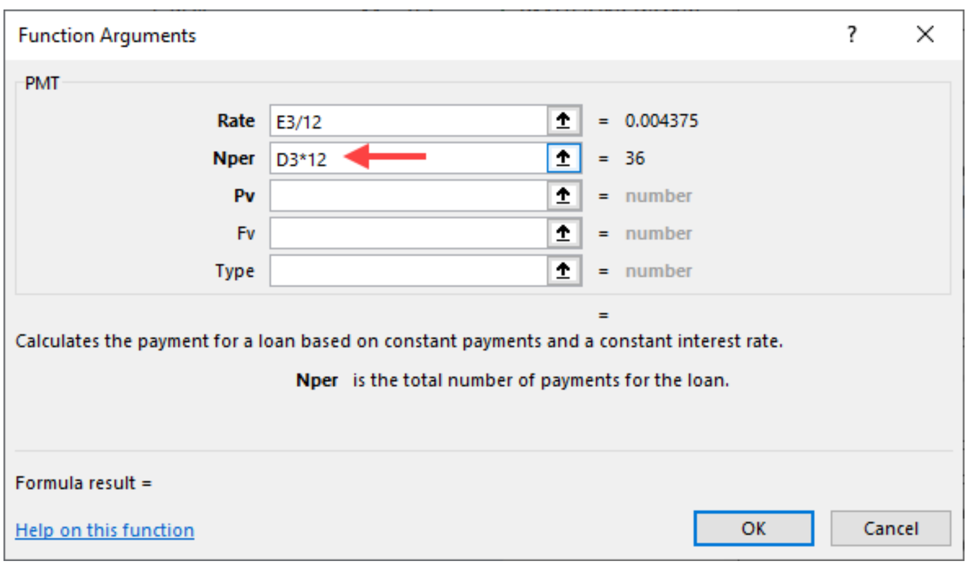
4. The Function Arguments dialog box appears. Within this dialog box you need to enter all of the arguments. As the interest rate is stored in cell E3, type "**E3**" into the Rate text box:



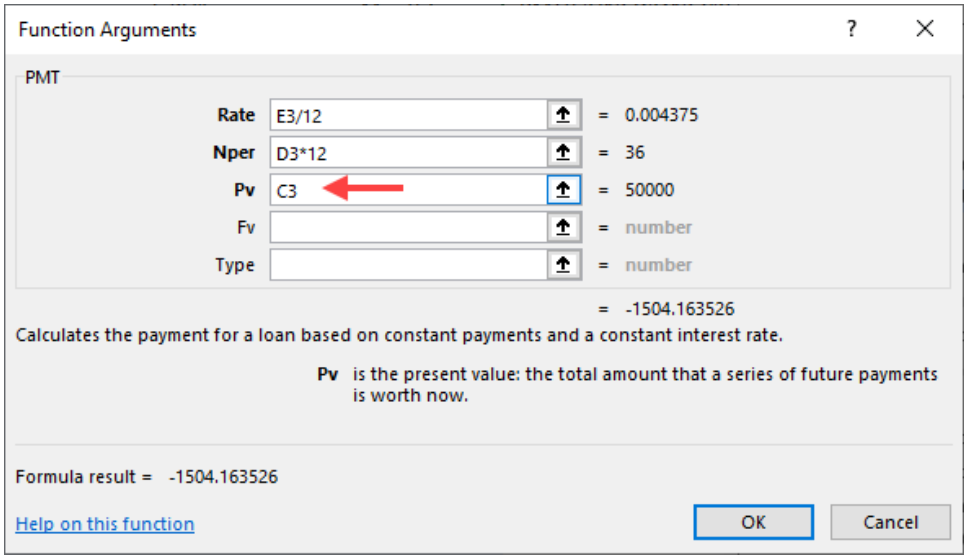
5. As these are annual interest rates and the payments will be monthly, you need to divide this value by 12. Type “**/12**” following the cell reference in the Rate text box:



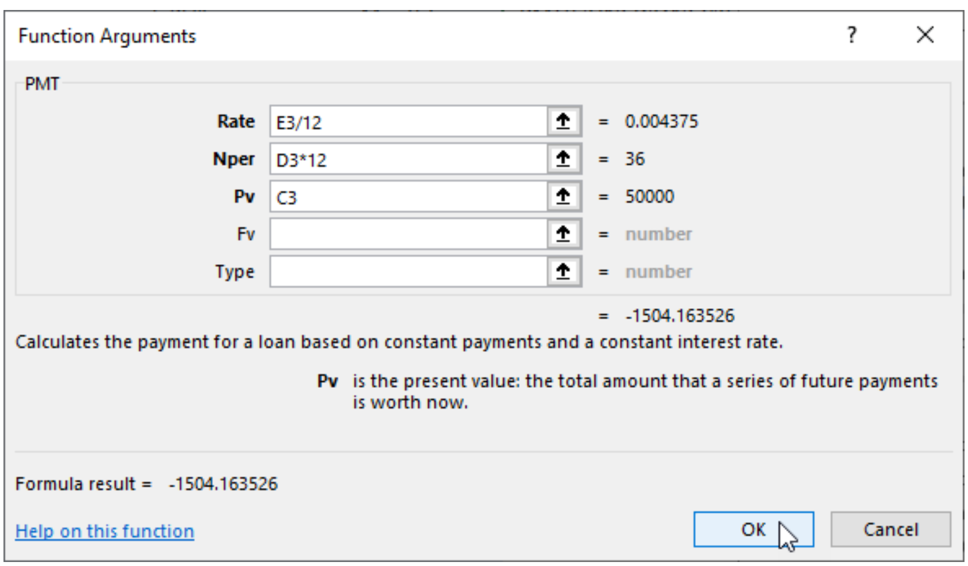
6. The next argument is Nper, or the number of payment periods over the life of the loan. This information is contained in cell D3, but it is provided in years. Because you need to enter it as months, type “**D3*12**” into the Nper text box:



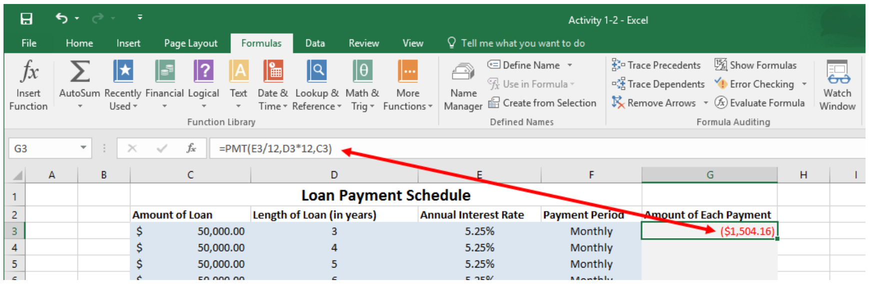
7. The next argument is Pv, or present value. This is the amount of money that is being borrowed. This information is contained in cell C3, so type “**C3**” into the Pv text box:



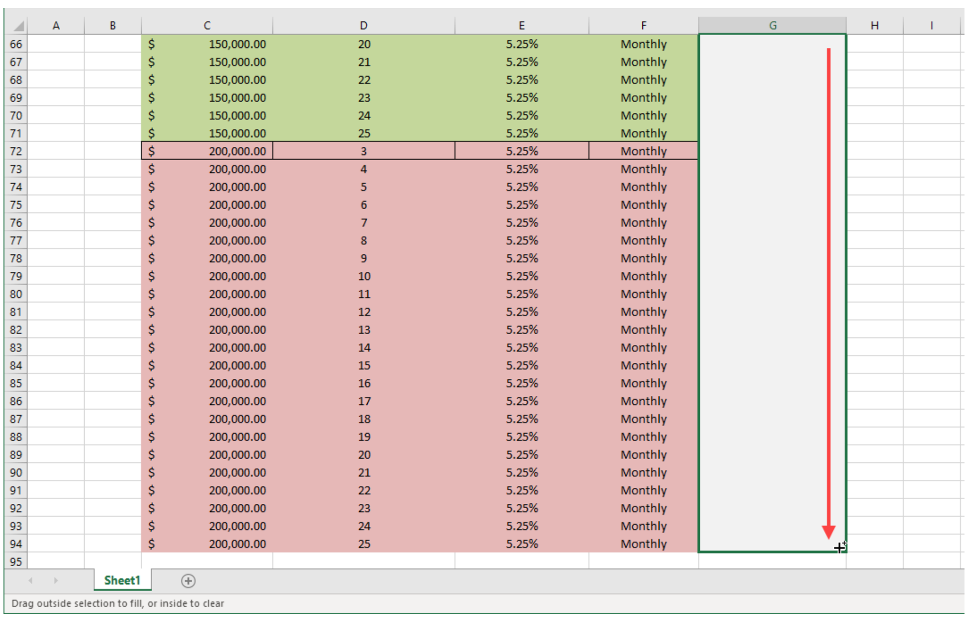
8. Leave the Fv (Future Value) argument field empty. This argument will default to 0, which is what we want. (This means there will be no part of the loan left outstanding at the end of the payments.) We will also let the Type field default to 0, meaning payments will be due at the end of the payment period. Click **OK** to create the function:



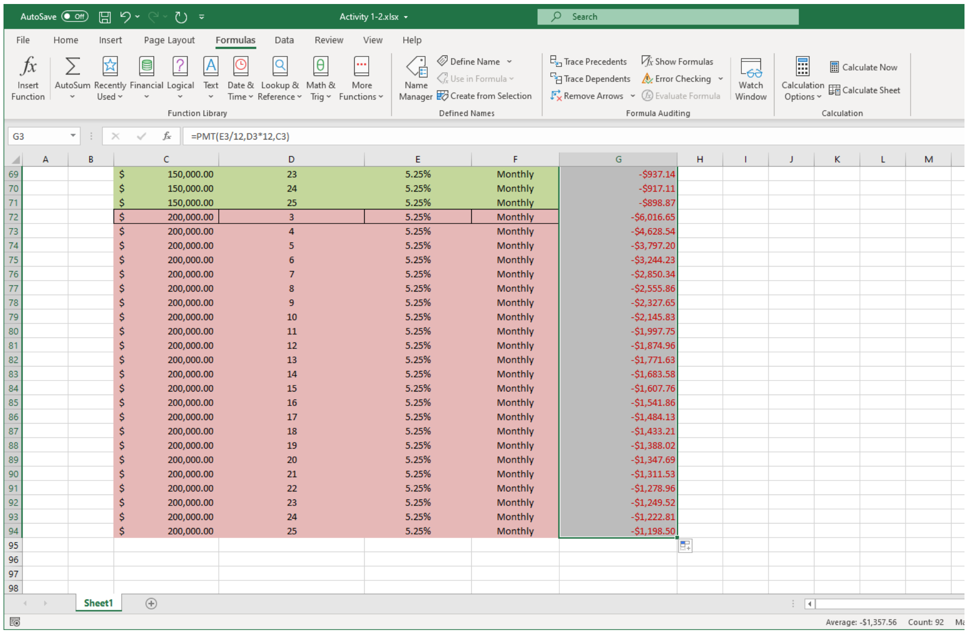
9. You now have a result in the cell G3. You will also see the PMT function in the Formula Bar:



10. Now it is time to enter this formula for the rest of the data rows. To do this, click cell **G3** to make it active, and then drag the AutoFill handle in the lower right corner of the cell down to **G94**:



11. Release the mouse button. You will see that the loan payments for each entry have been calculated:



12. Save the current workbook as Activity 1-2 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

In this lesson you learned about range names and how to apply them. Additionally, you learned about the different function categories and specialized functions that are available. You should also now be familiar with function syntax, nested functions, automatic workbook calculations, and iterative calculations.

Review Questions

1. **For a selected range, where do you type in a new range name?**

2. **How many function categories are there in Microsoft 365 Excel?**

3. **What is the command sequence to show formulas rather than calculated values in cells?**

4. **What is a nested function?**

5. **What is the command sequence to change workbook calculations to manual?**

LESSON 2: ANALYZING DATA WITH LOGICAL AND LOOKUP FUNCTIONS

Lesson Objectives

In this lesson you will learn how to:

- Use text functions
- Use logical functions
- Use lookup functions
- Use date functions
- Use financial functions

TOPIC A: Use Text Functions

Now that you are familiar with Excel's more commonly used functions, you will learn about some of its more specialized ones. In this topic you will learn about functions that are specific to text analysis.

Topic Objectives

In this session, you will learn:

- About text functions
- About LEFT and RIGHT functions
- About the MID function
- About the LEN function
- About the TRIM function
- About the UPPER, LOWER, and PROPER functions
- About the TEXTJOIN function
- About the TRANSPOSE function

Text Functions

Text functions are used in Excel to analyze text-based worksheet data. While such functions can be used for data analysis, they are typically used instead to prepare data for analysis. This is because they allow you to format textual data for use in other areas. For example, you can use text functions to import textual data from another workbook and format it so that it meets the formatting requirements for the destination workbook.

The LEFT and RIGHT Functions

```
=LEFT(text, [num_chars])
```

```
=RIGHT(text, [num_chars])
```

The **LEFT** and **RIGHT** functions are used to return a specific number of characters from either the left or the right side of a text string. Typically, these functions are used in situations where you need to transfer text to a destination where there is a limit on the number of characters each entry may have. The **text** argument is used to declare which text you would like to transfer, while the **[num_chars]** argument is used to declare how many characters you would like transferred.

Suppose that cell A1 contains “John Smith” as a text string in a worksheet. Examine the possible examples of how the LEFT and RIGHT functions would work with this data:

Function	Description
=RIGHT(A1)	As the num_chars argument was not set in this function, it will default to one character. This means that the output for this function would be “h” – the last letter on the far right of the text string.
=RIGHT(A1, 5)	With the num_chars argument set to 5, this function would result in “Smith” as an output – the last five letters on the far right of the text string.
=LEFT(A1, 5)	With the num_chars argument set to 5, this function would result in “John ” (including the space) as an output – the first five letters on the far left of the text string.
=LEFT(“John”)	This function would return only “J” as an output because the num_chars argument was not set.

The MID Function

=MID(text, start_num, num_chars)

Similar in use and design to the LEFT and RIGHT functions, the **MID** function returns characters from the middle of a text string. As with the LEFT and RIGHT functions, the **text** argument is used to reference the cell(s) with the text string in question or to enter a text string directly into the function surrounded by double quotation marks. The **start_num** argument is unique to the MID function as it tells the function which character in the text string to start with. The **num_chars** argument then allows you to set the number of characters that you would like to return from the starting point that you set in the previous argument. Keep in mind that while the num_chars argument behaves the same as it does in the LEFT and RIGHT functions, it is required in order for the MID function to operate correctly.

Suppose that A1 contains “John Smith” as a text string in a worksheet. Examine the possible examples of how the MID function would work with this text string:

Function	Description
=MID(A1, 5, 5)	In this case, the text is contained within cell A1. The start_num argument is set to 5, so the function starts five characters (including spaces) into the text string. The num_chars argument is set to five so the five characters after the starting position will be returned. This means that “Smith” would be the output for this formula.
=MID(A1, 1, 4)	In this case, the text is contained within cell A1. The start_num function is set to 1, so the function starts at the beginning of the text string. The num_chars argument is set to 4 so the four characters after the starting position will be returned. This means that “John” would be the output for this formula.

The LEN Function

=LEN(text)

The **LEN** (short for length) function’s sole purpose is to return the number of characters that appear within a text string. While there can be many uses for this function, it is typically used to ensure that text strings are of the correct length. For example, you could use this function to make sure that all of the text data within a row is under a specified length. The only argument in this function, **text**, is used to specify where the text data that you would like to count is stored.

Suppose that A1 contains “John Smith” as a text string and B1 contains “Jane Doe” as a text string. Examine the possible examples of how the LEN function would work with this information in mind:

Function	Description
=LEN(A1)	In this case the LEN function has the text argument set to A1. This means that a count of the text string within this cell will be returned. The output of this function would then be 10.
=LEN(B1)	In this case the LEN function has the text argument set to B1. This means that a count of the text string within this cell will be returned. The output of this function would then be 8.

The TRIM Function

=TRIM(text)

The **TRIM** function is used to remove any empty spaces from text strings, excluding spaces between words. This function can be very useful in solving data compatibility issues. For example, a frequent problem in data entry is random spaces at the beginning or end of a text string. Such problems can greatly affect your ability to work with text-based data.

Note that the only argument in this function, **text**, is used to specify where the text data that you would like to work with is stored.

Suppose that A1 contains " John Smith" as a text string and B1 contains "Jane " as a text string. Examine the possible examples of how the TRIM function would work with this information in mind:

Function	Description
=TRIM(A1)	In this case the TRIM function has the text argument set to A1. "John Smith" will be returned with all of the spaces at the beginning of this text string removed.
=TRIM(B1)	In this case the TRIM function has the text argument set to B1. "Jane" will be returned with all of the spaces at the end of this text string removed.

The UPPER, LOWER, and PROPER Functions

=UPPER(text)

=LOWER(text)

=PROPER(text)

The **UPPER**, **LOWER**, and **PROPER** functions are used to change the casing of text-based data. The UPPER function converts all lowercase characters into uppercase, while the LOWER function will do the opposite. The PROPER function will only capitalize the first character of each word in a text string. For all of these functions, the only argument is **text**. This is used to indicate the text-based data that you would like this function to work with.

Suppose that A1 contains “John Smith” as a text string and B1 contains “jANe smiTh” as a text string. Examine the possible examples of how the UPPER, LOWER, and PROPER functions would work with this information in mind:

Function	**Description**
=UPPER(A1)	In this example, the UPPER function converts all of the text within cell A1 to uppercase. This means that the output would be “JOHN SMITH”.
=LOWER(A1)	In this example, the LOWER function converts all of the text within cell A1 to lowercase. This means that the output would be “john smith”.
=PROPER(B1)	In this example, the PROPER function ensures that only the first character in each word in cell B1 is capitalized. This means that “Jane Smith” would be the resulting output.

The TEXTJOIN Function

=TEXTJOIN(delimeter, ignore_empty, text1, [text2], …)

The **TEXTJOIN** function allows you to combine (concatenate) text strings together from multiple cells into a single cell. This function can save you an enormous amount of time if you need to combine data from multiple sources into one cell.

The delimiter argument is used to define a text string (empty, or one or more characters) that will separate the text strings you are joining. The ignore_empty argument is either TRUE (default) or FALSE and allows the function to ignore empty cells that are defined by the text arguments. Finally, the text arguments allow you to define the text strings, or ranges of strings that you want to join.

Suppose that A1 contains “John Smith” as a text string, B1 is blank, and C1 contains “Jane Doe” as a text string. Examine the possible examples of how the TEXTJOIN functions would work with this information in mind:

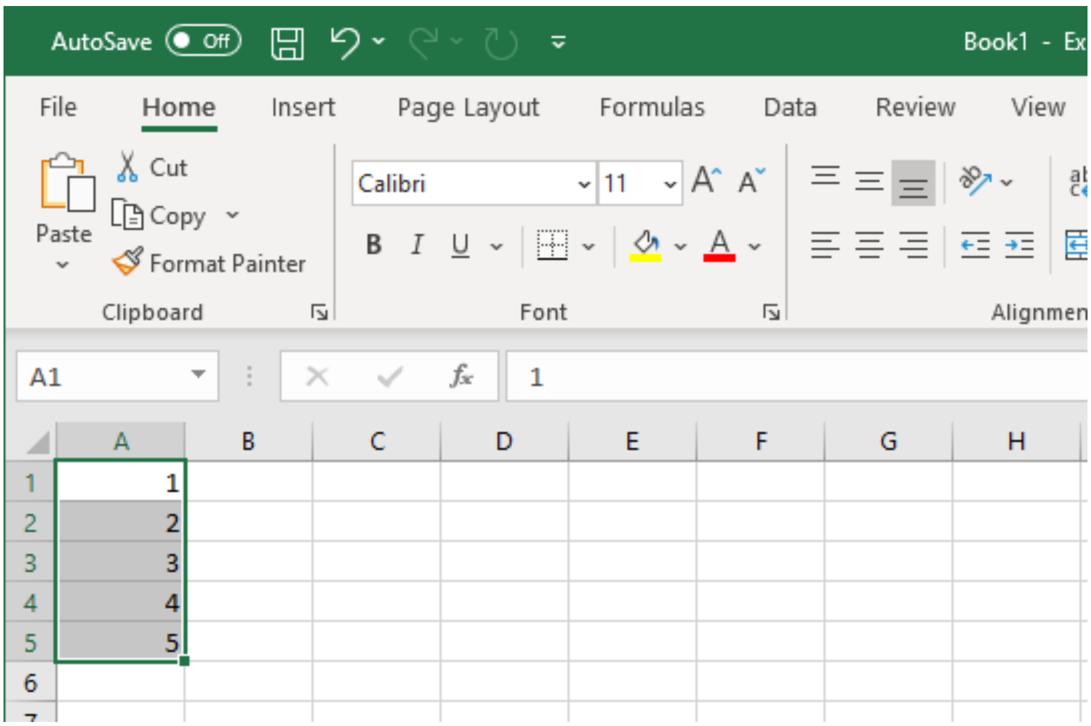
Function	**Description**
=TEXTJOIN(“, “, TRUE, A1, B1, C1)	In this example, the TEXTJOIN function combines cell A1, add a comma and a space, ignore cell B1 because it is empty, then add cell C1. The output would be “John Smith, Jane Doe”.
=TEXTJOIN(“, “, FALSE, A1, B1, C1)	In this example, the TEXTJOIN function combines cell A1, add a comma and a space, add another comma and space for cell B1, because the empty cell is not ignored, then add cell C1. The output would be “John Smith, , Jane Doe”.
TEXTJOIN(, TRUE, A1, B1, C1)	In this example, because the delimiter argument is empty, the TEXTJOIN function combines cell A1, ignore cell B1, because the ignore_empty argument is TRUE, then add cell C1. The output would be “John SmithJane Doe”.

The TRANSPOSE Function

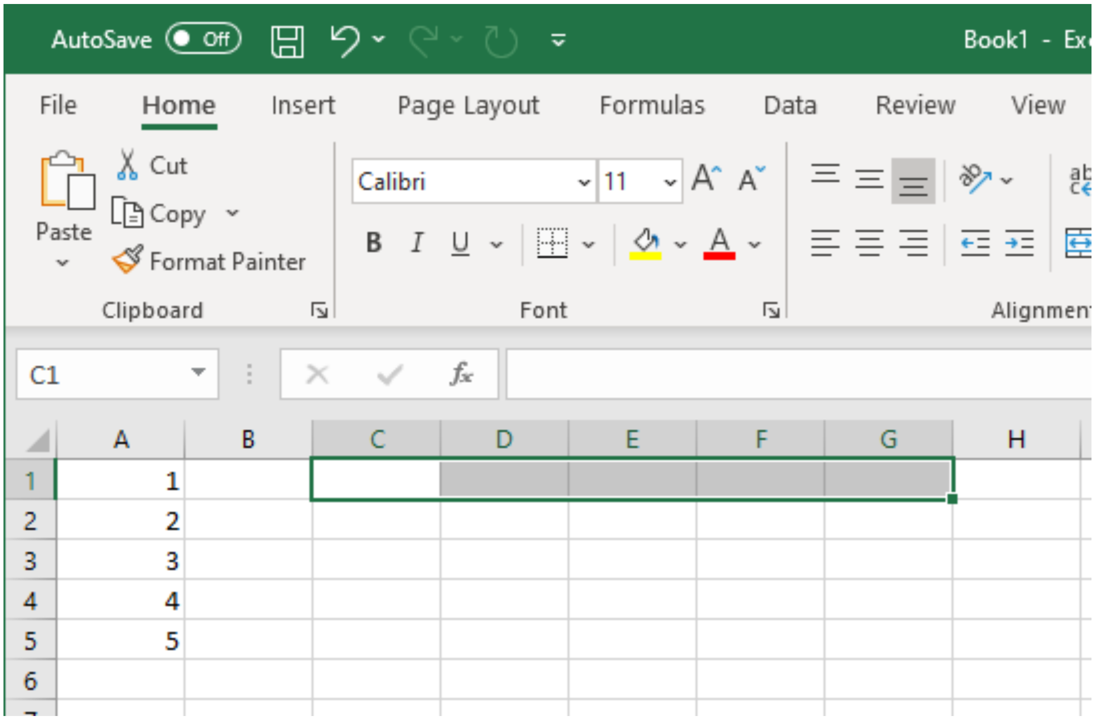
=TRANSPOSE(array)

The **Transpose** function shifts a vertical range of cells to a horizontal range or vice versa. To operate correctly, this function needs to be entered as an array formula in a range that has the same number of rows and columns.

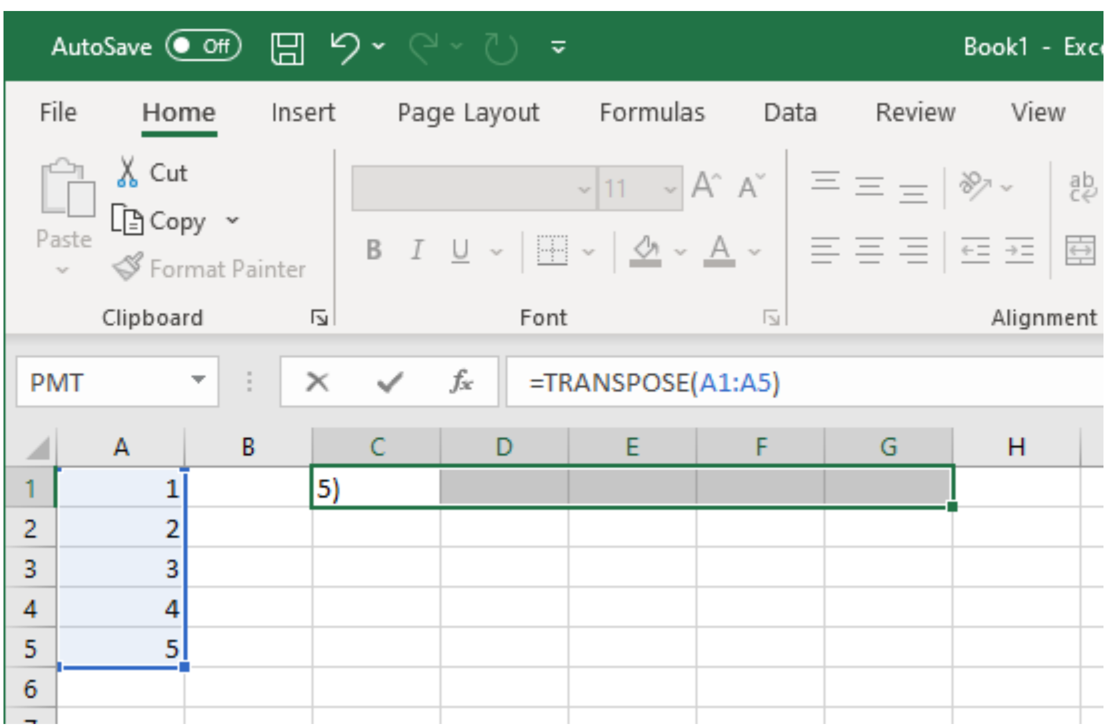
For example, suppose that you wanted to transpose the values in column A so that they appear horizontally on row 1:



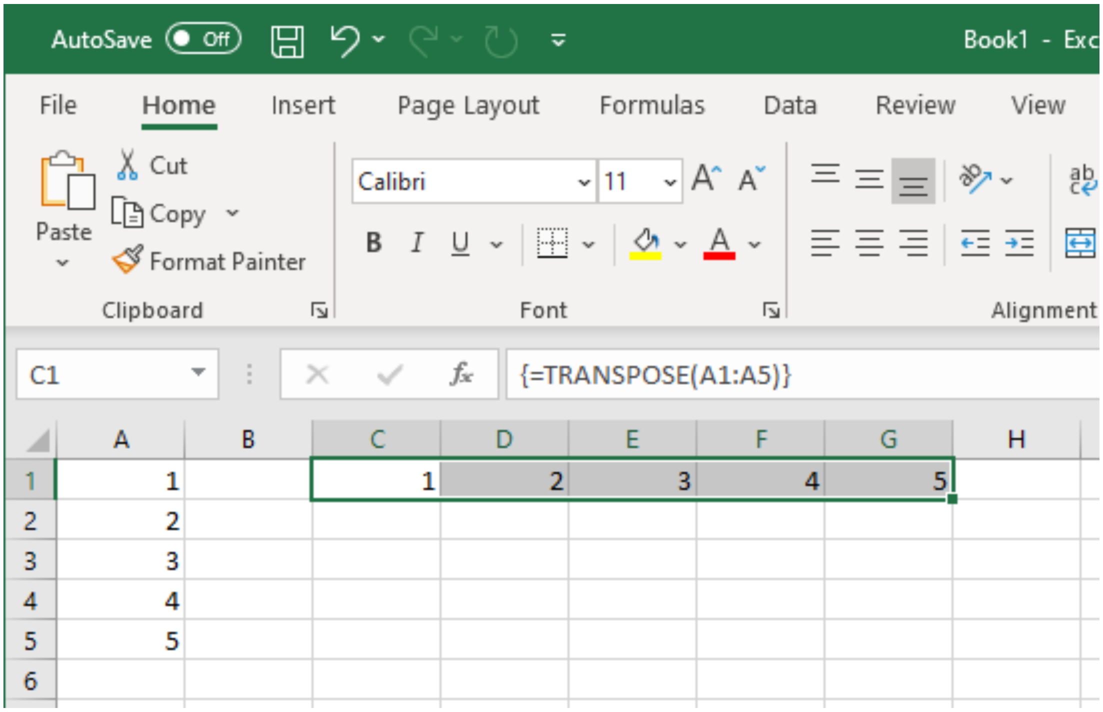
To do this, first select the destination cells that you would like the results to be shown in:



Next, you would enter the transpose function into the Formula Bar with the original cell range as the argument – in this case it would be "**=TRANSPOSE(A1:A5)**":



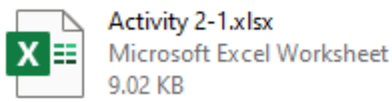
Press **Ctrl + Shift + Enter** to enter this function as an array formula and the results will be displayed within the selected cells:



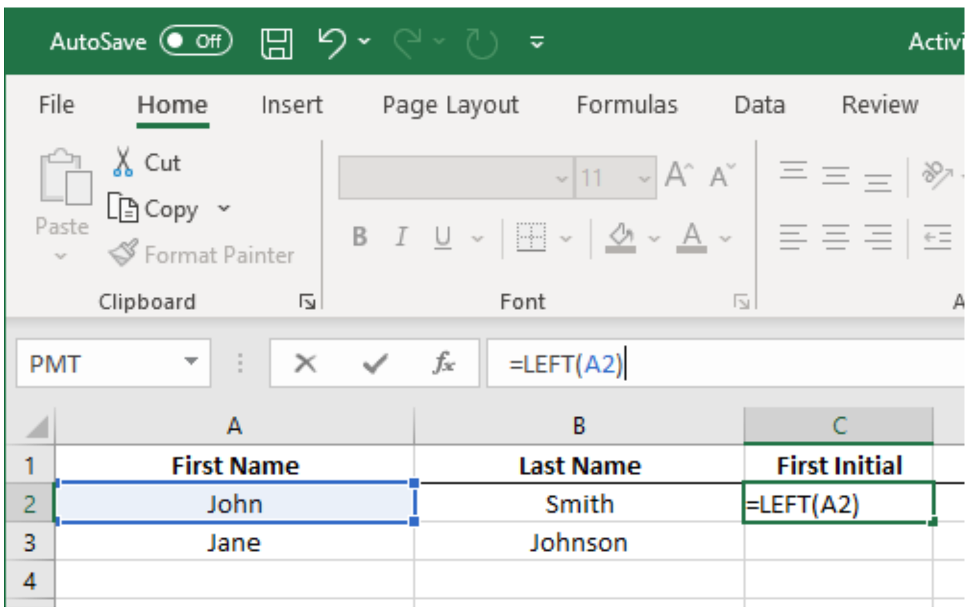
Activity 2-1: Analyzing Data Using Text Functions

Using some of the text functions that you have learned about in this session, you would like to automate portions of an invoice form to decrease the time needed for data entry.

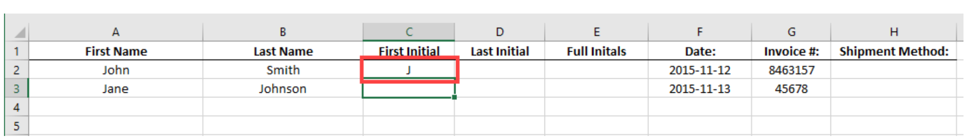
1. To begin, open Activity 2-1 from your Exercise Files folder:



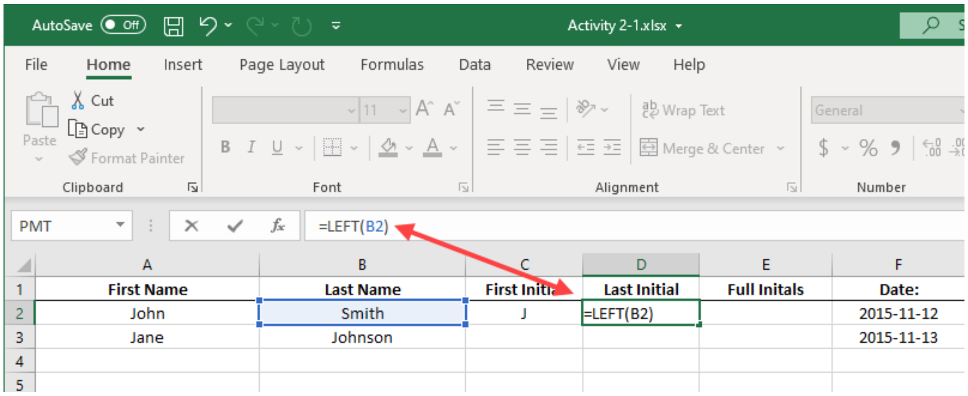
2. First you would like to find the first initial from the first name that is entered into column A. Click to select cell C2 and type "**=LEFT(A2)**" into the Formula Bar:



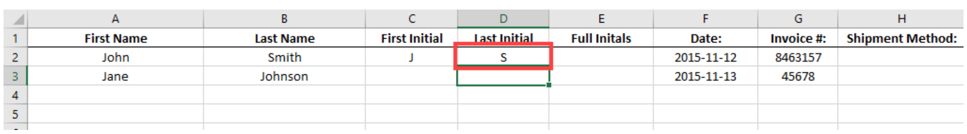
3. Press the **Enter** key on your keyboard and you will see that the previously selected cell now displays the initial from the first name ("J" in this case):



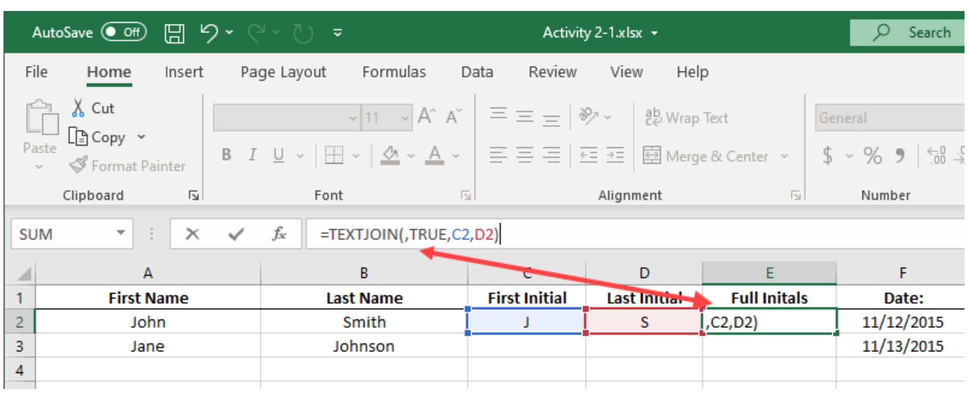
4. Next, you need to do the same thing and find the first initial from the last name that is entered into column B. Click to select cell D2 and type "**=LEFT(B2)**" into the Formula Bar:



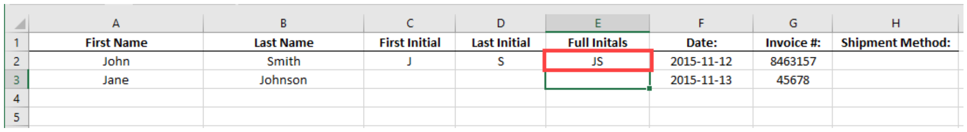
5. Press the **Enter** key on your keyboard and you will see that the previously selected cell now displays the initial from the last name ("S" in this case):



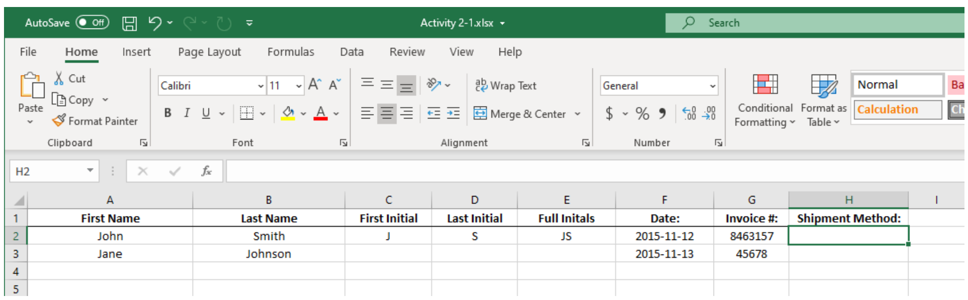
6. Now you need to use the TEXTJOIN function to fill in the Full Initials column. Click to select the **E2** cell and then type "**=TEXTJOIN(,TRUE,C2,D2)**" into the Formula Bar:



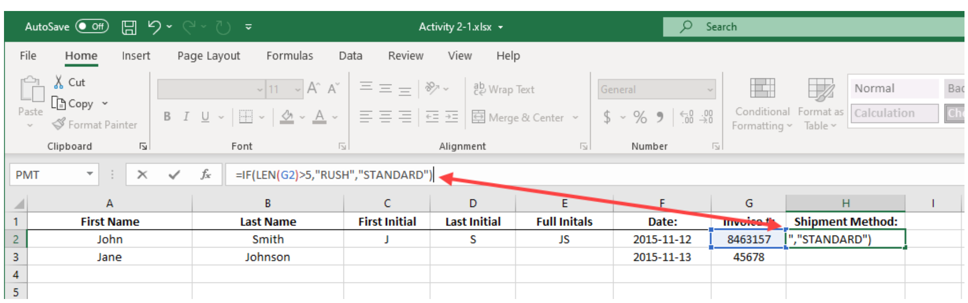
7. Press the **Enter** key and you will see that the values from cells C2 and D2 have been combined to show the full initials:



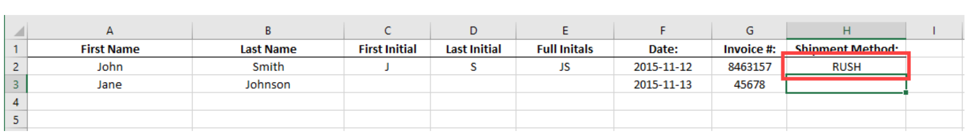
8. Finally, you would like to automatically fill in the shipment method based on the number of characters that appear in the invoice number. If the invoice has more than five characters, then it is designated a rush order and if it is five characters or less, it is a standard order. Select **H2**:



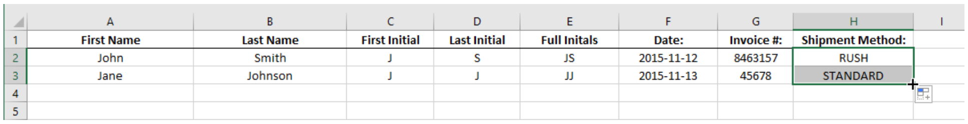
9. Type "**=IF(LEN(G2)>5, "RUSH", "STANDARD")**" into the Formula Bar:



10. Press the **Enter** key on your keyboard and you will see that this particular order is a rush order because its invoice number is more than five characters:



11. Use the **Auto Fill** feature to copy the formulas that you entered during this activity into the adjacent cells in row 3:



	A	B	C	D	E	F	G	H	I
1	First Name	Last Name	First Initial	Last Initial	Full Initals	Date:	Invoice #:	Shipment Method:	
2	John	Smith	J	S	JS	2015-11-12	8463157	RUSH	
3	Jane	Johnson	J	J	JJ	2015-11-13	45678	STANDARD	
4									
5									

12. Save the current workbook as Activity 2-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Use Logical Functions

Logical functions are used to ask yes or no questions related to your data. In this session you will learn all about the logical functions that are available in Excel 365, including the AND, OR, and IF functions.

Topic Objectives

In this session, you will learn:

- About logical functions
- About logical operators
- About the AND function
- About the OR function
- About the IF function
- About the IFS function

Logical Functions

Excel contains a collection of **logical functions** that allow you to essentially ask yes or no questions related to your data. Such questions return a positive (**TRUE**) or negative (**FALSE**) response. Logical functions also allow you to perform calculations when certain conditions are met. For example, logical functions could be used to ask your data if the sales department met its goals for this quarter, or it could be used to find out if the sales department met its goal, and if so, what the bonus would be for the team members.

Logical Operators

Logical operators are used to compare two values against one another to see if they meet a specified logical condition. For example, should the values meet the logical condition (2 > 1) then the output would be the logical value of TRUE. If the values do not meet the logical condition (2 < 1), then the output would instead be FALSE. Due to this behavior, logical operators are instrumental in constructing conditions for functions and calculations to run correctly.

Below you will find a table with all of the logical operators that are available in Excel 365 and what they do:

Operator	Symbol	Examples with TRUE Result
Equal to	=	1 = 1
Greater than	>	2 > 1
Less than	<	1 < 2
Greater than or equal to	>=	2 >= 2 3 >=2
Less than or equal to	<=	2 <= 2 1 <=2
Not equal to	<>	1 <> 2

The AND Function

=AND(logical1, [logical2], …)

This function returns a TRUE value when all of the arguments are true. On the flipside, it returns a FALSE value when any of the arguments in this function are false. While there can be a varied amount of use cases for this function, you would typically use it for conditional purposes. For example, you could use this function to check whether all of the departments in an organization have met all of their goals for the current quarter.

The first argument that is required in this function is **logical1.** You can have up to 30 of these arguments in one **AND** function with each argument separated by a comma. These arguments are where you enter the logical values and operators that you would like to test for (e.g. A1>B2). Additionally, you also have the option of entering a formula as a single argument.

Suppose that A1 contains the value of 15, while cell B1 holds the value 20, and C1 contains 25. Additionally, assume that D1 holds the logical value of FALSE:

	A	B	C	D	E
1	15	20	25	FALSE	
2					

Function	Description
=AND(A1<B1, B1>C1)	While the value of A1 is less than the value in B1, B1 is actually less than C1. As not all of the arguments in this function are true, the AND function will output **FALSE**.
=AND(A1<B1, B1<C1)	The value of A1 is less than B1, and similarly the value of B1 is less than C1. As all of the arguments in this AND function have returned as true, the output for this function would be **TRUE**.
=AND(D1)	The value of D1 holds the logical value of FALSE so the output of this AND function would also be **FALSE**.
=AND(2*2=4)	In this function a simple equation has been added as an argument. As this equation is correct (2X2=4) the output from this AND function would be **TRUE**.

The OR Function

=OR(logical1, [logical2], …)

The **OR** function is similar to the AND function with one key difference: the OR function returns a TRUE value if **any** of the arguments evaluate to TRUE. With the same 30 arguments limit as the AND function, the OR function is constructed in the same manner and supports the same items (formulas, cell references, etc.). Typically, this function would be used to determine if there is a TRUE value in a group of data. For example, you could use it to quickly see if anyone in your sales department has made sales over a particular dollar amount in any one of the four months of this quarter.

Suppose that A1 contains the value of 15, while cell B1 holds the value 20, and C1 contains 25. Additionally, assume that D1 holds the logical value of FALSE:

	A	B	C	D	E
1	15	20	25	FALSE	
2					

Function	Description
=OR(A1<B1, B1>C1)	While the value of A1 is less than the value in B1, B1 is actually less than C1. Even though only one of the arguments in this function has returned as TRUE, the OR function will still output **TRUE**.
=OR(A1<B1, B1<C1)	The value of A1 is less than B1, and similarly the value of B1 is less than C1. As all of the arguments in this OR function have returned as true, the output for this function would be **TRUE**.
=OR(D1, A1<5)	The value of D1 holds the logical value of FALSE and the data in A1 is not less than 5, so both of these arguments resolve to FALSE. This means that the output for this OR function would also be **FALSE**.

The IF Function

=IF(logical_test, [value_if_true], [value_if_false])

The **IF** function is one of the most commonly used logical functions. It sets a cell value based upon whether a logical test resolves to be true or false. For example, you could use this function to test if a salesperson in your organization exceeded a sales goal. If that resolves to true, then this function could output a bonus amount. If it resolves to false, then this function could output a zero amount.

The IF function has three arguments: **logical_test**, **value_if_true**, and **value_if_false**. The **logical_test** argument is where you create the condition that you would like to test. The **value_if_true** argument will be the output of this function if the condition is found to be true. Similarly, the **value_if_false** argument will be the output if the condition is found to be false. Keep in mind that the value arguments in this function can hold both text and numerical data; however, all text data must be enclosed in double quotation marks.

Suppose that A1 contains the value of 15, while cell B1 holds the value 20, and C1 contains 25. Additionally, assume that D1 holds the logical value of FALSE:

	A	B	C	D	E
1	15	20	25	FALSE	
2					

Function	Description
=IF(A1<B1, “Yes”, “No”)	In this example, A1 is in fact less than B1 so this function would output **Yes**.
=IF(A1<B1, B1*C1, “No”)	In this example, A1 is less than B1 so this function would output the result of the B1*C1 formula - **500** in this case.
=IF(A1>B1, “Yes”, “No”)	In this example, A1 is less than B1 so this function results in **No** as the output.

The IFS Function

=IFS(logical_test1, value_if_true1, [logical_test2], [value_if_true2], …)

The **IFS** function is an evolution of the IF function that was introduced in Excel 2016. It is an alternative to using nested IF functions, where you want to test multiple conditions and return multiple results based on those conditions. It is much easier to use and much easier to understand than a complex nested IF function, and you should keep it mind as you begin to use more complex logical analysis in your workbooks.

The IFS function only has two required arguments: **logical_test1**, and **value_if_true1**. Each argument is similar to those in the IF function, but the benefits of the IFS function are realized when you begin to add additional arguments. The IFS function checks whether the first condition (**logical_test1**) is true, and, if so, returns the **value_if_true1** argument. If the first condition is false, it moves to the next condition and performs the same analysis again, then continues through all of the logical tests. If none of the logical tests are true the IFS function will return #N/A. You can prevent this outcome by making the last logical test in your IFS function TRUE.

Suppose that A1 contains the value of 15, while cell B1 holds the value 20, and C1 contains 25. Additionally, assume that D1 holds the logical value of FALSE:

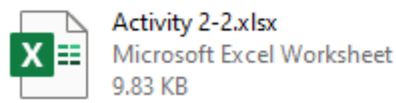
	A	B	C	D	E
1	15	20	25	FALSE	
2					

Function	Description
=IFS(A1>B1, A1, B1<C1,B1)	In this example, A1 is in fact less than B1 so the first logical test is false. In the second logical test, B1 is less than C1, therefore the function would output the contents of cell B1, **20**.
=IFS(A1<B1, “A1”,B1<C1,”B1”)	In this example, both of the logical tests are true. The function would output the string **“A1”** because it returns the value_if_true of the first logical test that is true.
=IFS(A1>B1, A1, B1>C1,B1,TRUE,C1)	In this example, both the first and second logical tests resolve to FALSE. The third logical test has been defined as TRUE, so the function would output the contents of cell C1, **25**.

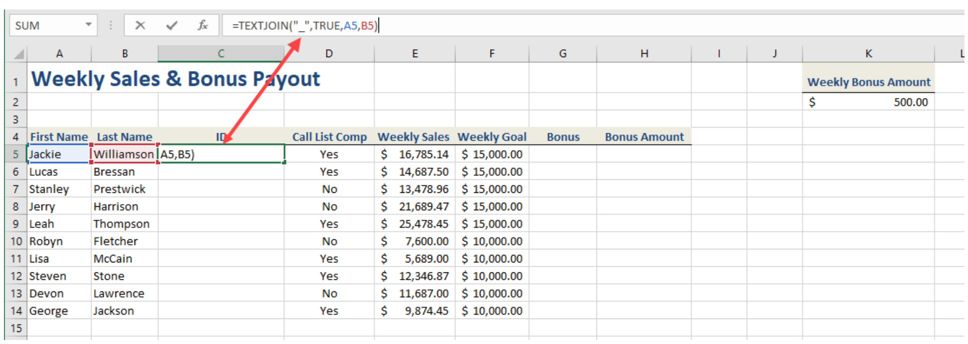
Activity 2-2: Analyzing Data Using Logical Functions

You have been tasked with maintaining a worksheet that is used to determine whether employees qualify for a bonus. Use the functions you learned about in this lesson to determine which employees will receive a bonus and complete the data in the ID column.

1. To begin, open Activity 2-2 from your Exercise Files folder:

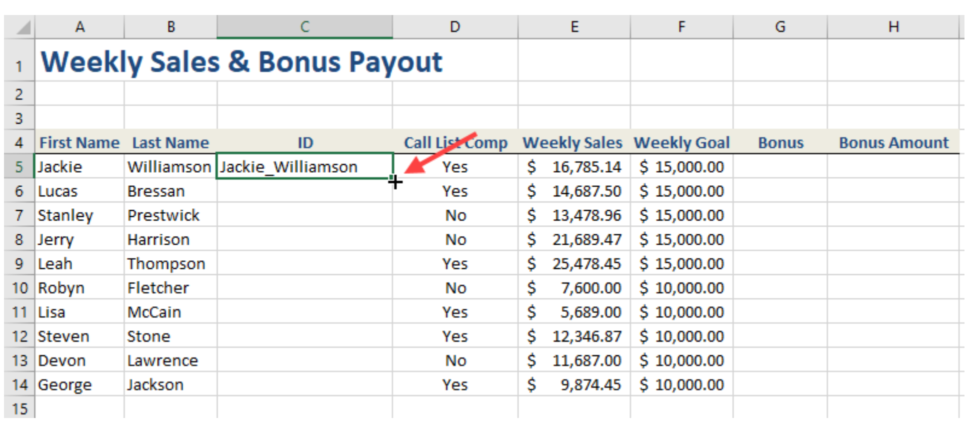


2. First you need to fill in the ID column. This data is the first name and last name separated by an underscore (_). While you can do this manually, the TEXTJOIN function is built for exactly this type of work. Select cell **C5**, then, in the Formula Bar, type "**=TEXTJOIN("_",TRUE,A5,B5)**"



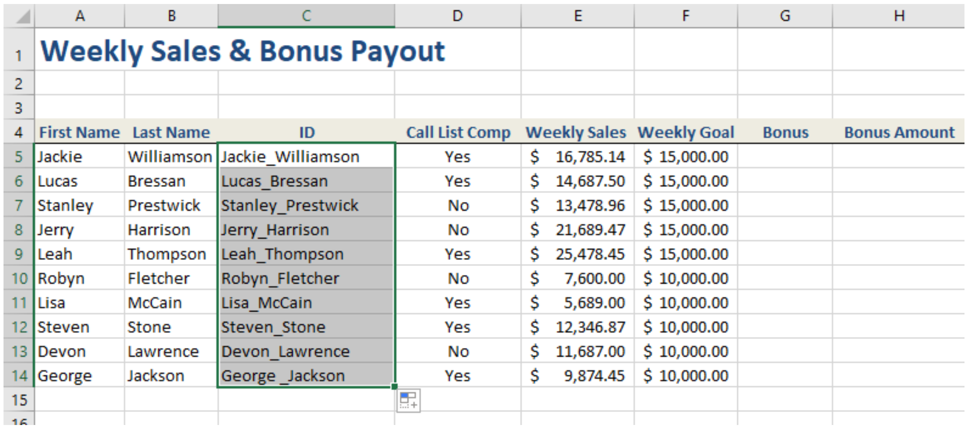
First Name	Last Name	ID	Call List Comp	Weekly Sales	Weekly Goal	Bonus	Bonus Amount
Jackie	Williamson	A5,B5)	Yes	$ 16,785.14	$ 15,000.00		
Lucas	Bressan		Yes	$ 14,687.50	$ 15,000.00		
Stanley	Prestwick		No	$ 13,478.96	$ 15,000.00		
Jerry	Harrison		No	$ 21,689.47	$ 15,000.00		
Leah	Thompson		Yes	$ 25,478.45	$ 15,000.00		
Robyn	Fletcher		No	$ 7,600.00	$ 10,000.00		
Lisa	McCain		Yes	$ 5,689.00	$ 10,000.00		
Steven	Stone		Yes	$ 12,346.87	$ 10,000.00		
Devon	Lawrence		No	$ 11,687.00	$ 10,000.00		
George	Jackson		Yes	$ 9,874.45	$ 10,000.00		

3. Press **Enter**, to enter the formula, then select cell **C5** again, hover your cursor over the cell handle until your cursor icon turns into a small black cross:



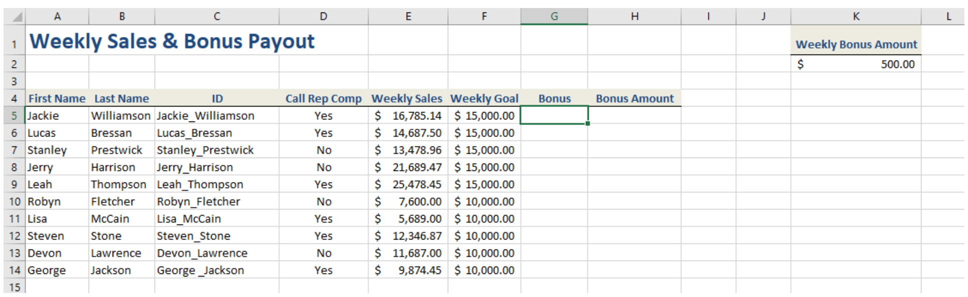
First Name	Last Name	ID	Call List Comp	Weekly Sales	Weekly Goal	Bonus	Bonus Amount
Jackie	Williamson	Jackie_Williamson	Yes	$ 16,785.14	$ 15,000.00		
Lucas	Bressan		Yes	$ 14,687.50	$ 15,000.00		
Stanley	Prestwick		No	$ 13,478.96	$ 15,000.00		
Jerry	Harrison		No	$ 21,689.47	$ 15,000.00		
Leah	Thompson		Yes	$ 25,478.45	$ 15,000.00		
Robyn	Fletcher		No	$ 7,600.00	$ 10,000.00		
Lisa	McCain		Yes	$ 5,689.00	$ 10,000.00		
Steven	Stone		Yes	$ 12,346.87	$ 10,000.00		
Devon	Lawrence		No	$ 11,687.00	$ 10,000.00		
George	Jackson		Yes	$ 9,874.45	$ 10,000.00		

4. **Double click on the cell handle** to automatically copy your formula down the column, to cell C14:



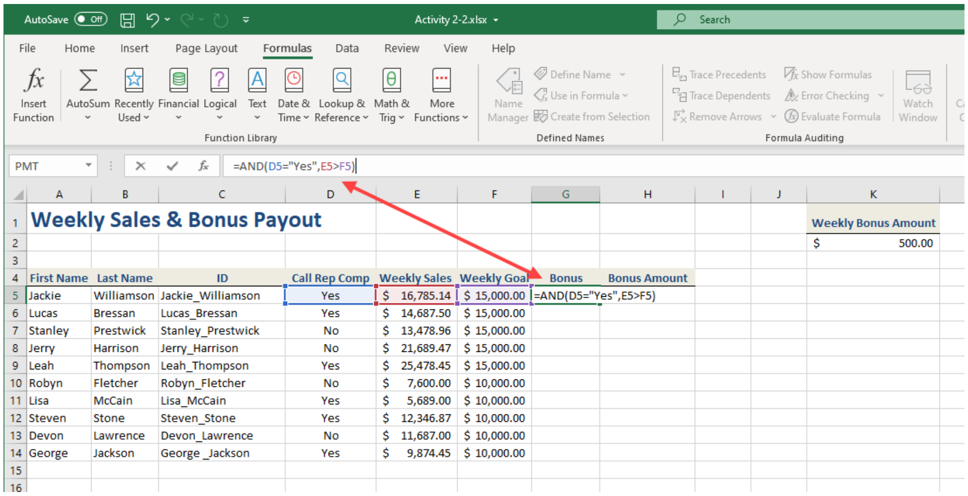
	A	B	C	D	E	F	G	H
1	Weekly Sales & Bonus Payout							
2								
3								
4	First Name	Last Name	ID	Call List Comp	Weekly Sales	Weekly Goal	Bonus	Bonus Amount
5	Jackie	Williamson	Jackie_Williamson	Yes	$ 16,785.14	$ 15,000.00		
6	Lucas	Bressan	Lucas_Bressan	Yes	$ 14,687.50	$ 15,000.00		
7	Stanley	Prestwick	Stanley_Prestwick	No	$ 13,478.96	$ 15,000.00		
8	Jerry	Harrison	Jerry_Harrison	No	$ 21,689.47	$ 15,000.00		
9	Leah	Thompson	Leah_Thompson	Yes	$ 25,478.45	$ 15,000.00		
10	Robyn	Fletcher	Robyn_Fletcher	No	$ 7,600.00	$ 10,000.00		
11	Lisa	McCain	Lisa_McCain	Yes	$ 5,689.00	$ 10,000.00		
12	Steven	Stone	Steven_Stone	Yes	$ 12,346.87	$ 10,000.00		
13	Devon	Lawrence	Devon_Lawrence	No	$ 11,687.00	$ 10,000.00		
14	George	Jackson	George _Jackson	Yes	$ 9,874.45	$ 10,000.00		
15								

5. Next, you need to determine which salespeople are going to receive a bonus. Bonuses are dispensed when the representative exceeds their weekly sales goal, and if their call reports are complete. For this purpose, you can use the AND function. Use your cursor to select cells **G5** on the worksheet:

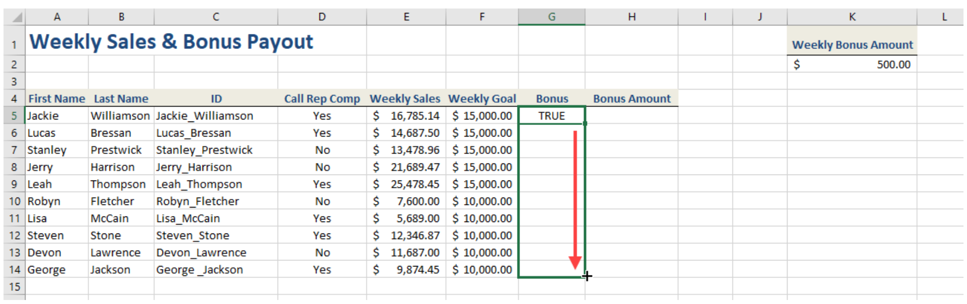


	A	B	C	D	E	F	G	H	I	J	K	L
1	Weekly Sales & Bonus Payout										Weekly Bonus Amount	
2											$ 500.00	
3												
4	First Name	Last Name	ID	Call Rep Comp	Weekly Sales	Weekly Goal	Bonus	Bonus Amount				
5	Jackie	Williamson	Jackie_Williamson	Yes	$ 16,785.14	$ 15,000.00						
6	Lucas	Bressan	Lucas_Bressan	Yes	$ 14,687.50	$ 15,000.00						
7	Stanley	Prestwick	Stanley_Prestwick	No	$ 13,478.96	$ 15,000.00						
8	Jerry	Harrison	Jerry_Harrison	No	$ 21,689.47	$ 15,000.00						
9	Leah	Thompson	Leah_Thompson	Yes	$ 25,478.45	$ 15,000.00						
10	Robyn	Fletcher	Robyn_Fletcher	No	$ 7,600.00	$ 10,000.00						
11	Lisa	McCain	Lisa_McCain	Yes	$ 5,689.00	$ 10,000.00						
12	Steven	Stone	Steven_Stone	Yes	$ 12,346.87	$ 10,000.00						
13	Devon	Lawrence	Devon_Lawrence	No	$ 11,687.00	$ 10,000.00						
14	George	Jackson	George _Jackson	Yes	$ 9,874.45	$ 10,000.00						
15												

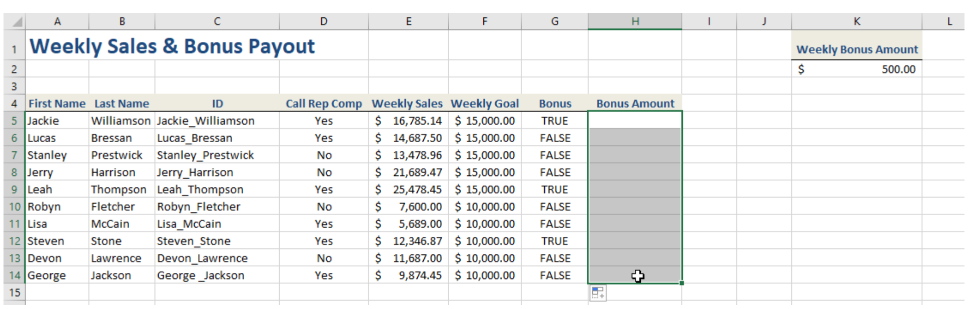
6. Inside the Formula Bar, type "**=AND(D5="Yes",E5>F5)**" and then press **Enter:**



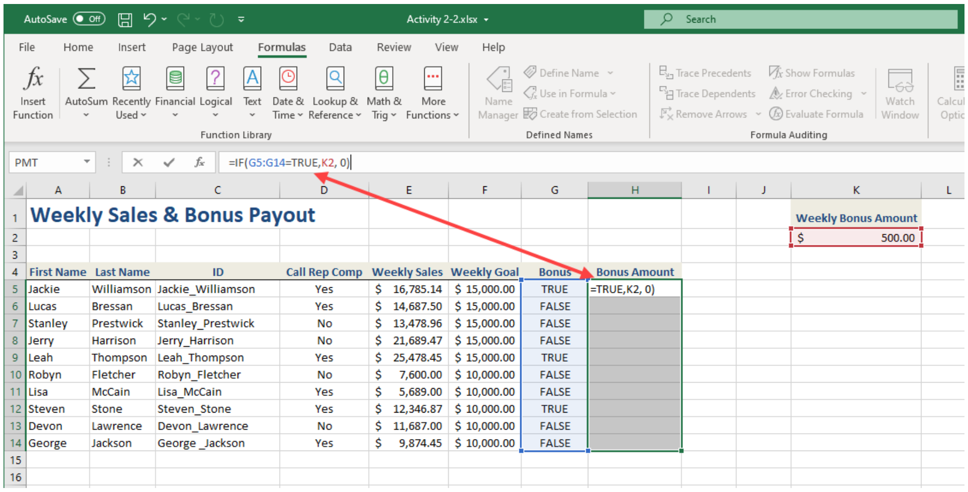
7. Because both logical tests are true, the formula returns the value of TRUE in cell G5. Now **drag the AutoFill handle** at the bottom right of the cell down to cell G14:



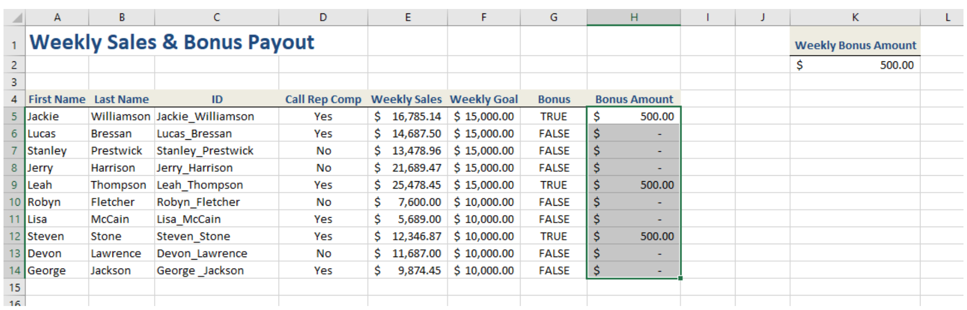
8. All sales representatives who have met both conditions now show a value of TRUE in this column. To add the bonus amount to column H, first select cells **H5 through H14**:



9. Inside the Formula Bar, type "**=IF(G5:G14=TRUE,K2, 0)**". Because this is an array function, press **Ctrl + Shift + Enter:**



10. The bonus information has now been calculated for all employees in this worksheet:



11. Save the current workbook as Activity 2-2 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC C: Use Lookup Functions

Looking up a specific value within a dataset is one of the more common tasks you will complete in Excel. In this session you will learn about the various lookup functions that are available and the situations where they can be most effective.

Topic Objectives

In this session, you will learn about:

- The LOOKUP function
- The HLOOKUP function
- The VLOOKUP function
- The MATCH function
- The INDEX function

Lookup Functions

Lookup functions are used to find and return a value by searching a corresponding row or column. For example, suppose that you are trying to find a product name that corresponds to a product number. You could use one of the lookup functions to search for the product number and then return the value from an adjacent column (Product Name in this case):

	A	B	C	D	E	F
1	Product #	Product Name	Unit Price			
2	54946	USB Cable	4.99			
3	48948	Keyboard	29.99			
4	15467	Wireless Mouse	49.99			
5						

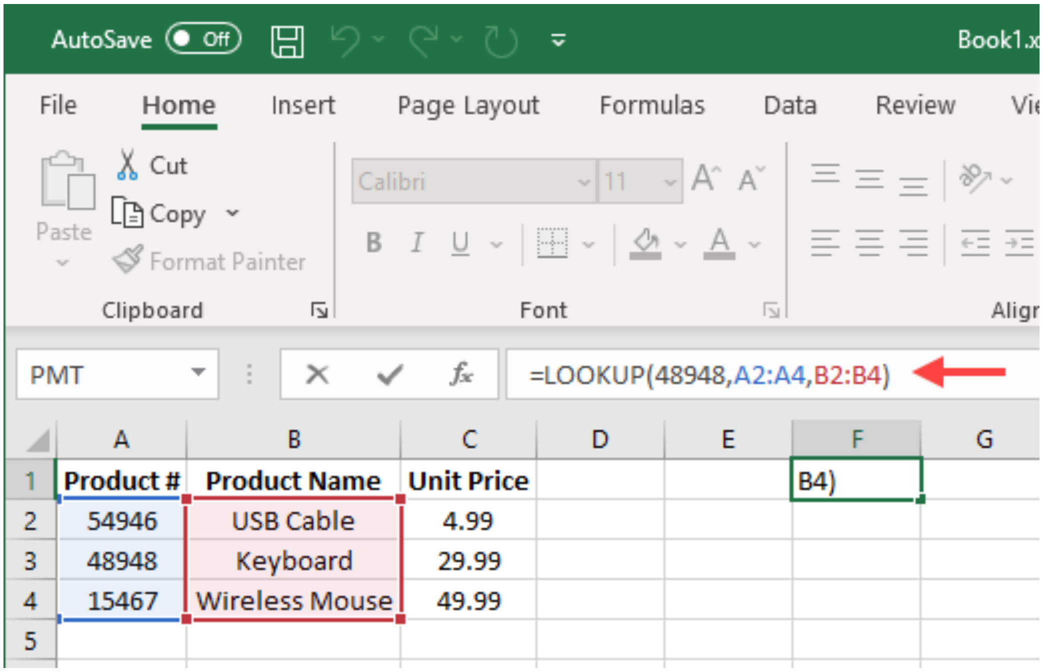
The LOOKUP Function

=LOOKUP(lookup_value, lookup_vector, [result_vector])

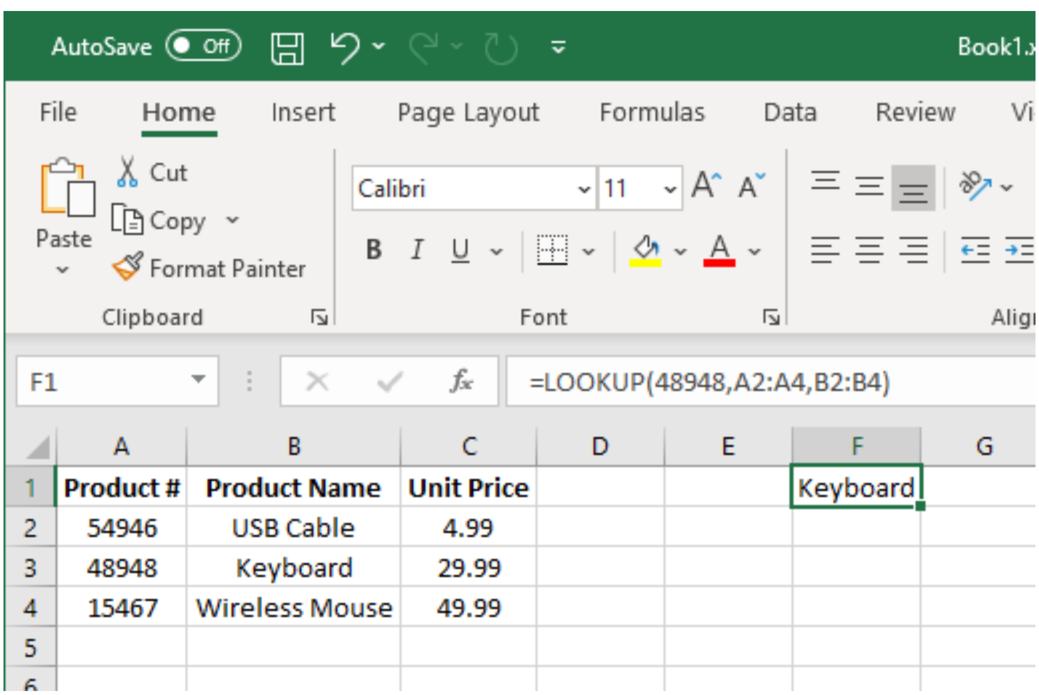
The **LOOKUP** function requires three arguments. The first is the value that you are searching for, followed by the area that you would like to search, and then the corresponding range from which you would like the results to be shown. For example, let's suppose that you want to find out the product name for product number 48948 in the following worksheet:

	A	B	C	D	E
1	Product #	Product Name	Unit Price		
2	54946	USB Cable	4.99		
3	48948	Keyboard	29.99		
4	15467	Wireless Mouse	49.99		
5					

To do this using a LOOKUP function, you would use the following formula:



As you can see, the value that you are looking up is entered first (48948), followed by the lookup area (A2:A4), and it is ended with the results area where the corresponding result is found (B2:B4). In this case, the result is "Keyboard:"

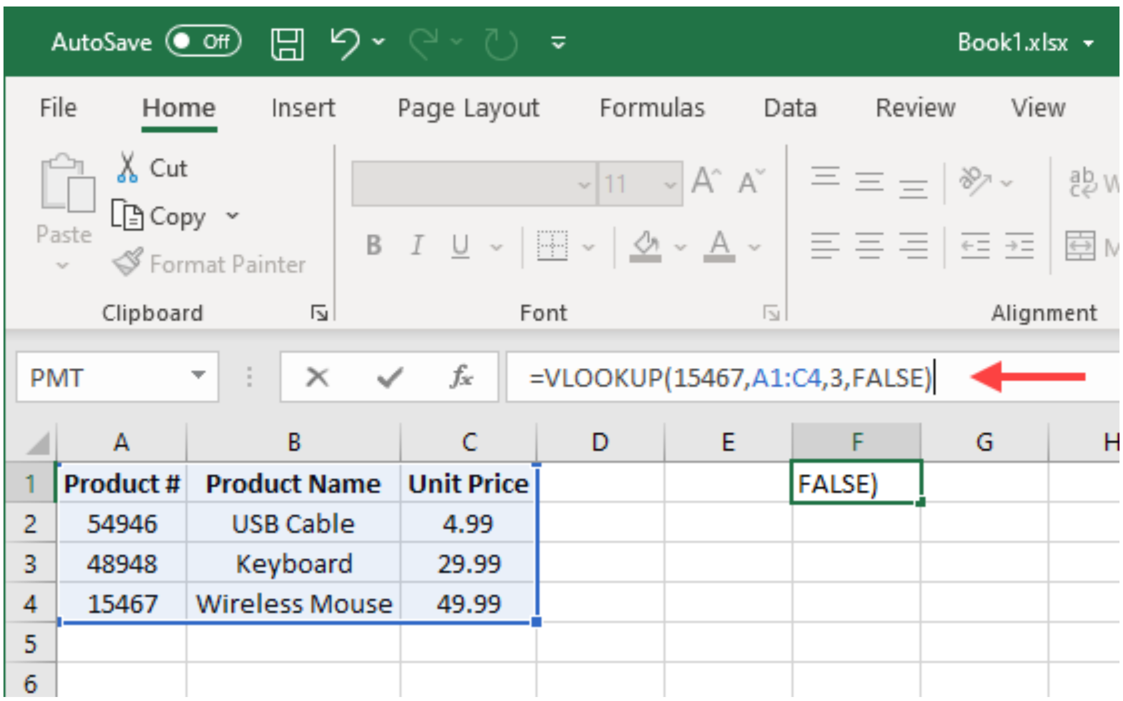


The VLOOKUP Function

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

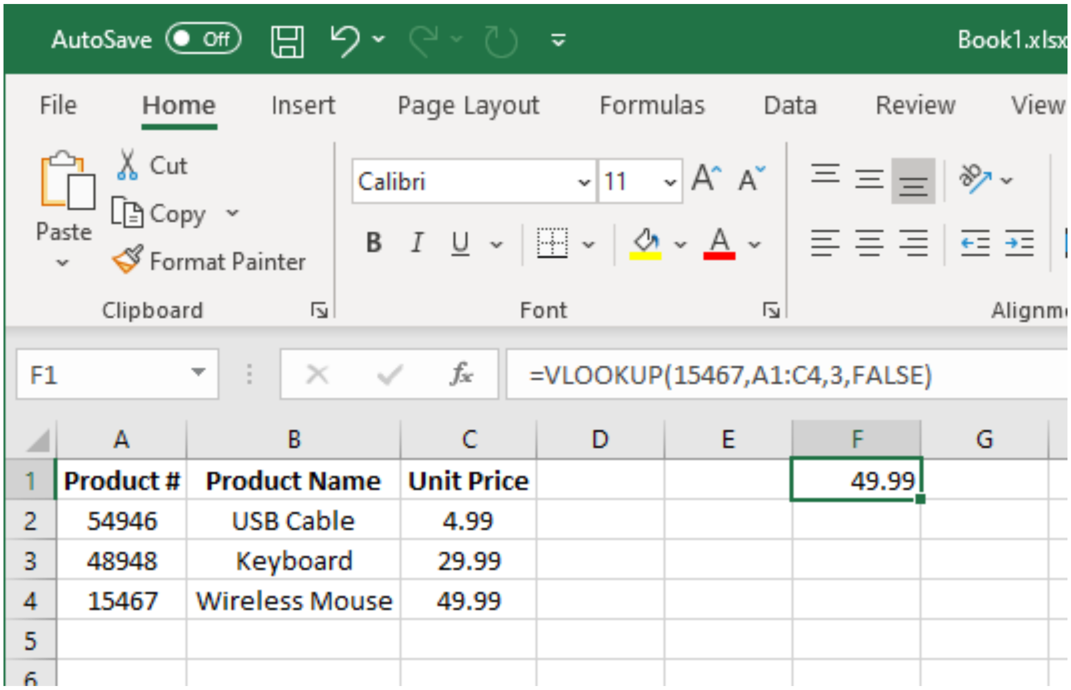
The **VLOOKUP** (vertical lookup) function operates in a similar way to the LOOKUP function. It is used when you need to find things in a table or range only by row, and it does this by only looking for a value that appears in the left-most column of an array and then returns the corresponding value from any other column that you specify.

For example, let's suppose that you want to find the unit price for product number 15467. To do this, you would enter the following formula:



As you can see, the value that you are looking for is entered first 15467), followed by the array (A1:C4). Following this is the column index number. Columns in the selected range or table are numbered from left to right, with the first column numbered 1, the next 2, and so on. In this example, as we are looking for the unit price, we entered 3 for the third column. Finally, you can then choose between looking for approximate or exact matches. In this example FALSE was chosen because we wanted an exact match.

The final result returned by the formula is 49.99:

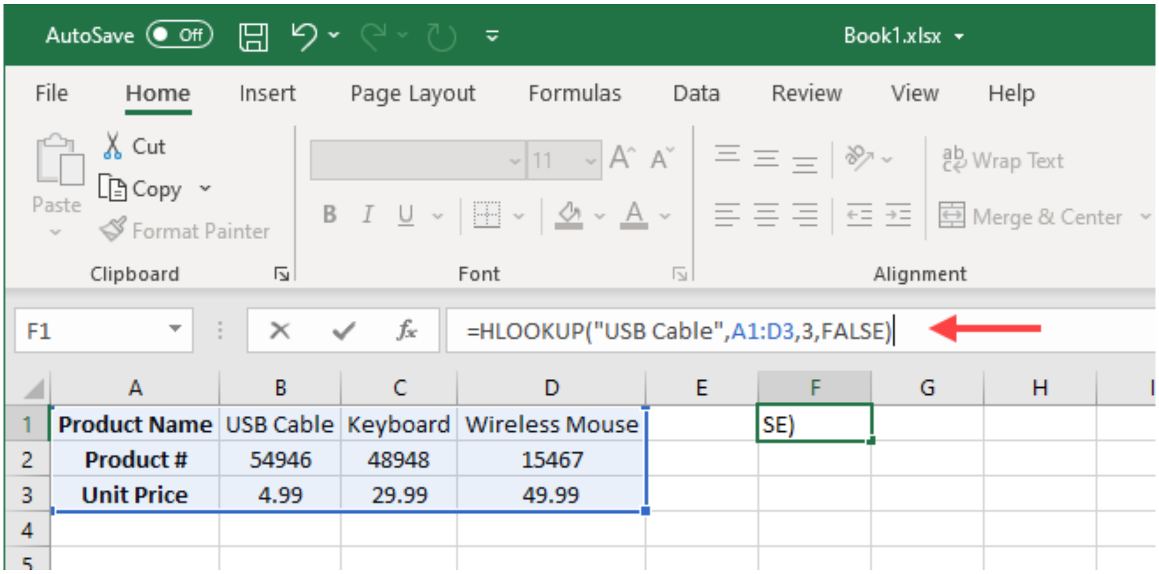


The HLOOKUP Function

=HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])

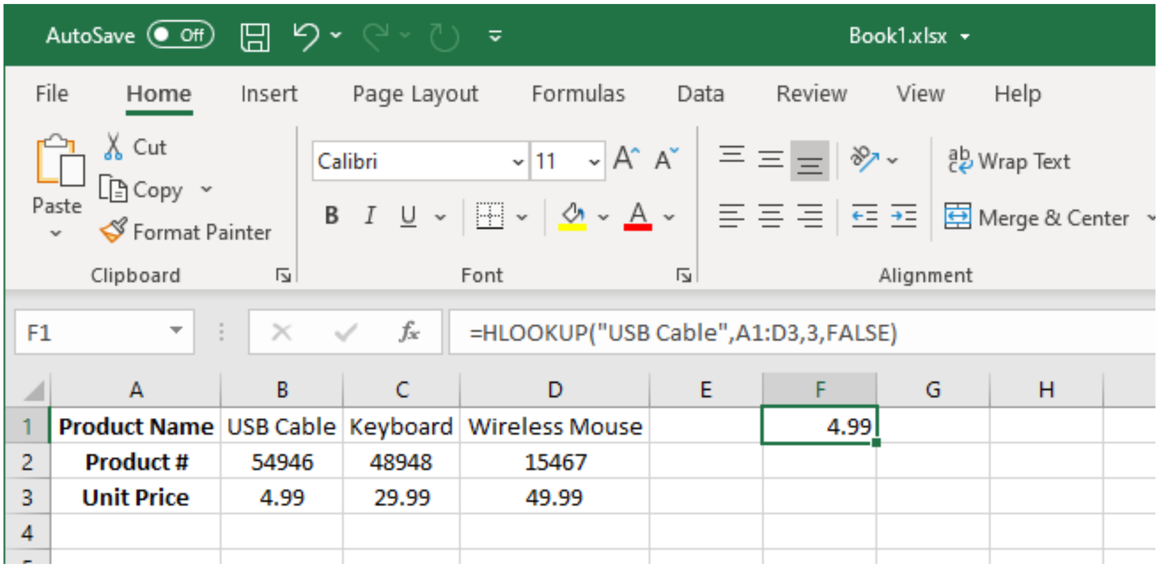
The **HLOOKUP** function is very similar to the VLOOKUP function, but it works horizontally rather than vertically. Like the others, it is used when you need to find things in a table or range only by column. It does this by only looking for a value that appears in the top-most row of a table and then returns the corresponding value from any other row that you specify.

For example, let's suppose that you want to find unit price for "USB Cable" product. To do this, you would enter the following formula:



As you can see the value that you are looking up is entered first ("USB Cable"), followed by the lookup area (A1:D3) that includes the whole range (or table). Following this is the row index number. Rows in the selected range or table are numbered from top to bottom, with the first row numbered 1, the next 2, and so on. In this example, as we are looking for the unit price, we entered 3 for the third row. Finally, you can then choose between looking for approximate or exact matches. In this example FALSE was chosen as we wanted an exact match.

The final result is 4.99 being returned by the formula:



The MATCH Function

= MATCH(lookup_value, lookup_array, [match_type])

The **MATCH** function searches for a value in a range of cells and then returns its position. This function requires two arguments: the value that you are searching for, followed by the range of cells that you would like to search. Note that this function is not case-sensitive.

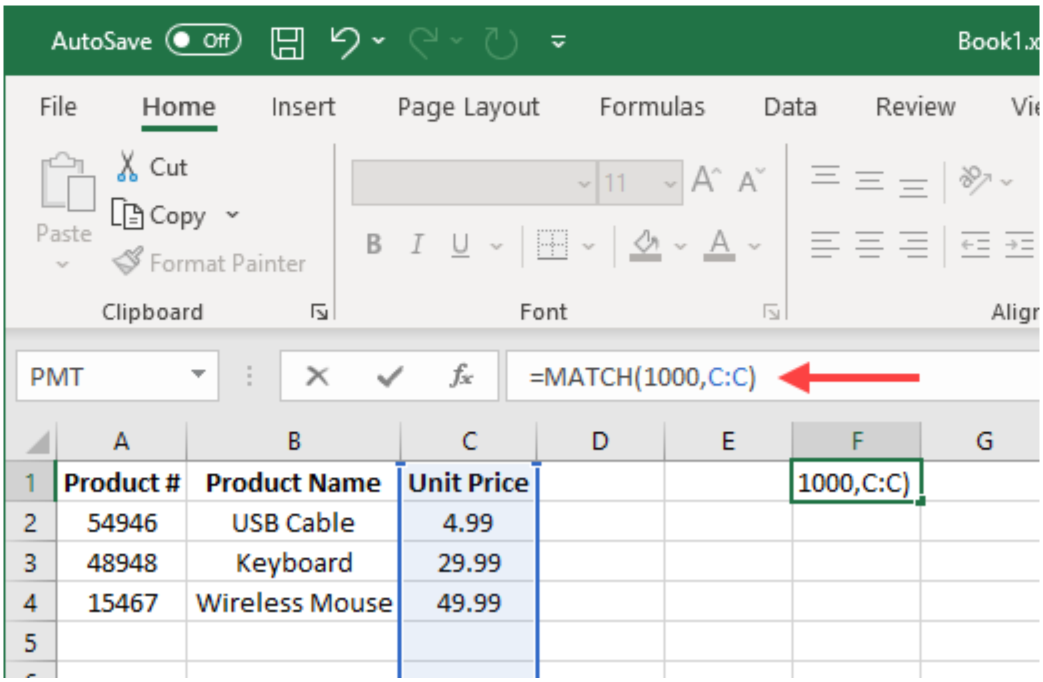
You can also use the optional match_type argument to customize the function's behavior:

Match_Type	**Behavior**
1 *(or omitted)*	Finds the largest value that is less than or equal to the lookup value. Requires the lookup_array argument values to be in ascending order.
0	Finds the first value exactly matching the lookup_value argument.
2	Finds the smallest value that is greater than or equal to the lookup value. Requires the lookup_array argument values to be in descending order.

For example, let's suppose that you want to find the most expensive product in this worksheet:

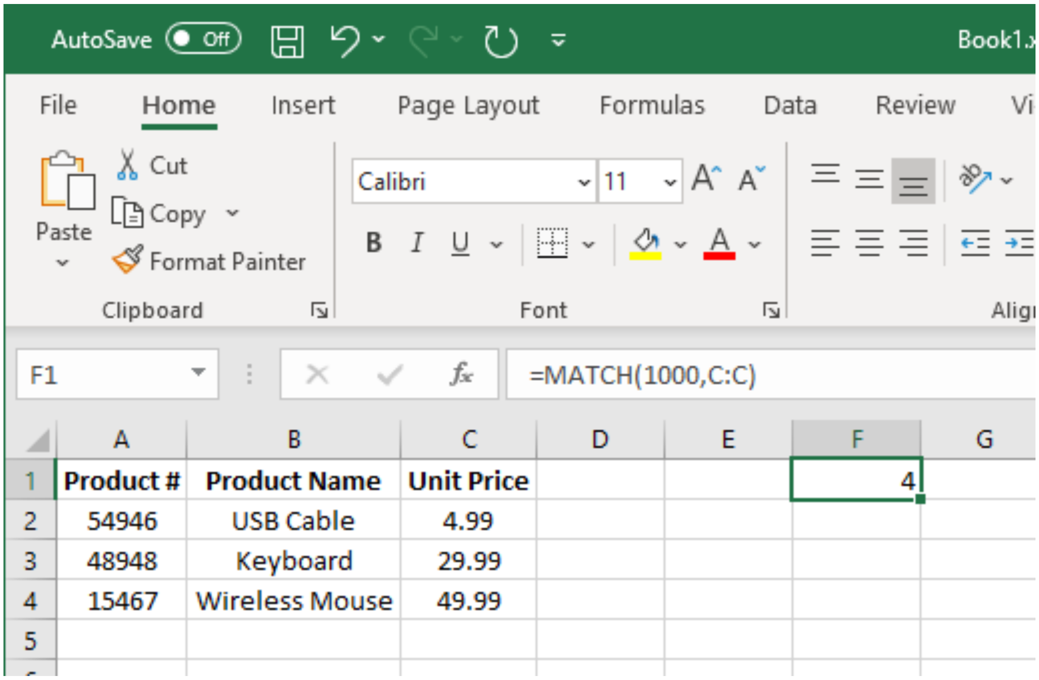
	A	B	C	D	E	F	G
1	**Product #**	**Product Name**	**Unit Price**				
2	54946	USB Cable	4.99				
3	48948	Keyboard	29.99				
4	15467	Wireless Mouse	49.99				
5							

To do this using a MATCH function, you would use the following formula:



We know we do not sell any products over $1,000, so we have entered that as the lookup value, followed by the lookup area (Column C). We have also omitted the match_type argument as we want the default behavior.

In this case, results are returned showing the most expensive product is in Row 4 of our dataset:



The INDEX Function

INDEX(reference, row_num, [column_num], [area_num])

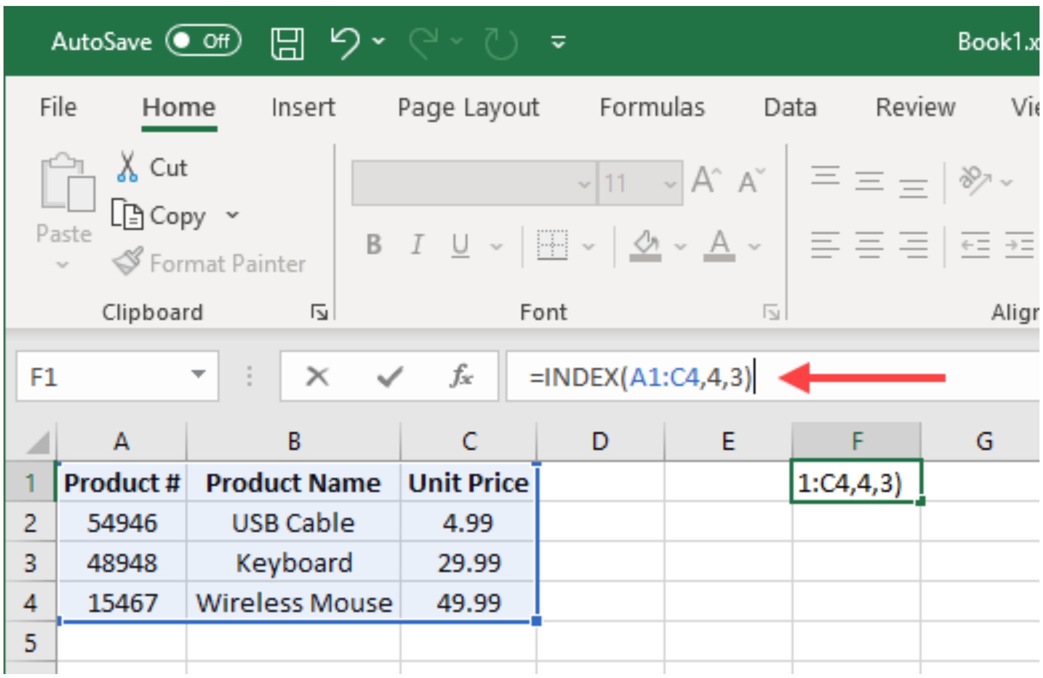
The **INDEX** function returns a value from a table or range. It also offers an alternative syntax, which allows you to use it with an array:

INDEX(array, row_num, [column_num])

For example, let's suppose that you want to find the value at the very end of this range:

	A	B	C	D	E	F	G
1	**Product #**	**Product Name**	**Unit Price**				
2	54946	USB Cable	4.99				
3	48948	Keyboard	29.99				
4	15467	Wireless Mouse	49.99				
5							

To do this using an INDEX function, you would use the following formula:



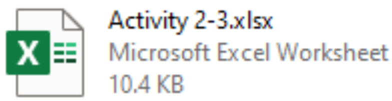
In this case, the value in Row 4, Column 3 of the range A1:C4, 49.99 is returned:

	A	B	C	D	E	F	G
1	**Product #**	**Product Name**	**Unit Price**			49.99	
2	54946	USB Cable	4.99				
3	48948	Keyboard	29.99				
4	15467	Wireless Mouse	49.99				
5							

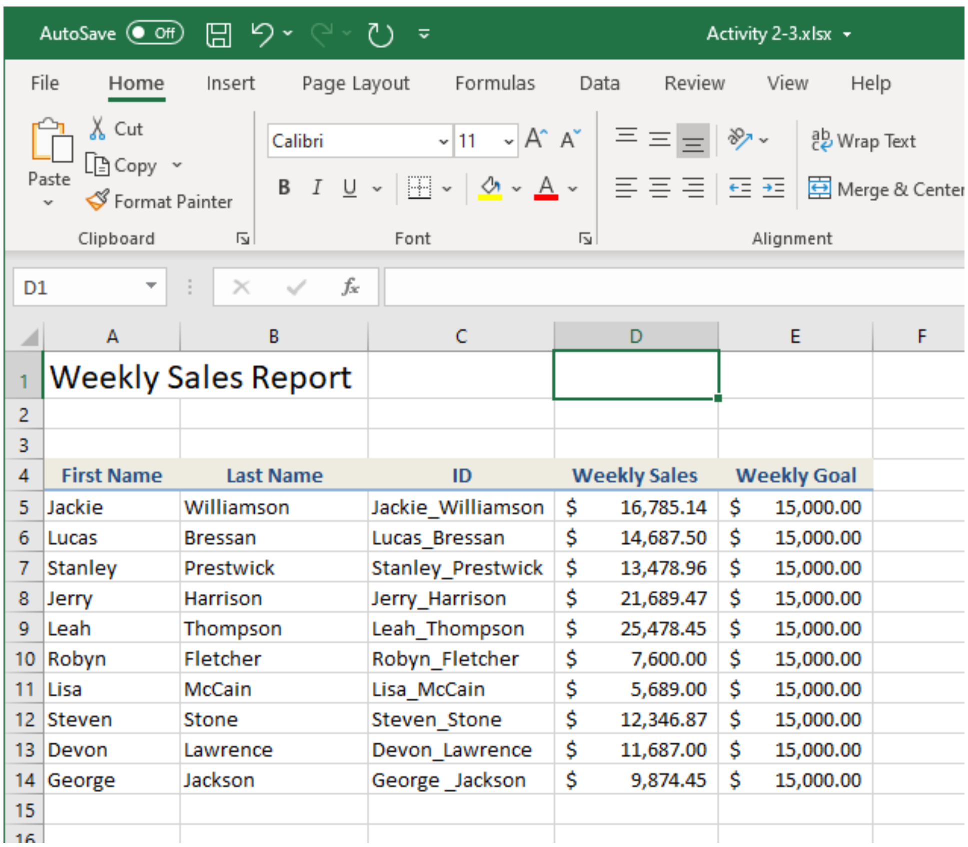
Activity 2-3: Analyzing Data Using Lookup Functions

Using a lookup function, you would like to find the total amount of sales that were made by a particular employee.

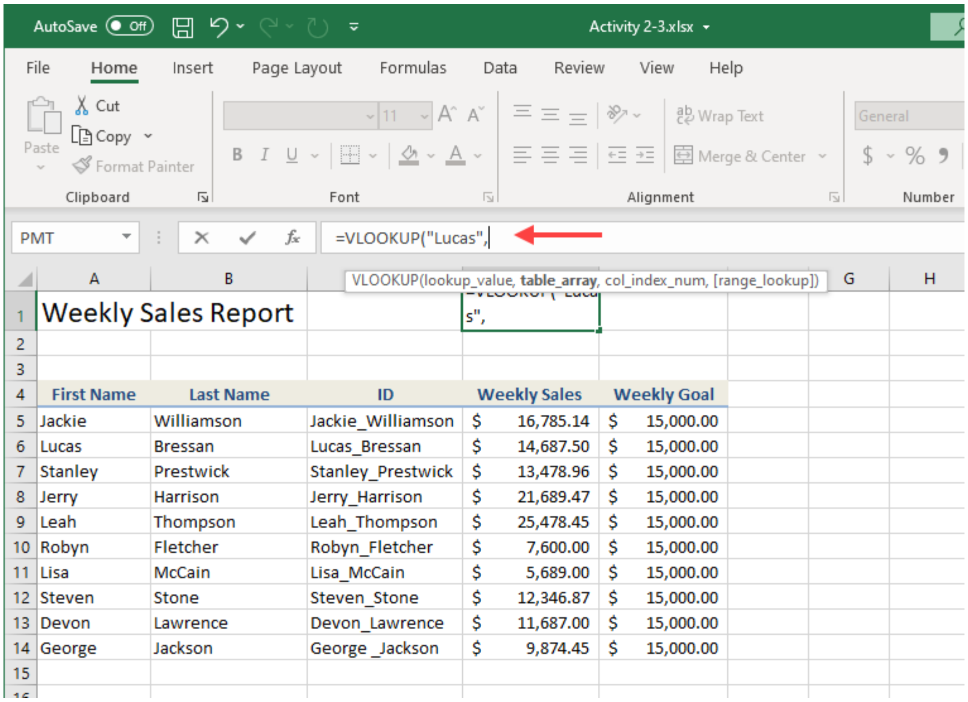
1. To begin, open Activity 2-3 from your Exercise Files folder:



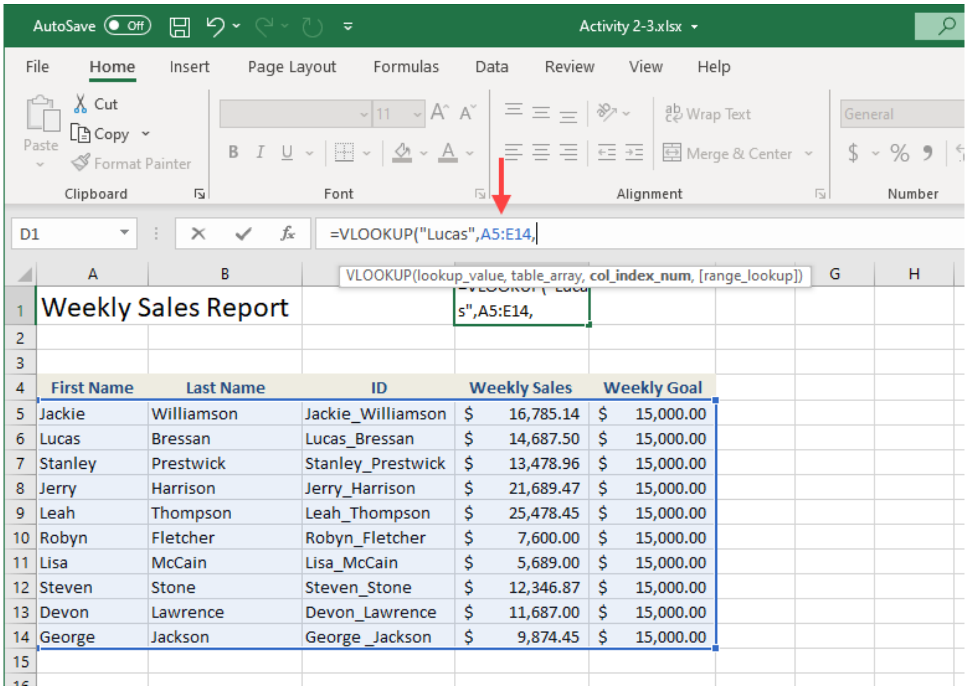
2. Click cell **D1** to place your cursor there:



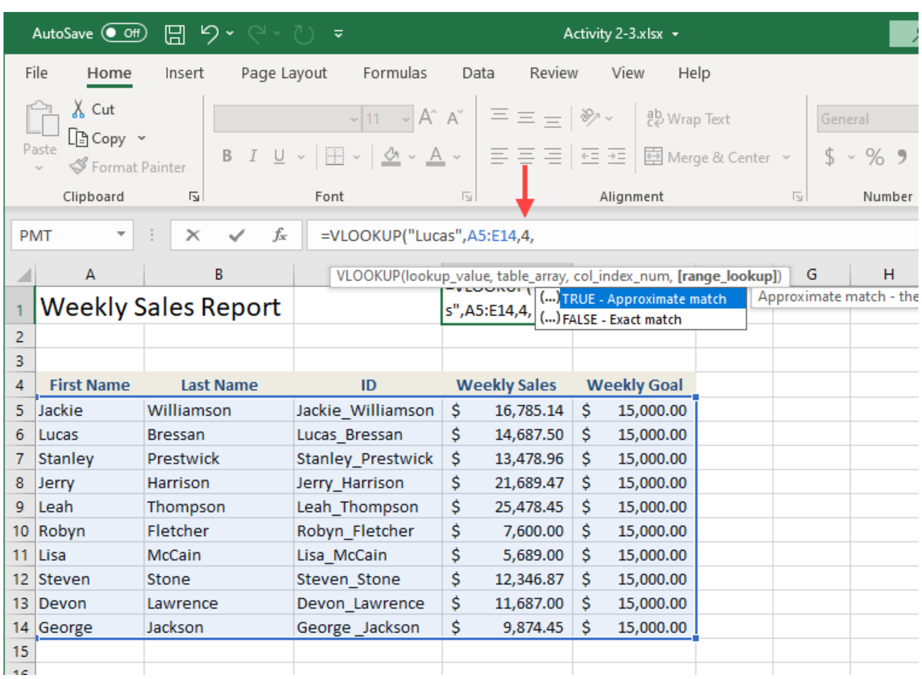
3. You would like to find out the weekly sales that Lucas made, so start by typing "**=VLOOKUP("Lucas",**" into the Formula Bar (without the outer most quotation marks):



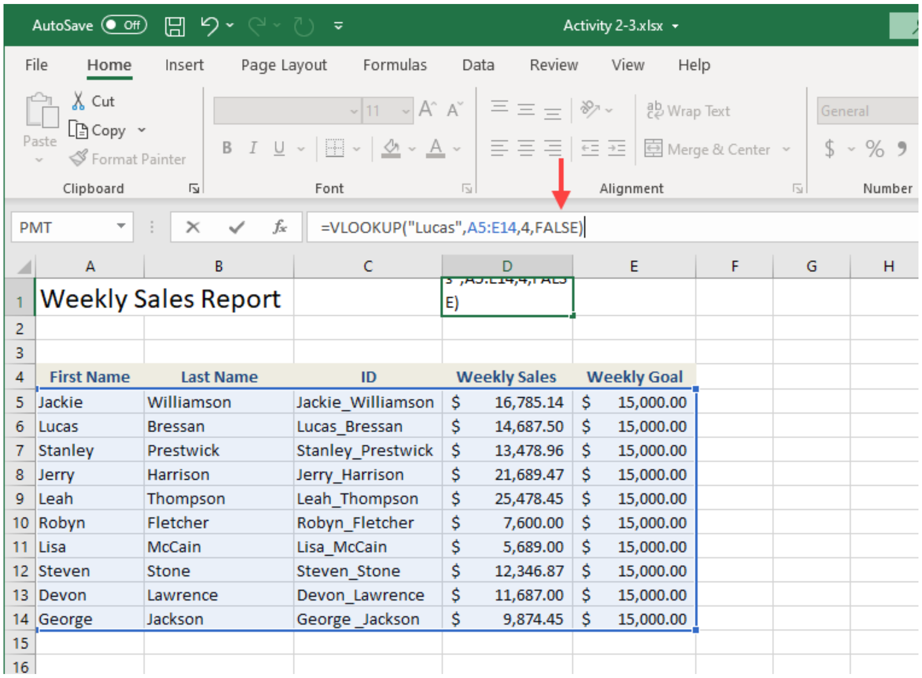
4. Next, you need to add the cell range that you are working with. For this example, type "**A5:E14,**" (without quotation marks), following the comma:



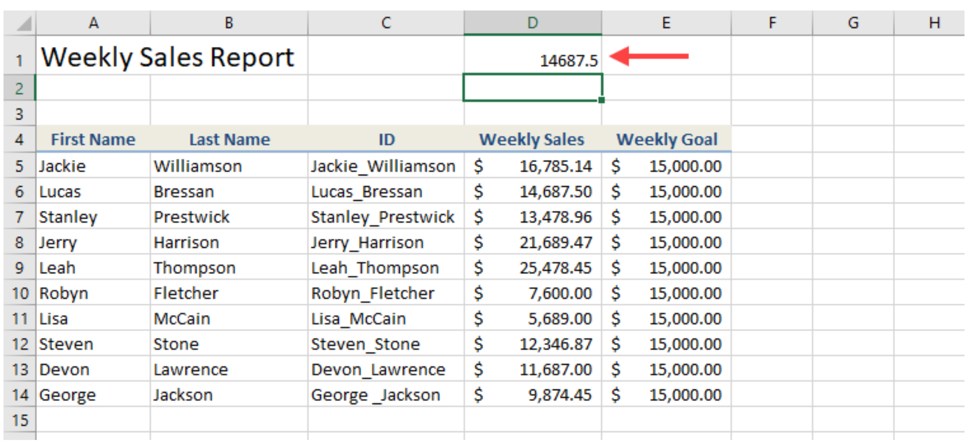
5. Now you need to enter the column of the data you would like to use as a result. In this case you want the weekly sales to be shown, so type "**4,**" as the Weekly Sales column is further from the left:



6. Finally, you need to decide if you would like only exact matches to be used or approximate matches. For this example, you would like exact matches, so type "**FALSE**" followed by a **closing parenthesis**:



7. With the formula now completed, press **Enter**. The weekly sales that Lucas made will now be shown in D1:



8. Save the current workbook as Activity 2-3 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC D: Use Date Functions

Entering the current date and time into a worksheet is one of the more common tasks that you will complete using Excel. In this topic, you will learn how to add date information using the TODAY and NOW date functions.

Topic Objectives

In this session, you will learn:

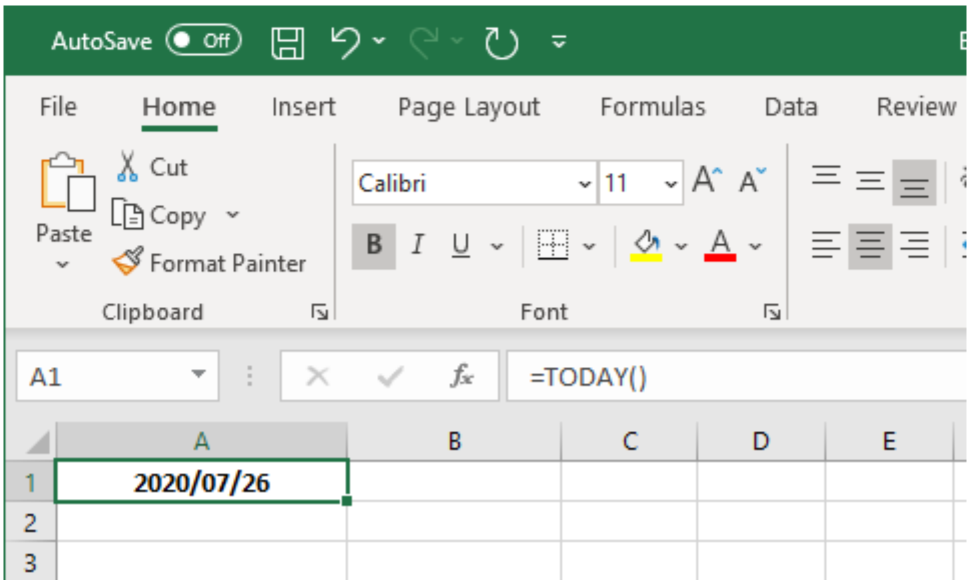
- About the TODAY function
- About the NOW function
- How to serialize dates and times with functions

The TODAY Function

About as simple as a function can get, the **TODAY** function has no arguments:

=TODAY()

When executed, it will simply print today's date into a cell:

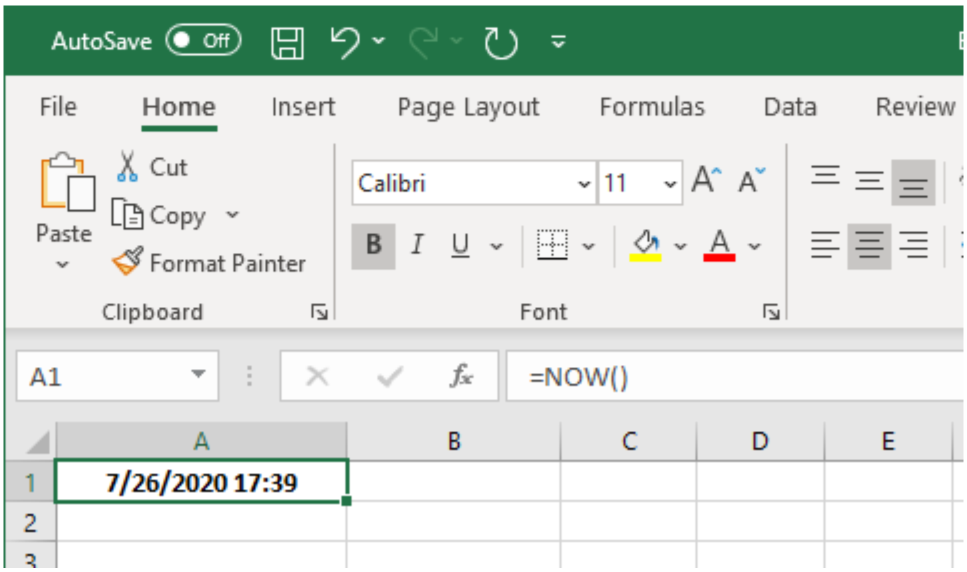


The NOW Function

The **NOW** function is also very simple and uses no arguments:

=NOW()

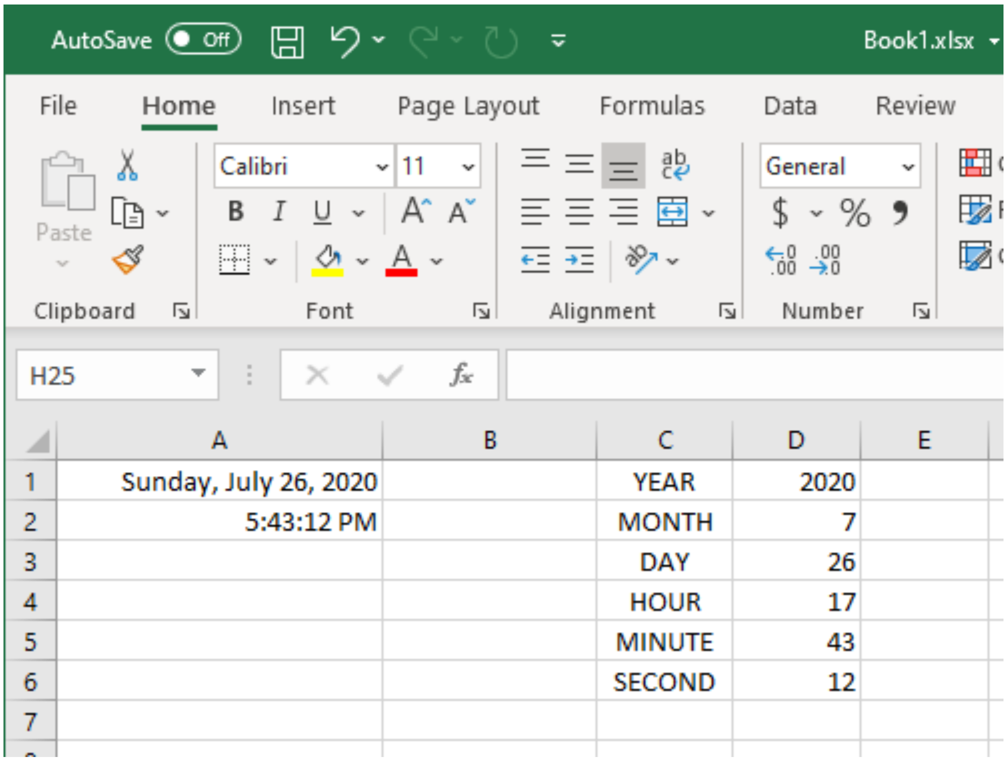
It prints the current date and time into the cell where the function is placed:



Usually this function would be used in conjunction with others to complete time calculations.

Serializing Dates and Times with Functions

If you are using formulas where you only need the month or a specific time of day, there are a number of different functions that you can use to gather that information from an original date or time serial value. For example, here you can see the YEAR, MONTH, DAY, HOUR, MINUTE, and SECOND functions **serializing** the date in A1 and the time in A2:



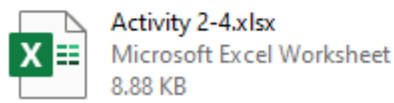
Each of these functions only accept one argument – a reference to the cell that contains the date or time value. For example, here you can see the syntax of a YEAR function pointing to cell A1:

```
=YEAR(A1)
```

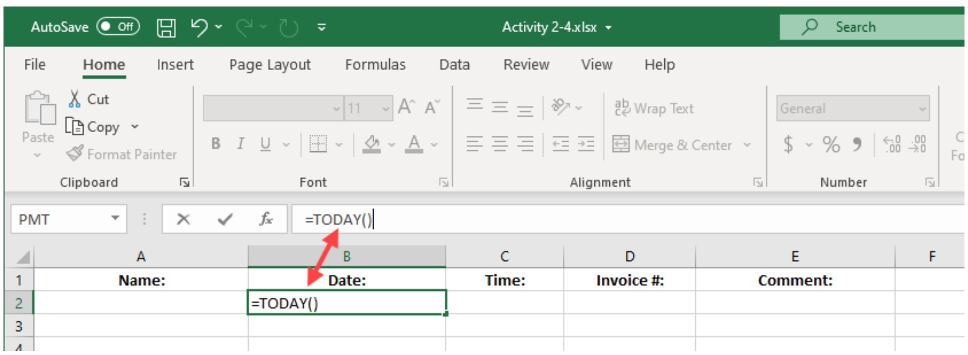
Activity 2-4: Analyzing Data Using Date Functions

You would like to fill out an invoice tracking sheet using some of the date functions that you learned about in this topic.

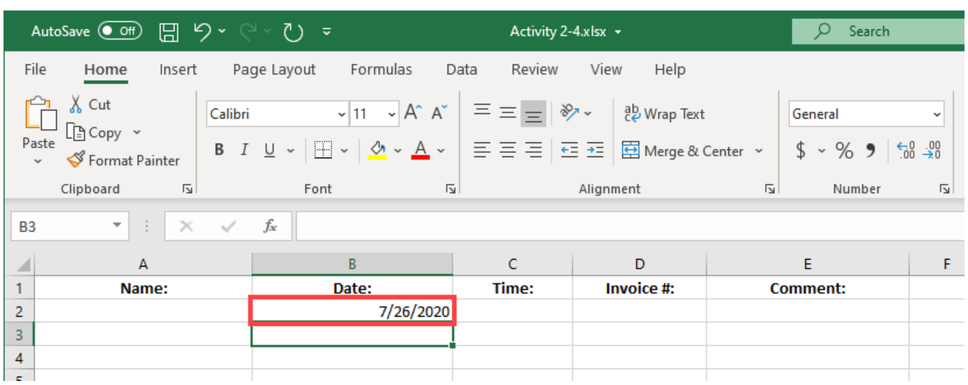
1. To begin, open Activity 2-4 from your Exercise Files folder:



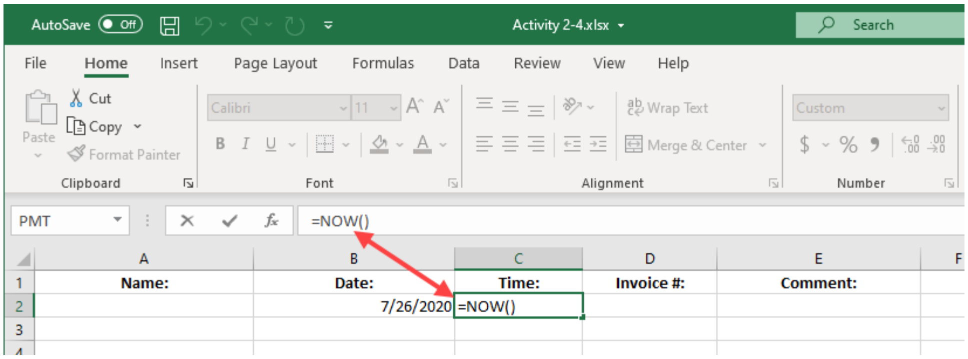
2. Ensure that cell **B2** is selected and then type "**TODAY()**" into the formula bar:



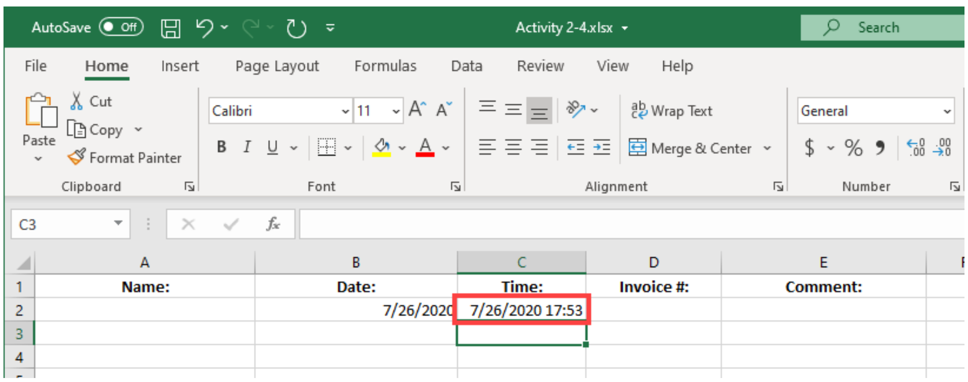
3. Press **Enter** and the current date will be shown as a value in previously selected cell:



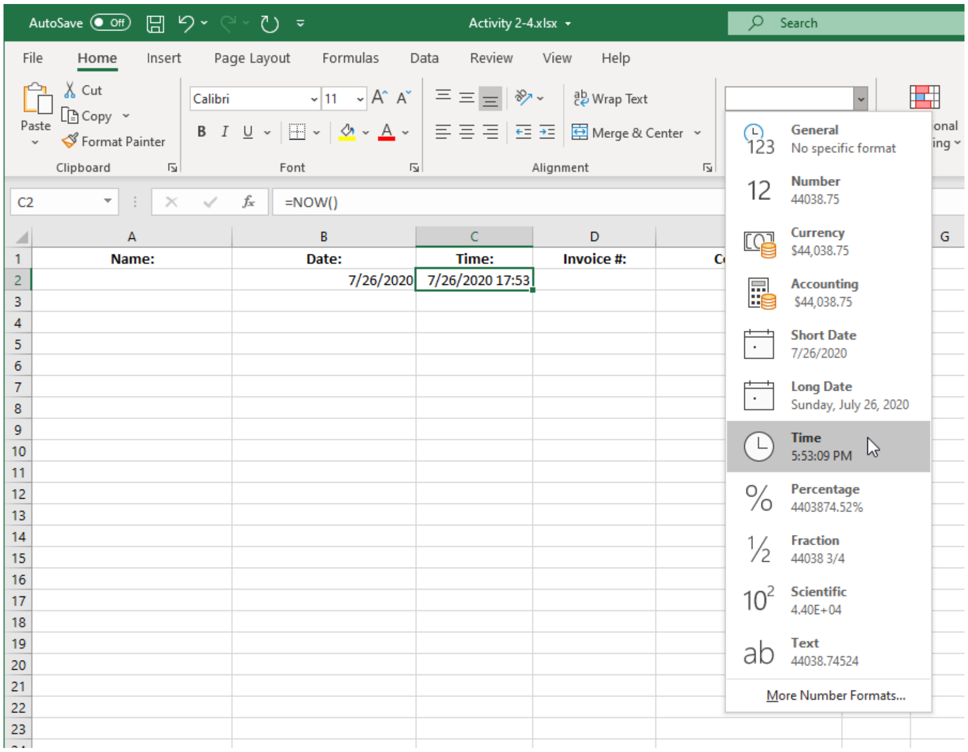
4. Click cell **C2** and type “**=NOW()**” into the formula bar:



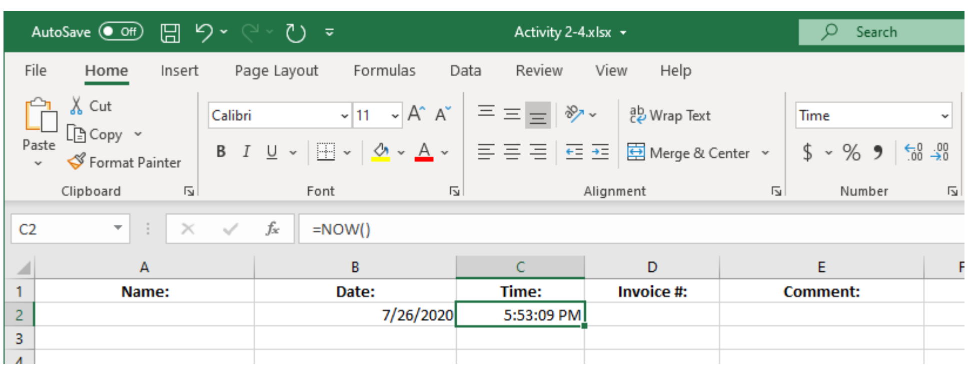
5. Press **Enter** and the current date and time will be the value shown in the previously selected cell:



6. Select cell **C2** once again. Change the number format to Time by clicking **Home → Number Format → Time**:



7. With the time number format applied to the selected cell, you will see that its value will now only show the current time:



8. Save the current workbook as Activity 2-4 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC E: Use Financial Functions

As Microsoft Excel is widely used by many accounting and finance professionals, it includes a number of special financial functions. For example, some financial functions can be used to calculate loan interest, while others can be used to determine the value of investments over time. During this topic you will learn about the four major financial functions that are available in Excel 365.

Topic Objectives

In this session, you will learn about:

- The IPMT function
- The PPMT function
- The NPV function
- The FV function

The IPMT Function

=IPMT(rate, per, nper, pv, [fv], [type])

The **IPMT** function is used to calculate the interest payment that is due for a period on a loan that has a fixed interest rate with regular payments. Alternatively, this function could also be used to calculate the return per period on an investment with the same restrictions.

The **rate** argument is where you declare the interest rate per period. For example, if you were trying to calculate the interest payment on a loan that has a 3% annual interest rate, you would divide 3% by 12.

The **per** argument is the period over which you need to calculate the interest. For example, if the period of the loan is four years and payments are being made monthly, the per argument would be 48. If annual payments are being made, the per argument would be 4.

The total number of payments for the loan or investment are entered as the **nper** argument. For example, if payments are being calculated on a three-year investment, nper would be 36.

Finally, the **pv** argument is where you enter the principal of the loan or total amount of money being invested.

In addition to the required argument, the IPMT function includes two optional arguments: **fv** and **type**. The **fv** argument is used to enter the future value of the investment after all payments have been made to it, or if working with a loan, the balance of the loan. If you choose not to set this argument, it defaults to 0 (the typical balance of a loan after all the payments are made). Finally, the **type** argument is used to indicate if payments are due at the end of each payment period (indicated by “0” or by omitting the argument), or at the beginning (indicated by “1”). If left blank, this argument defaults to 0.

Suppose that in a worksheet, A1 contains the value of $15,000, while cell B1 holds the value 6%, and C1 contains the value 4:

	A	B	C	D	E
1	$15,000.00	6%	4		
2					

With that information in mind, below you can see how an IPMT function could be constructed to determine how much interest the borrower would owe one and a half years into the four-year loan:

Function	Description	Result
=IPMT(B1/12, 18, C1*12, A1)	This function calculates how much interest a borrower will owe for the loan (A1), one and a half years into the term (18) with an annual interest rate of 6% (B1/12) and a total term of four years (C1*12).	($50.46)

If this was from the lender's perspective, the function would be almost the same, but the principal would be a negative value as they would be paying that out. This would result in a positive end result rather than a negative one.

Function	Description	Result
=IPMT(B1/12, 18, C1*12, **-**A1)	This function calculates how much interest is owed to you as the lender of the loan (-A1), one and a half years into the loan (18) with an annual interest rate of 6% (B1/12) and a total term of four years (C1*12).	$50.46

The PPMT Function

=PPMT(rate, per, nper, pv, [fv], [type])

The **PPMT** (payment) function is used to calculate the amount owed against the principal on a loan (or gained from an investment) over a select period and a fixed interest rate. Like the IPMT function, the PPMT function uses the exact same arguments: rate, per, nper, pv, [fv], and [type]. You could even add the result from the same period of the same loan calculated by the IPMT function to the result using the same arguments from the PPMT function to calculate the total payment for the selected period.

Suppose that in a worksheet, A1 contains the value of $15,000, while cell B1 holds the value 6%, and C1 contains the value 4:

	A	B	C	D	E
1	$15,000.00	6%	4		
2					

With that information in mind, below you can see how a PPMT function could be constructed to determine the required payment on the principal of a loan, one and a half years into the four-year loan:

Function	Description	Result
=PPMT(B1/12, 18, C1*12, A1)	This function calculates the amount owed to the principal of a loan (A1), one and a half years into the loan (18) with an annual interest rate of 6% (B1/12) and a total term of four years (C1*12).	$(301.81)

The NPV Function

=NPV(rate, value1, [value2], ...)

If you are unfamiliar with **NPV** (net present value) calculations, they are used to compare the value of money today to the value of money in the future, taking inflation and returns into account. In particular, the NPV function is used to calculate the net present value of an asset or investment using the estimated (or known) future cash flow, as well as the discount rate per period.

The **rate** argument in this function is used to declare the discount rate per period. The **value** arguments are used to represent any future cash flow. For example, suppose that an initial cost of $75,000 is incurred (A1) with a discount rate of 9% (A2). The cash flows for the next consecutive four years are $16,000, $14,000, $12,000, and $10,000 (A3:A6) respectively:

	A	B	C	D	E
1	$(75,000.00)				
2	9%				
3	$ 16,000.00				
4	$ 14,000.00				
5	$ 12,000.00				
6	$ 10,000.00				
7					

The NPV function could then be constructed as follows:

Function	Description	Result
=NPV(A2, A3:A6)	This function calculates the net present value of $75,000 with a discount rate of 9% (A2) and future cash flow (A3:A6).	$42,812.87

Keep in mind that the output from this formula does not include the initial cost. To factor that into the result, you would subtract the result from the initial cost. With that in mind, the NPV for this example would be $32,187.13.

The FV Function

=FV(rate, nper, pmt, [pv], [type])

The **FV** function is used to calculate the future value of an investment that has a fixed interest rate, as well as a fixed or periodic payment schedule. Like most of the other financial functions covered in this topic, the FV function uses many of the same arguments.

The **rate** argument is where you declare the interest rate per period. For example, if you are trying to calculate the interest payment on an investment that has a 3% annual interest rate, you divide .03 by 12 and enter that result (.0025 in this case) as the argument.

The total number of periods from now that you want to use to calculate the future value of the investment are entered as the **nper** argument. Keep in mind that the periods entered into this argument are the same as the ones used to calculate the rate argument.

The **pmt** argument is where you enter the payment that is being made for each period. For example, if you are paying $200 a month into this investment over 10 years, you would enter 200 as the pmt value. It would also mean that the nper value would be 120 (12 x 10).

In addition to the required argument, the FV function includes two optional arguments: pv and type. The **pv** argument is used to enter the present value of the investment. This would be used if you need to calculate the future value of a one-time investment that has a fixed interest rate. The **type** argument is used to indicate if payments are due at the end of each payment period (indicated by “0” or by omitting the argument), or at the beginning (indicated by “1”). If left blank, this argument defaults to 0.

Suppose that in a worksheet, A1 contains the value of -$15,000 (initial investment), while cell B1 holds the value 6% (annual interest), and C1 contains the value -$200 (additional monthly payments). As well, assume that the investor wants to contribute the additional monthly payments for a period of 25 years:

	A	B	C	D	E
1	$(15,000.00)	6%	$(200.00)		
2					
3					

With that information in mind, below you can see how an FV function could be constructed to determine the future value of this investment:

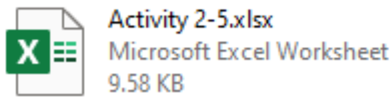
Function	**Description**	**Result**
=FV(B1/12, 25*12, C1, A1)	This function calculates the future value of the initial investment (A1), combined with a monthly contribution of (C1) over a period of 25 years (25*12) with a fixed annual interest rate of 6% (B1/12).	$205,573.34

Note that because you are calculating an investment, the initial payment (pv) and monthly payment (pmt) need to be entered as negative values to receive a positive result. On the other hand, entering positive values would result in a negative value.

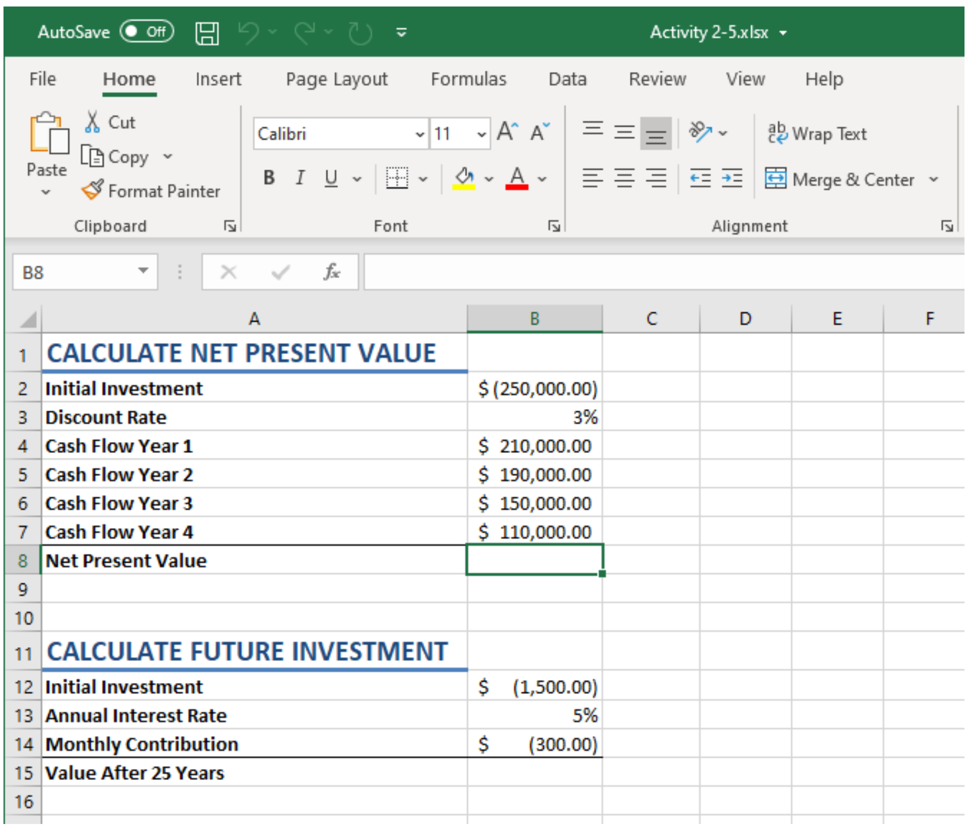
Activity 2-5: Using Financial Functions

You have been given the task of calculating the net present value of an investment, as well as calculating the future value of an investment.

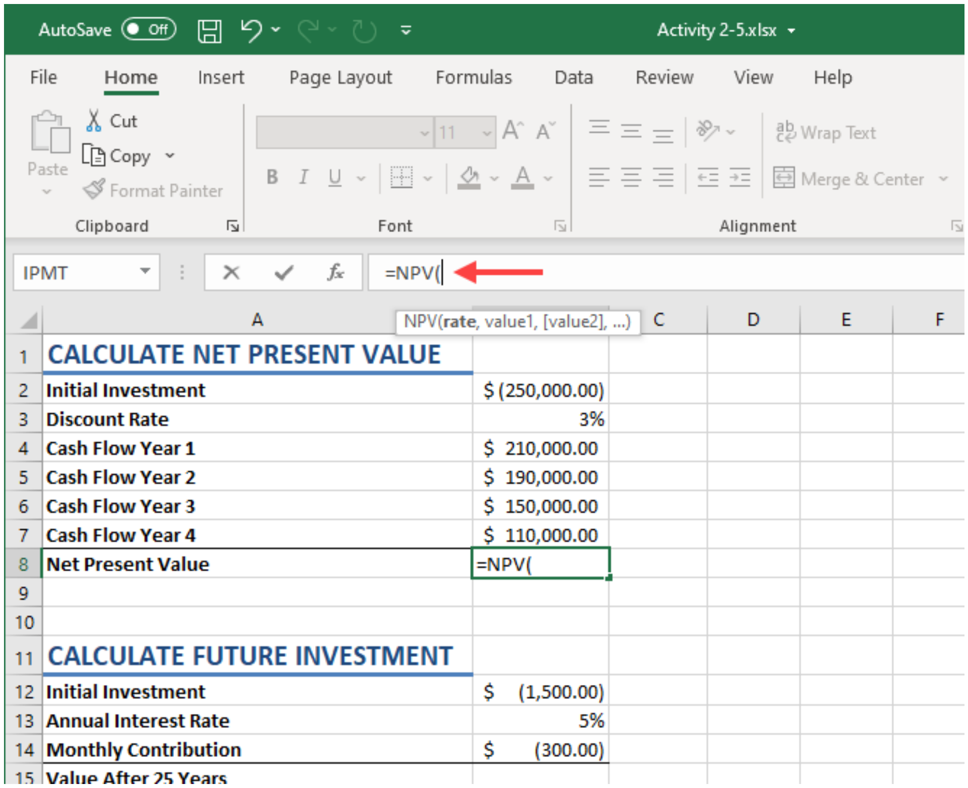
1. To begin, open Activity 2-5 from your Exercise Files folder:



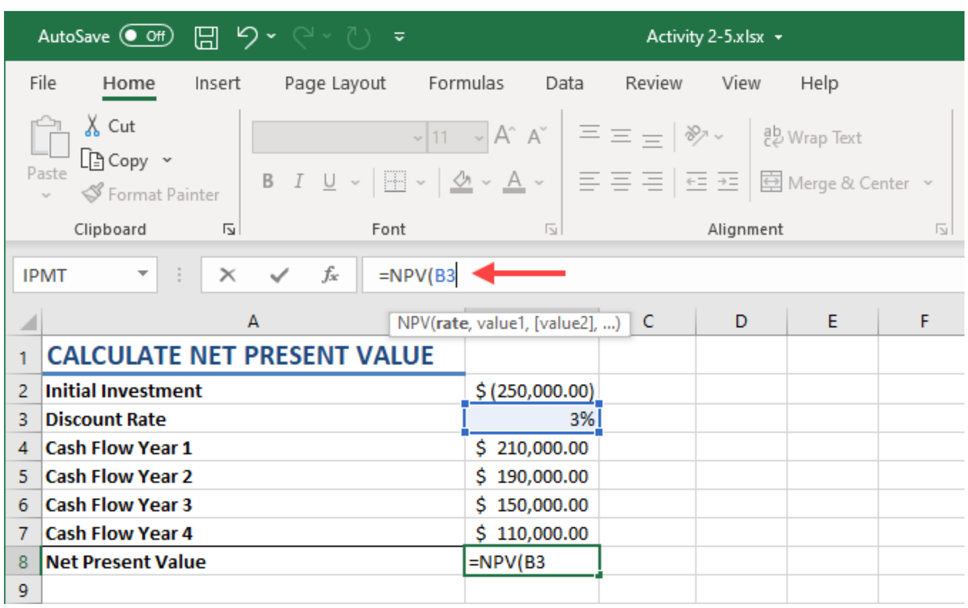
2. Let's start with the NPV calculation. Click inside cell **B8** to select it:



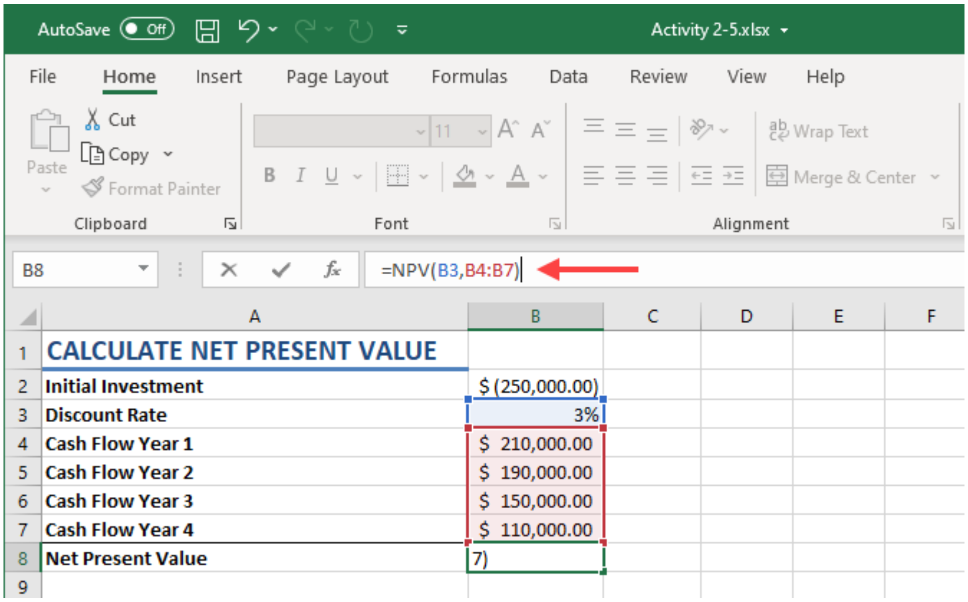
3. Next, in the Formula Bar, type "**=NPV(**":



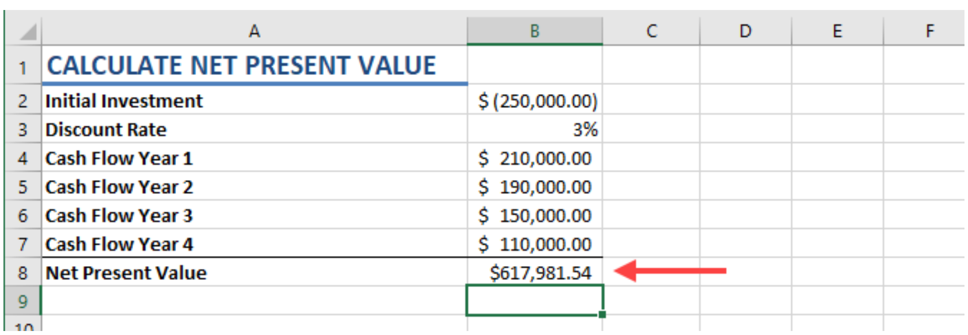
4. Now you need to enter the discount rate (rate argument). In this example it is **3%**, so enter the **B3** cell reference:



5. The future cash flow (value argument) now needs to be entered. Add a **comma** and then enter the **B4:B7** range followed by a **closing parenthesis**:

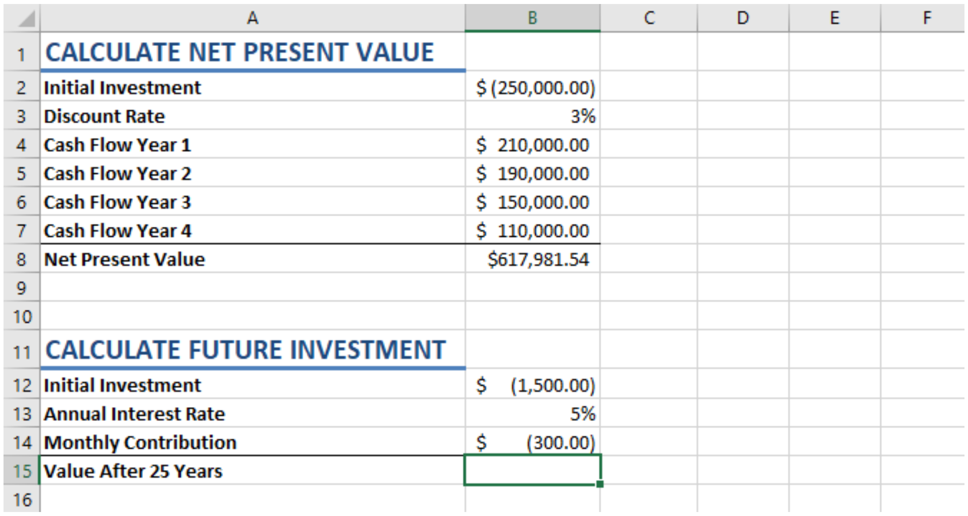


6. Press **Enter** to apply the new function. You will see the result in the currently selected cell:

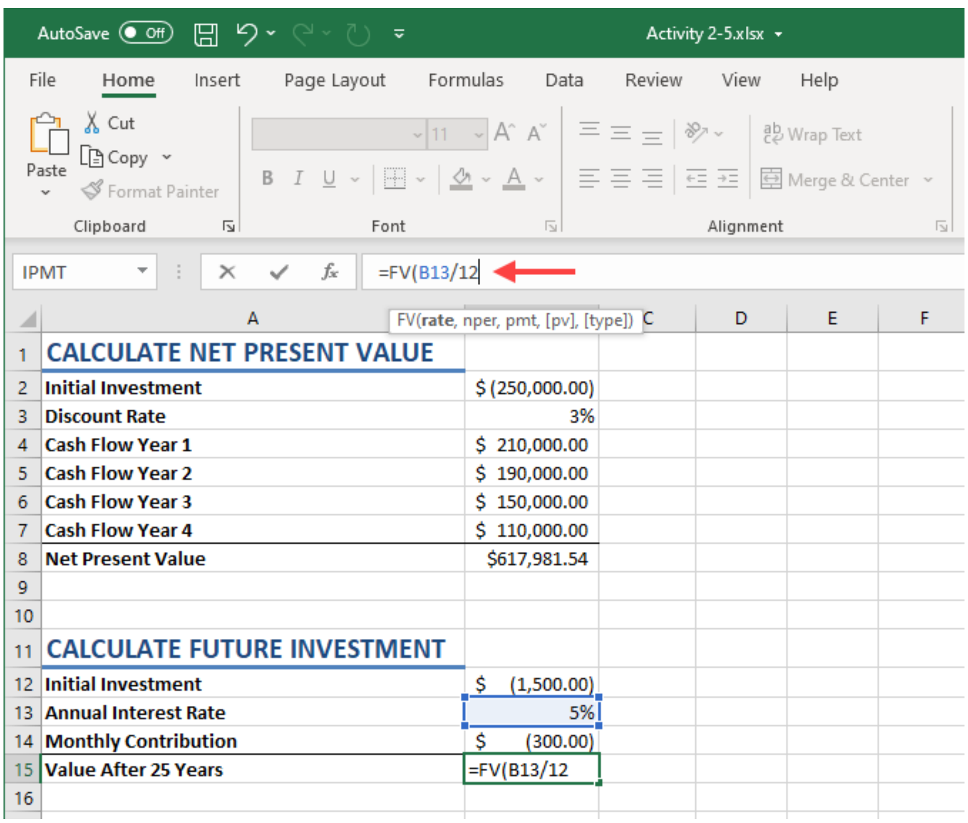


7. Keep in mind that this result does not factor in the initial cost (B2). In order to calculate the true NPV of this investment, the initial cost of the investment needs to be subtracted from the value that was returned from the NPV function. In this example, the NPV for this investment would be $367,981.54.

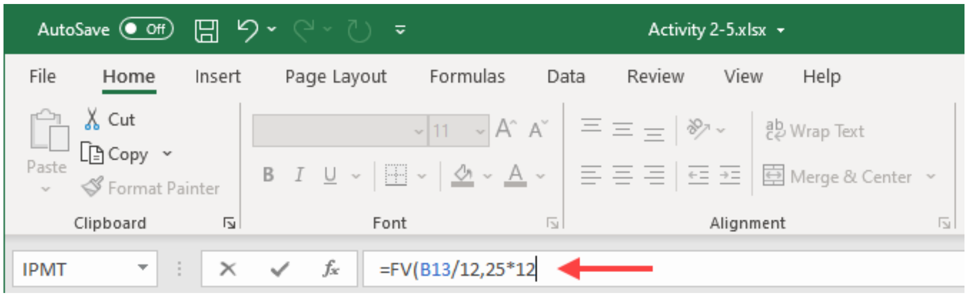
8. Next, you need to calculate the future investment value using the information a little lower on this worksheet. Click to select cell **B15**:



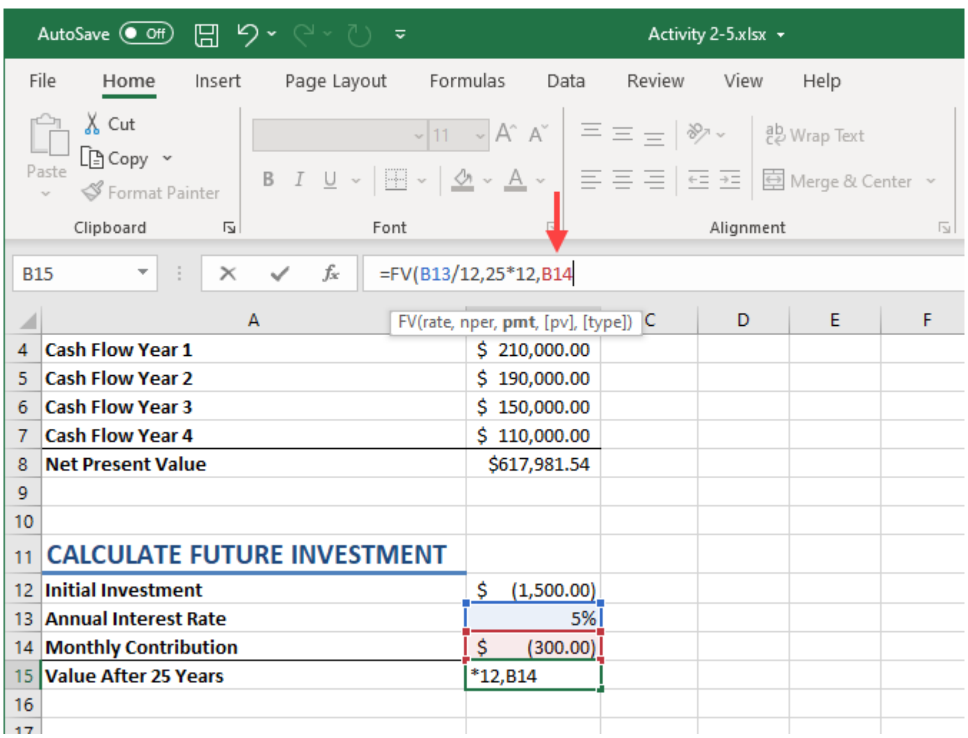
9. Inside the Formula Bar, type "**=FV(B13/12**":



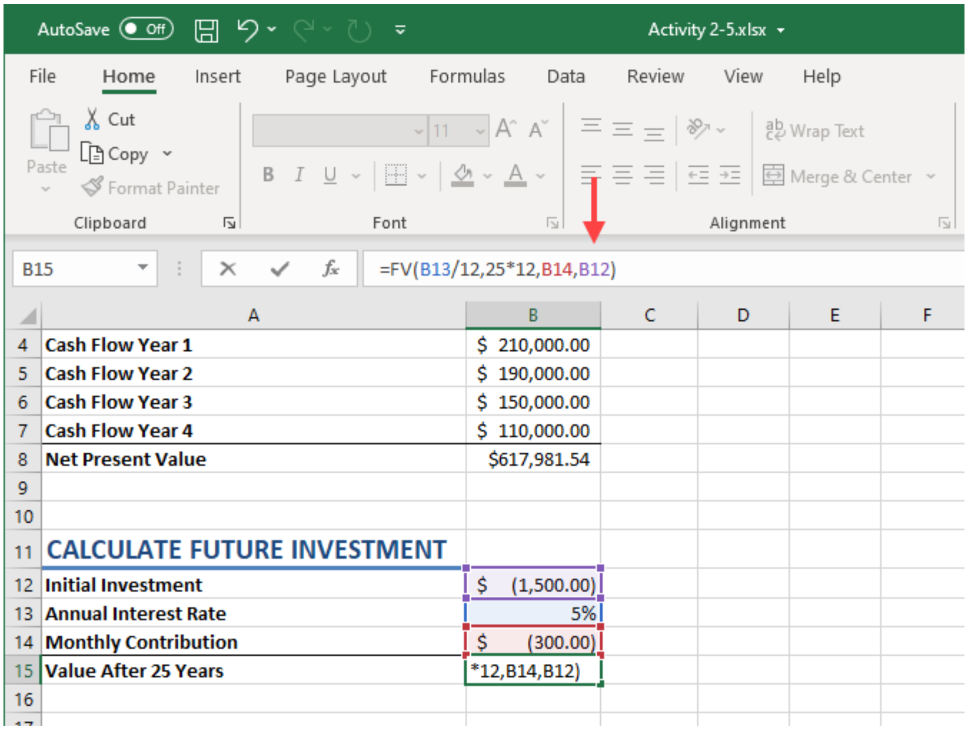
10. Now add the period that you wish to use to calculate the future value (nper). In this example it is 25 years, so in the Formula Bar add a **comma** and then type "**25*12**":



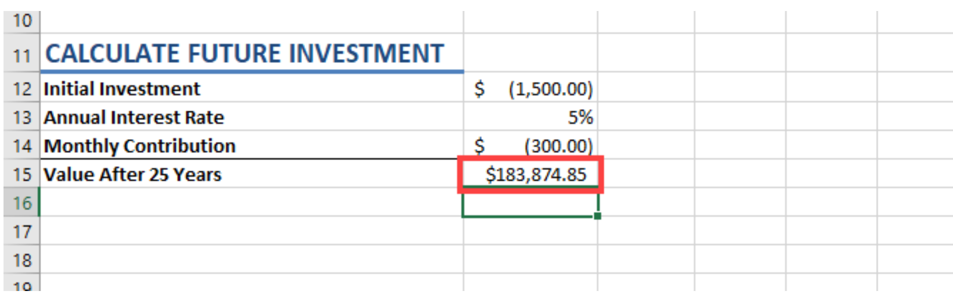
11. Next, you need to declare what the monthly contribution to this investment will be after the initial investment (pmt). In the Formula Bar, add a **comma** and type the "**B14**" cell reference:



12. Finally, you need to enter the present value of the investment (pv). In the Formula Bar, add a **comma** and then type **B12** followed by a **closing parenthesis**:



13. Press **Enter** to apply the new formula. You will see that the value of this investment will be $183,874.85 after 25 years of contributions and the initial investment of $1,500:



14. Save the current workbook as Activity 2-5 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

In this lesson you learned about using text functions to manage and manipulate text, using logical functions to answer questions, as well as how to use lookup functions to find information. You have also learned how to use date functions to return date information. Additionally, you learned about the different financial functions that are available and how they operate.

Review Questions

1. **What is the TRIM function used for?**

2. **What is the TEXTJOIN function used for?**

3. **What are the only two possible outputs from a logical function?**

4. **What is the difference between the TODAY function and the NOW function?**

5. **What is the FV function used for?**

LESSON 3: ORGANIZING WORKSHEET DATA WITH TABLES

Lesson Objectives

In this lesson you will learn how to:

- Create and format tables
- Modify tables
- Use table references

TOPIC A: Create and Format Tables

While formulas and functions are great at analyzing data within your workbook, they are more apt at analyzing entire workbooks rather than specific sets of data. If you need to analyze smaller sets of data within a large workbook or break down large sets of data into smaller parts, then converting your data into tables is often the best solution. Tables allow you to use Excel's powerful organizational capabilities without modifying the data itself. Using tables, you can narrow down specific data, focus on only the important information, and more.

Topic Objectives

In this session, you will learn:

- About tables
- About the components of a table
- How to use the Create Table dialog box
- About the Table Design contextual tab
- How to use and apply table styles, as well as Quick Styles
- How to customize row display

Tables

A **table** is a specially designated range of information that has added functionality. You can have multiple tables per worksheet, and tables can be as large or small as the amount of data you want to work with. Tables can be created from existing data ranges or from empty ranges and then populated afterwards. Once a table has been created, it will automatically be given a generic name such as “Table1” or “Table2” depending upon the number of tables present in the current workbook; however, these names can be changed at any time. Additionally, tables are flexible in that you can convert a table back to a normal range at any point without affecting the contents.

A table is made from adjacent columns of data, with a unique label or heading for each column. Columns and rows may be added to a table just as you would when working with a normal range.

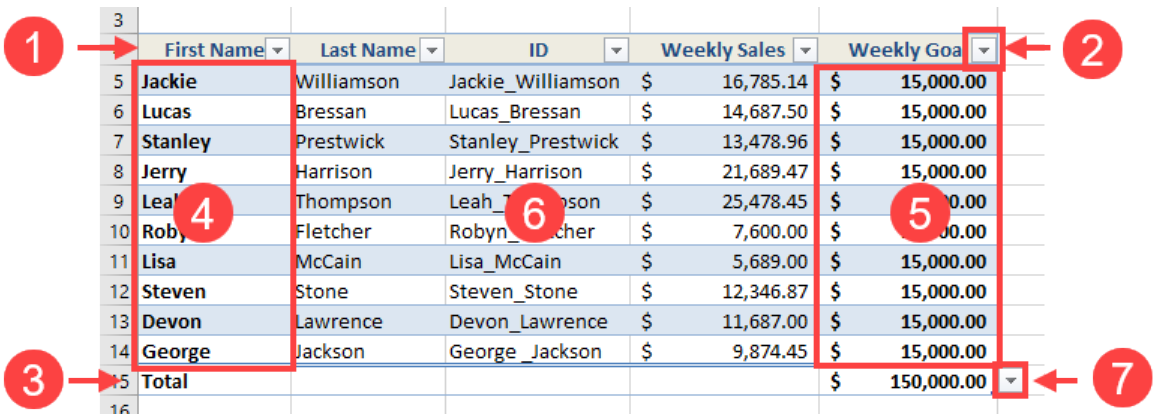
Remember that each worksheet has a lot more rows than columns. This design is well suited for data organized in long, adjacent, list-like columns:

Weekly Sales & Bonus Payout

First Name	Last Name	ID	Weekly Sales	Weekly Goal
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00

Table Components

A number of components come together to create a table. Here is an overview of each element.



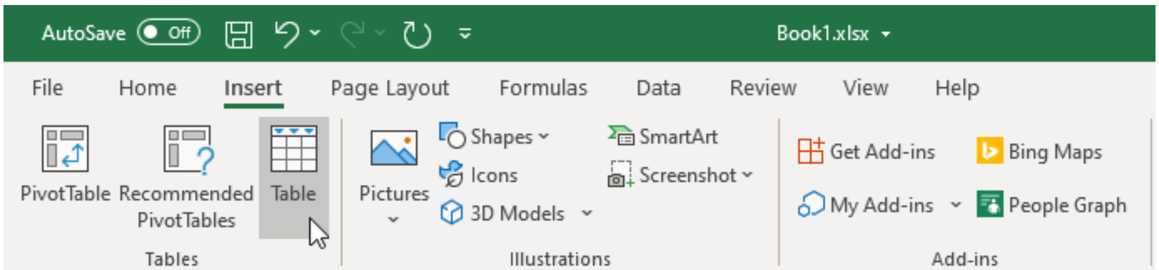
The **Header Row (1)** displays the column headers (or names) for each column in the table. For each header within the Header row, you will see the **Header Row drop-down arrow (2)**. This is used to access filter and sort commands.

Banded Rows (6) allow you to easily differentiate between each row that appears within the table, while the **Total Row (3)** is used to display the results of calculations that are done on a column-by-column basis. When the Total row is selected it also includes the **Total Row drop-down arrow (7)**. This gives you quick access to functions that can perform calculations on the table data.

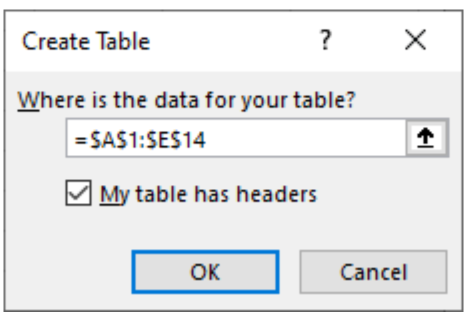
Finally, the **First Column (4)** option applies a bold effect to first column to the table to differentiate it from other columns. The **Last Column (5)** option, when applied, will do the same thing to the last column of data.

The Create Table Dialog Box

The **Create Table** dialog box is used to convert existing ranges of data into a table. To access this dialog box, select the cell range that you would like to convert into a table and then click **Insert → Table:**



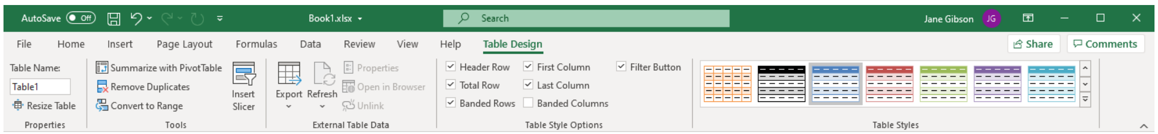
The Create Table dialog box will open. You will see the selected range (using absolute cell references) in the “Where is the data for your table?” text box. You can enter a different range into the provided field or, select one with your mouse by clicking the Cell Selector button:



Checking the “**My table has headers**” checkbox indicates that the first row in the selected range contains column names. If your data does not have headers (or column names), Excel inserts a header row and give the columns generic names of “Column”, followed by a sequential number. Clicking the OK button converts the selected cell range into a table.

The Table Design Contextual Tab

Whenever you are working with a table, the **Table Design** contextual tab appears on the ribbon. Using the controls on this tab, you can modify just about any aspect of your table:

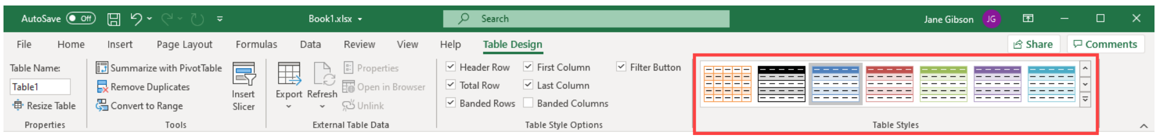


Here is a brief description of the various groups that are situated on this tab and the commands and options that they contain.

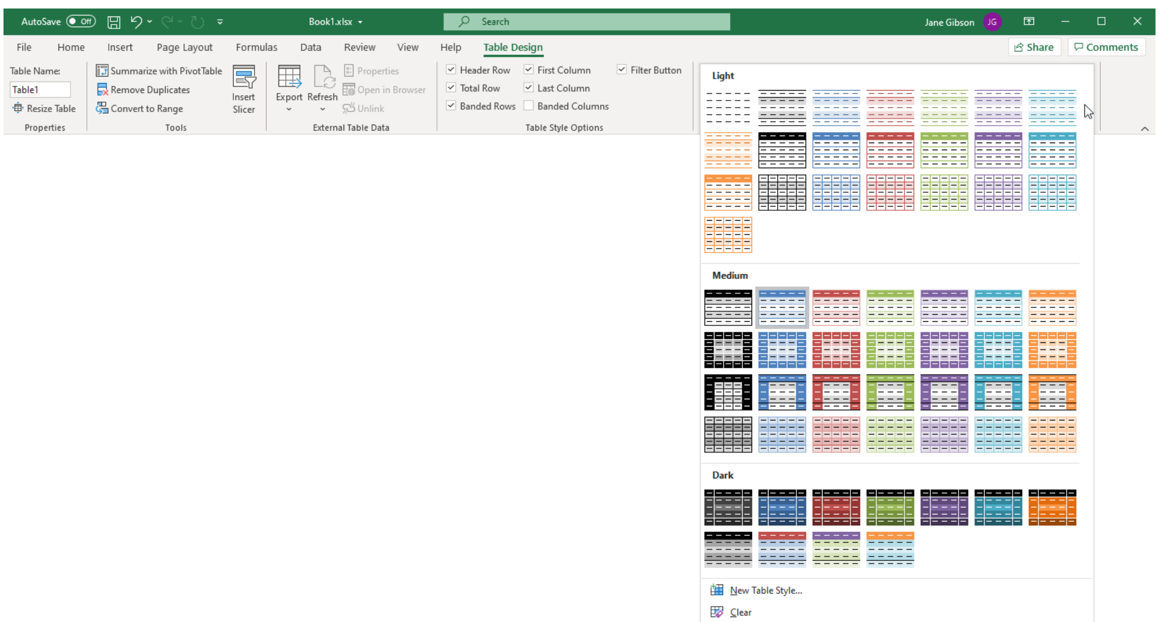
Properties	This group allows you to view and edit the current table's name. You can also redefine the table size using the Resize Table command.
Tools	Within this group, the Remove Duplicates command allows you to remove duplicate values from the current table. The "Summarize with PivotTable" command will create a PivotTable out of the current table, and the "Convert to Range" command will convert it back to a regular range. You can also insert a slicer into the table using the Insert Slicer command.
External Table Data	The commands in this group are used to export table data to other applications, as well as manage data links to external resources.
Table Style Options	The checkbox controls in this group allow you to toggle on or off available table components.
Table Styles	This group displays a gallery of styles that you can apply to the current table.

Styles and Quick Style Sets

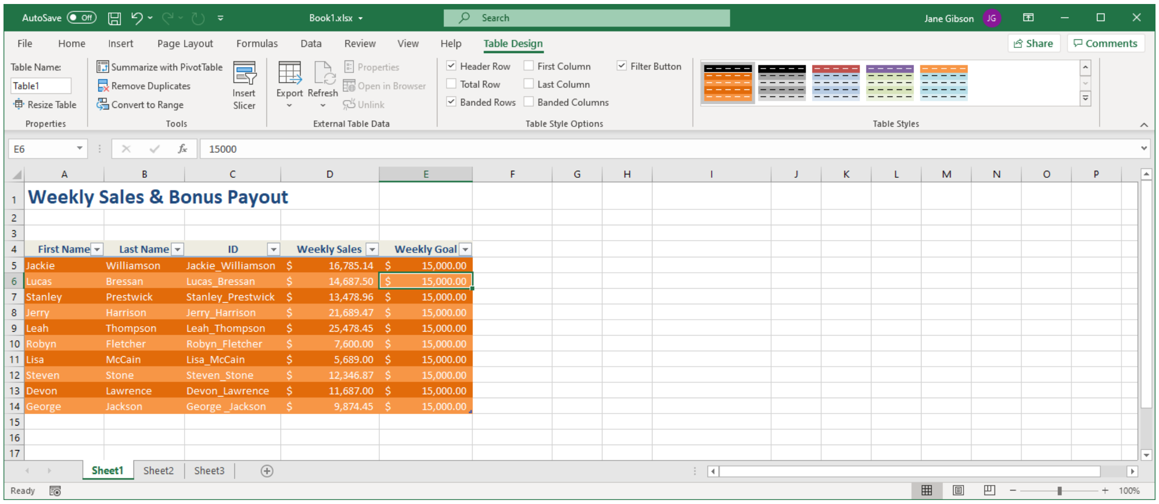
Similar to cell styles, **table styles** are preconfigured formatting options that can be applied to tables. They allow you to quickly apply a splash of color to your tables and in some cases enhance their readability. While you do have the option of configuring your own table style, you can also select from a variety of preconfigured quick styles. You can find all of these quick styles within the **Table Styles group** of the **Table Design tab**:



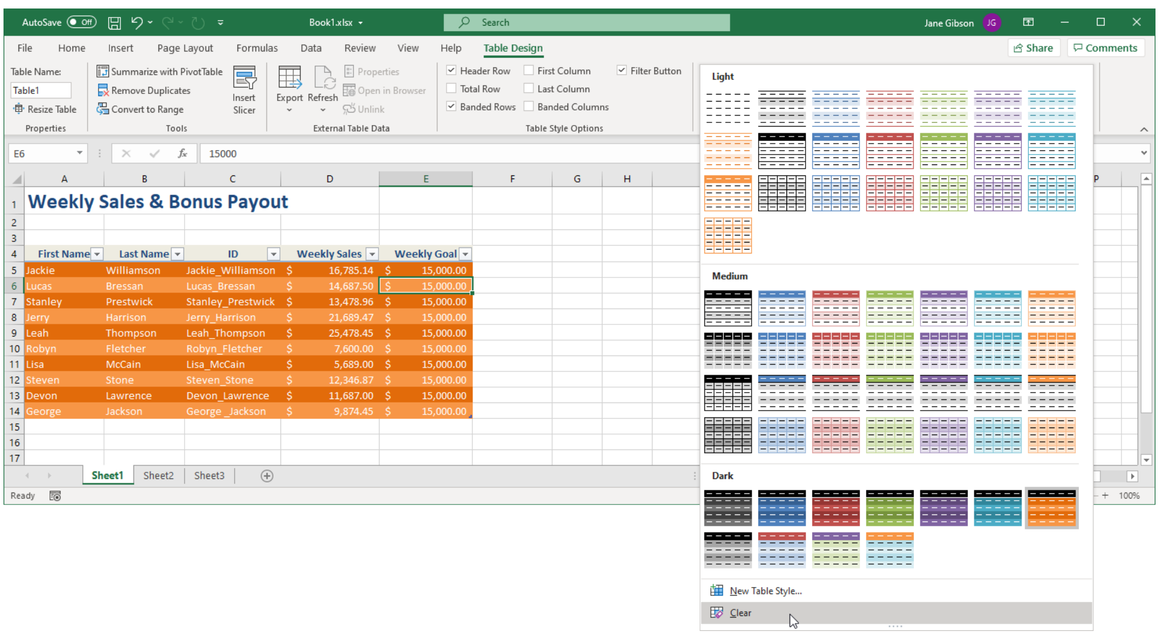
Clicking the **More arrow** () within the Table Styles gallery expands it to show more options:



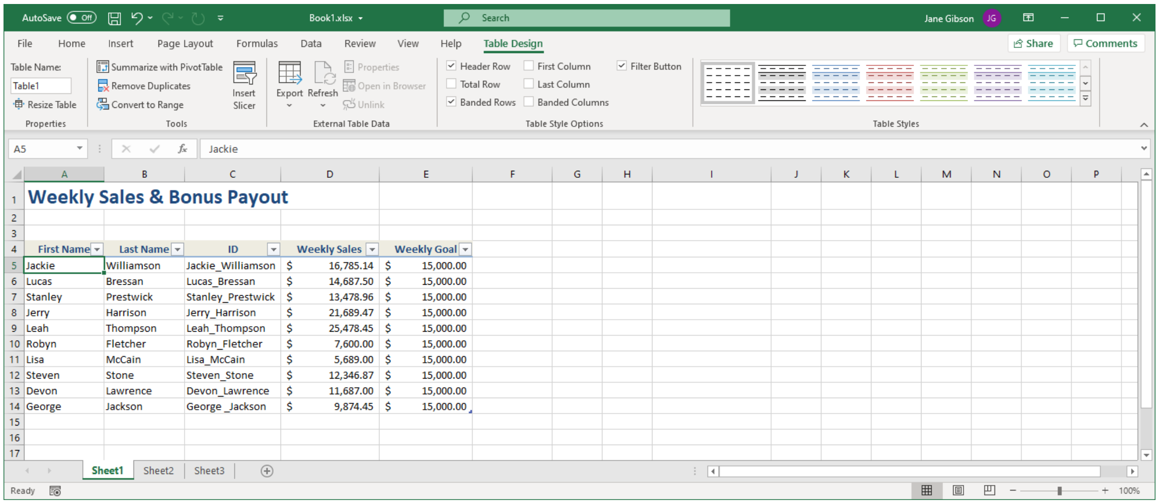
Clicking any style option inside the Table Styles gallery applies it to the current table:



To clear an applied style, click the **More arrow** ( ) within the Table Styles gallery, and then click **Clear:**



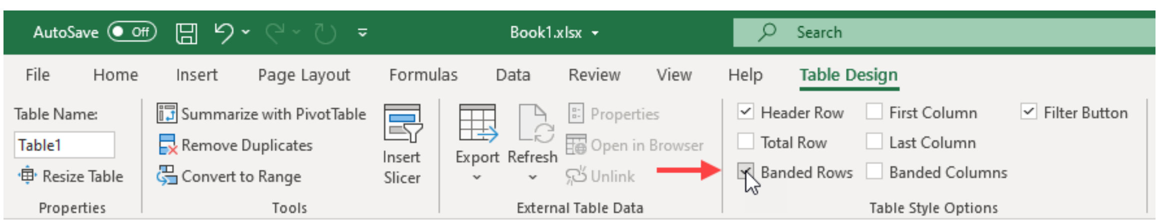
The table is then displayed with no style at all:



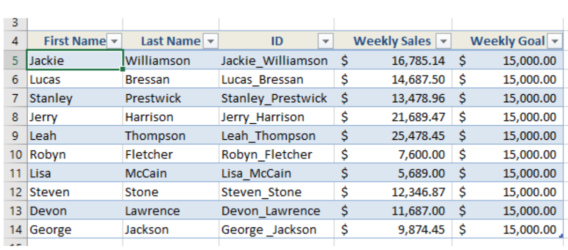
First Name	Last Name	ID	Weekly Sales	Weekly Goal
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00

Customizing Row Display

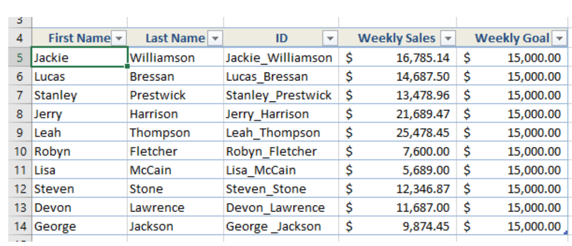
Rows in a table can be customized through the enabling (or disabling) of banded rows and the inclusion of total rows. To toggle banded rows, first select the table that you would like to work with and then click the **Banded Rows** checkbox in the Table Style Options group:



While banded rows are enabled by default to make the data easier to read, disabling it is always an option:

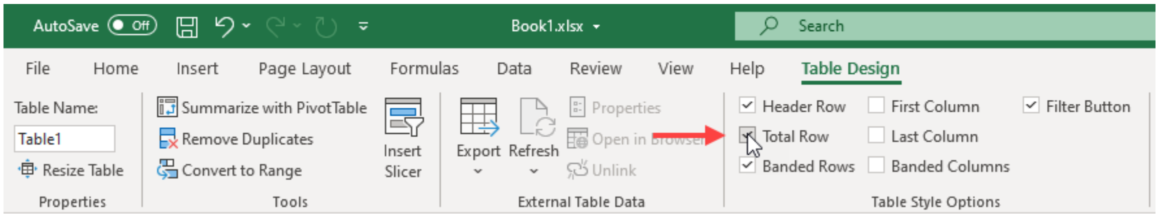


First Name	Last Name	ID	Weekly Sales	Weekly Goal
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00



First Name	Last Name	ID	Weekly Sales	Weekly Goal
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00

Clicking the **Total Row** checkbox in the Table Style Options group inserts a Total row at the bottom of the table:



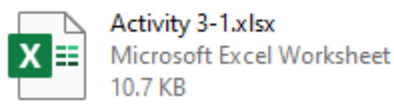
When the Total Row is shown, you will see that it appears bold and one or more of the columns will display a total:

	First Name	Last Name	ID	Weekly Sales	Weekly Goal
5	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
6	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
7	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
10	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
11	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
13	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
14	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00
15	**Total**				**$ 150,000.00**

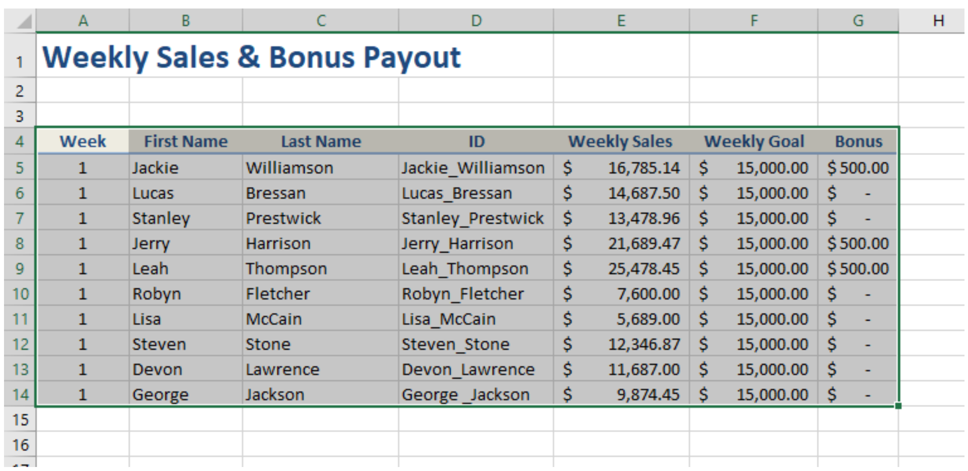
Activity 3-1: Creating and Modifying a Table

You have decided that because the Weekly Sales & Bonus Payout worksheet will become larger on a weekly basis, it is a good idea to convert the range into a table to facilitate data analysis. You would also like to apply a new table style to it.

1. To begin, open Activity 3-1 from your Exercise Files folder:



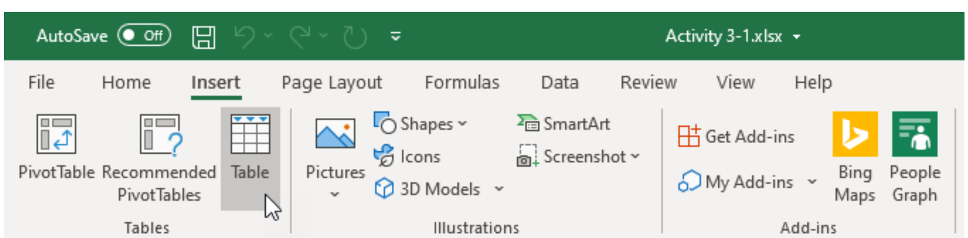
2. First, use your cursor to select the A4:G14 cell range:



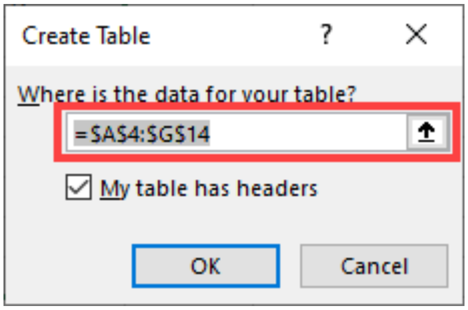
Weekly Sales & Bonus Payout

Week	First Name	Last Name	ID	Weekly Sales	Weekly Goal	Bonus
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 500.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ -
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ -
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 500.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 500.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ -
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ -
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ -
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ -
1	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ -

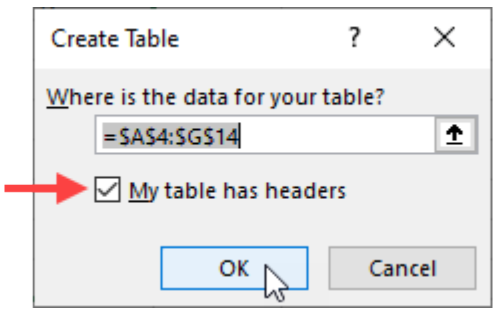
3. Next, click **Insert → Table**:



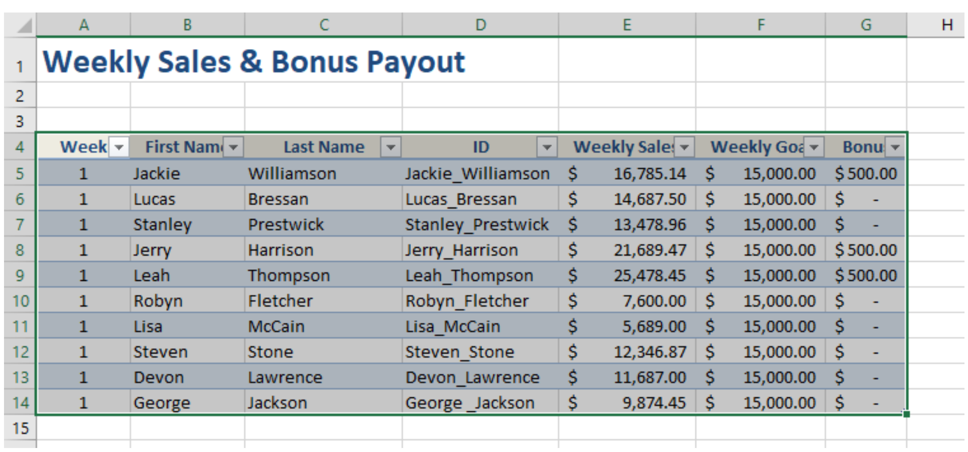
4. In the Create Table dialog box, you will see that the range you previously selected is listed inside the “Where is the data for your table?” text box:



5. Ensure that the “**My table has headers**” checkbox is checked and click **OK**:



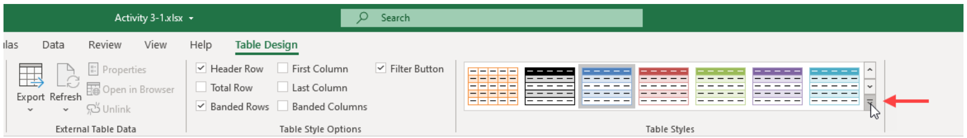
6. You will see that the previously selected range has now been converted into a table:



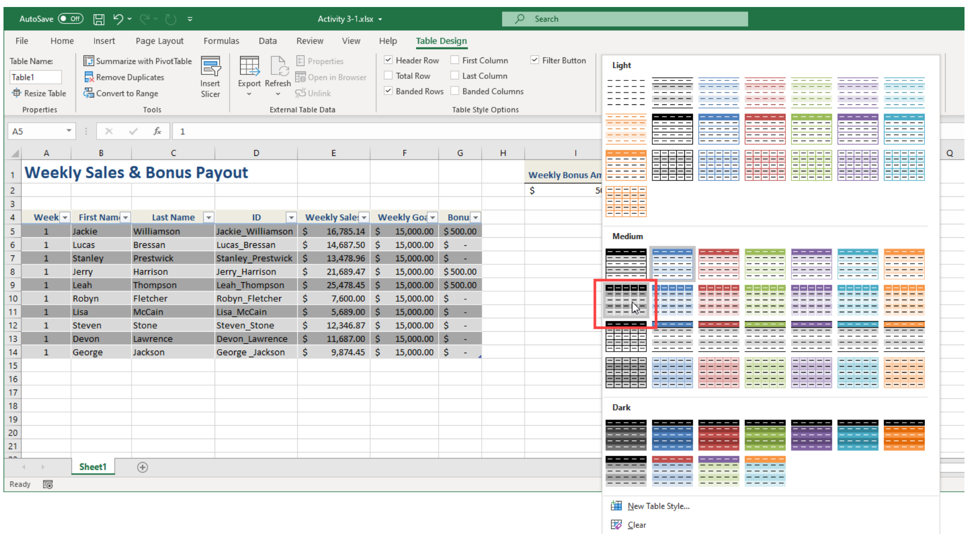
Weekly Sales & Bonus Payout

Week	First Nam	Last Name	ID	Weekly Sale	Weekly Goa	Bonu
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 500.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ -
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ -
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 500.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 500.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ -
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ -
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ -
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ -
1	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ -

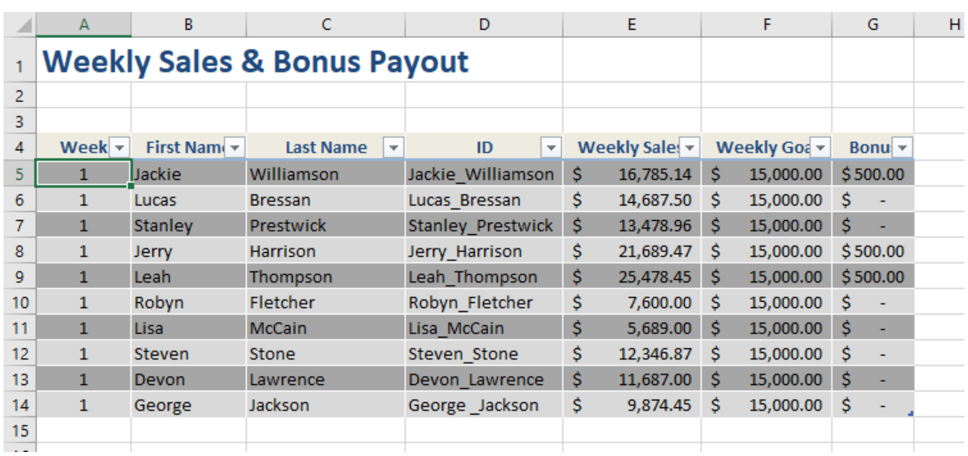
7. Now, you need to apply a new table style. With any of the cells inside the table selected, open the **Table Design** contextual tab. Within the Table Styles group, click the **More arrow** ( ):



8. A variety of different quick styles to choose from is now displayed. For this example, click **Table Style Medium 8**:



9. The new style is now applied to the current table:



Week	First Name	Last Name	ID	Weekly Sales	Weekly Goal	Bonus
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 500.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ -
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ -
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 500.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 500.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ -
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ -
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ -
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ -
1	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ -

10. Save the current workbook as Activity 3-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Modifying Tables

Once you have created and formatted a table, you will have access to many tools that will allow you to quickly organize and manage your data. During this topic you will learn how to resize a table, and how to quickly summarize your data. You will also learn how to clean your data by removing duplicates.

Topic Objectives

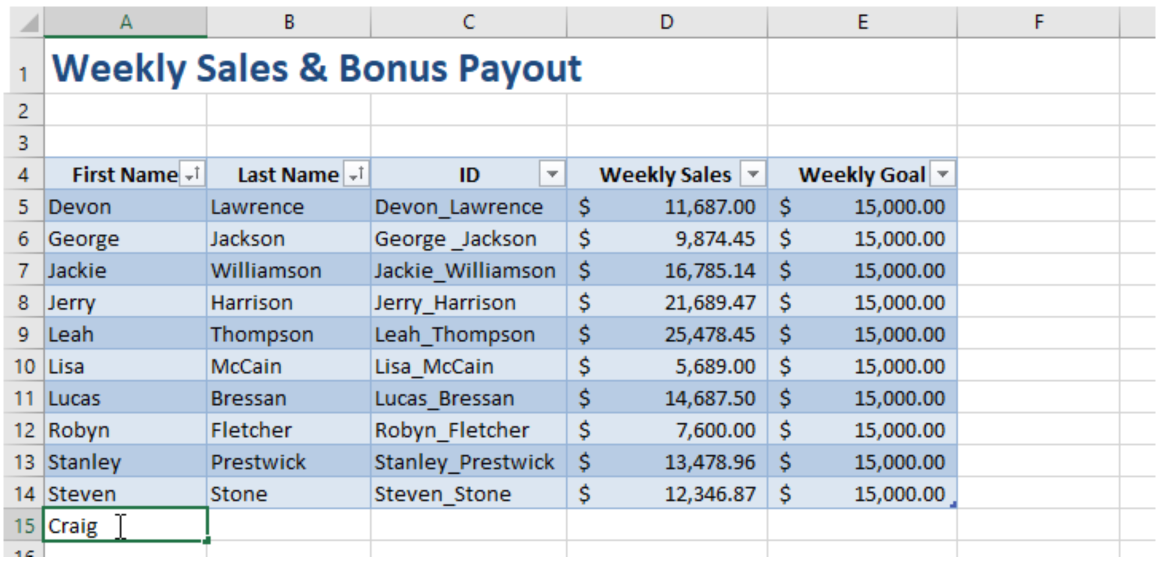
In this session, you will learn:

- How to add and remove rows and columns
- About total row functions
- How to remove duplicate values

Adding Rows and Columns

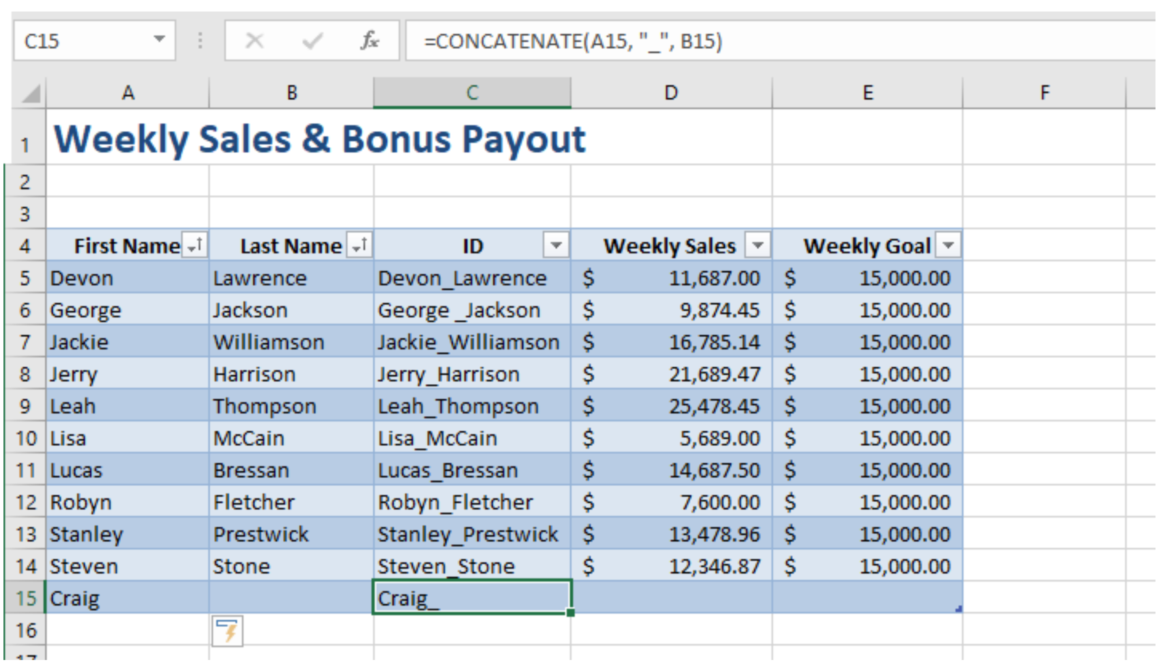
Once you have created a table in Excel, there are many ways that you can easily add or remove table rows and columns.

To add rows at the bottom of the table, you can simply select any cell immediately below the table and type your data:



	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
2						
3						
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal	
5	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
6	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
7	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
11	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	
12	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
13	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
14	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
15	Craig					

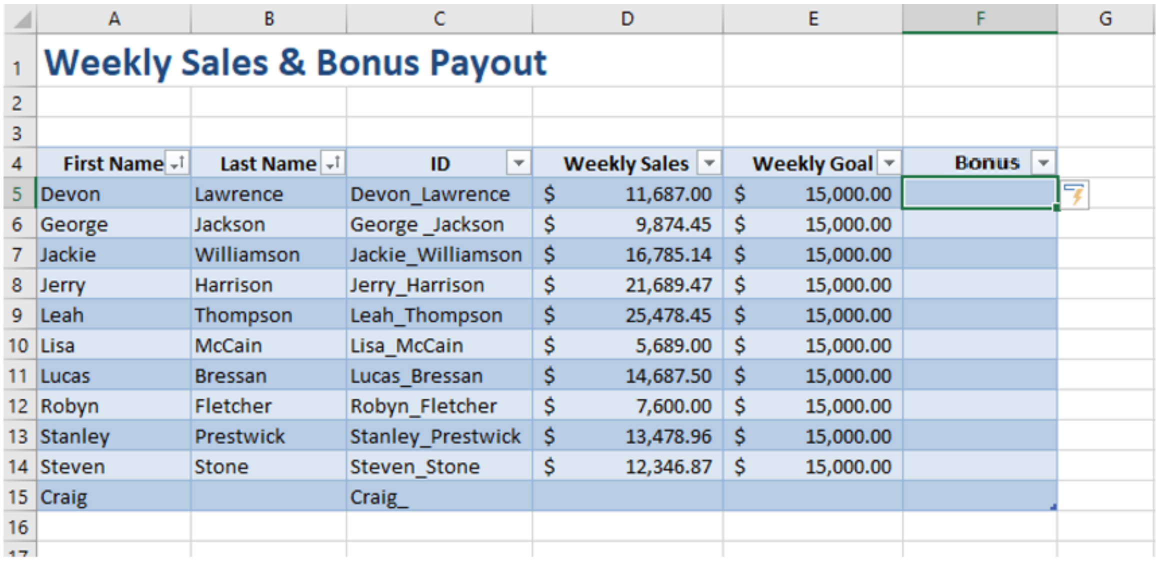
When you press **Enter** (or Tab or select a cell outside of the table) Excel automatically expands the table to include the new row. The new row will include any formulas that are used in the table:



C15 =CONCATENATE(A15, "_", B15)

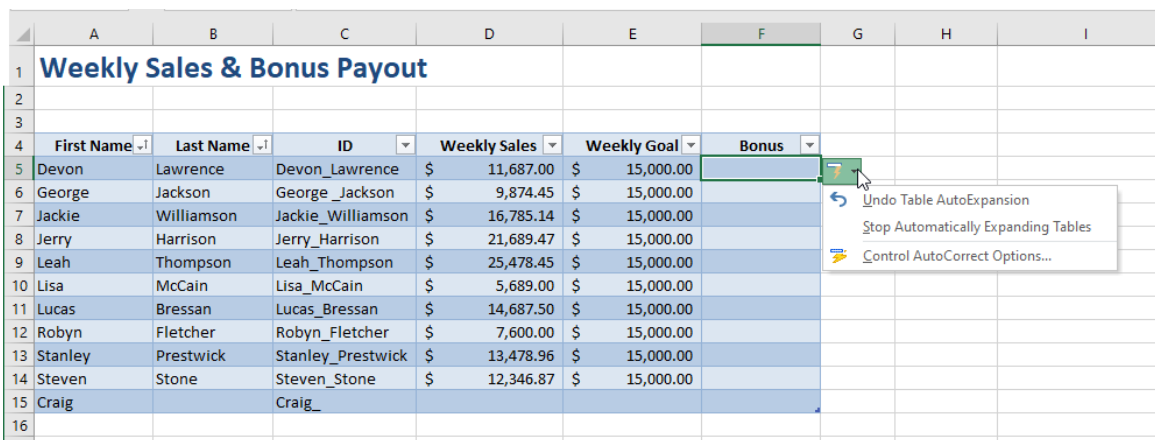
	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
2						
3						
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal	
5	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
6	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
7	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
11	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	
12	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
13	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
14	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
15	Craig		Craig_			
16						

Similarly, if you select a cell immediately to the right of a table and enter data, Excel automatically expands the table to include the new column:


Weekly Sales & Bonus Payout

First Name	Last Name	ID	Weekly Sales	Weekly Goal	Bonus
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
Craig		Craig_			

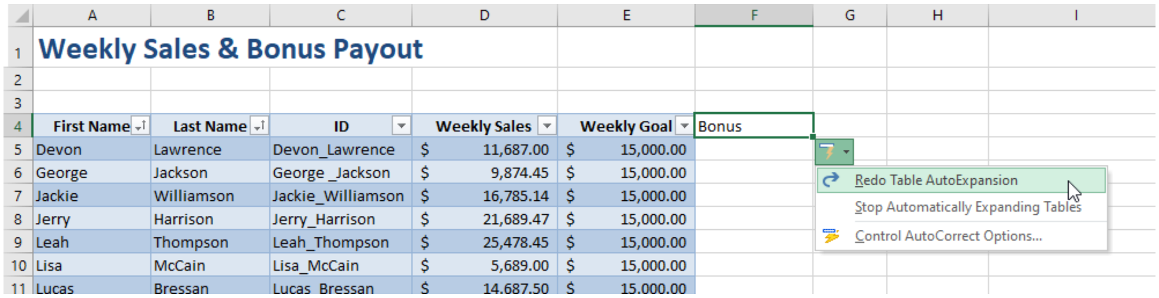
This functionality is called **Table AutoExpansion**. You can control this behavior by clicking on the Control AutoCorrect Options button that appears next to added row or column, and selecting the appropriate option:



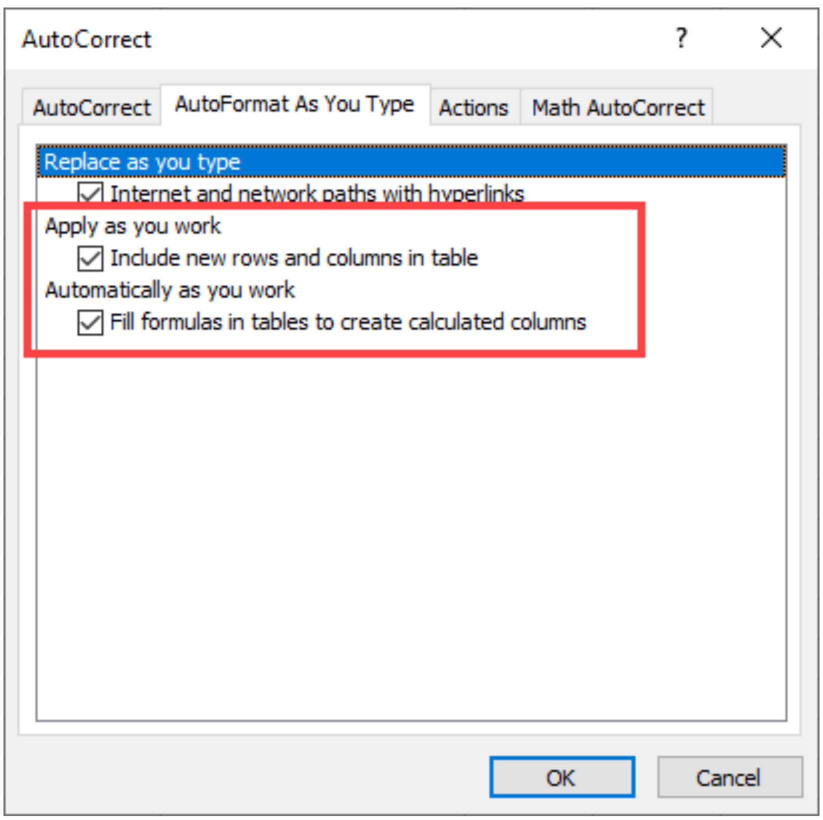
Weekly Sales & Bonus Payout

First Name	Last Name	ID	Weekly Sales	Weekly Goal	Bonus
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
Craig		Craig_			

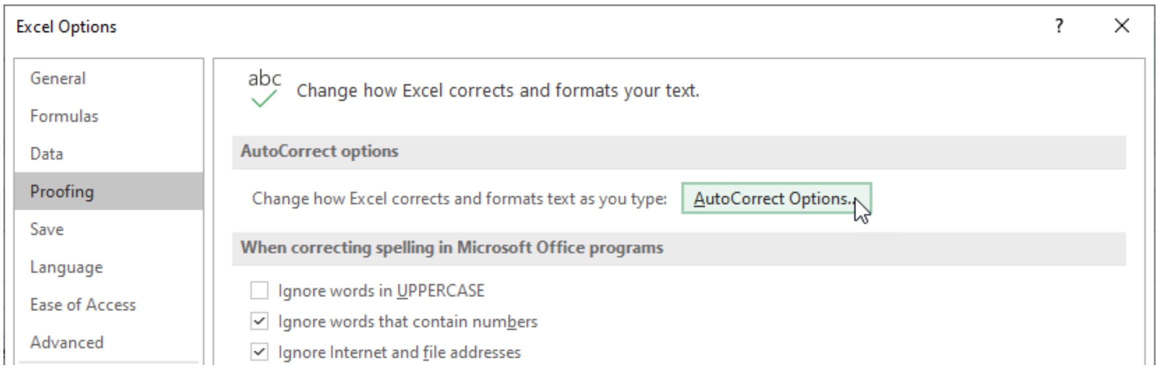
Selecting **Undo Table AutoExpansion** removes the column or row from the table, but the data you entered remains, and the AutoCorrect Options button is still displayed, allowing you to select **Redo Table AutoExpansion**:



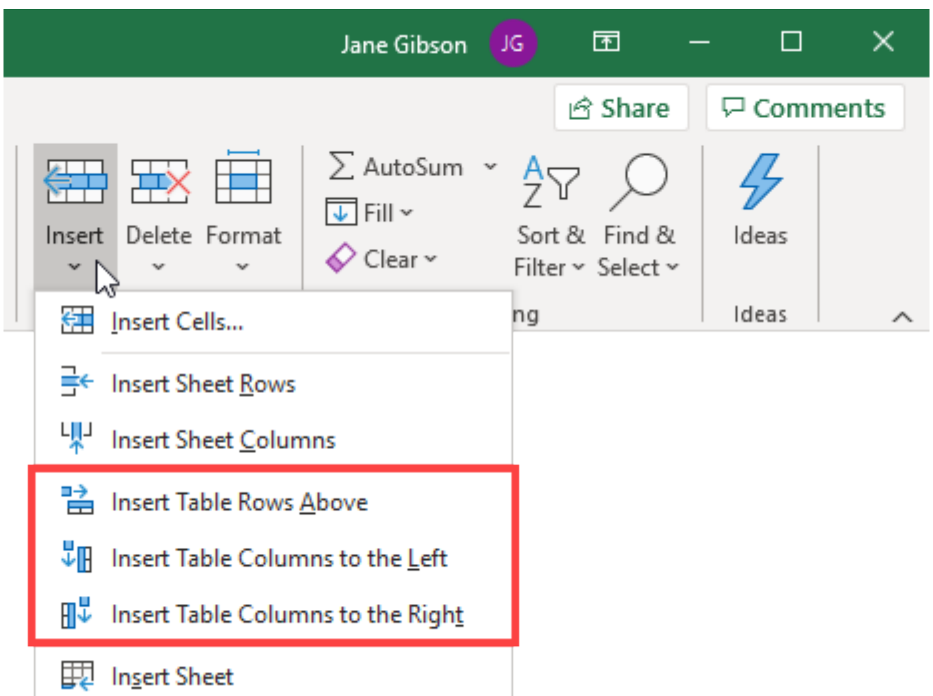
Selecting **Control Auto Correct Options** launches the **AutoCorrect** dialog box where, on the AutoFormat As You Type tab, you can set your preferences for automatically including new rows and columns in tables, and automatically filling formulas in tables:



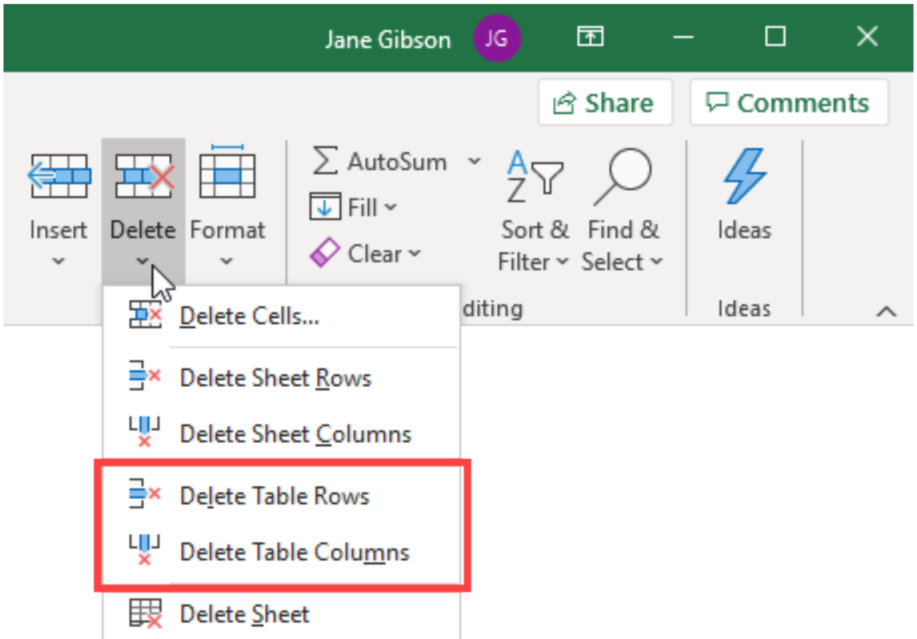
If you select **Stop Automatically Expanding Tables** after clicking the Auto Correct Options button, the AutoCorrect Options button is no longer visible when working on your tables. To open the AutoCorrect dialog box, click **File → Options,** then select the **Proofing** category in the Excel Options dialog box and click **AutoCorrect Options:**



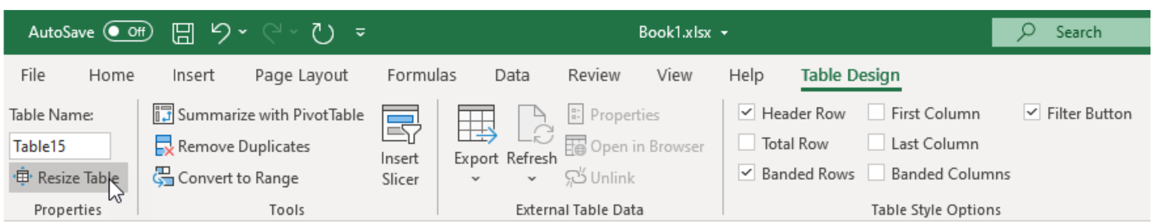
You can also add rows and columns to a table by selecting a cell, row, or column in the table and clicking **Home → Insert,** then selecting from the available options:



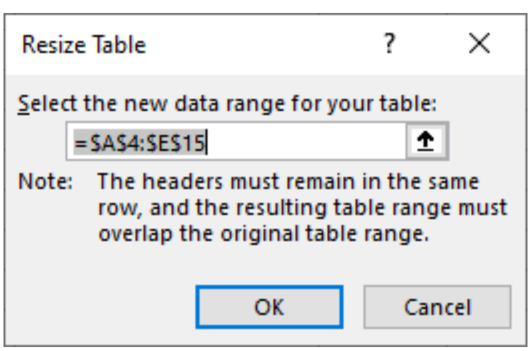
Similarly, you can delete rows or columns by clicking **Home → Delete,** and selecting either **Delete Table Rows** or **Delete Table Columns**:



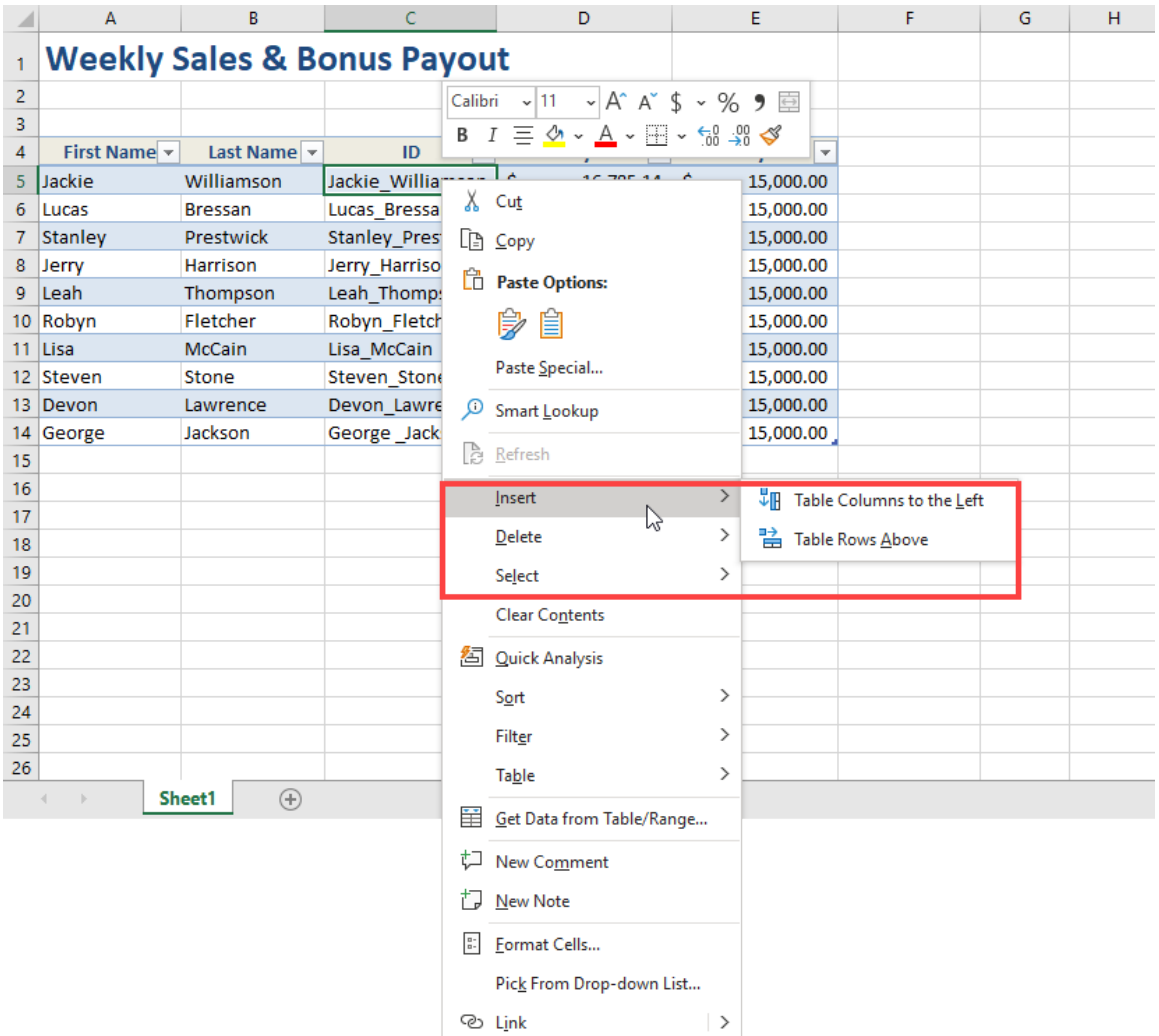
You can also adjust the size of your table by clicking **Table Design → Resize Table:**



This opens the **Resize Table** dialog box, where you can define the new range of your table. Keep in mind that the headers must remain in the same row, and the resulting table range must overlap the original table range:



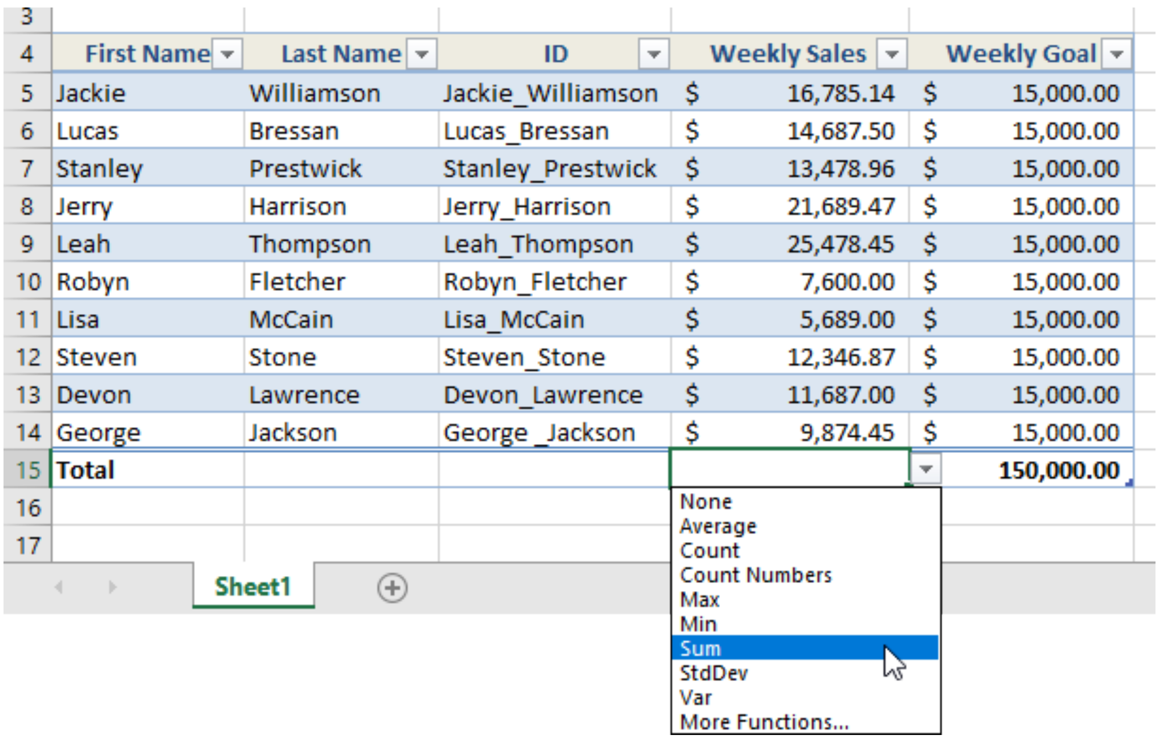
Additionally, options to add or remove row and/or columns are available by right-clicking a cell in the table and selecting from the available options in the menu:



Total Row Functions

As we discussed earlier in the lesson, you can add a **Total Row** to your tables by clicking the Total Row checkbox in the Table Style Options group of the Table Design contextual tab. Now we will explore some of the functions that are available in this row to help analyze and summarize your data.

Selecting any cell in the **Total Row** displays the Total Row drop-down arrow, which provides function options for calculating the total for that particular column:



	First Name	Last Name	ID	Weekly Sales	Weekly Goal
5	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
6	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
7	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
10	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
11	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
13	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
14	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00
15	Total				150,000.00

In the below example

	First Name	Last Name	ID	Weekly Sales	Weekly Goal
3					
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal
5	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
6	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
7	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
10	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
11	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
13	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
14	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00
15	Total		10	139,316.84	$ 150,000.00
16					

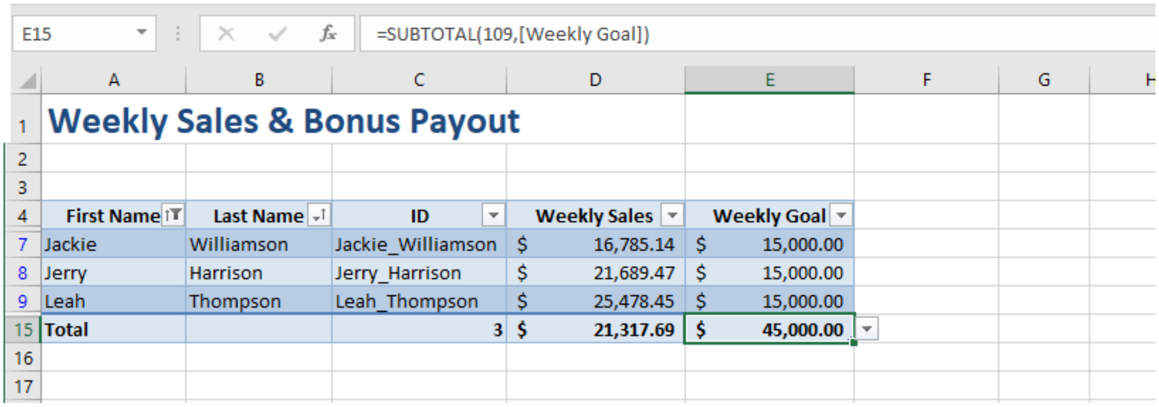
It is important to note, though, that the functions that you select are not necessarily the functions that are used to display the value. In this example, if we select cell E15, the sum of the Weekly Goal column, we will see in the Formula Bar that the function used is actually SUBTOTAL:

E15 =SUBTOTAL(109,[Weekly Goal])

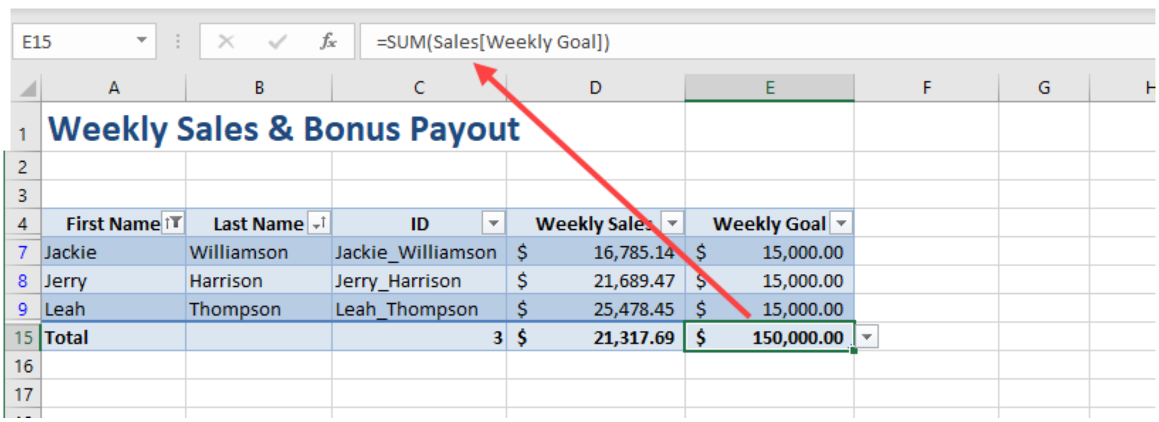
	A	B	C	D	E	F	G
1	Weekly Sales & Bonus Payout						
2							
3							
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal		
5	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00		
6	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00		
7	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00		
8	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00		
9	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00		
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00		
11	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00		
12	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00		
13	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00		
14	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00		
15	Total		10	$ 13,931.68	$ 150,000.00		
16							
17							

SUBTOTAL functions are used to perform calculations on only subsets of data within a range or table. In this case it is particularly useful to display the table total values when filters are applied to the table

In the below example, a filter has been applied to hide several of the sales representatives. Note that the results in the total row only reflect the data that is visible after the filter is applied:



If you prefer, you can manually enter functions in the Total Row cells. In the below example the Weekly Goal column total is a true SUM function, showing the total for all rows, while the Weekly Sales column remains a SUBTOTAL function, only showing the total for the rows that are not hidden:



SUBTOTAL Function

Now that you have seen how the **SUBTOTAL** function is used in the Total Row, here is some more detail on the function syntax and arguments.

=SUBTOTAL(function_num, ref1, [ref2], […])

The **function_num** argument is used to define other functions that you would like to use to calculate subtotals. Functions are called using numeric values of 1 to 11 when including hidden values and 101 to 111 when excluding them. For example, if you want to subtotal using the SUM function and include hidden values in the calculation, you would type “9” as the argument. To exclude the hidden values, as in the example shown above, you would type “109.”

Below is a table that tells you which value calls which function in the function_num argument:

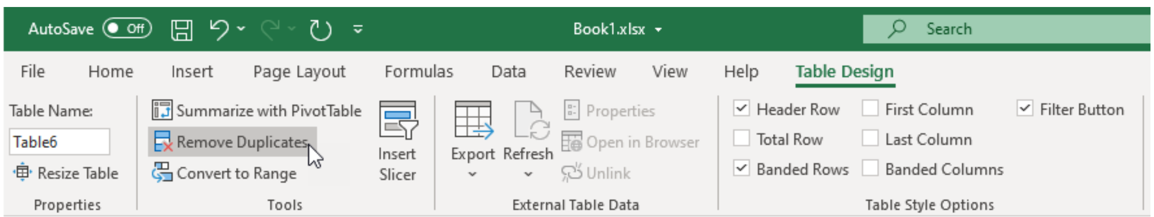
Function Argument Including Hidden Values	Function Argument Ignoring Hidden Values	Function
1	101	AVERAGE
2	102	COUNT
3	103	COUNTA
4	104	MAX
5	105	MIN
6	106	PRODUCT
7	107	STDEV
8	108	STDEVP
9	109	SUM
10	110	VAR
11	111	VARP

The reference arguments (**ref1**, **ref2**, etc.) identify the ranges that you want to subtotal.

Removing Duplicate Values

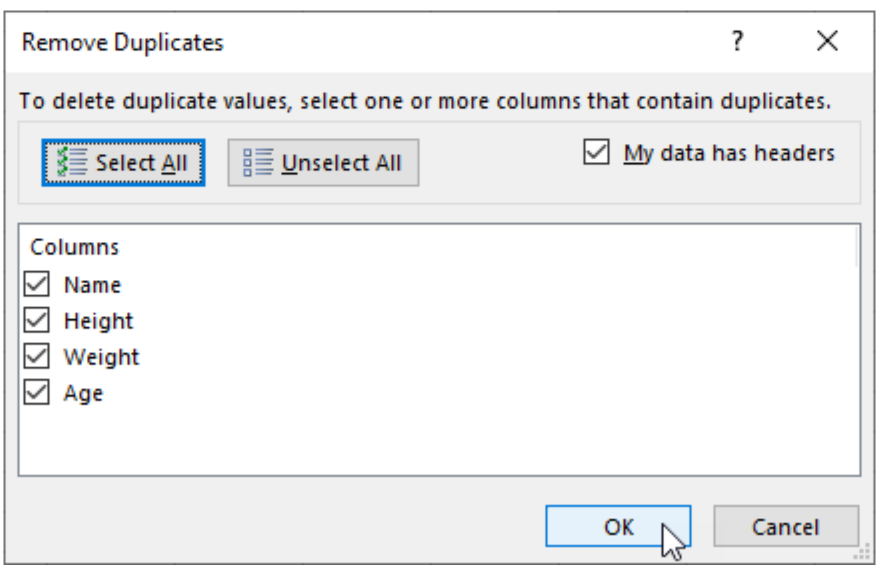
Duplicate values in data can be a common occurrence, especially in larger datasets, where data has originated from multiple sources, and they can be difficult to identify, when dealing with many columns and rows. It is important, however, to identify and remove duplicates from your data to ensure accuracy and that your analyses are correct.

While there are many strategies for identifying and removing duplicate data, Excel has a built-in function to remove duplicate values from tables (or ranges) that can be very effective. To use this function, click anywhere inside of a table and then click **Table Design → Remove Duplicates**:

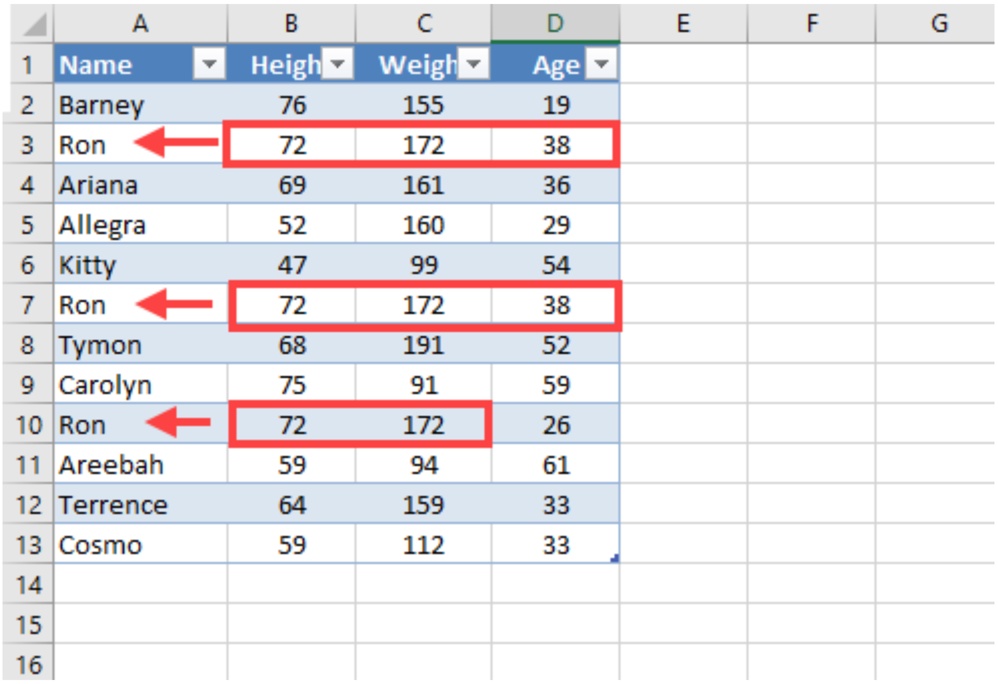


You can also access this function by clicking **Data → Remove Duplicates,** when working with ranges.

This displays the **Remove Duplicates** dialog box. Here, you can select the columns that contain the duplicates that you would like to remove (By default all of the columns in the table will be selected).

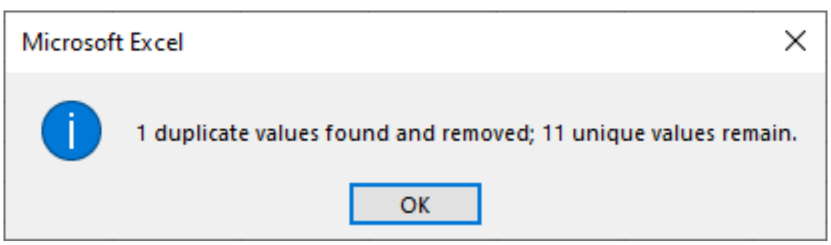


Use caution when selecting only some of the columns, as it may create a situation where you can unintentionally delete data that is not a duplicate. In the below example there are three instances of the name Ron in the dataset, but only two of the rows are identical across all of the columns. Extra care should be taken whenever you are removing duplicates and using only some of the columns to define them:



	A	B	C	D	E	F	G
1	Name	Heigh	Weigh	Age			
2	Barney	76	155	19			
3	Ron	72	172	38			
4	Ariana	69	161	36			
5	Allegra	52	160	29			
6	Kitty	47	99	54			
7	Ron	72	172	38			
8	Tymon	68	191	52			
9	Carolyn	75	91	59			
10	Ron	72	172	26			
11	Areebah	59	94	61			
12	Terrence	64	159	33			
13	Cosmo	59	112	33			
14							
15							
16							

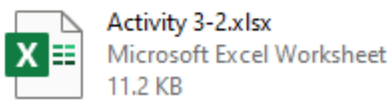
Once you have selected the columns, click **OK** in the Remove Duplicates dialog box. Any duplicate value that is found is then removed. An information box appears that informs you of the number of duplicate values found and how many unique values remain:



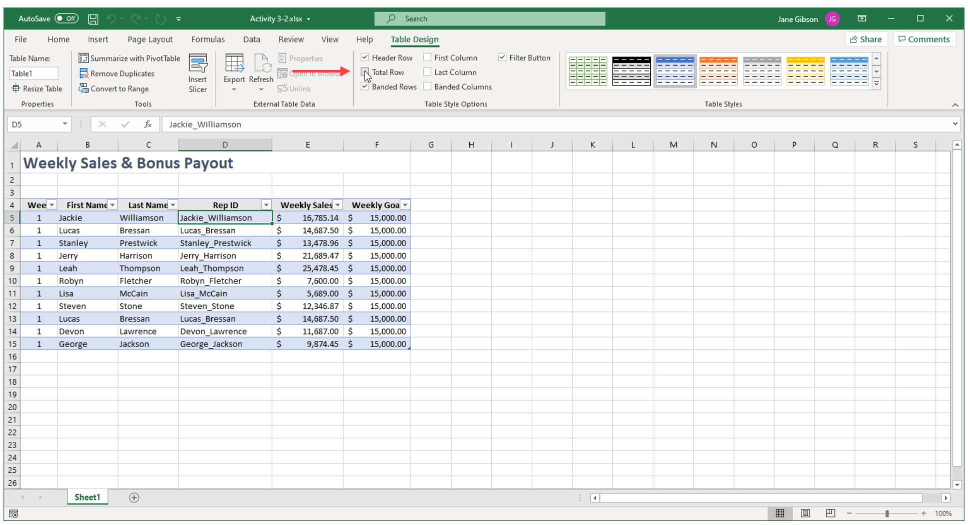
Activity 3-2: Modifying Tables

You would like to analyze the top sales associate data in the Weekly Sales & Bonus Payout worksheet that you have been working on.

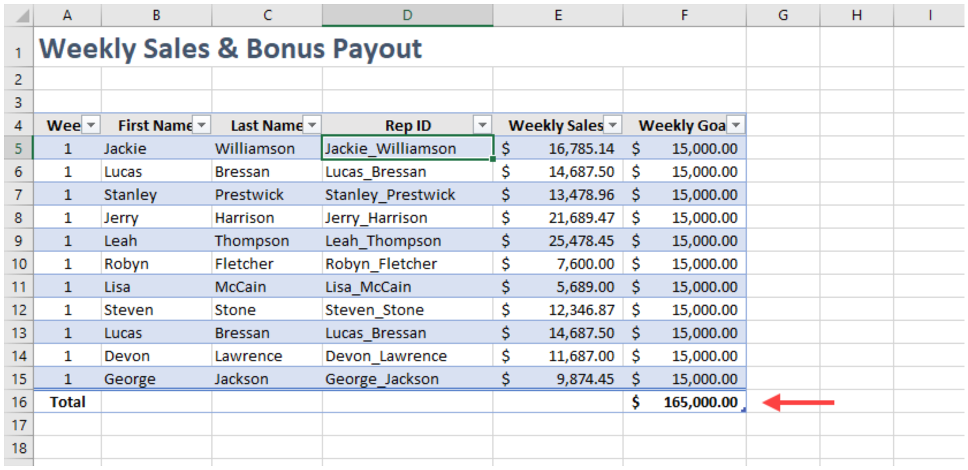
1. To begin, open Activity 3-2 from your Exercise Files folder:



2. To begin your analysis, you want to add a total row to your table. Click anywhere within the table then click **Table Design → Total Row**:



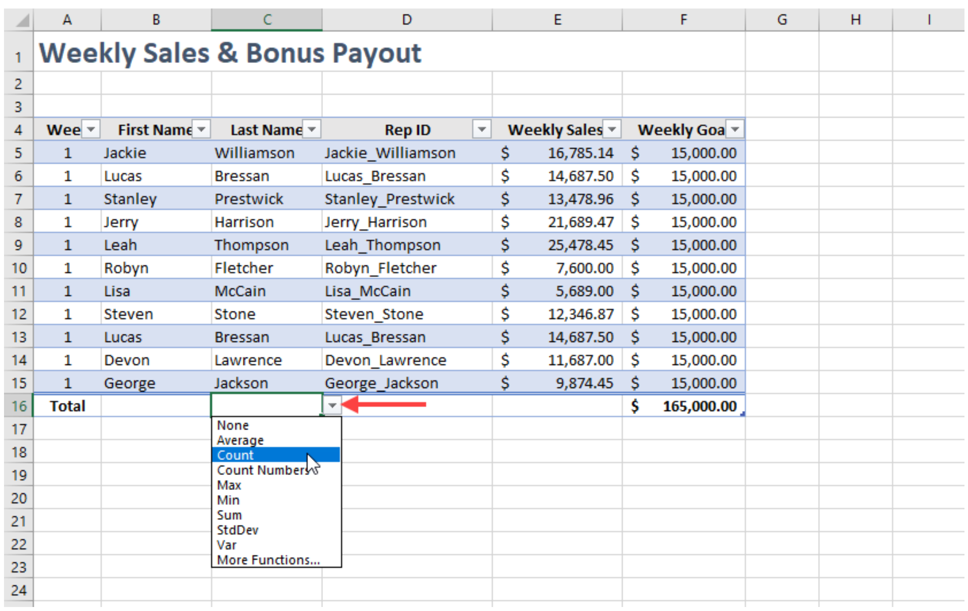
3. A Total Row is added to your table, with a total amount in the Weekly Goal column:



Weekly Sales & Bonus Payout

Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00
Total					$ 165,000.00

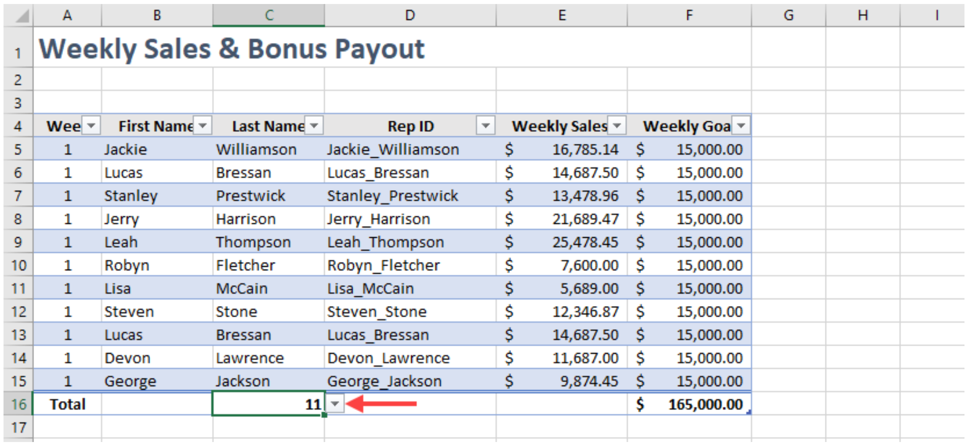
4. First, you want to add a count for the number of sales representatives. Select cell **C16**, then click the total row drop-down arrow and select **Count**:



Weekly Sales & Bonus Payout

Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00
Total					$ 165,000.00

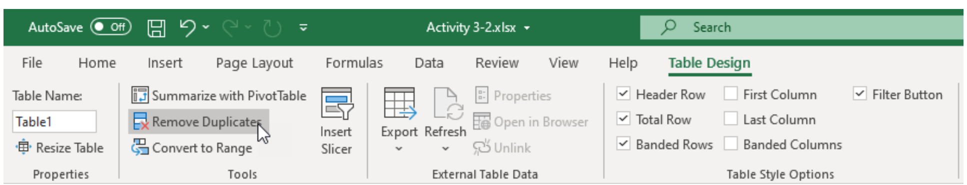
5. You see that the count of sales representatives is 11, but you know that there are only 10. You realize there must be duplicate data:



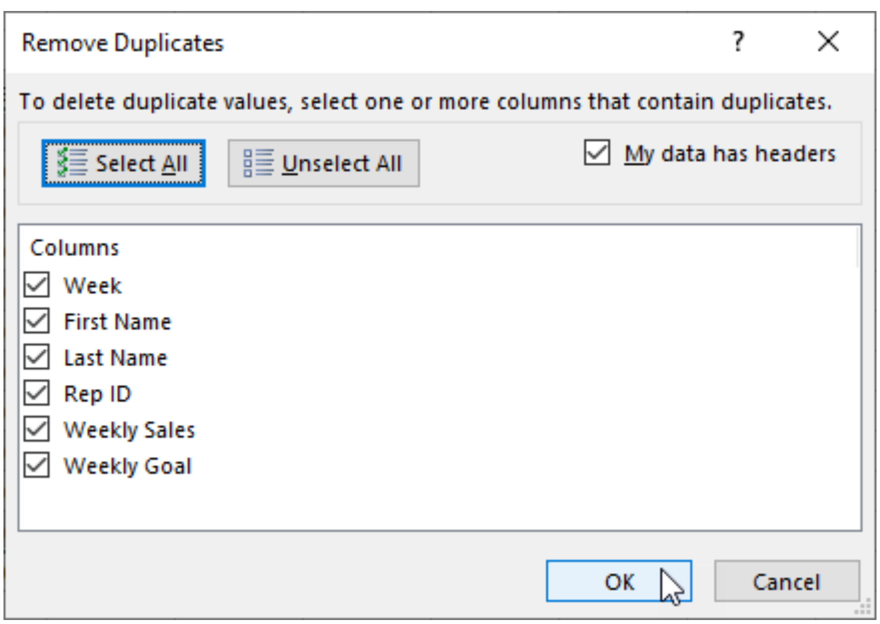
Weekly Sales & Bonus Payout

Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa
1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00
Total		11			$ 165,000.00

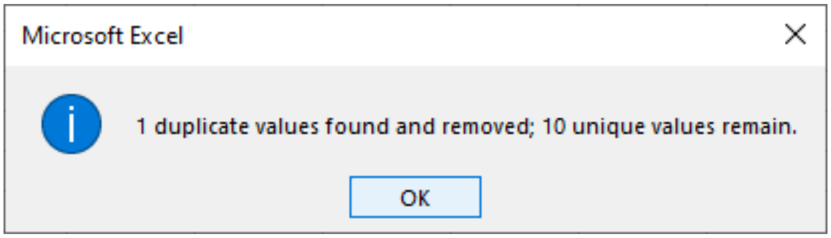
6. To remove the duplicate, click **Table Design → Remove Duplicates**:



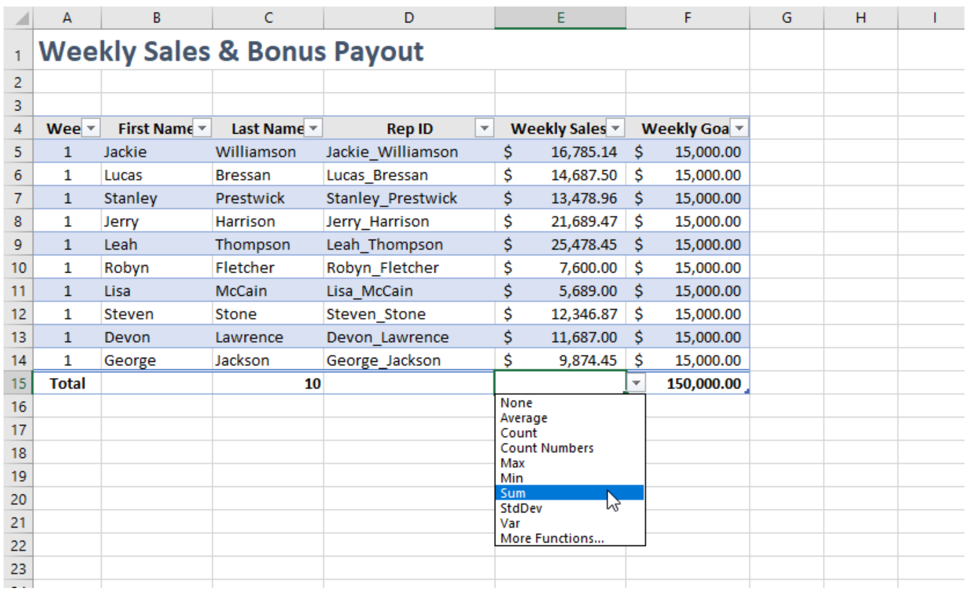
7. The Remove Duplicates dialog box opens. Leave all of the columns selected and click **OK**:



8. An information window appears, indicating that one duplicate has been removed and there 10 unique values remaining. Click **OK**:

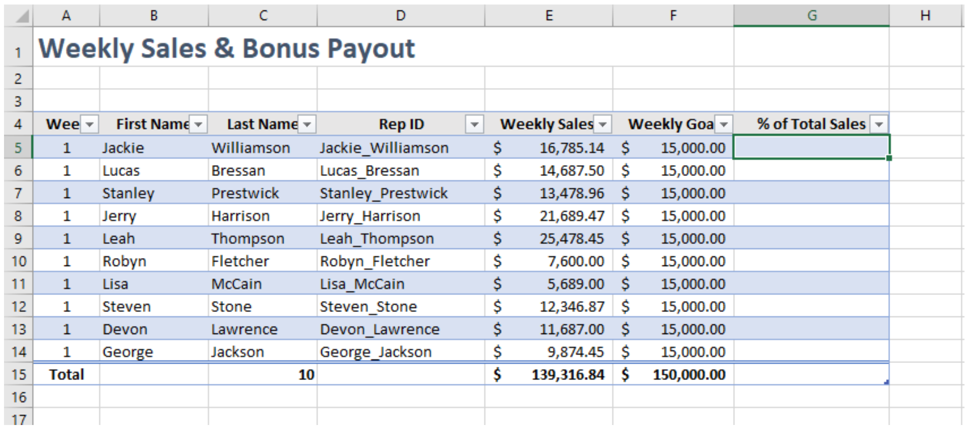


9. With the duplicate now removed you can now add a total to the Weekly Sales column. Select Cell **E15**, click the dropdown arrow, and select **Sum**:



	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
4	Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa
5	1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
6	1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
7	1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
8	1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
9	1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
10	1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
11	1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
12	1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
13	1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
14	1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00
15	Total		10			150,000.00

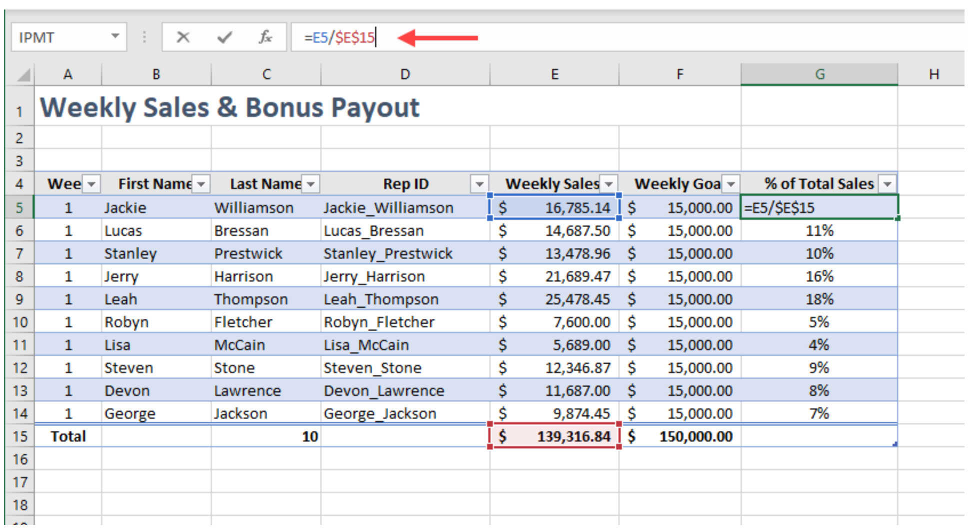
10. You can now add a column to your table by selecting cell **G4** and typing "**% of Total Sales**", then pressing **Enter**:



	A	B	C	D	E	F	G	H
1	Weekly Sales & Bonus Payout							
2								
3								
4	Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa	% of Total Sales	
5	1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00		
6	1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00		
7	1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00		
8	1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00		
9	1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00		
10	1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00		
11	1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00		
12	1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00		
13	1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00		
14	1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00		
15	Total		10		$ 139,316.84	$ 150,000.00		
16								
17								

(Adjust your column width as required to view the text in the header.)

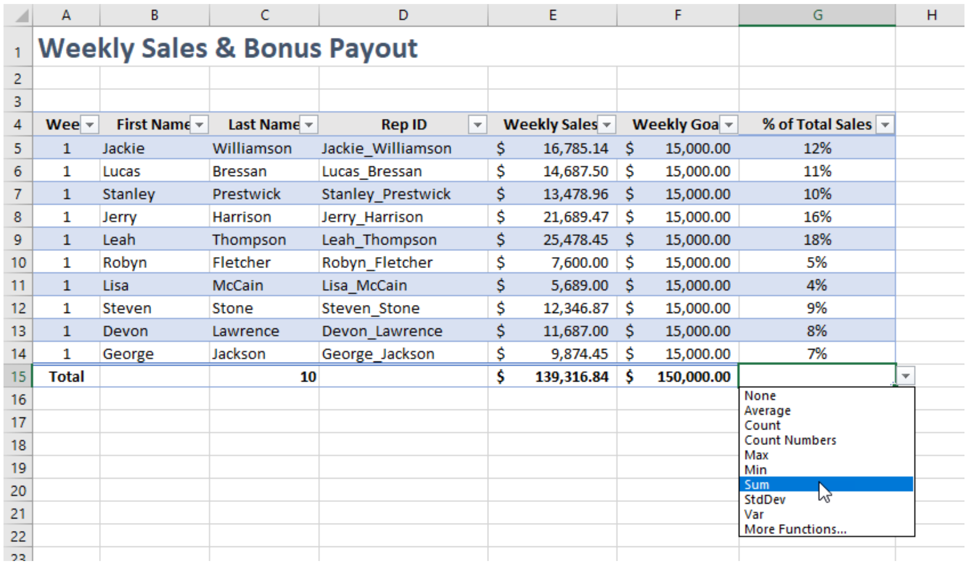
11. In cell **G5**, type the formula "**=E5/$E$15**" and press **Enter,** then set the format of the column to percentage, and center the content:



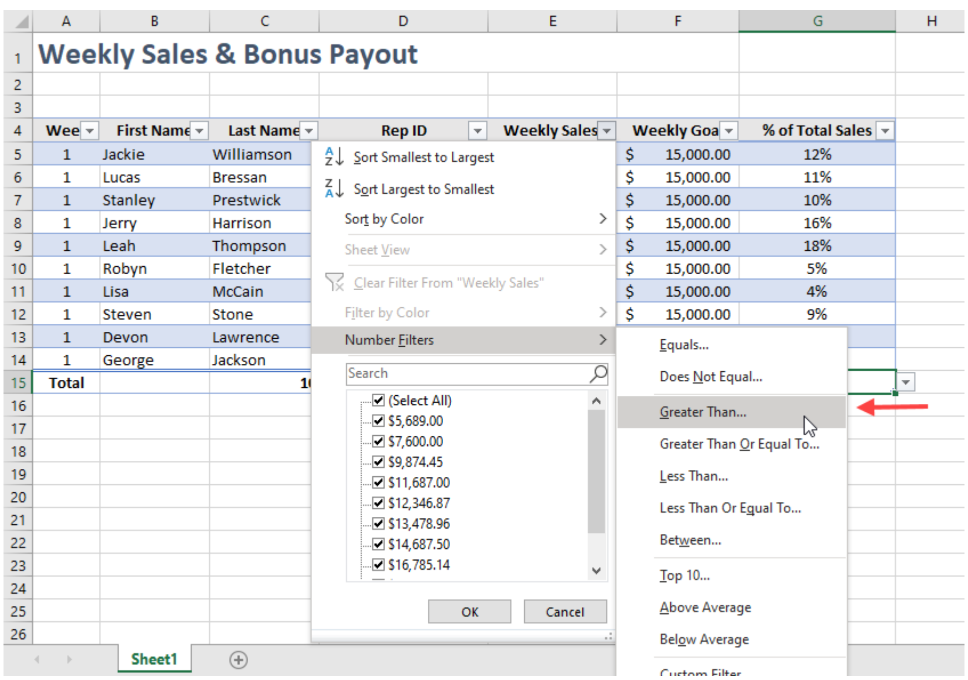
IPMT | =E5/$E$15

	A	B	C	D	E	F	G	H
1	Weekly Sales & Bonus Payout							
2								
3								
4	Wee	First Name	Last Name	Rep ID	Weekly Sales	Weekly Goa	% of Total Sales	
5	1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	=E5/$E$15	
6	1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	11%	
7	1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	10%	
8	1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	16%	
9	1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	18%	
10	1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	5%	
11	1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	4%	
12	1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	9%	
13	1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	8%	
14	1	George	Jackson	George_Jackson	$ 9,874.45	$ 15,000.00	7%	
15	Total		10		$ 139,316.84	$ 150,000.00		
16								
17								
18								

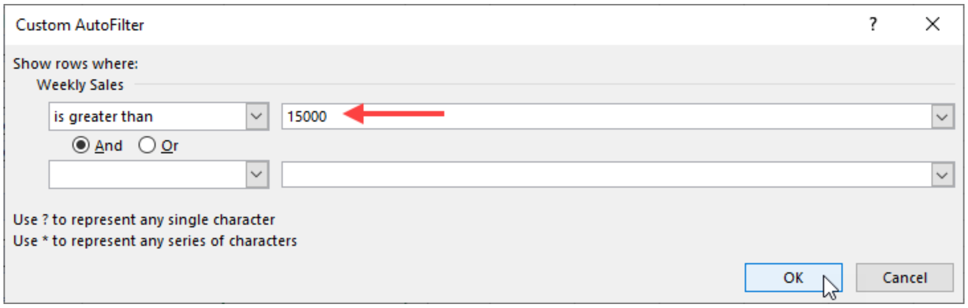
12. You can now add sum of the % of Total Sales column by selecting cell **G15**, clicking the drop-down arrow, then selecting **Sum**:



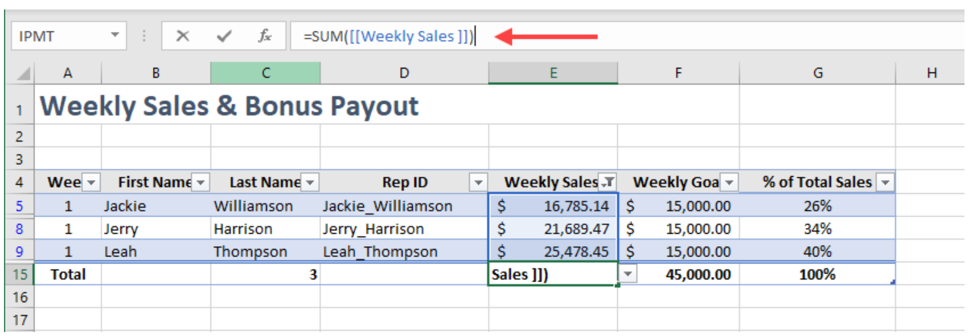
13. You can now filter the table to show only the sales representatives who reached their weekly goal by clicking the **header row drop-down arrow of the Weekly Sales column**, then selecting **Number Filters**, then **Greater Than**:



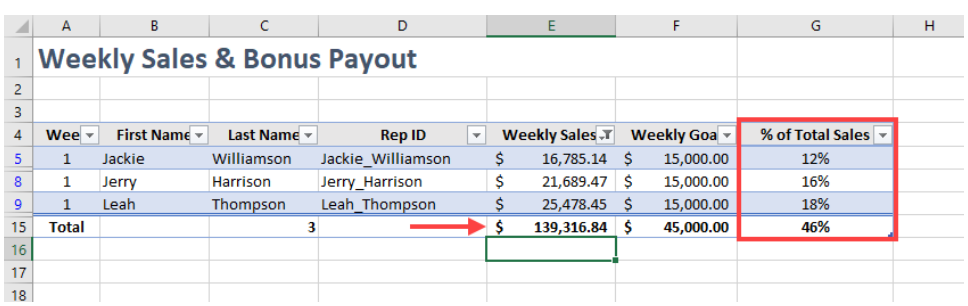
14. In the Custom AutoFilter dialog box, type "**15000**" next to the "**is greater than**" selection, then click **OK**:



15. You will now see the three sales representatives who reached their weekly goal, but the % of Total Sales column is showing percentages only for the total sales of the three. You want to see the percentages based on the total. To do this, select cell **E15**, then select the **Subtotal formula** in the formula bar and type "**=SUM([[Weekly Sales]])**" to replace it:



16. Press **Enter** to apply the formula. You will see that the value in the Total Row of the Weekly Sales column is now the sum of all of the sales, not just the ones that are visible. You will also see that the values in the % of Total Sales column are now displaying correctly:



17. Save the current workbook as Activity 3-2 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC C: Table References

Using tables is an excellent way to quickly define, organize, and analyze specific groups of data. By using table names and structured references you can simplify the process even more. In this topic you will learn how to name your tables and then use that information in structured references and database functions. You will also learn how to convert your table back to a range.

Topic Objectives

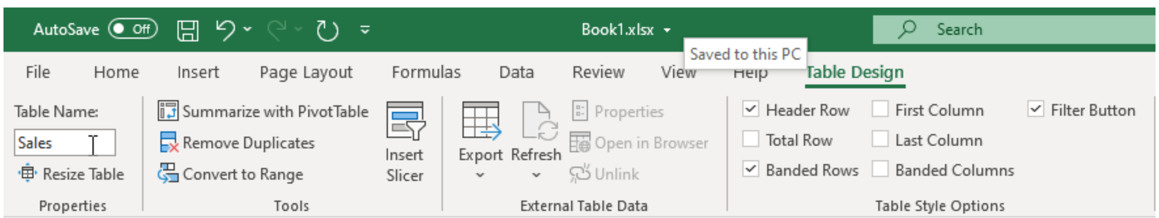
In this session, you will learn:

- About naming tables
- How to use structured references
- How to use database functions
- How to convert a table to a range

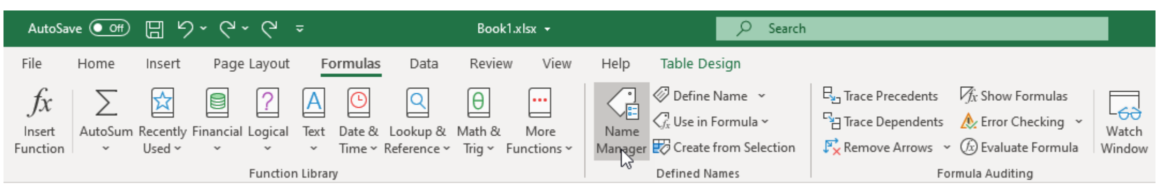
Naming Tables

As you learned earlier in this course, applying names to cells and ranges can help you create workbooks that are easy to understand and work with. Tables are automatically named by Excel as they are created, with a generic name of "Table" with a sequential number at the end, depending on how many existing tables you have in your workbook. Giving your table a unique name that clearly describes the purpose or use of the table will make the structure of your workbook, and the formulas you use, easier to understand.

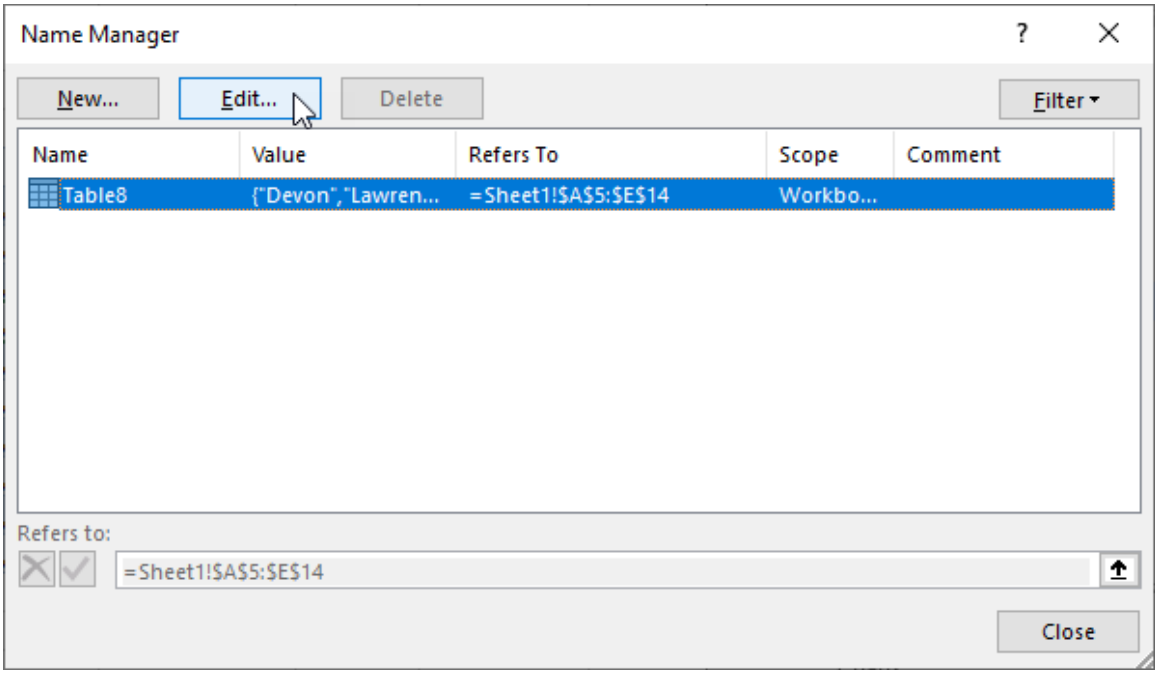
As with ranges and cells, there are several ways to name your table. The simplest is to first select a cell anywhere in your table, then type the new name of the table in the **Table Name** text box in the Properties group of the Table Design contextual tab, then press **Enter**:



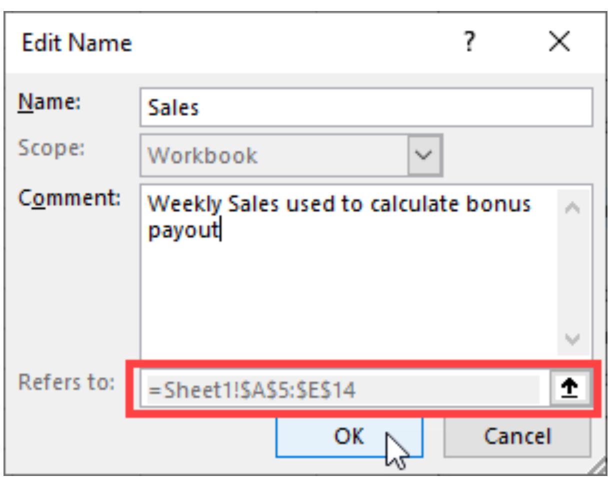
You can also open the Name Manager dialog box, to edit your table name, by clicking **Formulas → Name Manager**:



In the Name Manager dialog box, you can select and edit your table name:



In the **Edit Name** dialog box, you can edit the table name, and also add comments that can help you and other users understand the use of the table. You will notice, though, that the **Refers to** field is grayed out, because, unlike a range, table size is dynamic, so it cannot be set using the Name Manager:



Using Structured References

A **structured reference**, also known as a table reference, is a unique way of referencing tables and their elements that uses a combination of table and column names, instead of cell addresses.

This special syntax is used in tables because they are dynamic, and normal cell references cannot adjust as tables are modified.

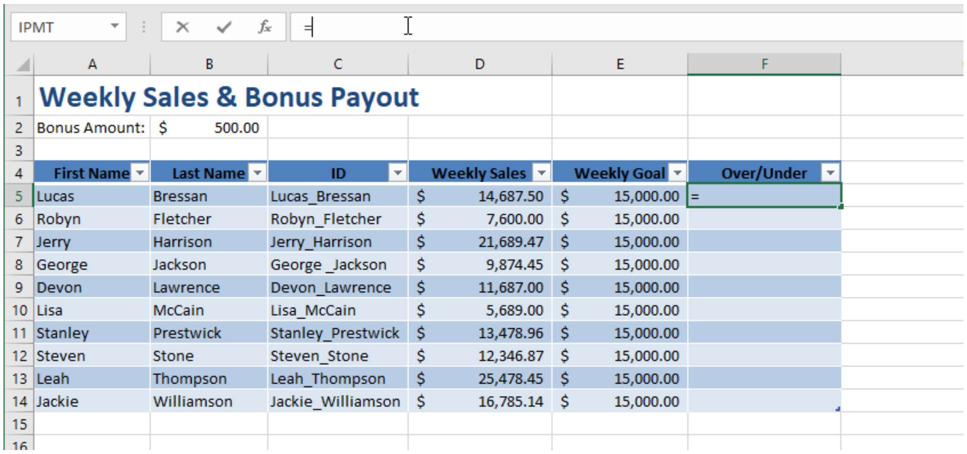
Some of the benefits of structured references are:

- They are easily created, by selecting the table elements you want to refer to.
- They update automatically when elements of the table are changed.
- They can be used inside and outside of the table, which can make your workbooks easier to understand.
- They take advantage of the auto-fill feature of AutoCorrect, filling the entire column of a table with a formula after entering it in just one cell.

As an example, in the following table, there is an open column that is used to calculate the dollar amount that a sales representative was over or under their weekly goal:

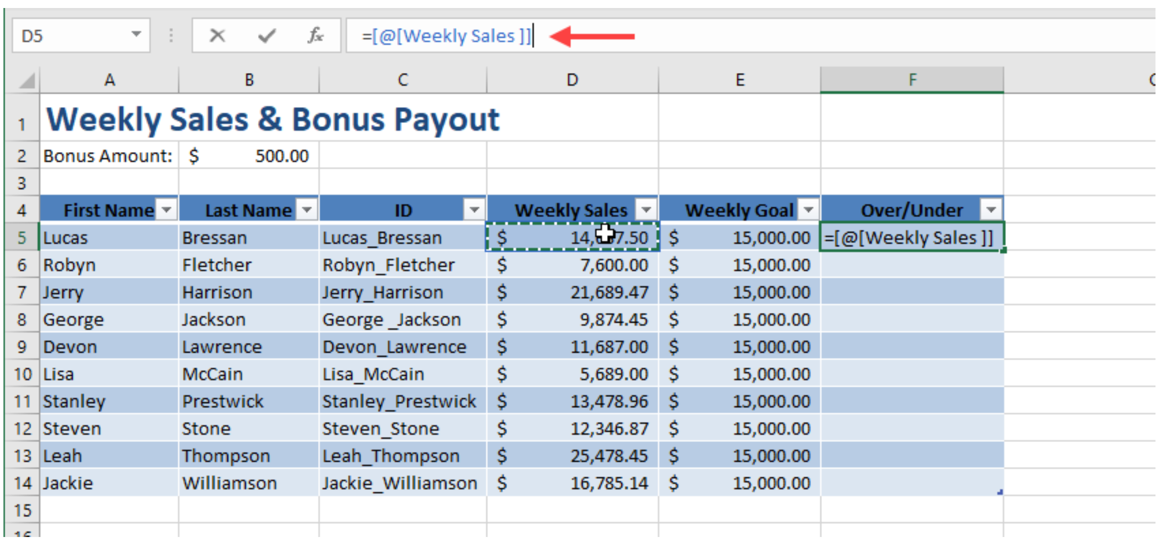
	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
2	Bonus Amount:	$ 500.00				
3						
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
5	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	
6	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
7	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
8	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
9	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
11	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
13	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
14	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
15						

To calculate this column using structured references, first select cell F5, and type the equal sign (=) in the Formula Bar:



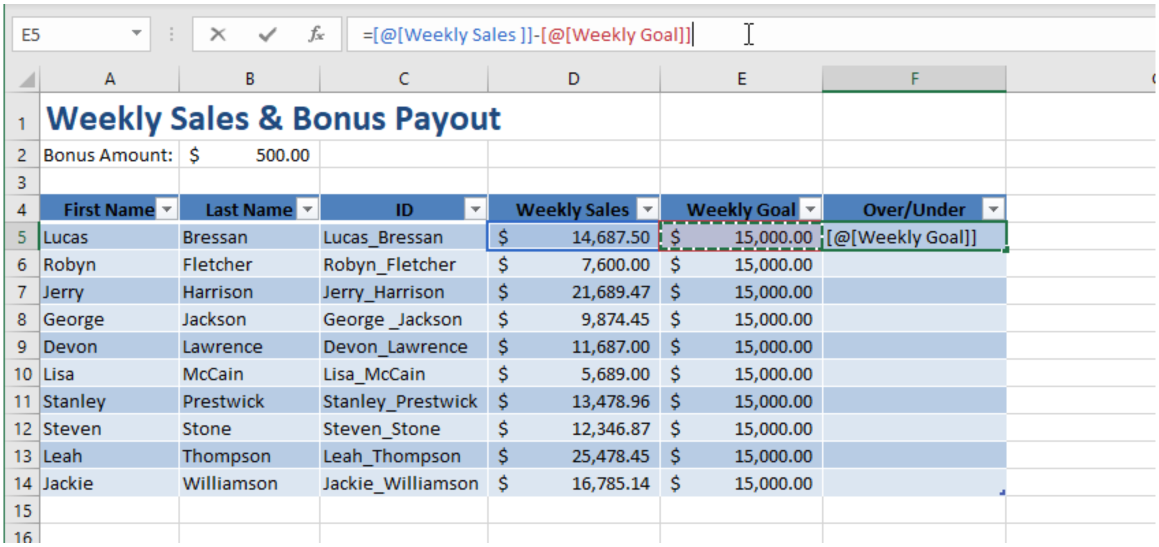
First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	=
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	

Then click on cell D5 to automatically add the structured reference, using the column name. In this case “[@[Weekly Sales]]:”



First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	=[@[Weekly Sales]]
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	

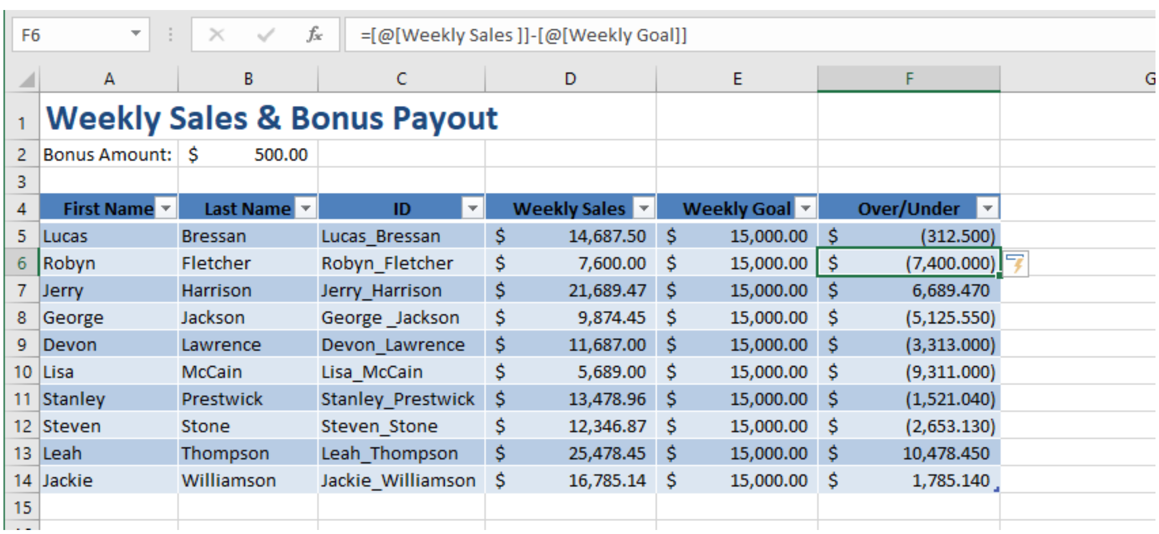
To complete the formula, type the minus sign (**-**), then click on cell E5:



E5 =[@[Weekly Sales]]-[@[Weekly Goal]]

	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
2	Bonus Amount:	$ 500.00				
3						
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
5	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	[@[Weekly Goal]]
6	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	
7	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	
8	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	
9	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	
11	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	
13	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	
14	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	
15						
16						

Again, Excel adds the structured reference using the column name. Pressing **Enter** completes the formula. Not only do the formula results appear in cell F5, but it is auto-filled to all the cells in the Over/Under column:

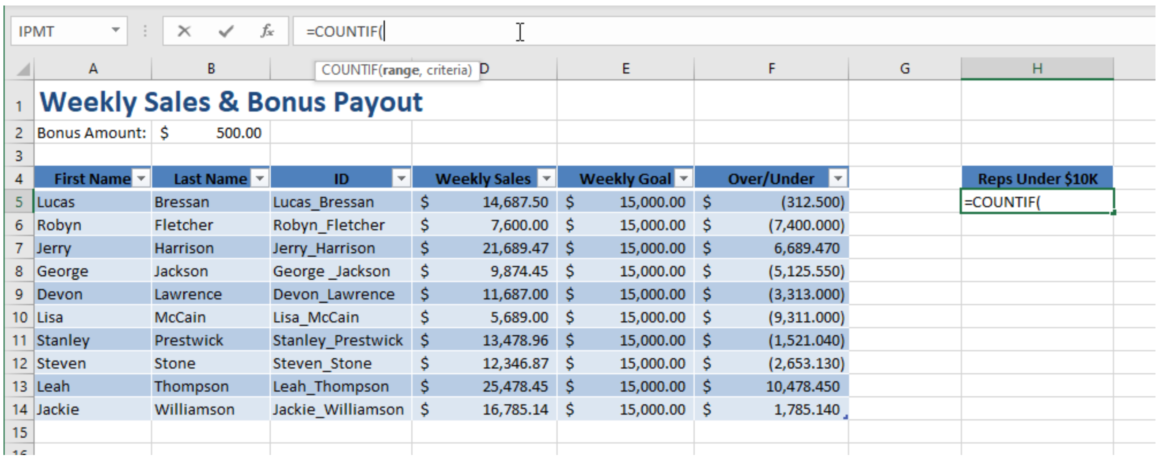


F6 =[@[Weekly Sales]]-[@[Weekly Goal]]

	A	B	C	D	E	F
1	Weekly Sales & Bonus Payout					
2	Bonus Amount:	$ 500.00				
3						
4	First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
5	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ (312.500)
6	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ (7,400.000)
7	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 6,689.470
8	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ (5,125.550)
9	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ (3,313.000)
10	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ (9,311.000)
11	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ (1,521.040)
12	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ (2,653.130)
13	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 10,478.450
14	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 1,785.140
15						

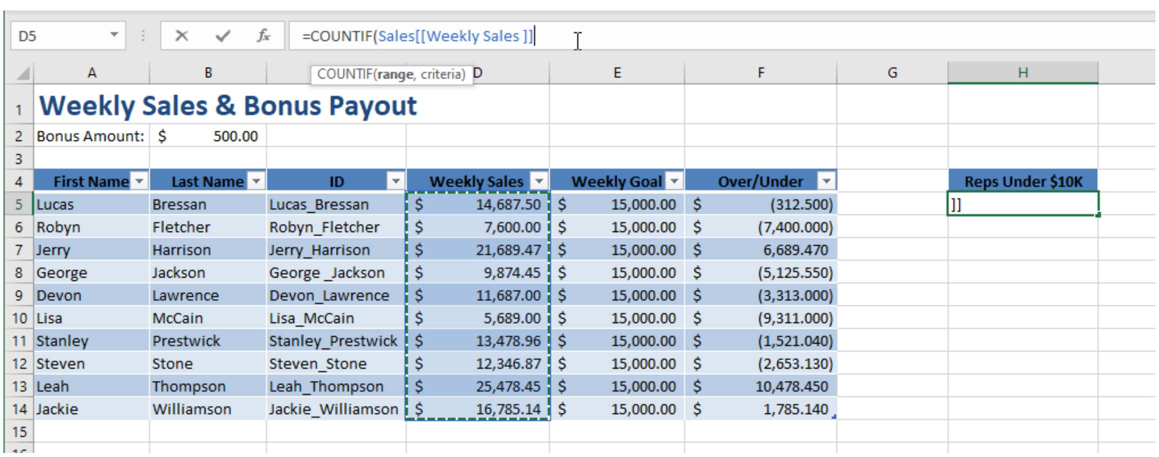
You can also use structured references in formulas outside of a table. In the example below, there is a field to show the number of sales representatives who have not reached their weekly goal. You could use normal cell references to create this formula, but if the table gets larger or changes, the formula may no longer refer to the correct cells. Using structured references ensure that the calculation is always correct.

To continue with the example, to create this structured reference outside of a formula, you would first select cell H5, then use the COUNTIF function by typing “=COUNTIF(“ in the Formula Bar:



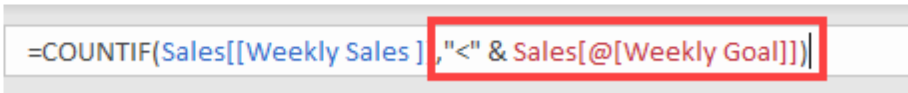
First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ (312.500)
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ (7,400.000)
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 6,689.470
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ (5,125.550)
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ (3,313.000)
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ (9,311.000)
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ (1,521.040)
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ (2,653.130)
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 10,478.450
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 1,785.140

For the range argument, select the column with the values you want to count (if they match the criteria argument). In this case you select the range D5:D14:

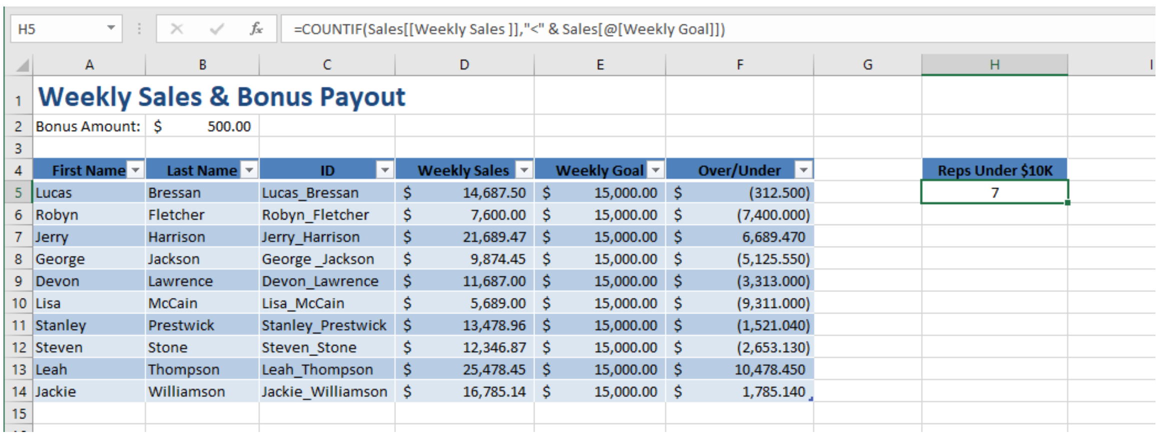


First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ (312.500)
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ (7,400.000)
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 6,689.470
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ (5,125.550)
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ (3,313.000)
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ (9,311.000)
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ (1,521.040)
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ (2,653.130)
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 10,478.450
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 1,785.140

Because the formula is outside of the table, the reference contains not only the column name (Weekly Sales), but also the table name (Sales), or “Sales[[Weekly Sales]].” To complete the formula, you would type a comma (,) to move to the next argument, then type a less than symbol, in parentheses (“<”), then an ampersand (&), then click on cell E5, and finally type a closing bracket and press **Enter**:



The formula calculates that seven sales representatives did not meet their weekly goal:



First Name	Last Name	ID	Weekly Sales	Weekly Goal	Over/Under		Reps Under $10K
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ (312.500)		7
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ (7,400.000)		
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 6,689.470		
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ (5,125.550)		
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ (3,313.000)		
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ (9,311.000)		
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ (1,521.040)		
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ (2,653.130)		
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 10,478.450		
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 1,785.140		

Letting Excel define the structured reference, by selecting cells and ranges, greatly simplifies the process of using these formulas. The syntax is complicated, and can be confusing at first, but as you become more familiar with tables and structured references you will come to understand them better and appreciate their value in complex workbooks.

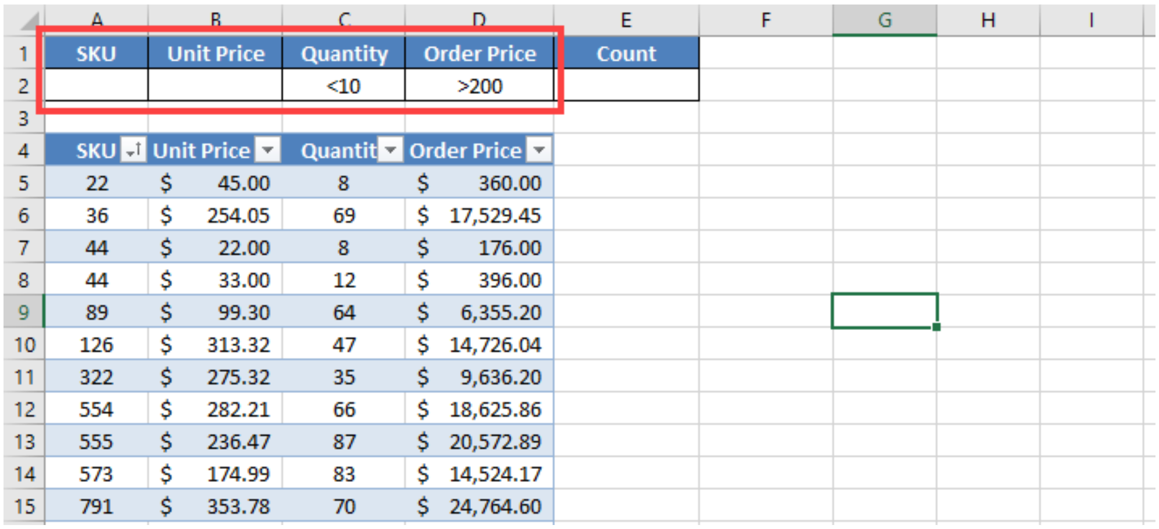
Database Functions

Database functions are similar to subtotal functions, in that they allow you to perform common operations on a specified subset of data. Unlike the subtotal function though, where the criteria is whether the data is hidden or not, database functions allow you to use criteria for the data in each column of your data set.

The syntax of a typical database functions is:

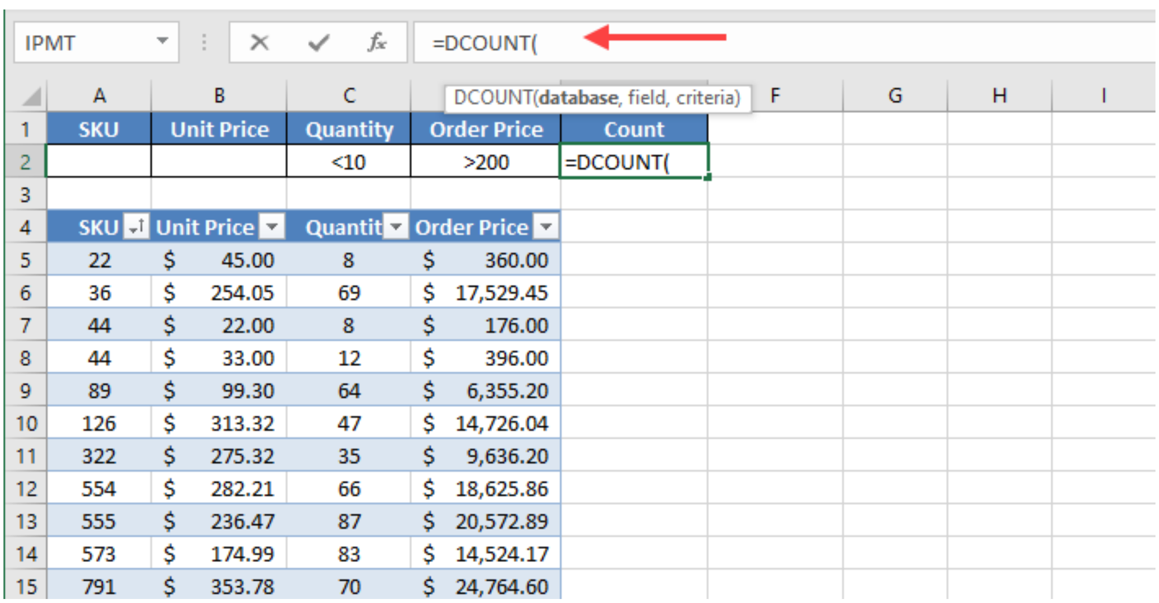
```
=DCOUNT(database,field,criteria)
```

Before creating a database function, you must first define the criteria you will be using somewhere within your workbook, using column names that exactly match the column names of your database. In the example below, we have created a range with all of the column names, but have only added criteria for the Quantity and Order Price columns:



	A	B	C	D	E
1	SKU	Unit Price	Quantity	Order Price	Count
2			<10	>200	
3					
4	SKU	Unit Price	Quantit	Order Price	
5	22	$ 45.00	8	$ 360.00	
6	36	$ 254.05	69	$ 17,529.45	
7	44	$ 22.00	8	$ 176.00	
8	44	$ 33.00	12	$ 396.00	
9	89	$ 99.30	64	$ 6,355.20	
10	126	$ 313.32	47	$ 14,726.04	
11	322	$ 275.32	35	$ 9,636.20	
12	554	$ 282.21	66	$ 18,625.86	
13	555	$ 236.47	87	$ 20,572.89	
14	573	$ 174.99	83	$ 14,524.17	
15	791	$ 353.78	70	$ 24,764.60	

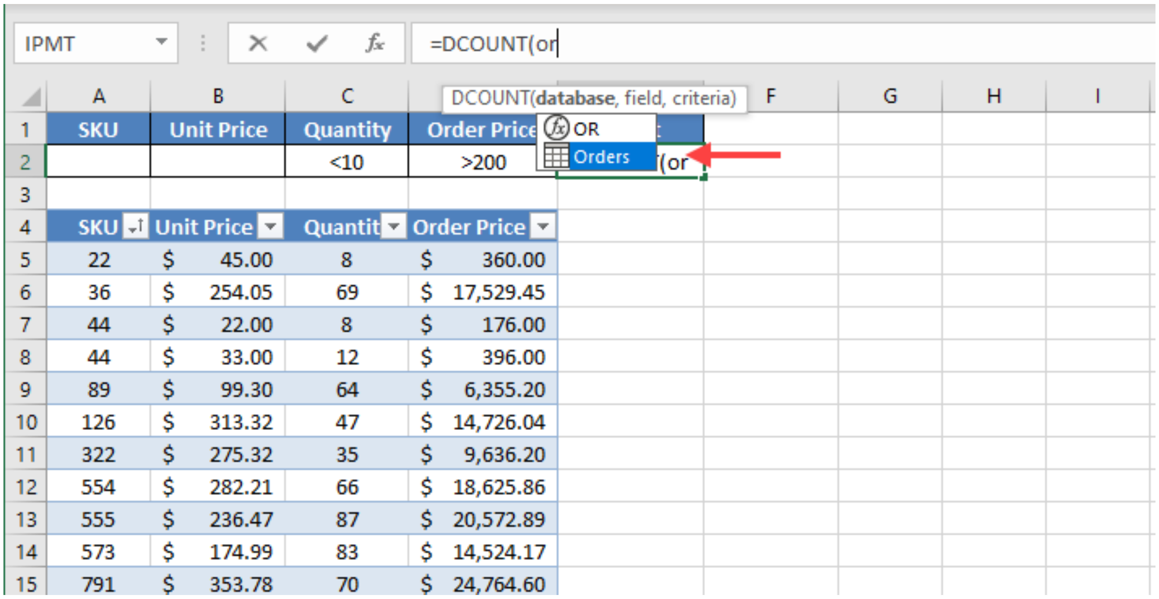
To count the number of orders in the database where the quantity is less than 10 and the order price is greater than 200, first select the cell where you want to enter the function, then type "=DCOUNT(" in the Formula Bar:



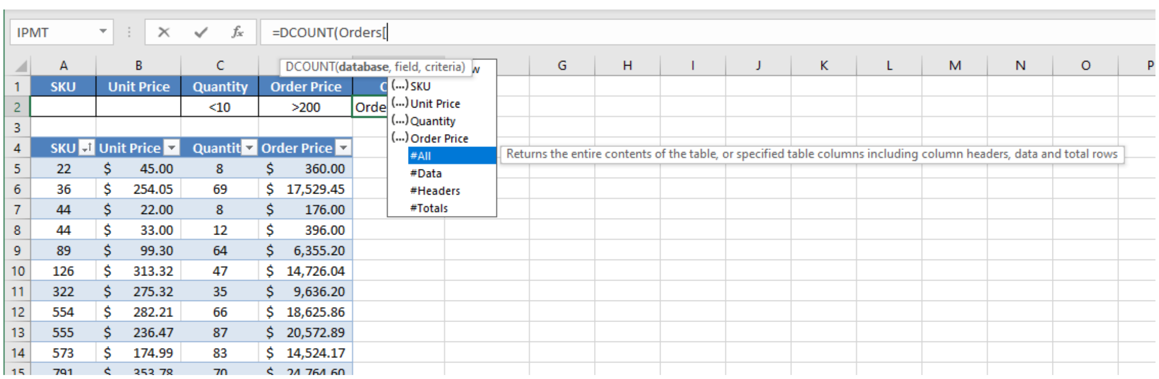
	A	B	C	D	E
1	SKU	Unit Price	Quantity	Order Price	Count
2			<10	>200	=DCOUNT(
3					
4	SKU	Unit Price	Quantit	Order Price	
5	22	$ 45.00	8	$ 360.00	
6	36	$ 254.05	69	$ 17,529.45	
7	44	$ 22.00	8	$ 176.00	
8	44	$ 33.00	12	$ 396.00	
9	89	$ 99.30	64	$ 6,355.20	
10	126	$ 313.32	47	$ 14,726.04	
11	322	$ 275.32	35	$ 9,636.20	
12	554	$ 282.21	66	$ 18,625.86	
13	555	$ 236.47	87	$ 20,572.89	
14	573	$ 174.99	83	$ 14,524.17	
15	791	$ 353.78	70	$ 24,764.60	

To define the database argument, select the full range or table of data, or, to better understand structured references, you can start typing the table name and the Excel

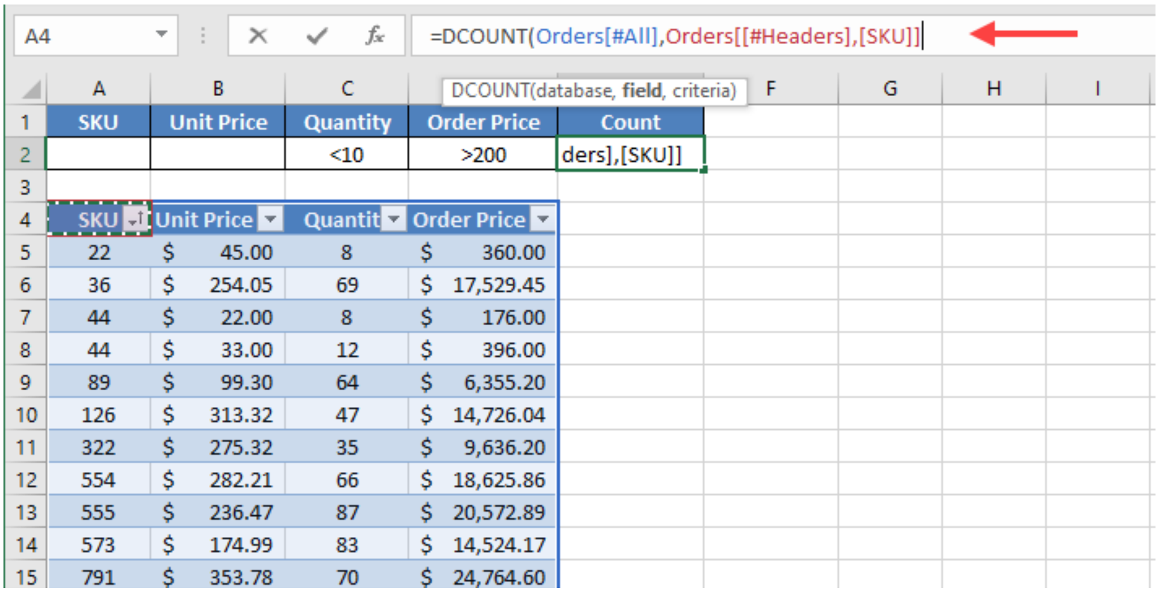
AutoComplete function suggests available table names. You can use the arrow keys to select the table and press Tab to apply it:



To continue defining the table, type an open square bracket ([), then use the arrow keys to select [#All], press Tab to apply it, then type a closed square bracket (]). In structured references, this describes the entire contents of the table, including headings, data, and total rows:



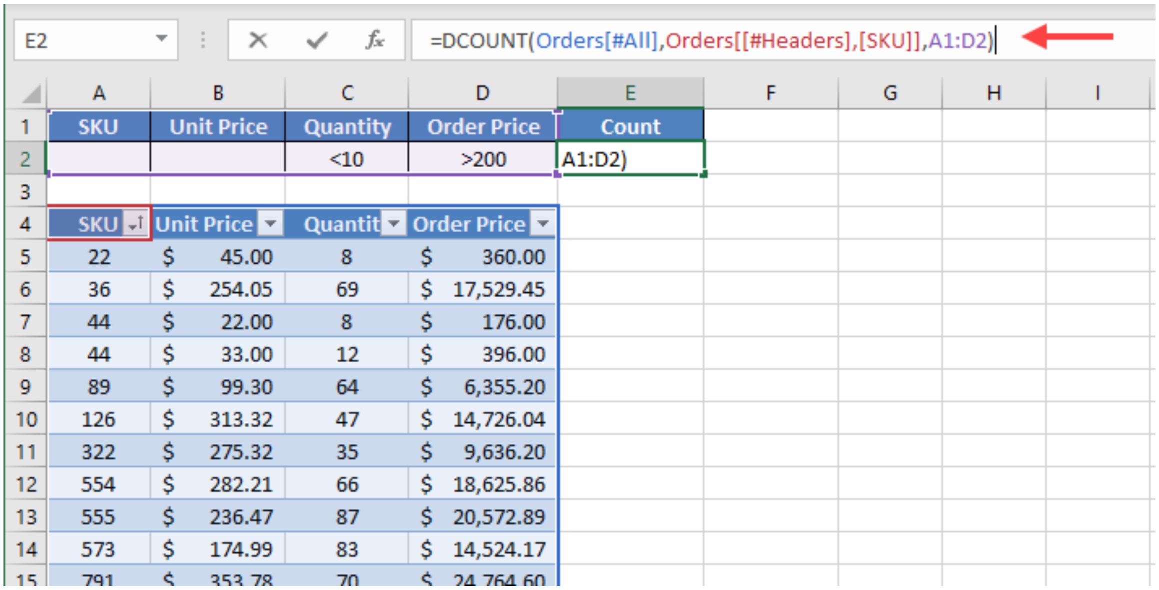
Once you have entered a comma to move to the next argument, define the field argument by selecting the full column that contains the items you want to count, or, in the case of a table, you can click the table header, and Excel inserts the structured reference in the function:



SKU	Unit Price	Quantity	Order Price	Count
		<10	>200	ders],[SKU]]

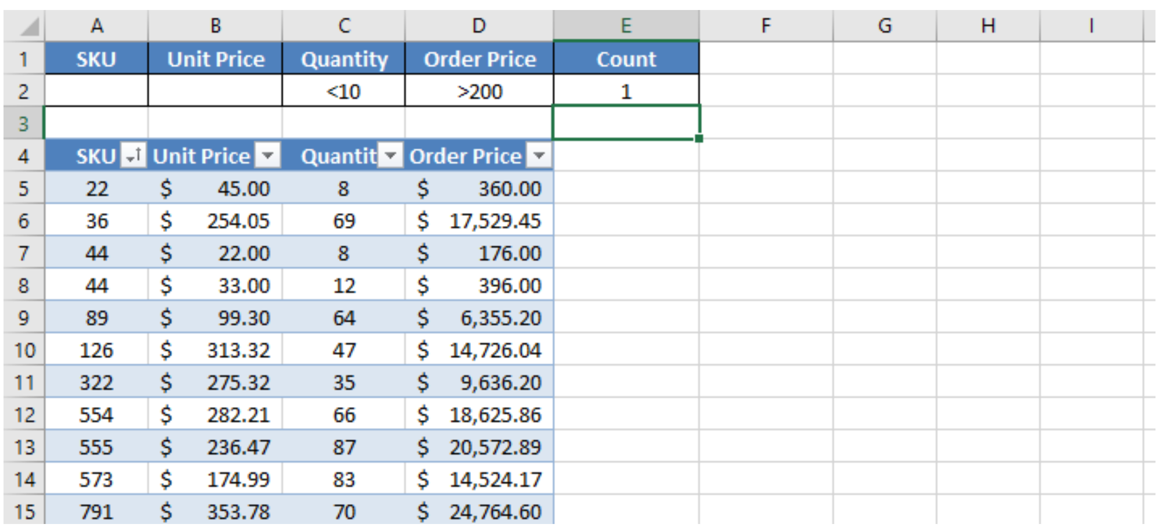
SKU	Unit Price	Quantit	Order Price
22	$ 45.00	8	$ 360.00
36	$ 254.05	69	$ 17,529.45
44	$ 22.00	8	$ 176.00
44	$ 33.00	12	$ 396.00
89	$ 99.30	64	$ 6,355.20
126	$ 313.32	47	$ 14,726.04
322	$ 275.32	35	$ 9,636.20
554	$ 282.21	66	$ 18,625.86
555	$ 236.47	87	$ 20,572.89
573	$ 174.99	83	$ 14,524.17
791	$ 353.78	70	$ 24,764.60

You would define the final argument, criteria, by selecting the cells that contain all of the column names and related criteria. In this example, select the range A1:D2, and finally, type a closed bracket to complete the function, then press **Enter**:



	A	B	C	D	E	F	G	H	I
1	SKU	Unit Price	Quantity	Order Price	Count				
2			<10	>200	A1:D2)				
3									
4	SKU	Unit Price	Quantit	Order Price					
5	22	$ 45.00	8	$ 360.00					
6	36	$ 254.05	69	$ 17,529.45					
7	44	$ 22.00	8	$ 176.00					
8	44	$ 33.00	12	$ 396.00					
9	89	$ 99.30	64	$ 6,355.20					
10	126	$ 313.32	47	$ 14,726.04					
11	322	$ 275.32	35	$ 9,636.20					
12	554	$ 282.21	66	$ 18,625.86					
13	555	$ 236.47	87	$ 20,572.89					
14	573	$ 174.99	83	$ 14,524.17					
15	791	$ 353.78	70	$ 24,764.60					

The function counts one order where the quantity is less than 10 and the order price is greater than 200:



	A	B	C	D	E	F	G	H	I
1	SKU	Unit Price	Quantity	Order Price	Count				
2			<10	>200	1				
3									
4	SKU	Unit Price	Quantit	Order Price					
5	22	$ 45.00	8	$ 360.00					
6	36	$ 254.05	69	$ 17,529.45					
7	44	$ 22.00	8	$ 176.00					
8	44	$ 33.00	12	$ 396.00					
9	89	$ 99.30	64	$ 6,355.20					
10	126	$ 313.32	47	$ 14,726.04					
11	322	$ 275.32	35	$ 9,636.20					
12	554	$ 282.21	66	$ 18,625.86					
13	555	$ 236.47	87	$ 20,572.89					
14	573	$ 174.99	83	$ 14,524.17					
15	791	$ 353.78	70	$ 24,764.60					

Now that the function has been created, changing the criteria in the criteria range changes the criteria for the function. In this example, changing the quantity to less than 50 shows that there are 10 orders in the dataset where the quantity is less than 50 and the order price is greater than 200:

	A	B	C	D	E	F	G	H	I
1	SKU	Unit Price	Quantity	Order Price	Count				
2			<50	>200	10				
3									
4	SKU	Unit Price	Quantit	Order Price					
5	22	$ 45.00	8	$ 360.00					
6	36	$ 254.05	69	$ 17,529.45					
7	44	$ 22.00	8	$ 176.00					
8	44	$ 33.00	12	$ 396.00					
9	89	$ 99.30	64	$ 6,355.20					
10	126	$ 313.32	47	$ 14,726.04					
11	322	$ 275.32	35	$ 9,636.20					
12	554	$ 282.21	66	$ 18,625.86					
13	555	$ 236.47	87	$ 20,572.89					
14	573	$ 174.99	83	$ 14,524.17					
15	791	$ 353.78	70	$ 24,764.60					

Because the function is built to include criteria for all of the columns, you can set the criteria any way you like. In the below example, there are seven orders with a unit price of less than 100 and an order price of greater than 200:

	A	B	C	D	E	F	G	H	I
1	SKU	Unit Price	Quantity	Order Price	Count				
2		<100		>200	7				
3									
4	SKU	Unit Price	Quantit	Order Price					
5	22	$ 45.00	8	$ 360.00					
6	36	$ 254.05	69	$ 17,529.45					
7	44	$ 22.00	8	$ 176.00					
8	44	$ 33.00	12	$ 396.00					
9	89	$ 99.30	64	$ 6,355.20					
10	126	$ 313.32	47	$ 14,726.04					
11	322	$ 275.32	35	$ 9,636.20					
12	554	$ 282.21	66	$ 18,625.86					
13	555	$ 236.47	87	$ 20,572.89					
14	573	$ 174.99	83	$ 14,524.17					
15	791	$ 353.78	70	$ 24,764.60					

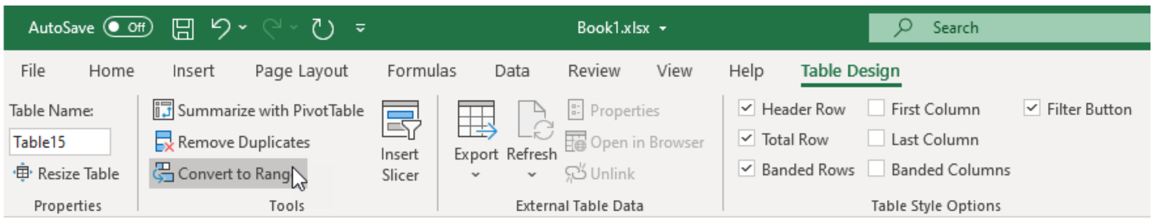
Below is a table of the available database functions, giving you the flexibility to perform many common operations on a specified subset of your data:

DAVERAGE	Calculates the average of values in a field of a list or database, that satisfy specified conditions
DCOUNT	Returns the number of cells containing numbers in a field of a list or database that satisfy specified conditions
DCOUNTA	Returns the number of non-blank cells in a field of a list or database, that satisfy specified conditions
DGET	Returns a single value from a field of a list or database, that satisfies specified conditions
DMAX	Returns the maximum value from a field of a list or database, that satisfy specified conditions
DMIN	Returns the minimum value from a field of a list or database, that satisfy specified conditions
DPRODUCT	Calculates the product of values in a field of a list or database, that satisfy specified conditions
DSTDEV	Calculates the standard deviation (based on a sample of a population) of values in a field of a list or database, that satisfy specified conditions
DSTDEVP	Calculates the standard deviation (based on an entire population) of values in a field of a list or database, that satisfy specified conditions
DSUM	Calculates the sum of values in a field of a list or database, that satisfy specified conditions
DVAR	Calculates the variance (based on a sample of a population) of values in a field of a list or database, that satisfy specified conditions
DVARP	Calculates the variance (based on an entire population) of values in a field of a list or database, that satisfy specified conditions

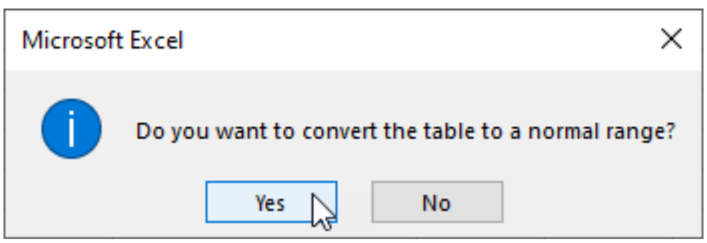
Converting to Range

There may be times when you decide that using a table for your data is not the best option for your purposes. In these cases, it is simple to remove the table structure from your data.

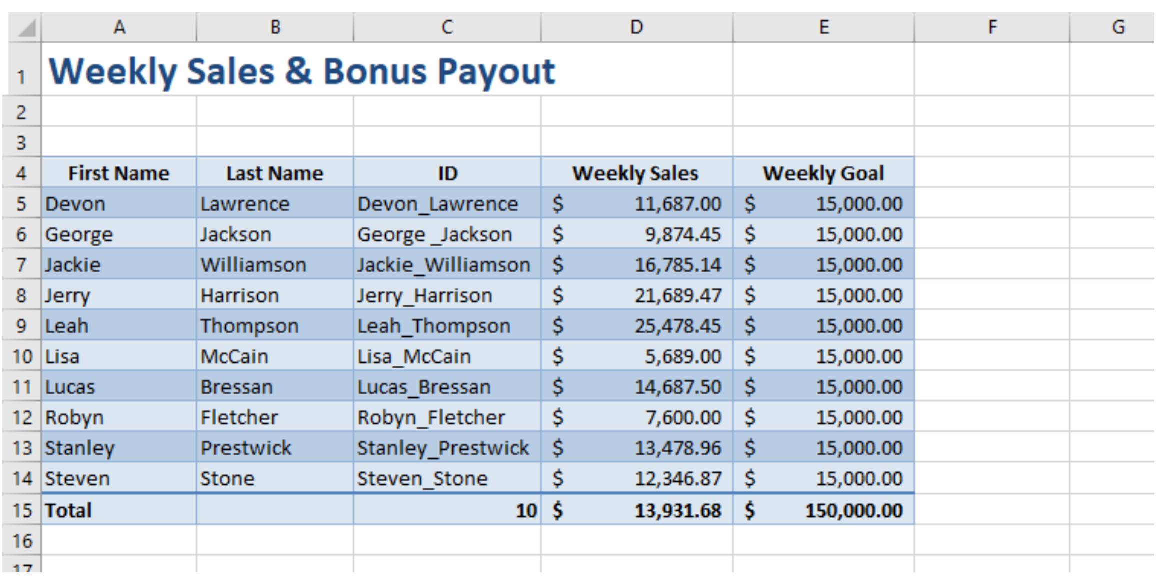
To convert your table to a range, first select any cell within the table, then click **Table Design → Convert to Range**:



An information window appears asking you to confirm that you want to convert your table to a range. Click **Yes**:



The table features, such as the sort and filter arrows, are no longer available for this data, but the table style formatting, and the Total Row remain, and all structure references will be converted to cell references:



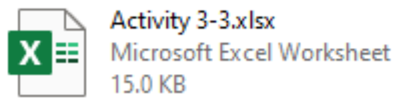
Weekly Sales & Bonus Payout

First Name	Last Name	ID	Weekly Sales	Weekly Goal
Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00
George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00
Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00
Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00
Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00
Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00
Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00
Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00
Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00
Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00
Total		**10**	**$ 13,931.68**	**$ 150,000.00**

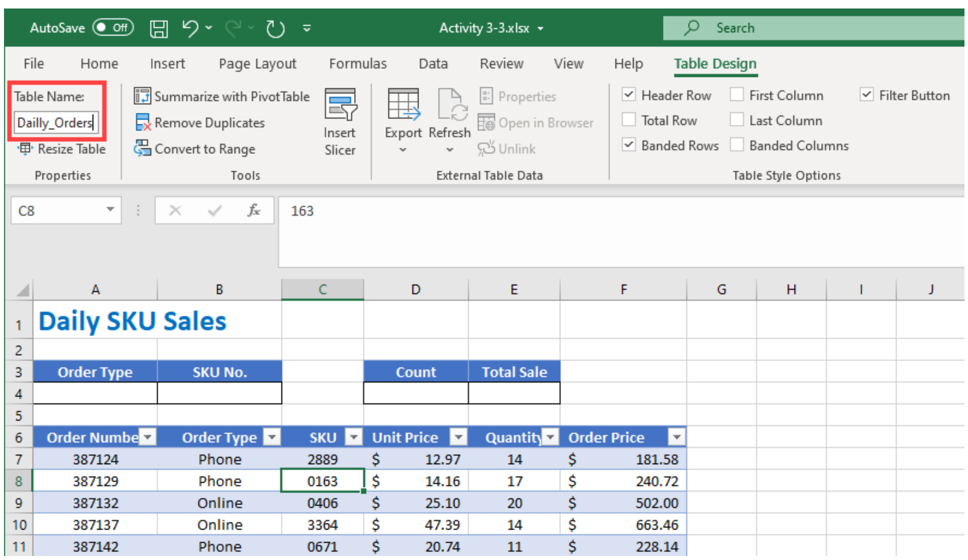
Activity 3-3: Table References

You have been asked to create a workbook to analyze the daily SKU sales, by SKU number, and by order type. To complete this task, you decide to use database functions with structured references.

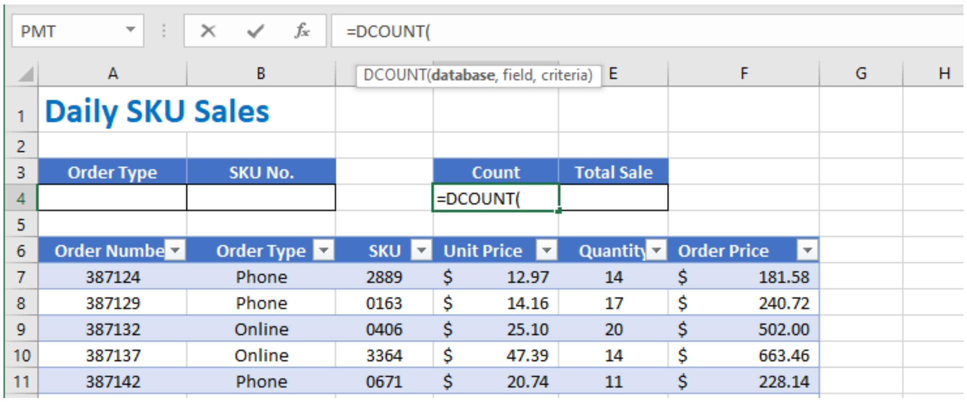
1. To begin, open Activity 3-3 from your Exercise Files folder:



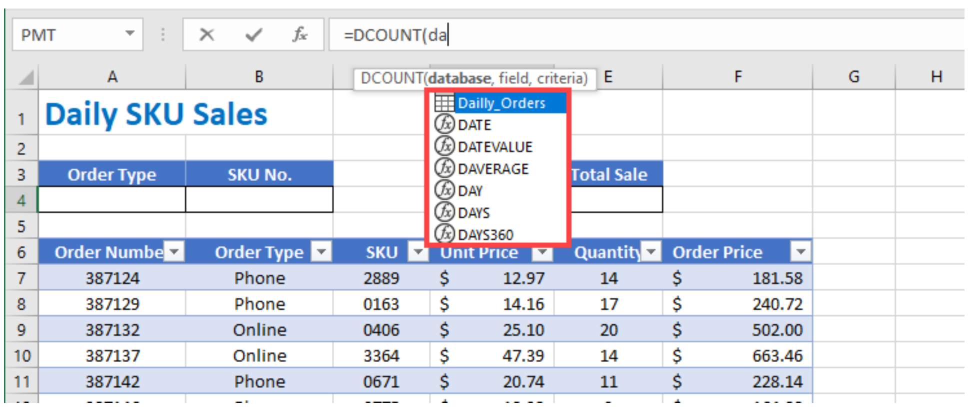
2. First select the table, then click **Table Design**, and type “**Daily_Orders**” in the Table Name field:



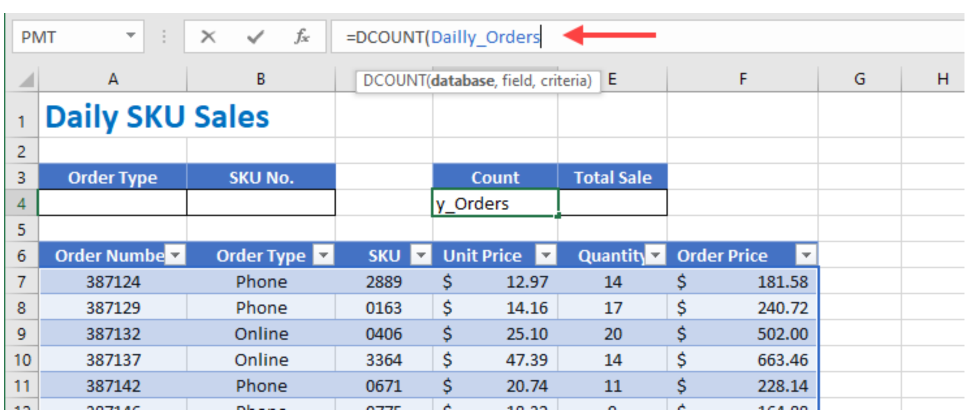
3. Press **Enter** to update the table name, then select cell **D4** and type "**=DCOUNT(**" in the Formula Bar:



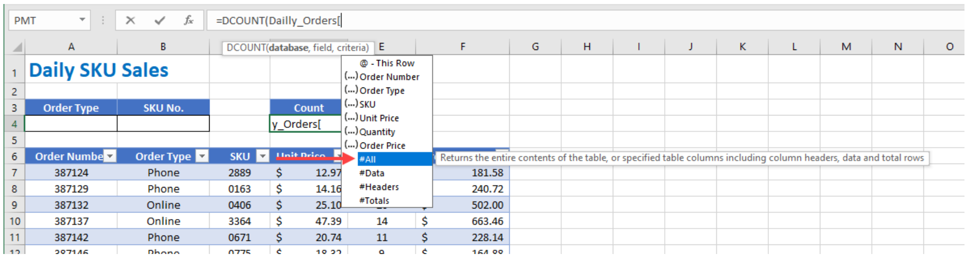
4. Now begin typing the table name, "**Daily_Orders**" to display table name suggestions:



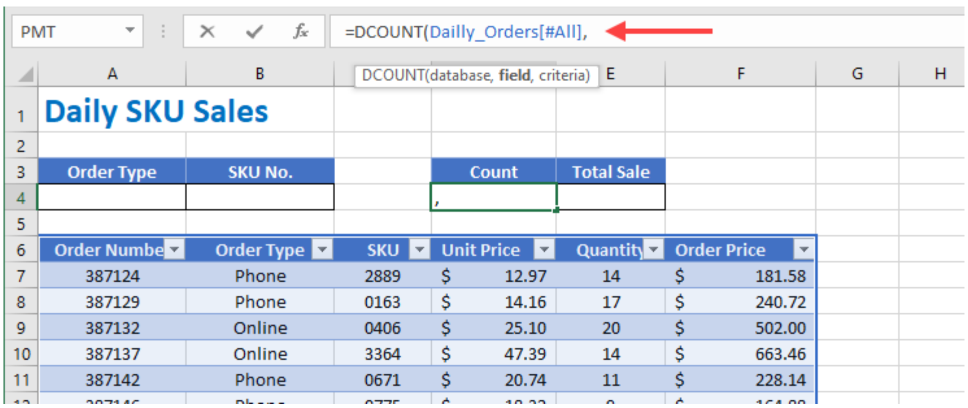
5. With the Daily_Orders table highlighted, press **Tab** to accept the suggestion:



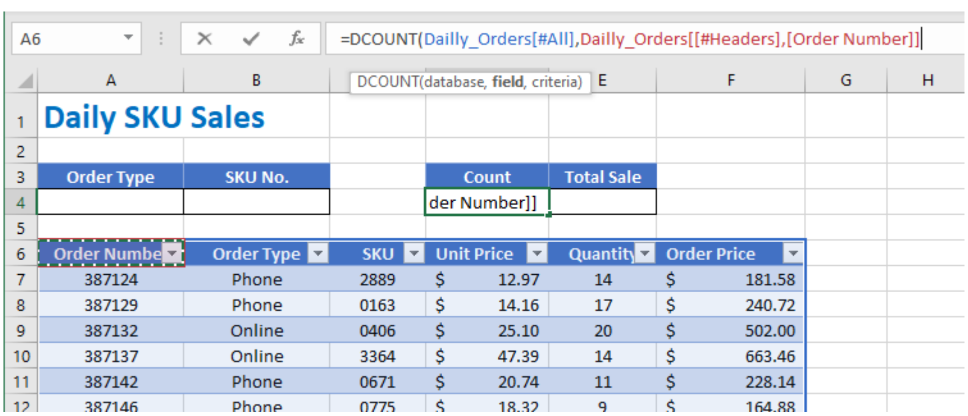
6. Next, type an open square bracket (**[**) to show suggestions for table elements. Use the arrow key to select "**#All**" from the list, then press **Tab** to accept:



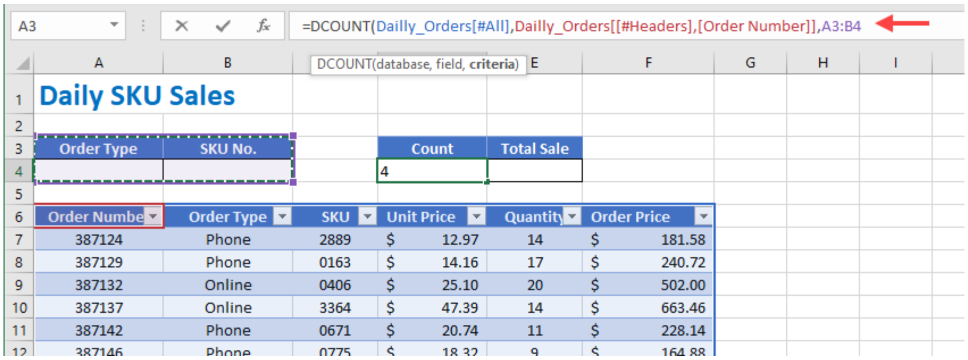
7. You can now type a closed square bracket (**]**) and a comma (**,**) to complete the database argument:



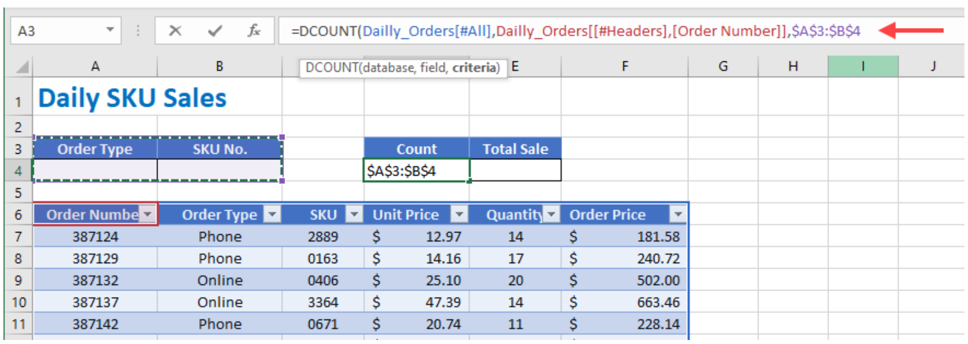
8. To define the field argument, click the table header "**Order Number**." Excel enters the structured reference automatically:



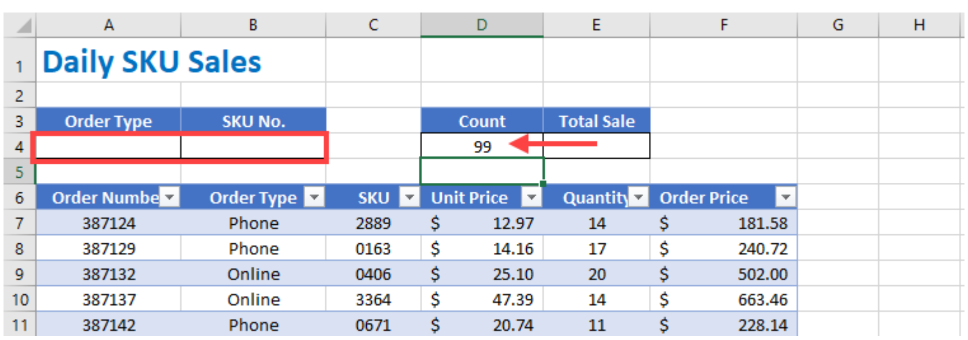
9. To define the criteria argument, and complete the formula, first type a comma (**,**) to move to the next argument, then select the range **A3:B4**:



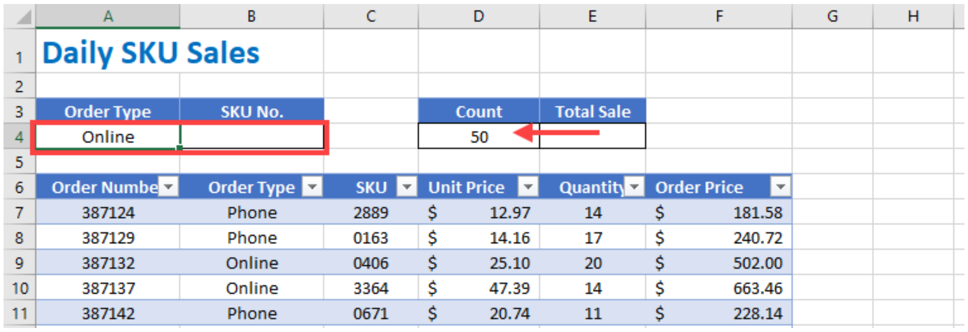
10. Press the **F4** key to make this an absolute reference, then press **Enter**:



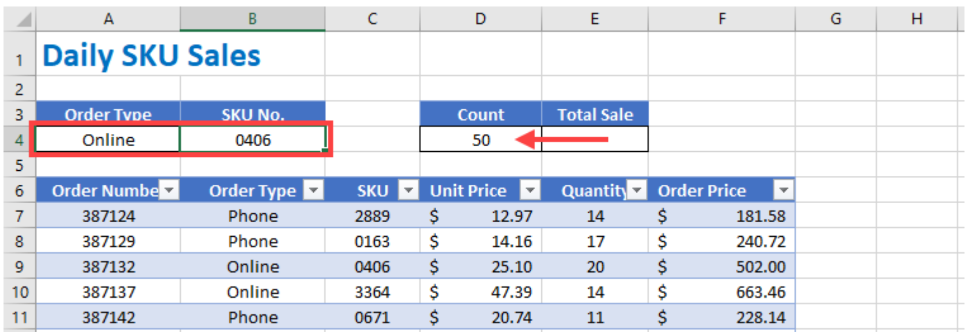
11. You will see that the formula returns the value 99, as there are 99 rows in the table, and no criteria have been entered:



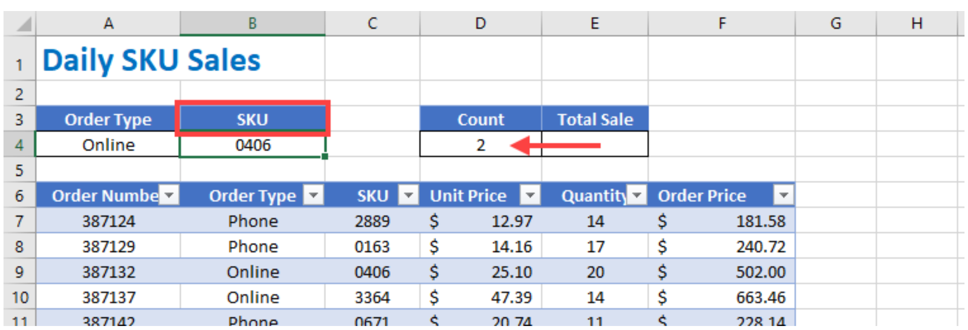
12. Now type “**Online**” in cell **A4**. You will see that 50 of the order types were Online:



13. Type the SKU number “**0406**” in cell **B4**. While you would expect the count value to change, it has not:



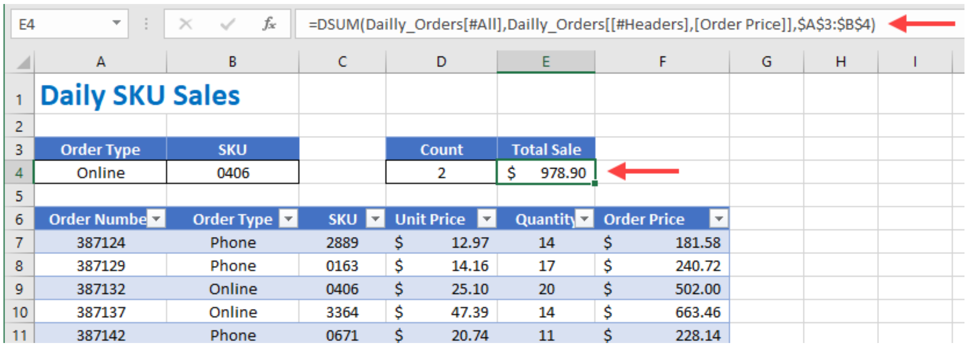
14. This is because the heading in cell B3, “SKU No.”, does not match the column name in your table. Change the text in cell **B3** to “**SKU**” to match the column name. Now you will see that the count value has changed:



15. You can now select cell **E4** and follow the same steps, but this time use the **DSUM** function and use the table header “**Order Price**” for the field argument:

```
=DSUM(Dailly_Orders[#All],Dailly_Orders[[#Headers],[Order Price]],$A$3:$B$4)
```

16. You will now see the sum of orders where SKU 0406 had an order type of Online:



17. Save the current workbook as Activity 3-3 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

In this lesson you learned how to organize your worksheet data with tables. You can now create, format, and modify tables. You can also use structured references, as well as the subtotal and database functions. Taking advantage of all these tools will enable you to learn more about your data than ever before.

Review Questions

1. **What is the command sequence to add a table?**

2. **How do you add a Total Row to a table?**

3. **What type of functions do Total Rows use by default?**

4. **How can you remove duplicate values from a table?**

5. **When you convert a table to a range, what happens to the structured references?**

LESSON 4:
VISUALIZING DATA WITH CHARTS

Lesson Objectives

In this lesson you will learn how to:

- Create charts
- Modify and format existing charts
- Create a trendline
- Create advanced charts

TOPIC A: Create Charts

Charts are an enormous help when people do not have time to study the data and only need a brief overview of the relevant information. In this topic, you will learn how to create charts of different types, using different methods in Excel 365.

Topic Objectives

In this session, you will learn:

- About charts
- About chart types
- How to insert a chart
- How to resize and move a chart
- How to add additional data
- How to switch between rows and columns

Charts

Charts are graphical representations of data and relationships in a dataset. They are commonly used in situations where viewers need to be able to quickly interpret data, without having to take a close look at the worksheet itself.

For example, here you can immediately see on this chart that Division A generates the vast amount of sales within the organization, while Division D generates the least:

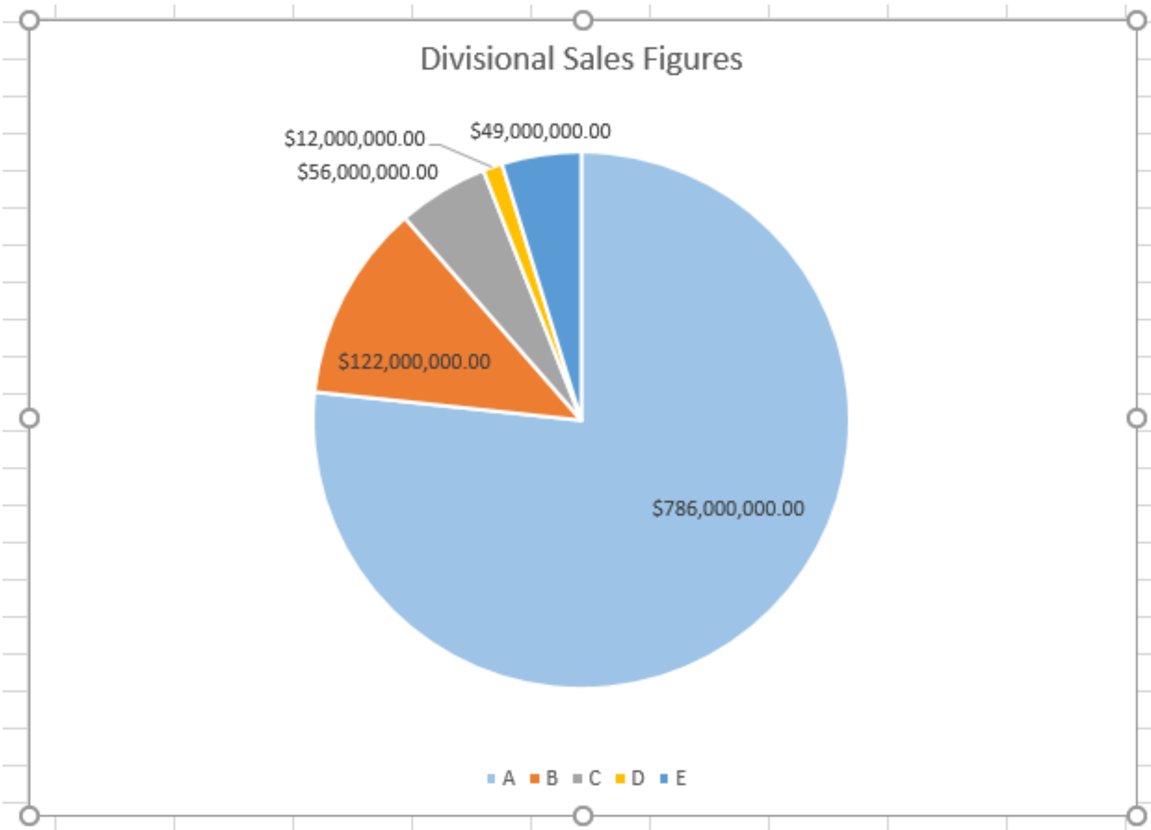
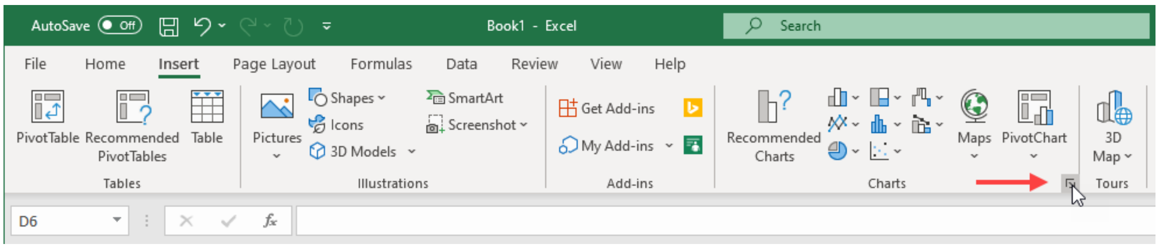


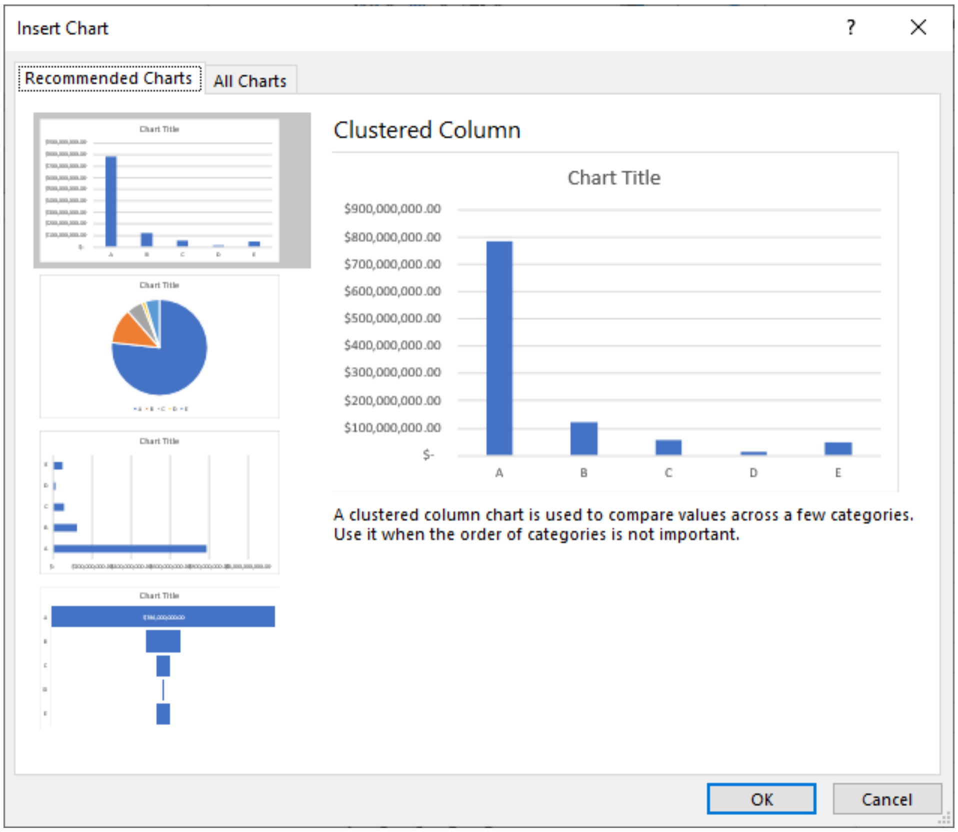
Chart Types

There are many different chart types to choose from, each tailored to display specific types of data. To further customize their appearance, each chart type then has even more sub-types from which to choose. All of these chart types and sub-types are accessed using the **Insert Chart** or **Change Chart Type** dialog boxes. To open the Insert Chart dialog box, click the **Insert** tab and click the **option button** ( ) in the Charts group while the dataset that you would like to represent is selected:

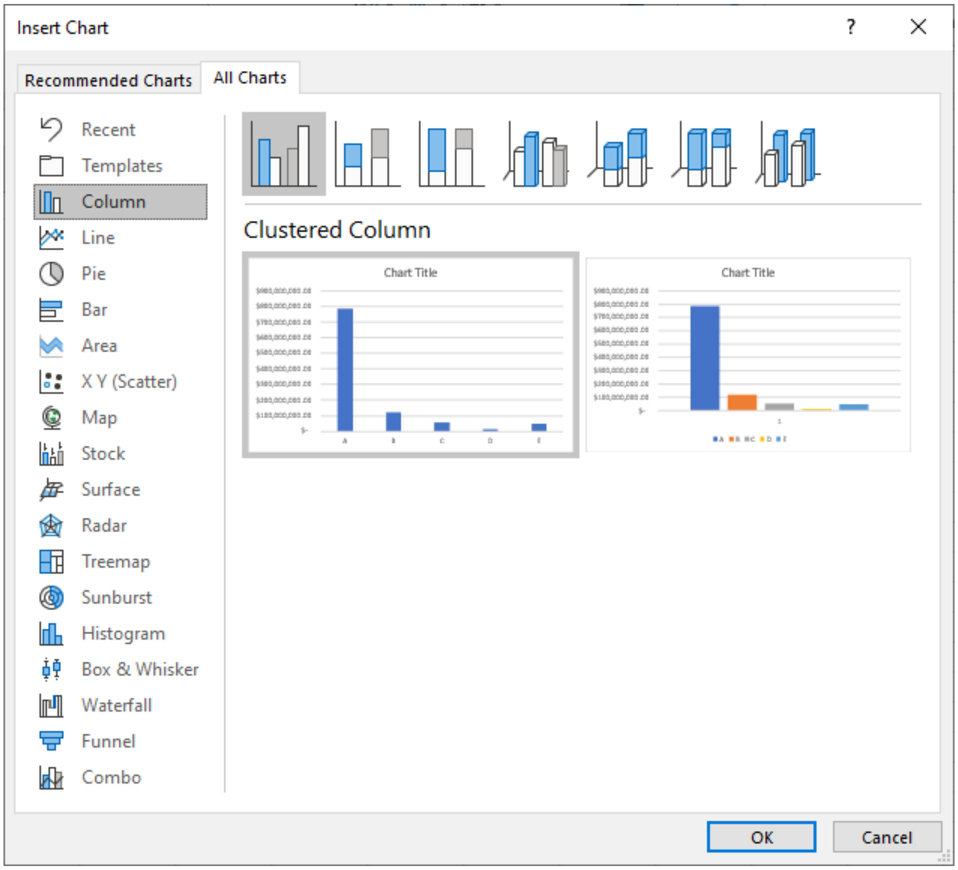


Alternatively, you can click **Insert → [Any Chart Category] → All Chart Types.**

The **Insert Chart** dialog box consists of two tabs – **Recommended Charts** and **All Charts**. The Recommended Charts tab are displayed by default and suggest a few chart types that best fit the data that you are trying to represent. Usually, there a few options to choose from with the top-most option being the most recommended one:



The **All Charts** tab displays a list of primary chart types on the left, with a gallery of sub-types on the right:



Below is a breakdown of each chart type that is available and what data each type is best suited to display:

Column	Best suited to display data changes over time or to compare separate data points.
Line	Typically used to display data changes over a period of time.
Pie	Used to compare different data points in relation to a total. For example, you could use this chart type to show the total expenses of a company broken down by department.
Doughnut	Like a pie chart, doughnut charts show the relationship of parts to a whole, but unlike pie charts, they can show more than one data series, one within another.
Bar	Typically, this chart type is used to compare different data points. It is similar to the Column chart type, but instead has the X-axis as the vertical axis and the Y-axis as the horizontal axis.
Area	This chart type is typically used to illustrate rates of change over a period of time, as well as include the total value in a trend.
XY (Scatter)	Used to illustrate values from a variety of different trends and their relationship to one another.
Bubble	Similar to an xy (scatter) chart, a bubble chart offers an additional axis to define the size of a data point.
Stock	As the name implies, this chart type is designed to show data fluctuations in a stock market.
Surface	While more complex than other options, this chart type is used to find favorable patterns between two separate data sets.
Radar	This chart type is used to compare values from multiple data sets all on the same chart with each separate data (category) on a separate axis. Typically, this chart type is best suited to identify outliers and commonalities between data points.
Treemap	This chart type is designed to display hierarchical data through nested rectangles. Each branch of the tree is shown as a rectangle which is then tiled with smaller rectangles that show sub-branches.

Sunburst	Displays data hierarchy as a series of rings where each ring represents the children of the ring it encloses.
Histogram	A column chart that is designed to show frequency data.
Box & Whisker	Also known as a box plot, this chart type is designed to depict groups of numerical data as boxes on the chart. These boxes also have a line that extends from each end (whiskers) that are used to describe upper and lower quartiles.
Waterfall	Sometimes referred to as a flying bricks chart or a Mario chart, this chart type represents data through a series of columns that are suspended in mid-air. These are typically used to understand how an initial value (e.g. sales revenue) is affected by positive or negative values (e.g. staff costs).
Funnel	Displays the values over multiple stages in a process, where the values decrease between stages, allowing the bars to resemble a funnel.
Combo	This type of chart combines the features of the bar chart and the line chart. Typically, this type of chart is useful if you need to compare values in different categories.
Map	Used to show categories and compare values across geographical regions, including countries, regions, states, counties, or postal codes.

Chart Insertion Methods

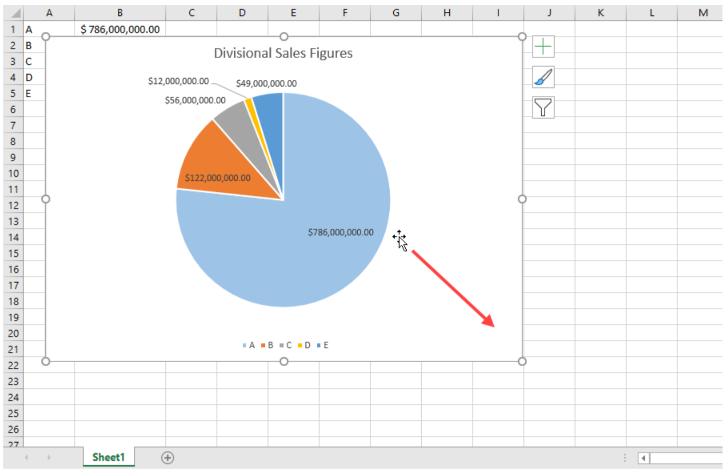
When inserting a new chart into a worksheet, you should always select the dataset that you would like represented. If you select only one cell within the dataset in question, Excel automatically tries to guess the data range that you are trying to represent. While this is a good idea in theory, in practice this feature does not always work as intended.

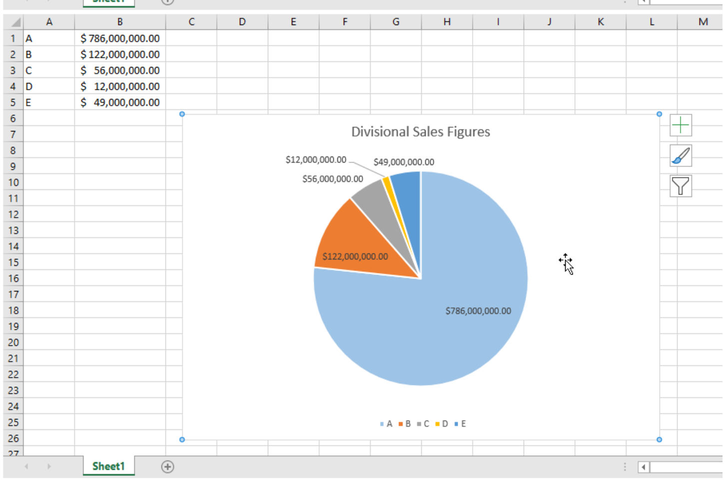
Additionally, when you are inserting charts remember to include the row or column header when selecting the dataset. This ensures that categories that you want plotted along the X axis of the chart are your column labels from the dataset and the data series are row labels. Once the data set, including labels, is selected, you can then insert a chart using one of several options. The most direct way is to use the commands inside the Charts group of the Insert tab. However, you can also use the Insert Chart dialog box, or insert the most recommended chart type for the selected data using keyboard shortcuts.

If you would like the most recommended chart type to be inserted onto the same worksheet, you would press **Alt + F1.** If you want the default chart type to be inserted into a new worksheet, press **F11.**

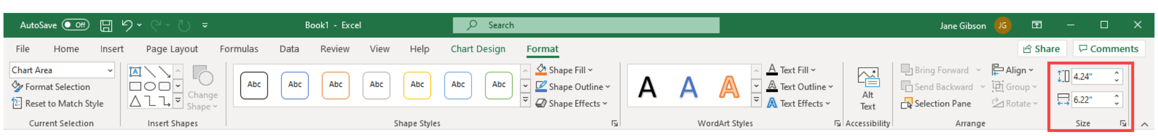
Resizing and Moving the Chart

Once a chart has been added to a worksheet, you are able to **resize** and **move** the chart around as you wish. To move a chart, click to select the chart and then drag it to its new destination. Release your mouse button to place it there:

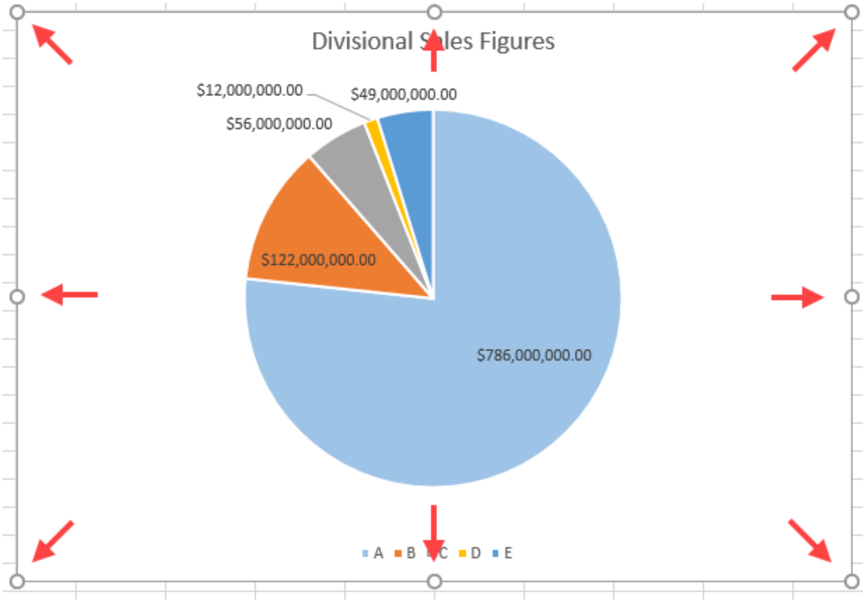




To resize the overall size of a chart, first click to select it. Next, click the **Format** contextual tab and examine the **Size** group. Inside of this group you are able to enter the exact height and width of the chart:

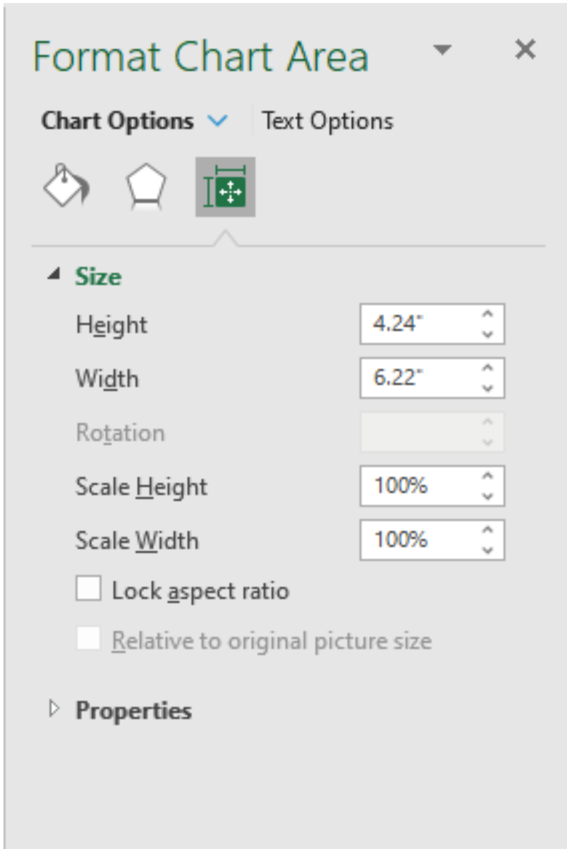


Alternatively, you can resize a chart using the **resize handles** that appear on each of its sides and corners while it is selected:



To use these handles, click and drag them in the direction in which you want the chart enlarged or made smaller. Using the handles on the sides you can modify the chart size in one direction (horizontal and vertical), while the corner resize handles allow you to resize the chart size in both directions at the same time.

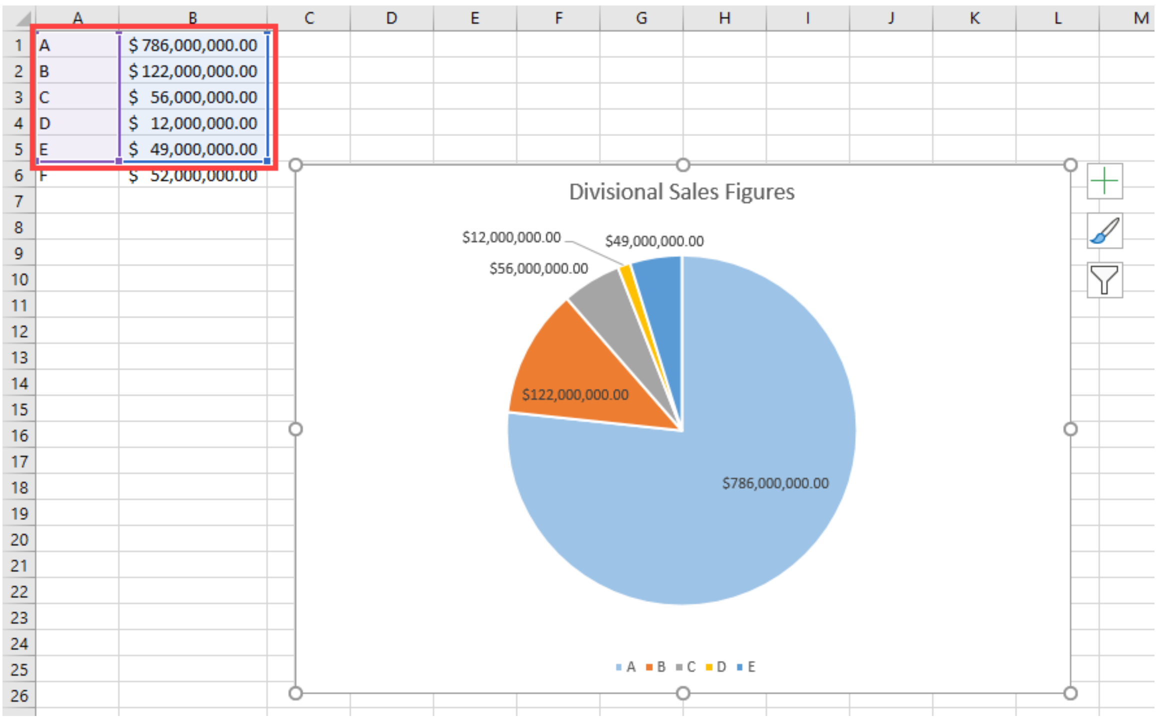
You can also find some resize options in the Format Chart Area task pane, in the Size and Properties section:



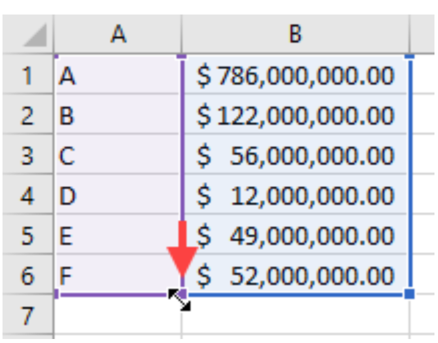
Included are both the **Height** and **Width** increment boxes, as well as options to adjust the height and width scaling. You would use the scaling options if you would like to decrease the size of your chart by half (50%) or increase it by half (150%). You will also find the **Lock aspect ratio** check box. For example, when checked this prevents your chart from getting skewed when you try to change only the height but not the width.

Adding Additional Data

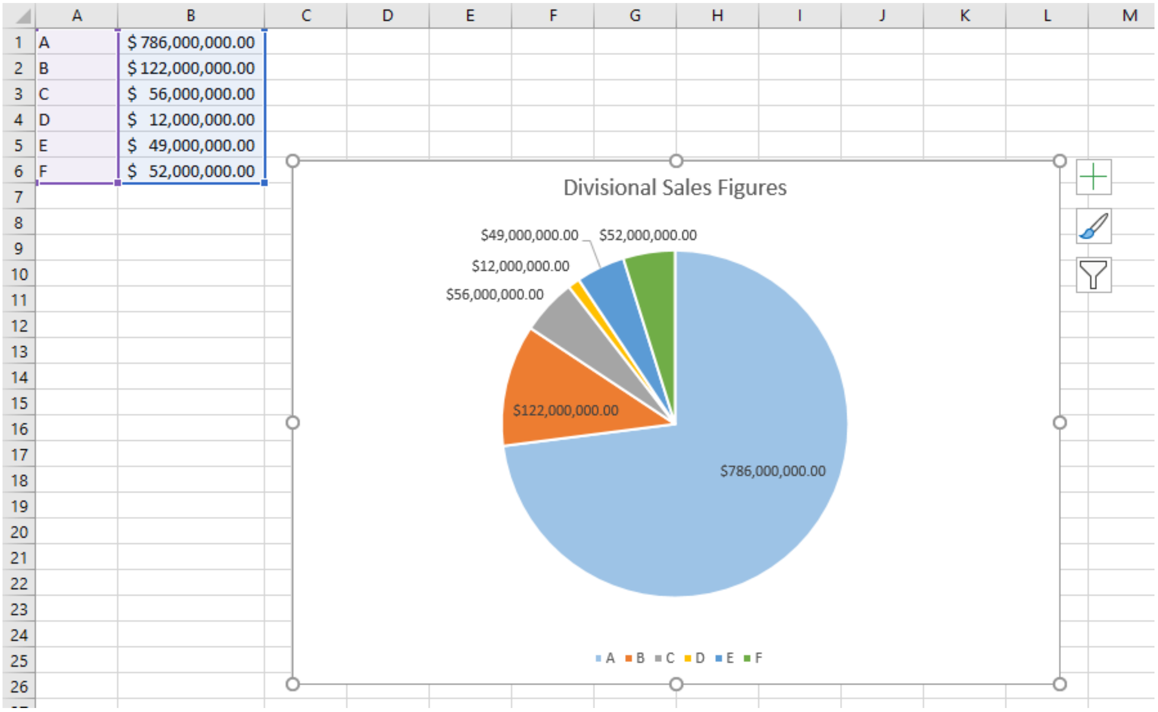
Once a chart has been created, the data that it represents does not have to be static. You can add or remove information from the data range and have the chart represent these changes instantaneously. To do this, first click to select the chart. While the chart is selected, you will see that the associated data range appears outlined and shaded on the worksheet:



Clicking and dragging the resize handles for these outlines lets you choose which data you would like to include in the chart. For example, if you want to include the additional line of information shown in the example above, you would click and drag the resize handle downwards:

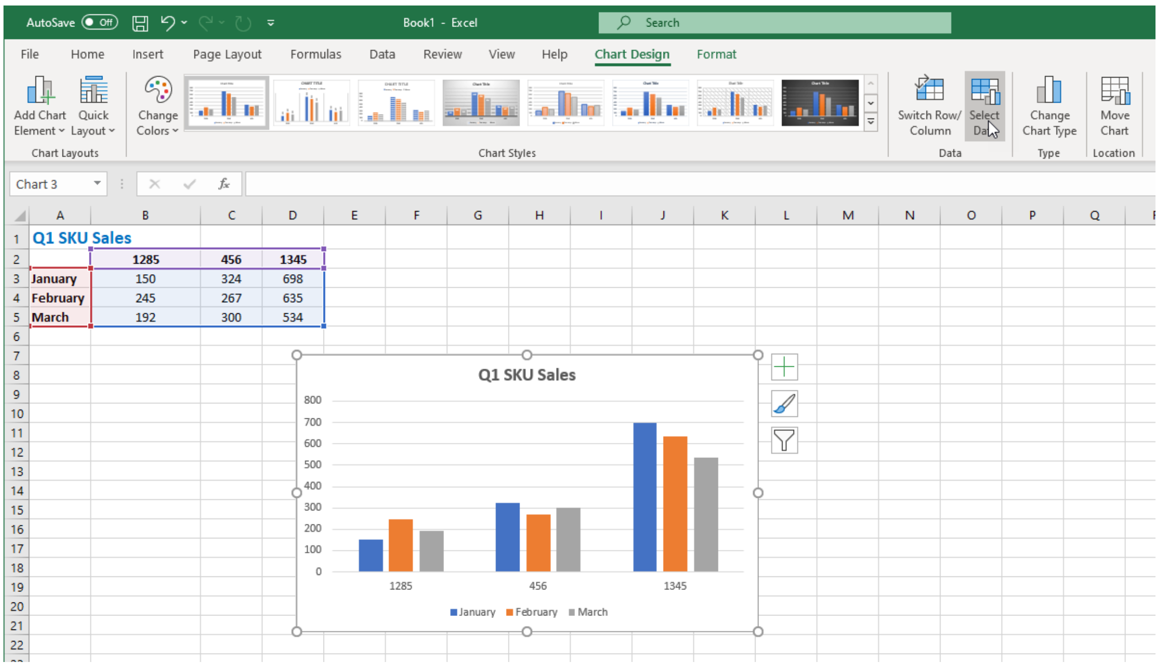


Once the range area has been successfully resized, the new data is immediately incorporated into the chart. In this case you can see that F is now represented:

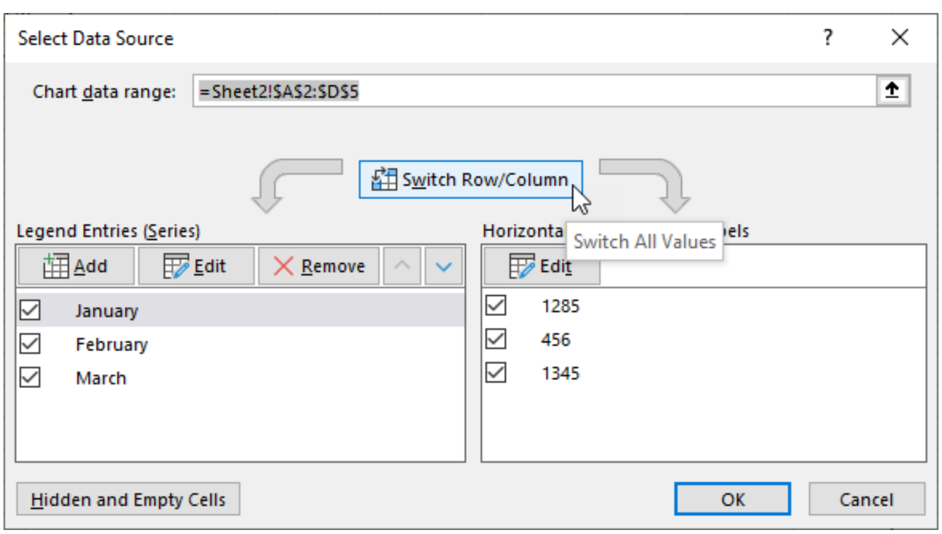


Switching Between Rows and Columns

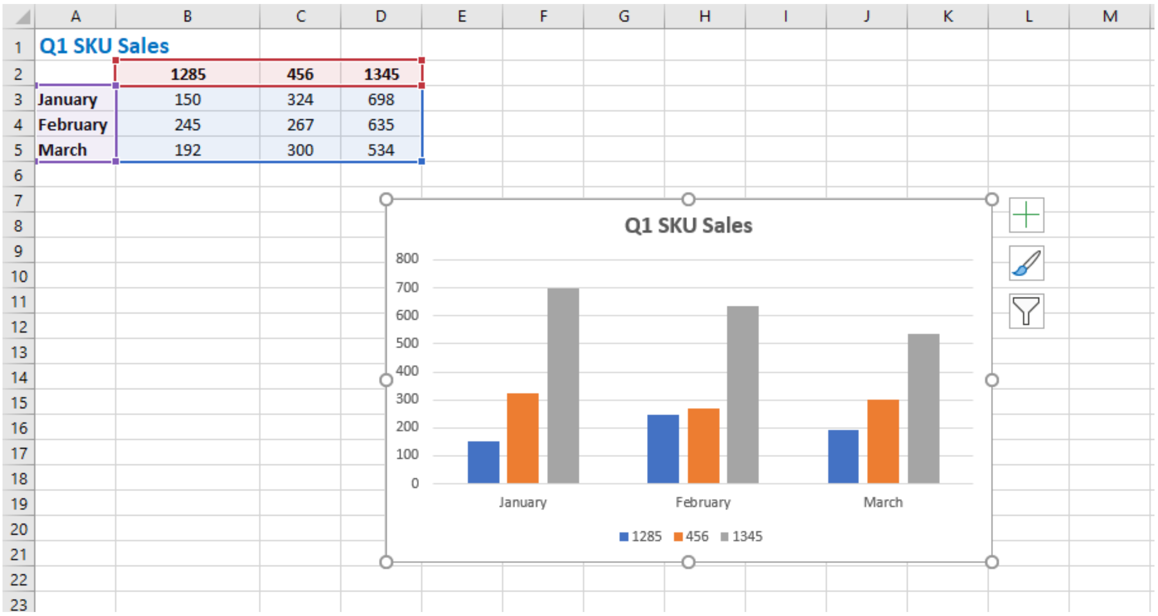
Occasionally, with some chart types, you may find the need to switch between rows and columns so that your chart represents the data more clearly. In the example below, the chart is displaying SKU sales by month, but the columns are grouped by the SKU number, and each column in the group represents a month in the quarter. You would prefer to group the data by month, and have each column in the group represent a SKU. To quickly make this change, first select your chart, then click **Chart Design → Select Data:**



This action displays the **Select Data Source** dialog box. Click the **Switch Row/Column** button to make the month the horizontal axis:



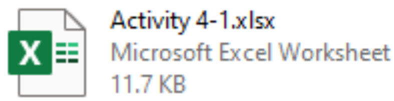
Clicking the **OK** button applies the new changes and they are represented in the chart:



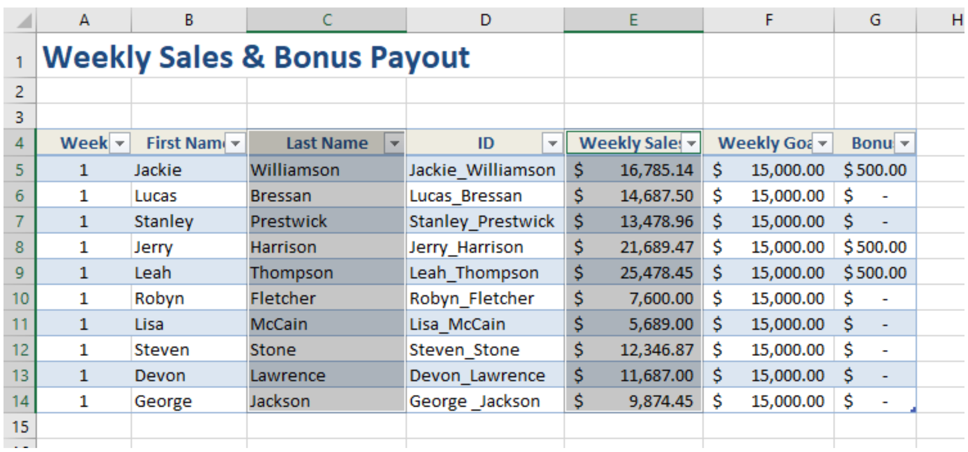
Activity 4-1: Creating Charts

You need to produce a chart that easily demonstrates to your supervisor which salesperson made the most sales in week 1.

1. To begin, open Activity 4-1 from your Exercise Files folder:

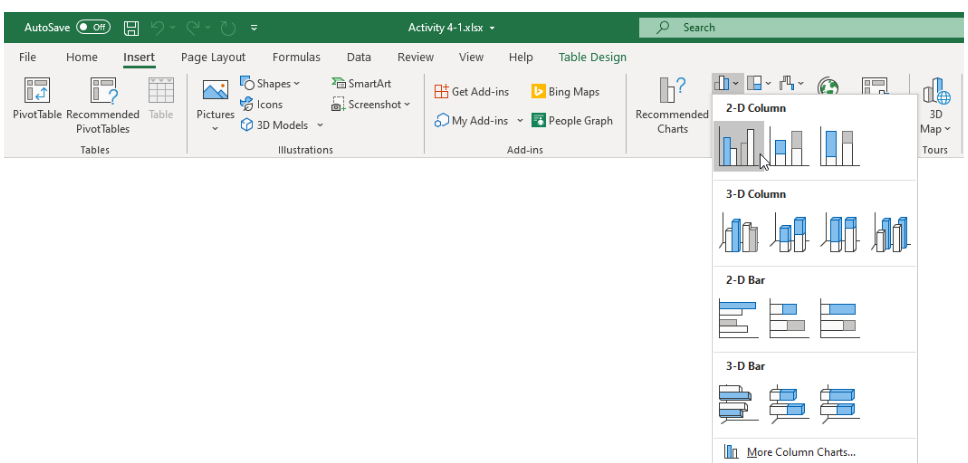


2. First, you need to select the dataset with which you would like to work. Use your cursor to select cells **C4:C14** and **E4:E14**. Remember to hold the Ctrl key down when selecting non-adjacent cell ranges:

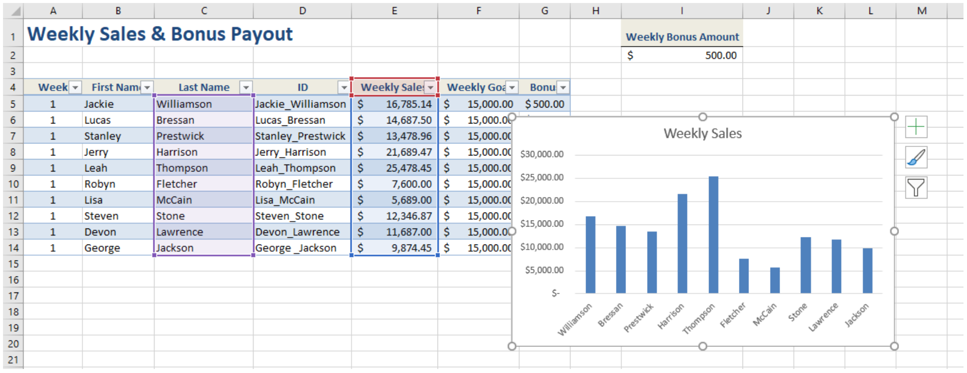


	A	B	C	D	E	F	G	H
1	Weekly Sales & Bonus Payout							
2								
3								
4	Week	First Nam	Last Name	ID	Weekly Sale	Weekly Goa	Bonu	
5	1	Jackie	Williamson	Jackie_Williamson	$ 16,785.14	$ 15,000.00	$ 500.00	
6	1	Lucas	Bressan	Lucas_Bressan	$ 14,687.50	$ 15,000.00	$ -	
7	1	Stanley	Prestwick	Stanley_Prestwick	$ 13,478.96	$ 15,000.00	$ -	
8	1	Jerry	Harrison	Jerry_Harrison	$ 21,689.47	$ 15,000.00	$ 500.00	
9	1	Leah	Thompson	Leah_Thompson	$ 25,478.45	$ 15,000.00	$ 500.00	
10	1	Robyn	Fletcher	Robyn_Fletcher	$ 7,600.00	$ 15,000.00	$ -	
11	1	Lisa	McCain	Lisa_McCain	$ 5,689.00	$ 15,000.00	$ -	
12	1	Steven	Stone	Steven_Stone	$ 12,346.87	$ 15,000.00	$ -	
13	1	Devon	Lawrence	Devon_Lawrence	$ 11,687.00	$ 15,000.00	$ -	
14	1	George	Jackson	George _Jackson	$ 9,874.45	$ 15,000.00	$ -	
15								

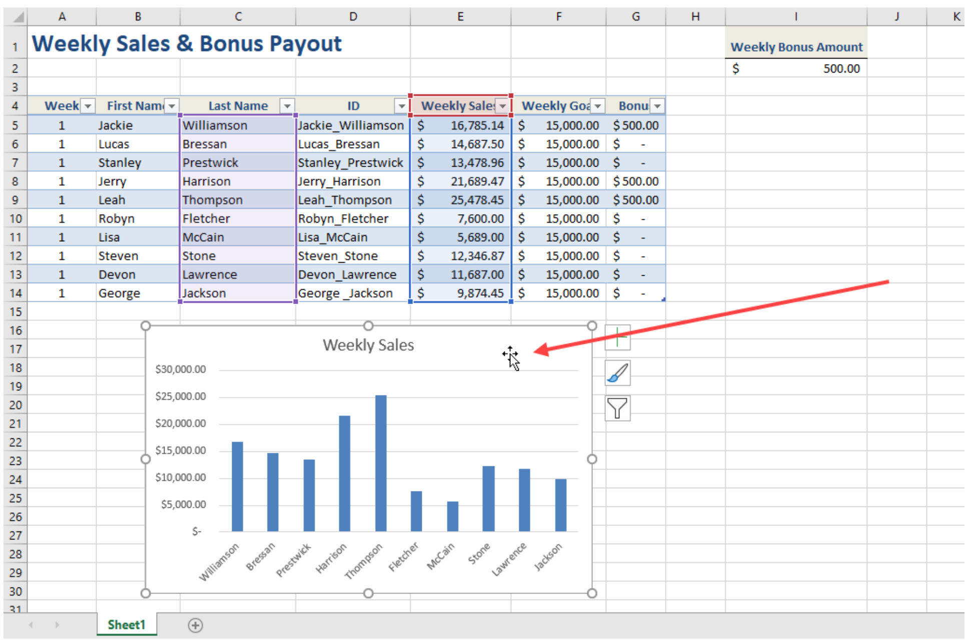
3. Next, click **Insert → Insert Column or Bar Chart → Clustered Column**:



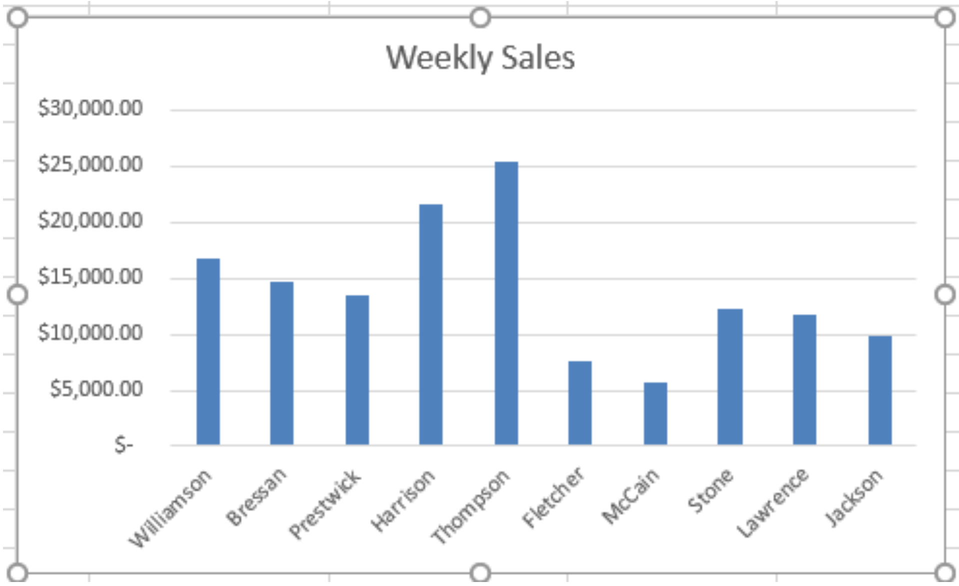
4. The new chart now appears on the current worksheet, overlapping some of the data:



5. **Click and drag this chart** to a location on the worksheet where it is not overlapping anything:



6. Examine the new chart. You will quickly see that Thompson made the most sales in week 1, with Harrison as the next runner up. McCain clearly has some work to do:



7. Save the current workbook as Activity 4-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Modify and Format Charts

Charts can be added quickly and easily using the default chart configurations, but sometimes those configurations are not ideal for your requirements. In such cases, you will need to know how to modify your chart to include more or less data, display or hide elements, and apply formatting.

Topic Objectives

In this session, you will learn:

- About modification vs. formatting
- About chart elements
- Guidelines for including chart elements
- About the Chart contextual tabs
- About formatting the chart with a style
- How to add a legend to the chart

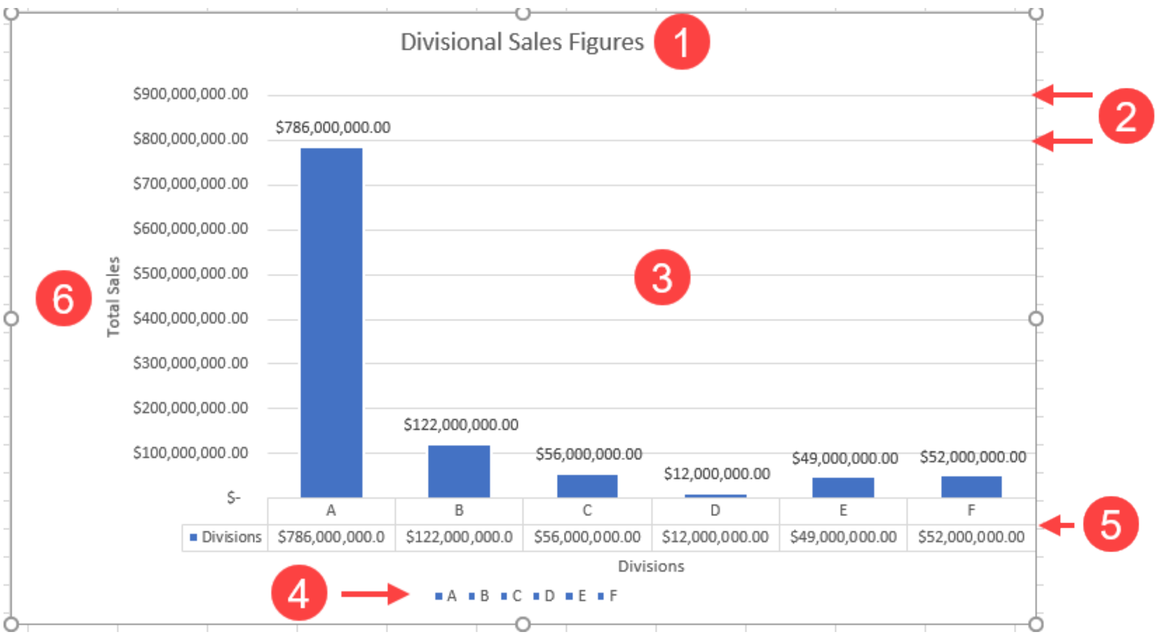
The Difference Between Modifying and Formatting

While modifying and formatting charts sound like the same thing, they are actually different in this context. When you choose to **modify** a chart, you are changing the various elements that are used to illustrate the data. For example, adding or removing chart elements or changing the chart type would be considering modifying a chart.

Formatting is the process of altering the overall appearance of the chart. This includes changing the chart's colors, fonts, and/or size. For example, if you need to change a chart to incorporate your organization's branding rules, you would be formatting it.

Chart Elements

Chart elements are the individual pieces of the chart that come together to create it. There will always be at least one chart element present in a chart, but the combination of chart elements largely depends on the chart type. Here is a sample column chart:



The above chart contains six chart elements: Chart **Title (1)**, **Gridlines (2)**, **Data series (3)**, **Legend (4)**, **Data table (5)**, and **Axis Titles (6)**.

Note that elements differ for each individual chart.

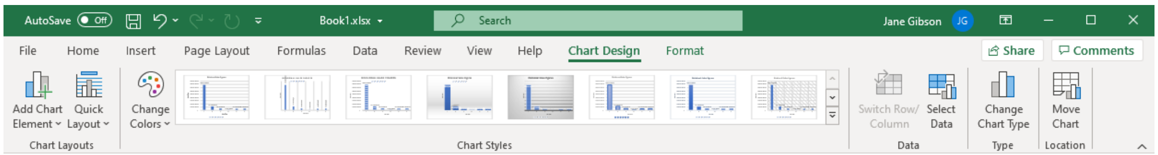
Minimize Extraneous Chart Elements

When modifying charts, you can have a significant impact on how and what information is conveyed. Because of this, it is best to keep your charts as simple as possible. This allows the data to speak for itself without cluttering it with extraneous information that the chart was trying to simplify in the first place. However, there are some instances where chart elements can help add meaning and context to the information being displayed. For example, the legend can be helpful when you are dealing with multiple sets of data, but less so when you are working with only one dataset.

The Chart Contextual Tabs

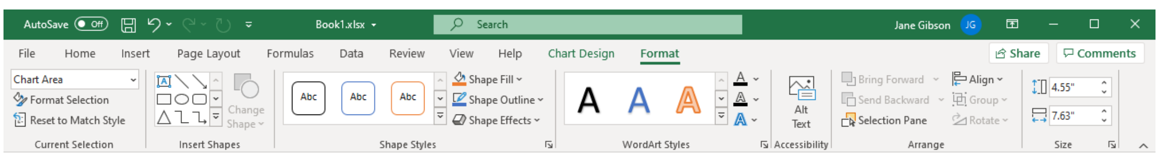
When a chart is selected in the worksheet, the **Chart Design** and **Format** contextual tab sets will become available on the ribbon.

The Chart Design Tab



The Chart Design tab includes commands to change the overall appearance of the selected chart. This includes things such as adding and removing chart elements, changing the chart layout, colors, and applying chart styles. Additionally, this tab gives you access to commands to change the chart's dataset range and switch row and column data. The Type group contains a command to change the chart type, while the Location group contains a command that is used to move charts between worksheets in the current workbook.

The Format Tab

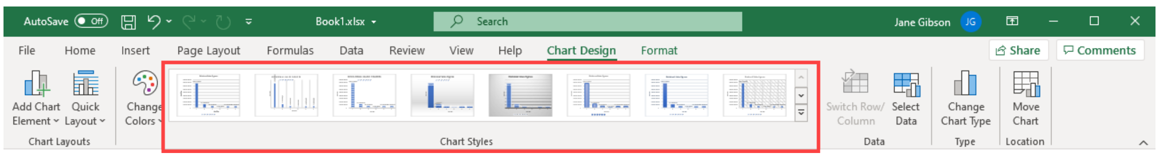


On the Format tab, the Current Selection controls allow you to select individual chart elements to edit, as well as access the Format Selection dialog box. Shape styles can be applied and configured using the commands in the Shape Styles group. The WordArt Styles group is used to configure and format chart text. Inside the Arrange group you will see controls to change the layered order of elements on a chart, as well as change the orientation of selected chart elements. Finally, the Size group is used to view and change the overall size of the currently selected chart.

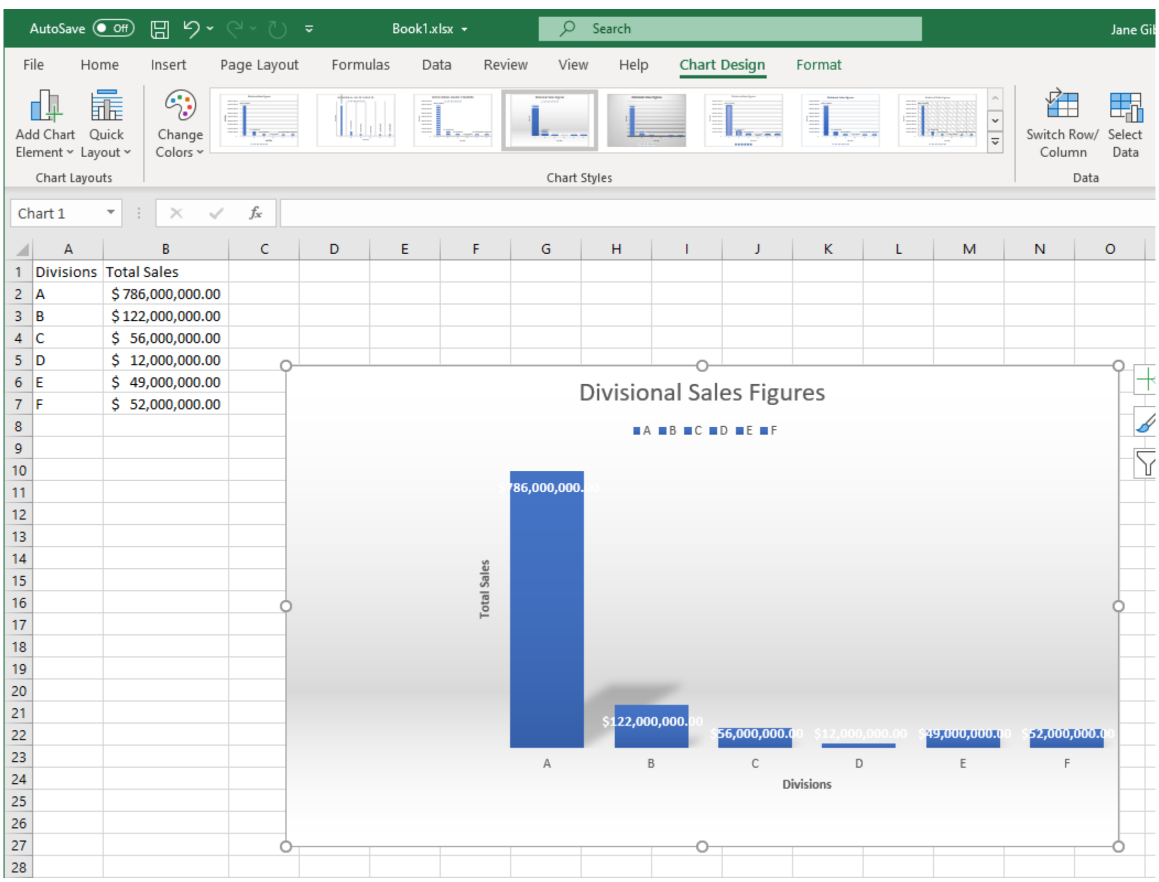
Formatting the Chart with a Style

Chart styles are used to slightly adjust how a chart is arranged without changing the primary color scheme. This is excellent for adding visual flair to your chart and on occasion a new chart style can also help a chart's readability.

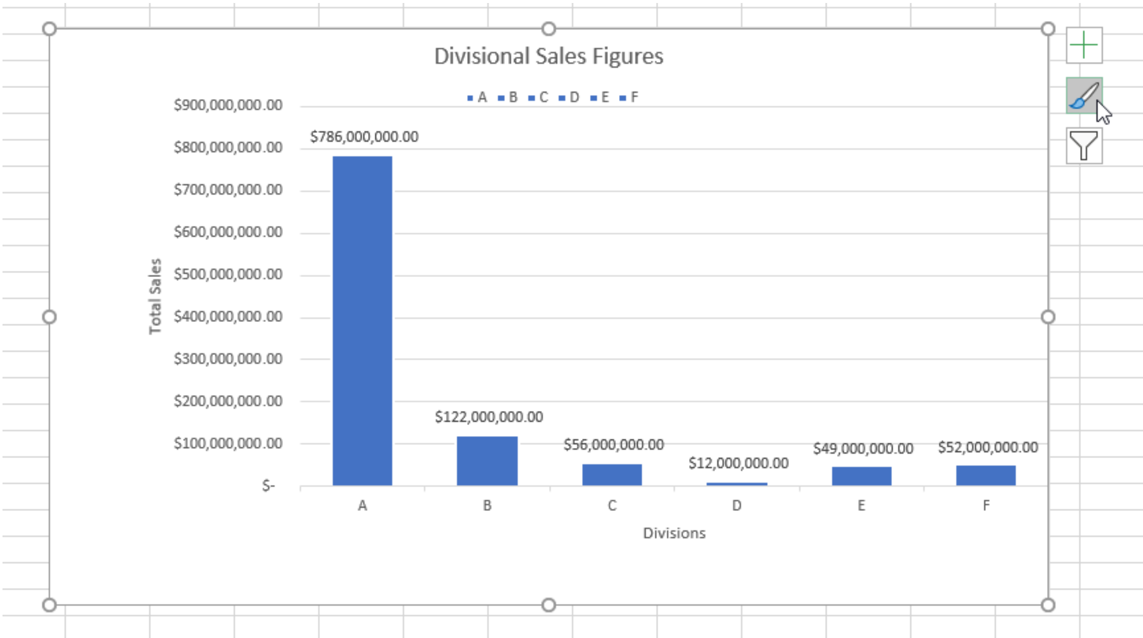
To format a chart with a style, first click to select the chart and then click **Chart Design**. Examine the Chart Styles group and you will see a gallery of different chart styles that you can choose from:



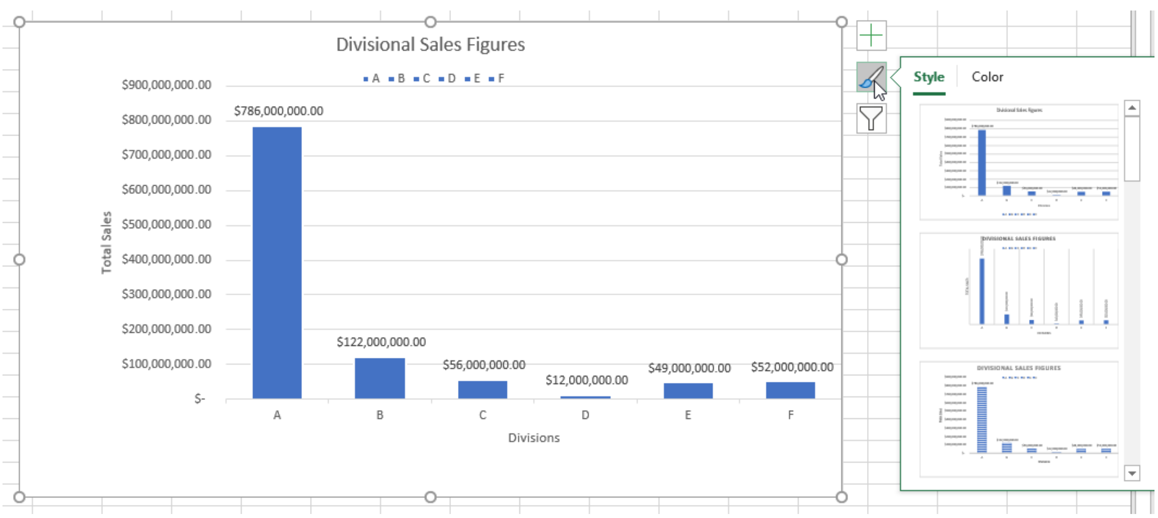
Move your cursor over these chart styles and you will see a preview of how these styles look once applied to your chart. Clicking on a style applies it:



You can also find these styles by clicking the **Chart Styles** button that appears to the top right of a selected chart:

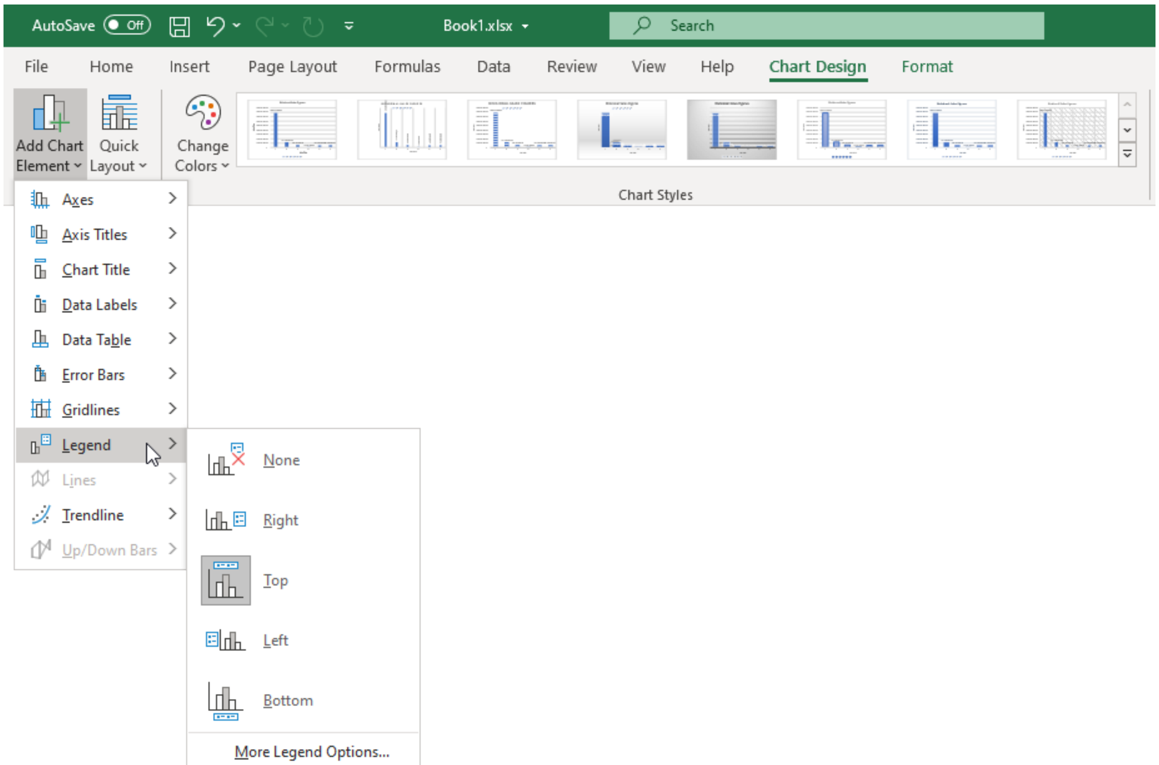


This button displays a scrolling menu of the same chart styles that you can select from:



Adding a Legend to the Chart

When working with charts, **legends** can be very important to the understanding of the data that a chart is trying to convey. While legends are usually displayed by default, you are able to toggle on or off this legend, as well as reposition it. To do this, select the chart by clicking **Chart Design → Add Chart Element → Legend → [Position]**:

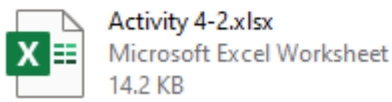


Alternatively, you can use the Chart Elements buttons and submenu that appears near the top right-hand corner of a selected chart.

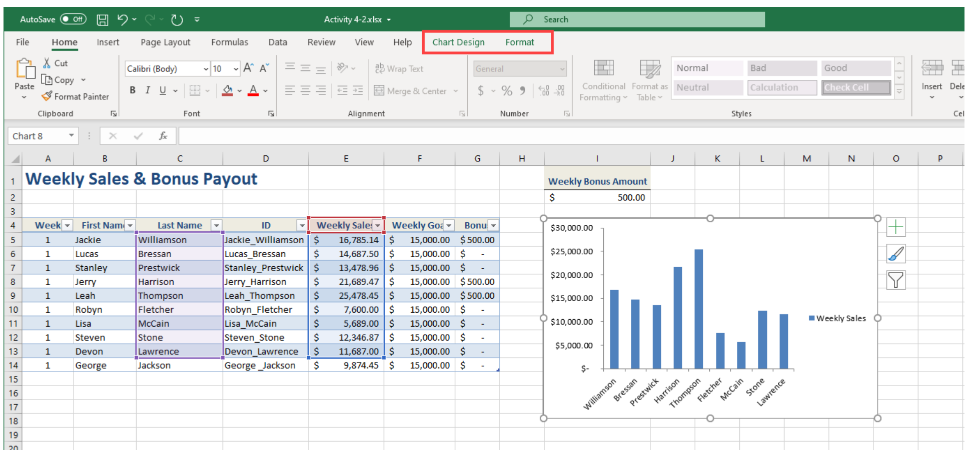
Activity 4-2: Modifying and Formatting Charts

You have created a chart that illustrates the weekly sales made by your sales staff. You would like to improve the look of the chart. Additionally, it looks as though George Jackson's data has been accidentally left out of the chart.

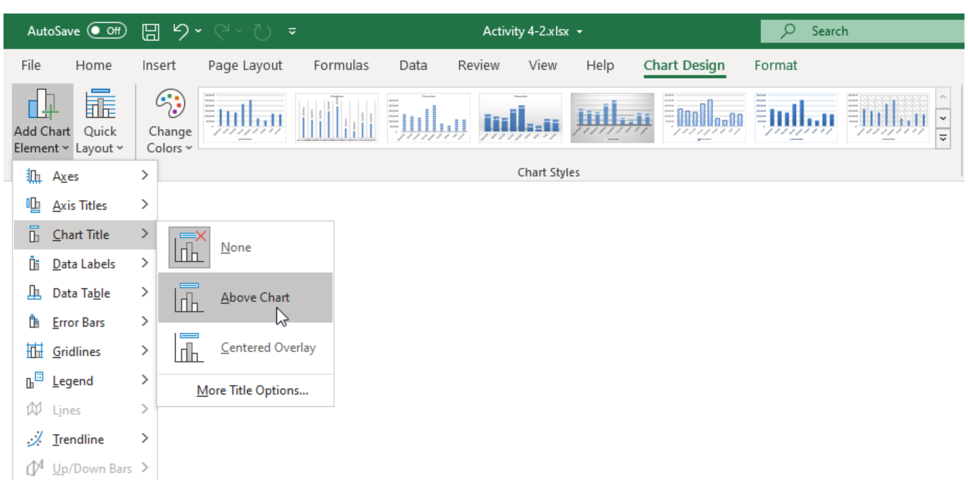
1. To begin, open Activity 4-2 from your Exercise Files folder:



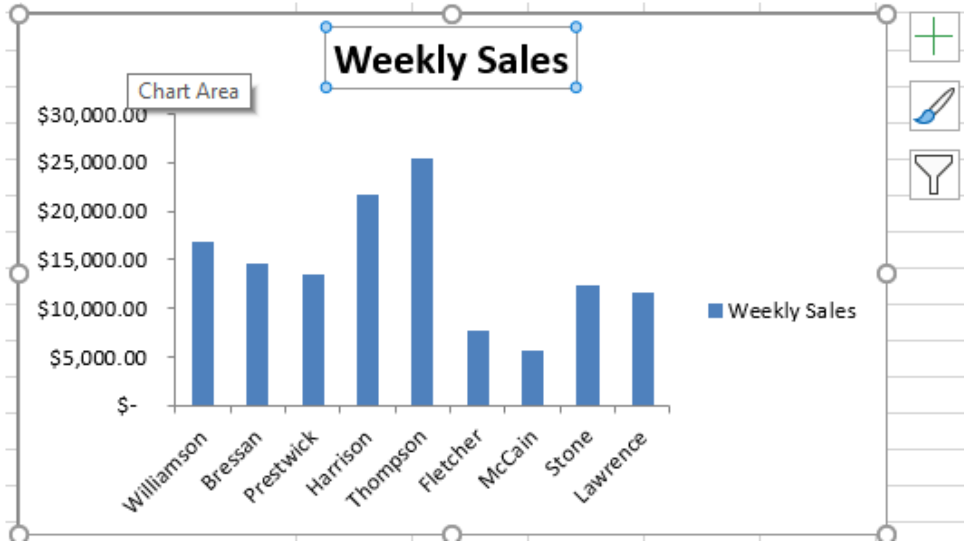
2. Click to **select the chart** on the current worksheet. You will see the Chart Design and Format contextual tabs appear on the ribbon:



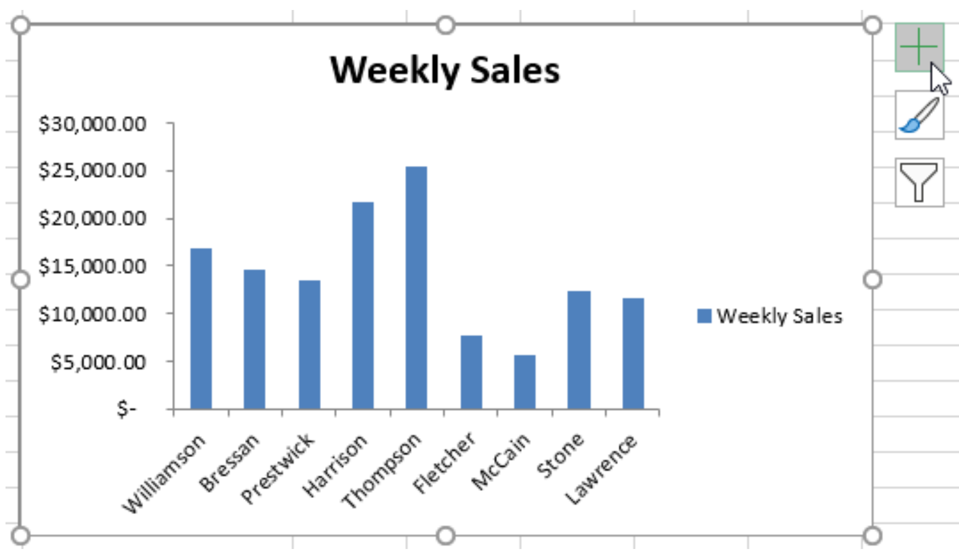
3. First, you should add a title to this chart. Click **Chart Design → Add Chart Element → Chart Title → Above Chart**:



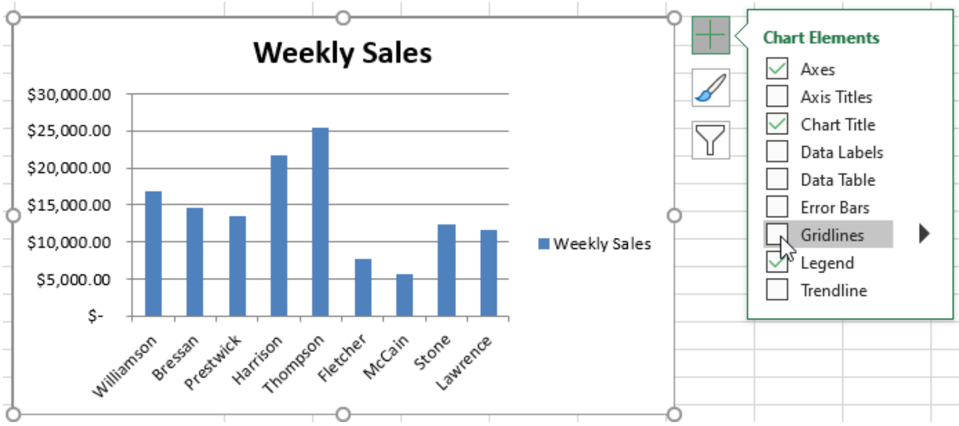
4. The chart title is now displayed above the data series on the chart:



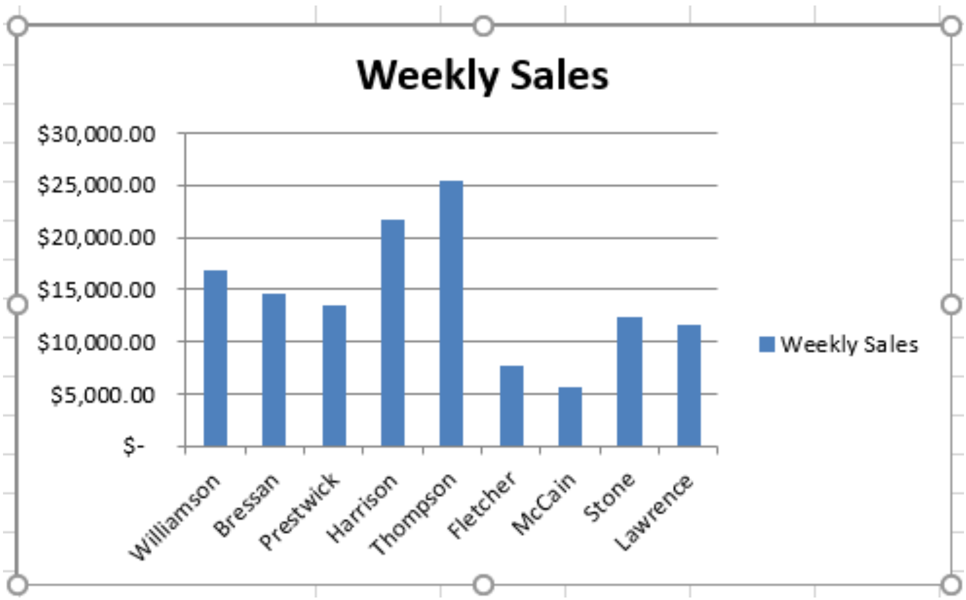
5. Next, you should add gridlines to make this chart a little easier to read. Click to **select the chart** and then click the **Chart Elements** button that appears near the top right-hand corner:



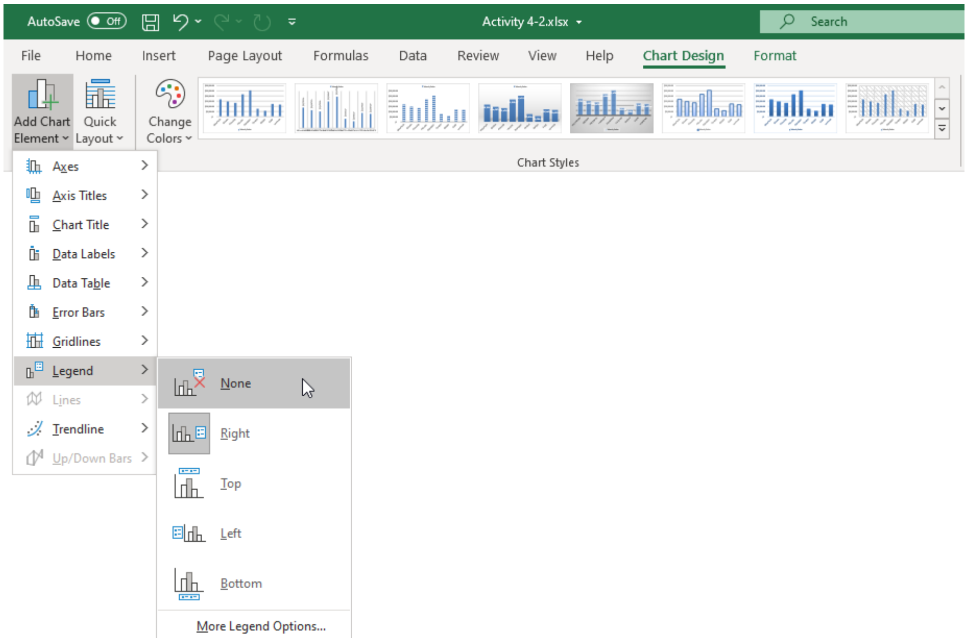
6. From the menu that appears, check the **Gridlines** check box:



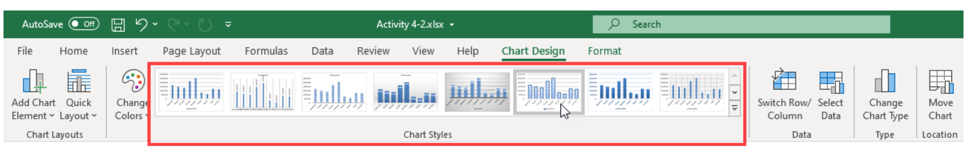
7. Major gridlines are now displayed on the chart:



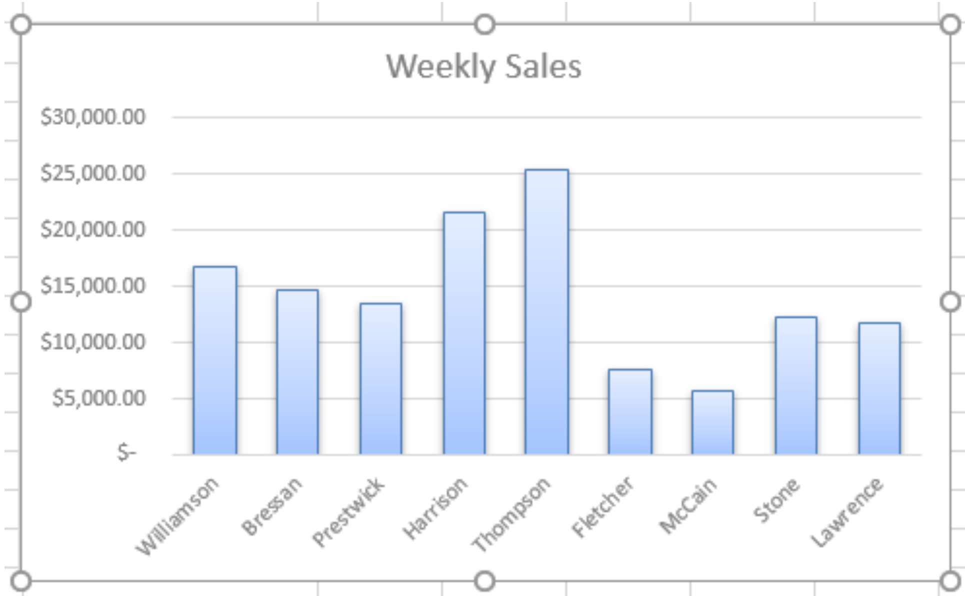
8. Finally, you might as well remove the legend as it is fairly self-evident what this data represents. Click **Chart Design → Legend → None**:



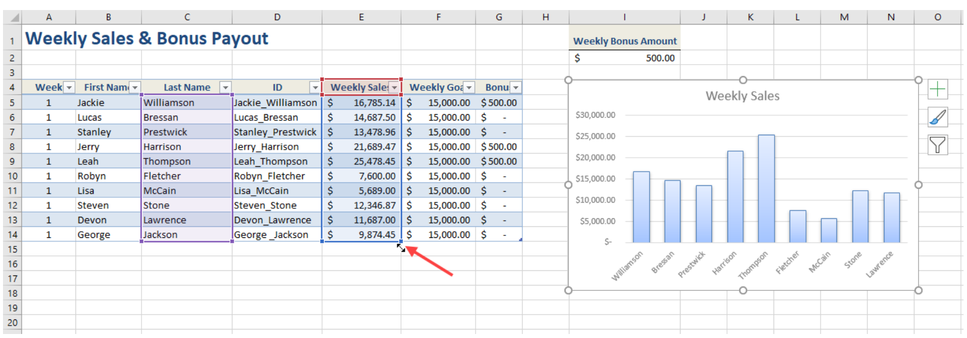
9. Now you need to adjust the color of this chart. Click the **Chart Design** contextual tab. Within the **Chart Styles** gallery, **click any** of the chart styles presented:



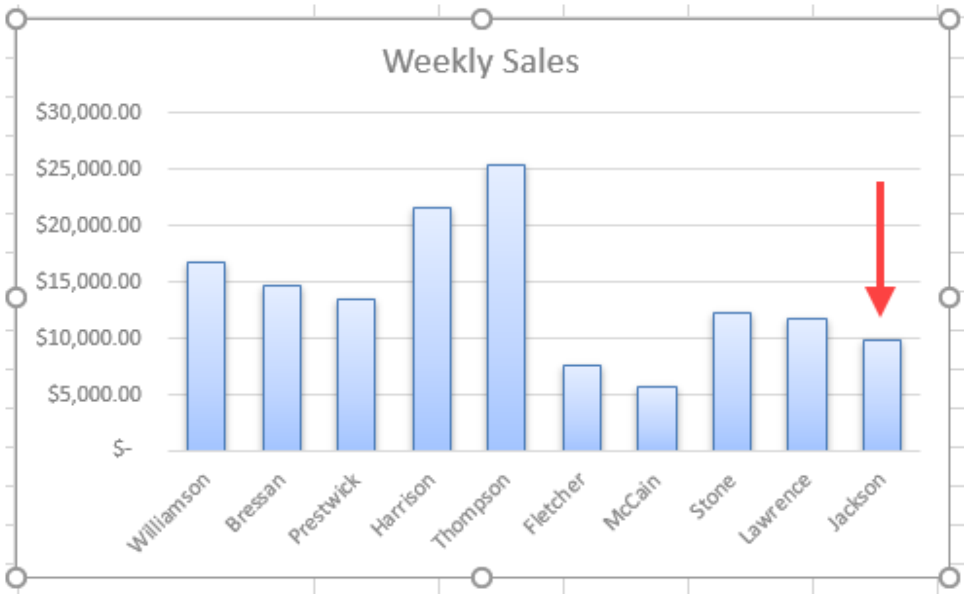
10. The new style is now applied to the selected chart:



11. Finally, with the chart selected, **click and drag the handle** of the highlighted data selection, at the bottom right of cell **E13**, and **drag it down one row**:



12. A column representing the weekly sales of George Jackson will be added to the chart:



13. Save your current workbook as Activity 4-2 Complete and close Microsoft 365 Excel to complete this exercise.

TOPIC C: Create a Trendline

Trendlines are designed to help you better understand the data that a chart shows, as well as to try to predict future trends. In this topic, we will learn all about trendlines, the different types that are available, and how to add them.

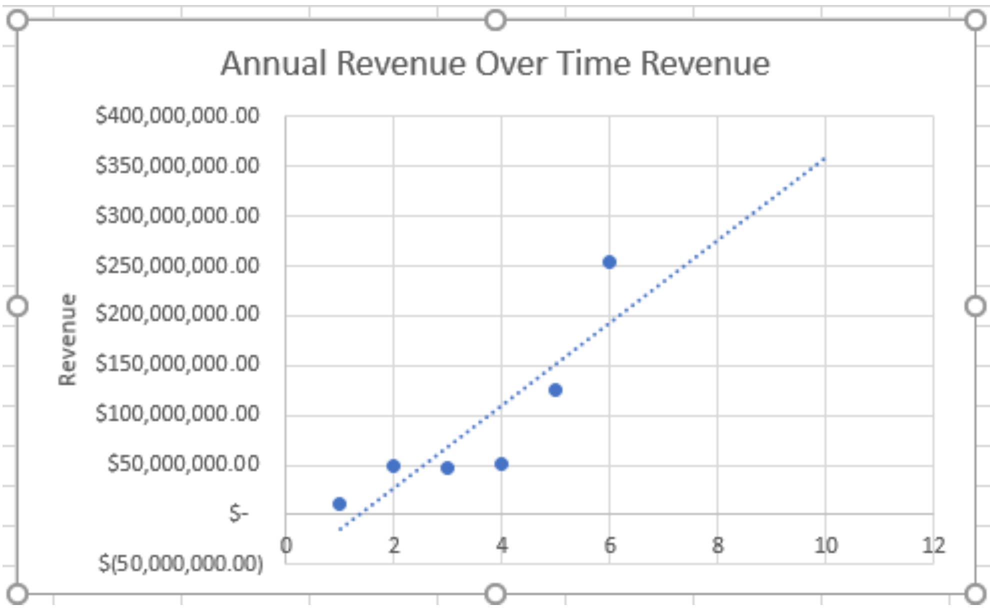
Topic Objectives

In this session, you will learn:

- About trendlines
- About the types of trendlines
- How to add a trendline
- About the Format Trendline task pane

Trendlines

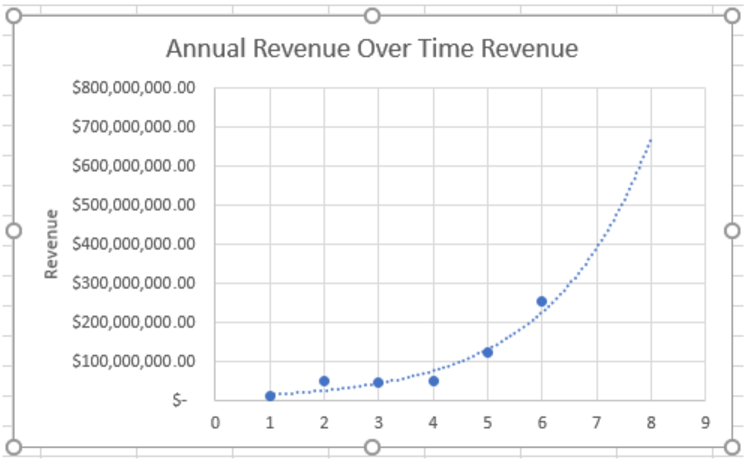
Trendlines are used to graphically depict trends that exist within your data or show a forecast of future data in a chart. For example, here you can see a trendline that forecasts two years ahead that shows a trend towards increasing revenue:



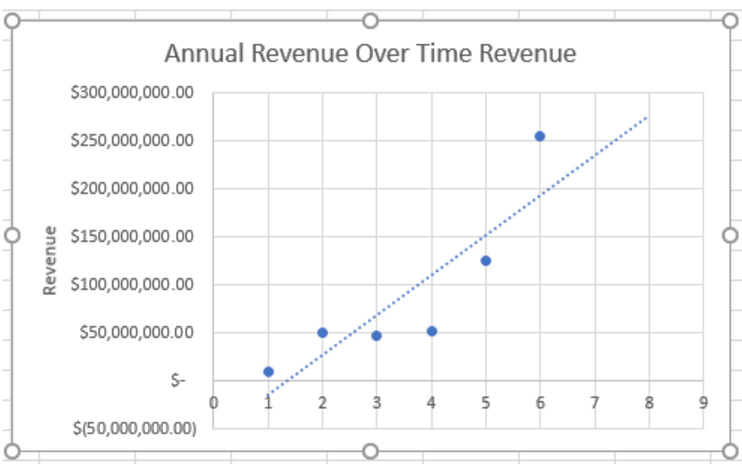
Types of Trendlines

Excel includes six different trend types that you can add to a chart. The type of trendline that you add depends on the type of data that the chart represents. Let's breakdown each type of trendline and the type of data that they are best suited to represent:

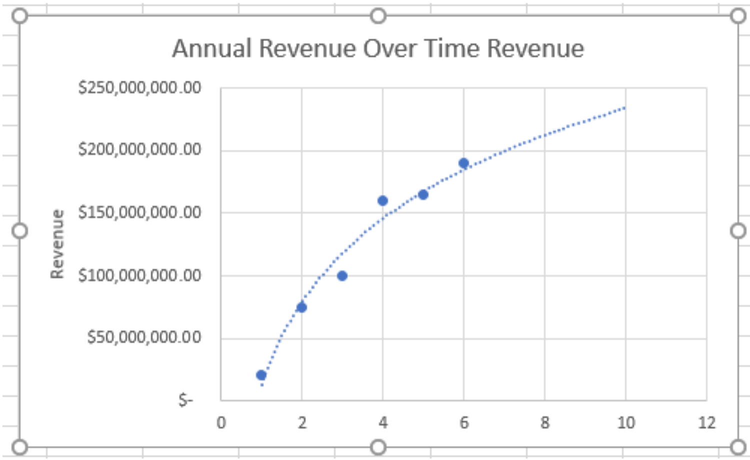
Exponential – These types of trendlines are curved to illustrate data rising or falling at constant rates:



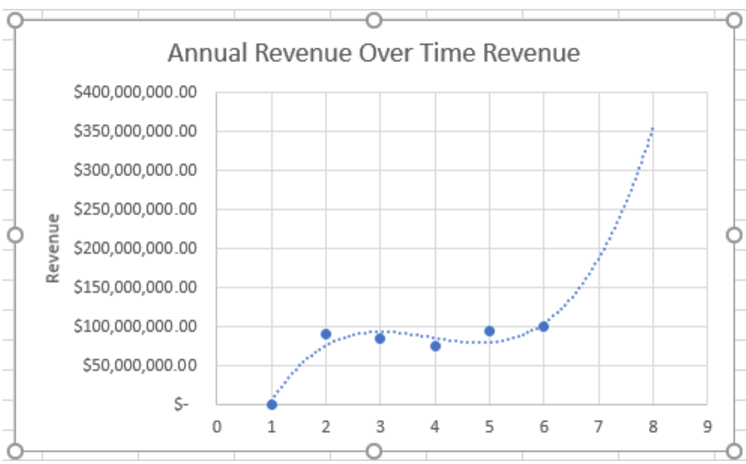
Linear – This trendline is typically used to represent simple linear data sets. It is a way to illustrate that something is increasing or decreasing over time:



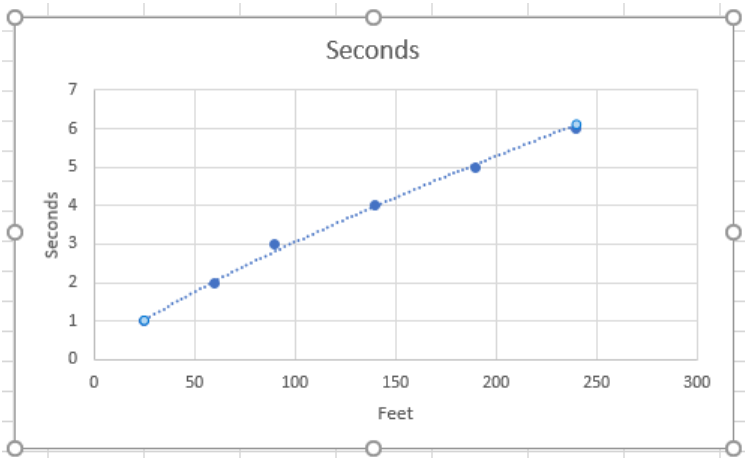
Logarithmic – This trendline is best suited for data that changes quickly and then evens out over time:



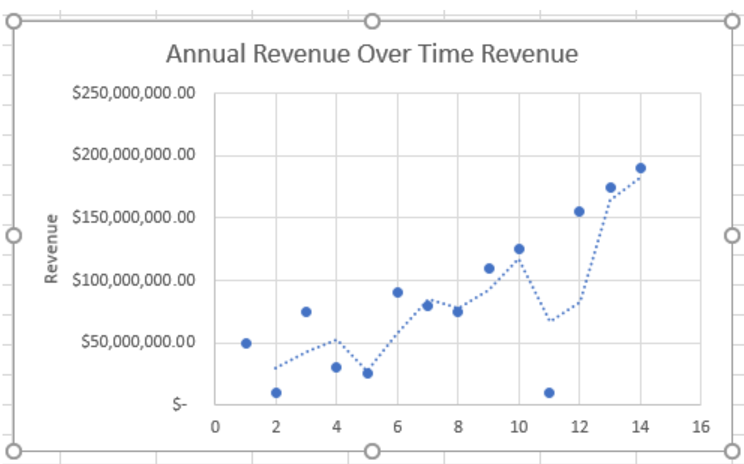
Polynomial – This type of trendline is curved to help illustrate fluctuating data points. It is divided in three orders: Order 2, Order 3, and Order 4. Order 2 trendlines include one hill or valley. Order 3 trendlines have one or two hills or valleys, while Order 4 trendlines have up to three hills or valleys:



Power – This type of trendline is also curved but is used with data sets that compare measurements at a specific rate. For example, you could use this trendline to measure acceleration over time:

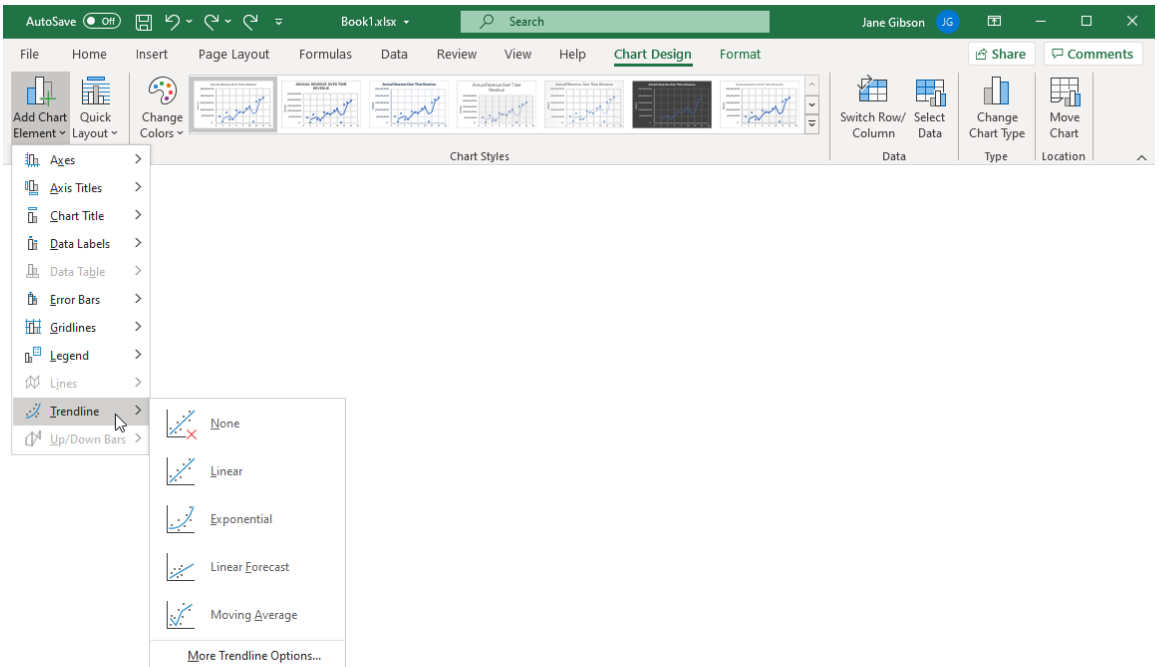


Moving Average – This type of trendline is intended to smooth out data that includes a lot of fluctuation. It does this by averaging a chosen number of data points. The number of data points is decided by setting the Period option. If this option is set to "2" then the first two points are used to create the trendline:

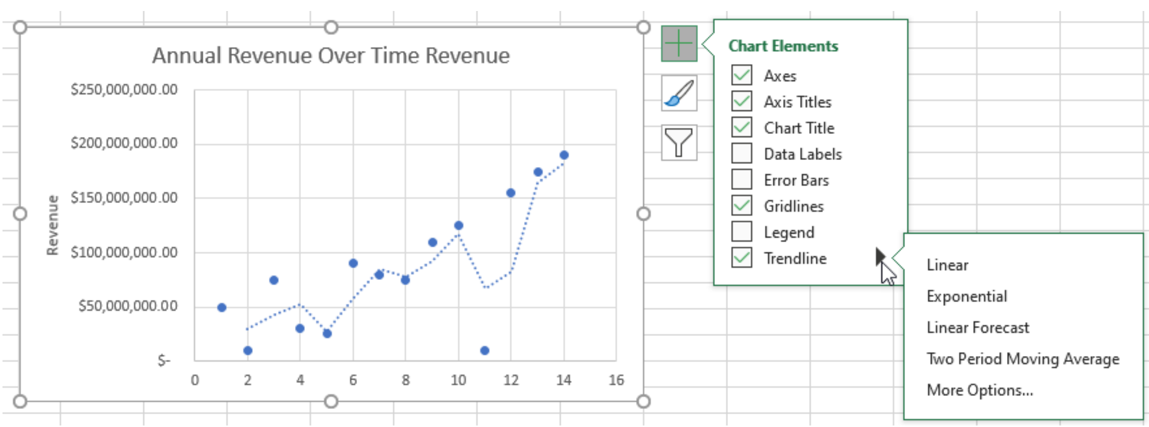


Adding a Trendline

Trendlines can be added to charts in Excel through a number of different methods. The first method involves selecting the chart and then click **Chart Design → Add Chart Element → Trendline → [Trendline]**:

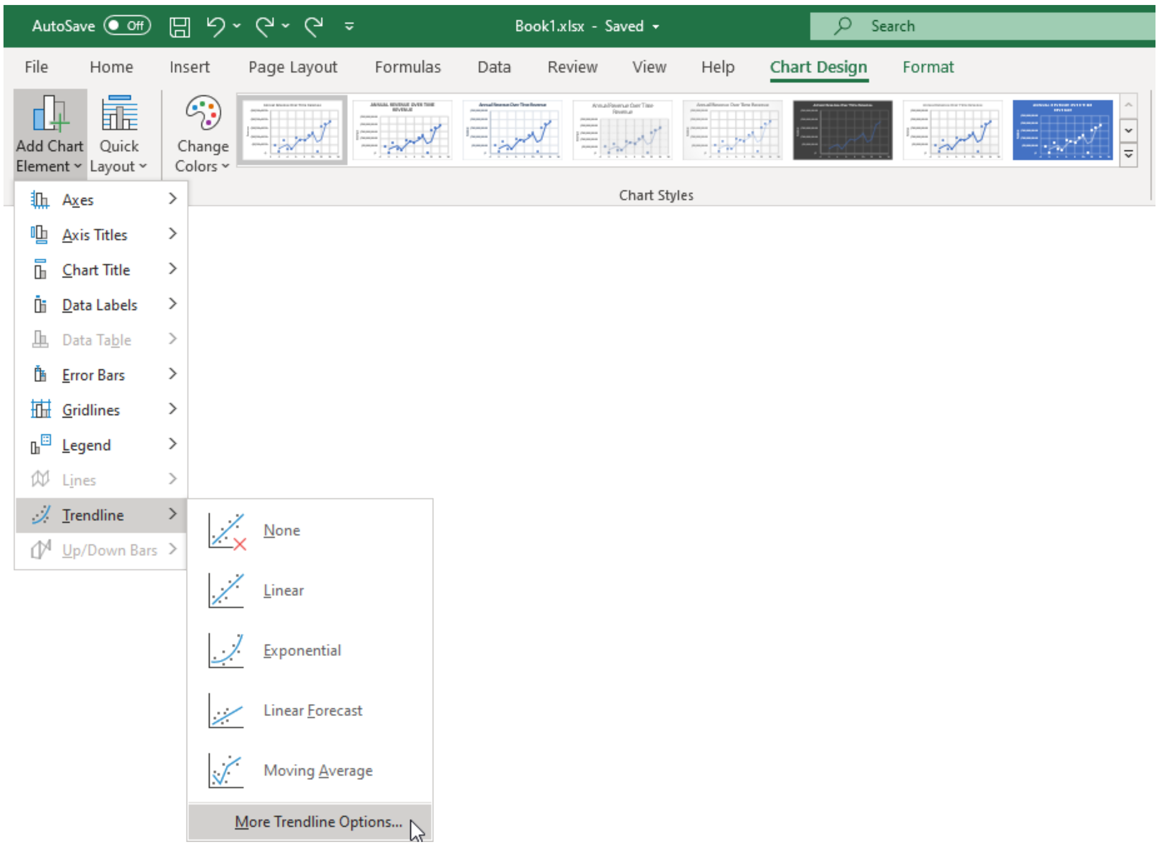


Alternatively, you can click to select the chart to display the **Chart Elements** button. Click this button and click the arrow icon that appears next to the **Trendline** listing. **Click the trendline** that you would like to add:

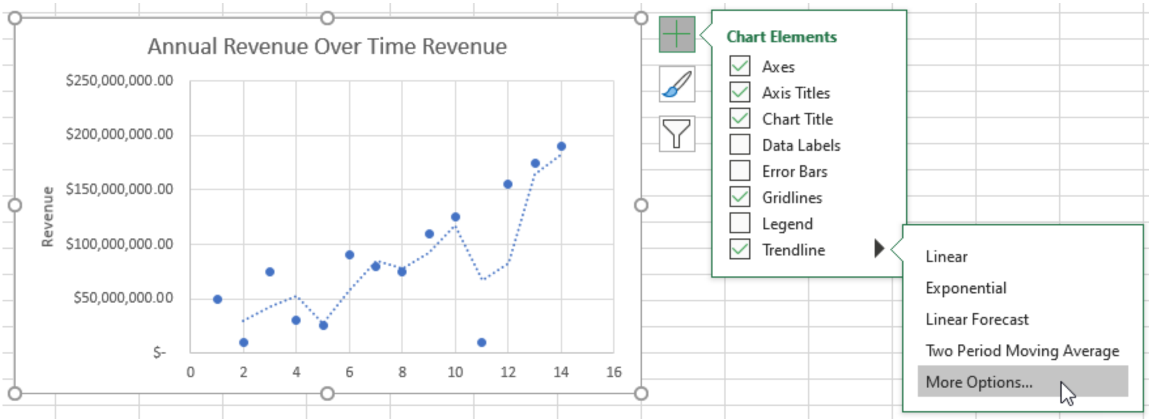


The Format Trendline Task Pane

The **Format Trendline** task pane allows you to add and modify a trendline in a number of different ways. To open this task pane, click **Chart Design → Add Chart Element → Trendline → More Trendline Options**:



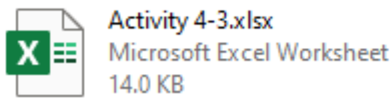
Alternatively, you can click **More Options** from the Trendline submenu when the Chart Elements button is clicked:



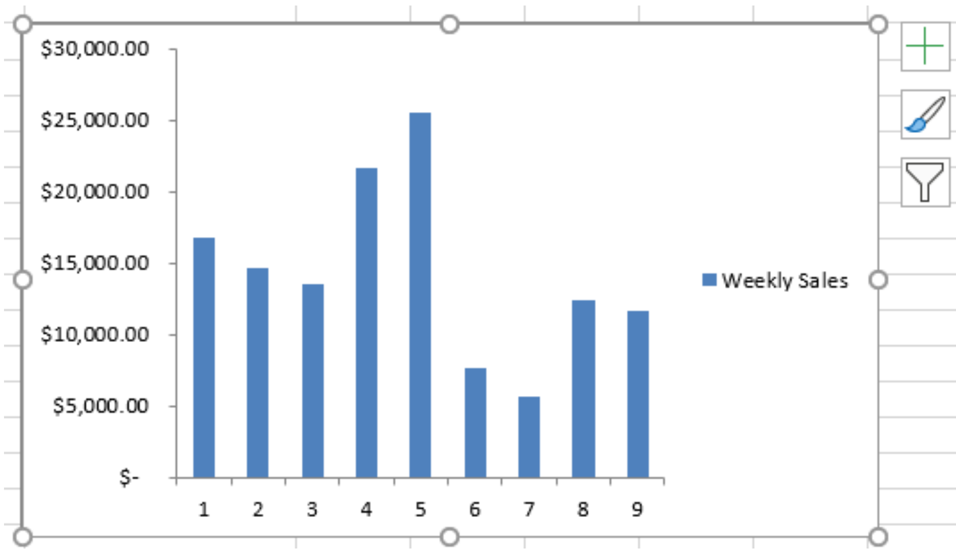
Activity 4-3: Create a Trendline

You would like to add a moving average trendline to a chart that illustrates sales data over the period of several weeks.

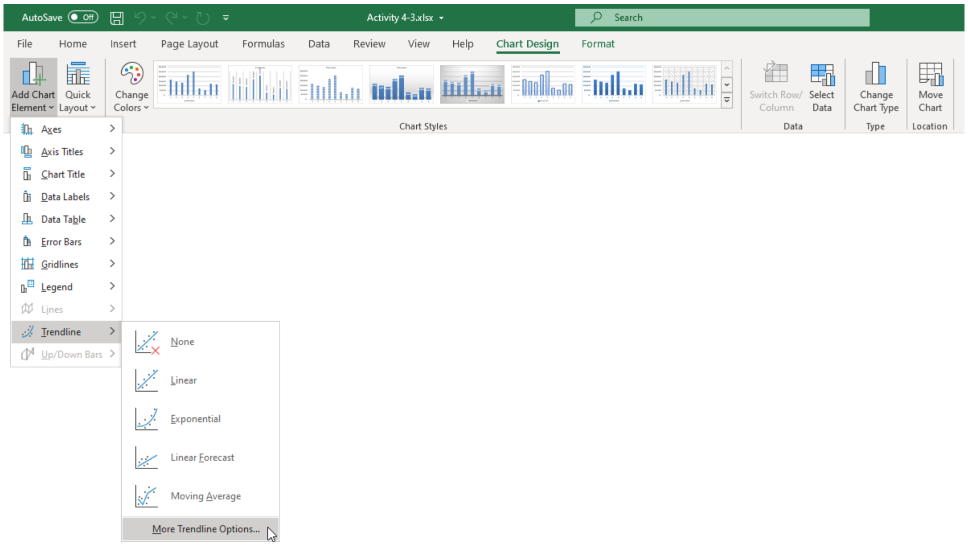
1. To begin, open Activity 4-3 from your Exercise Files folder:



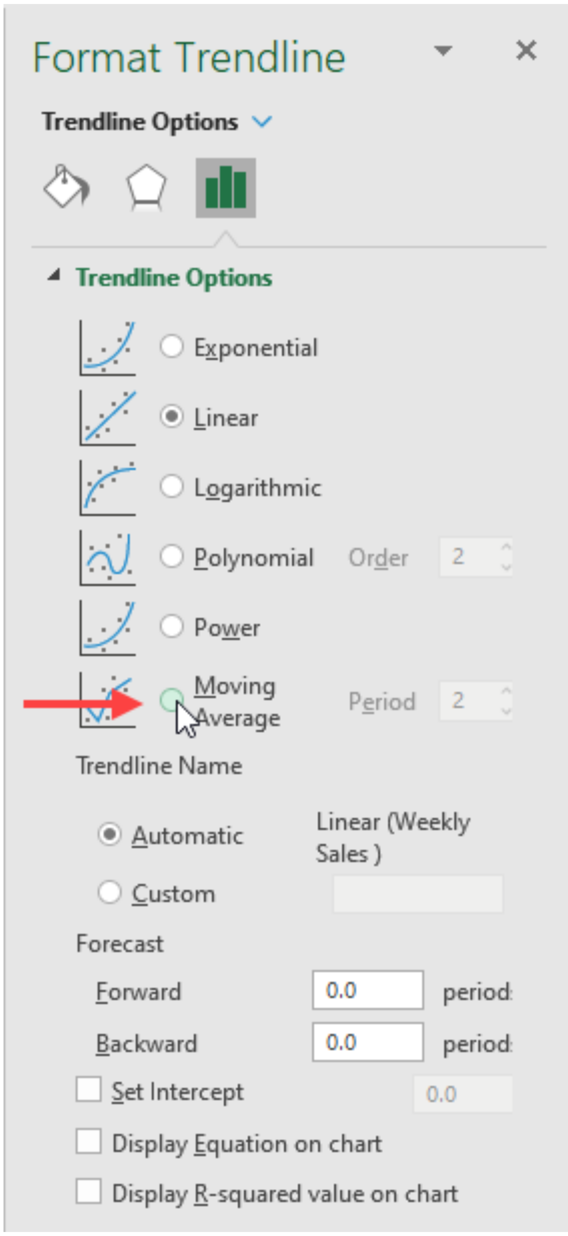
2. Click to **select the large chart** that appears on **Sheet1** of the current workbook:



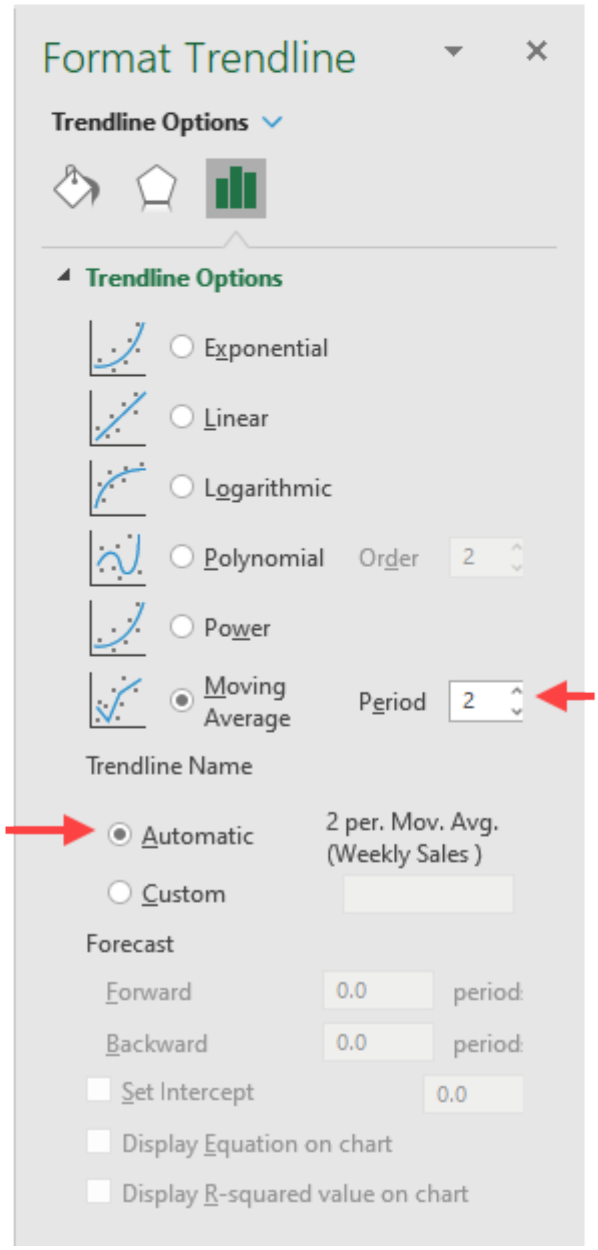
3. Click **Chart Design → Add Chart Element → Trendline → More Trendline Options**:



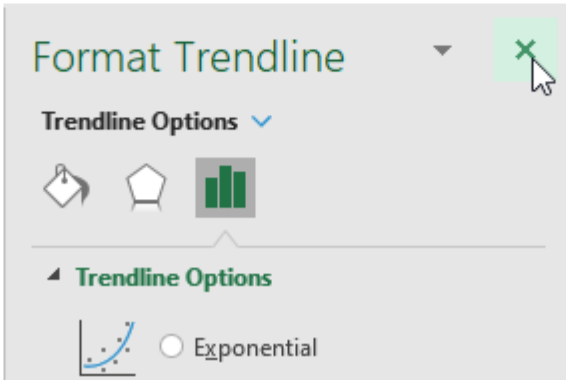
4. The Format Trendline task pane now appears on the right side of the Excel window. Click the **Moving Average** radio button:



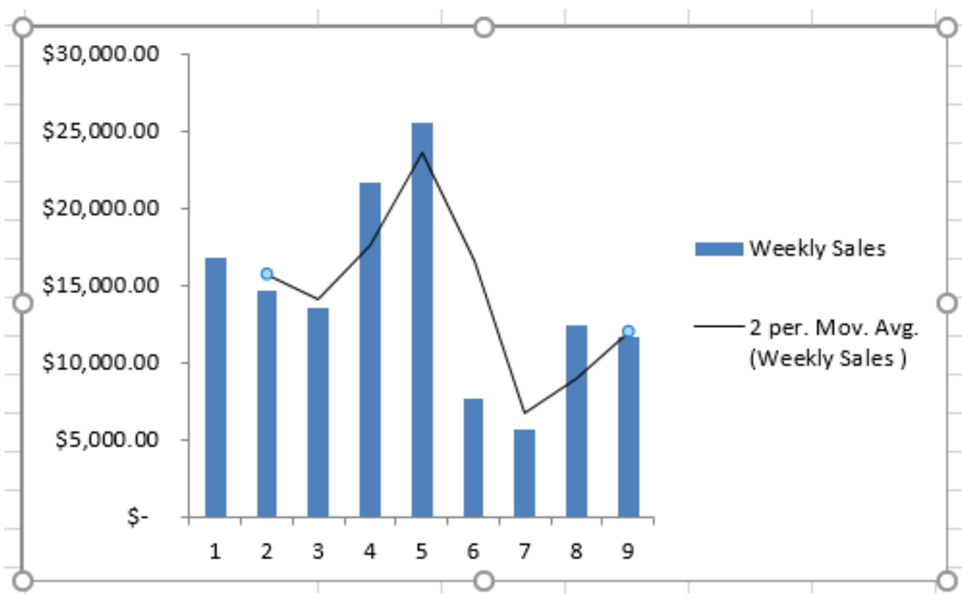
5. Ensure that the Period setting is set to "**2**" and that the Trendline Name radio button is set to **Automatic**:



6. Close the Format Trendline task pane by clicking the **Close** button (✕) in its upper right-hand corner:



7. Examine the graph and you will see that the trendline that has been added better illustrates the fluctuation in this data over time:



8. Save the current workbook as Activity 4-3 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC D: Create Advanced Charts

Beyond the basic chart types that are available and the simple modifications that you can make to them, Excel 365 offers more advanced charts that can be used to represent your data. During this topic you will learn how to create advanced charts.

Topic Objectives

In this session, you will learn:

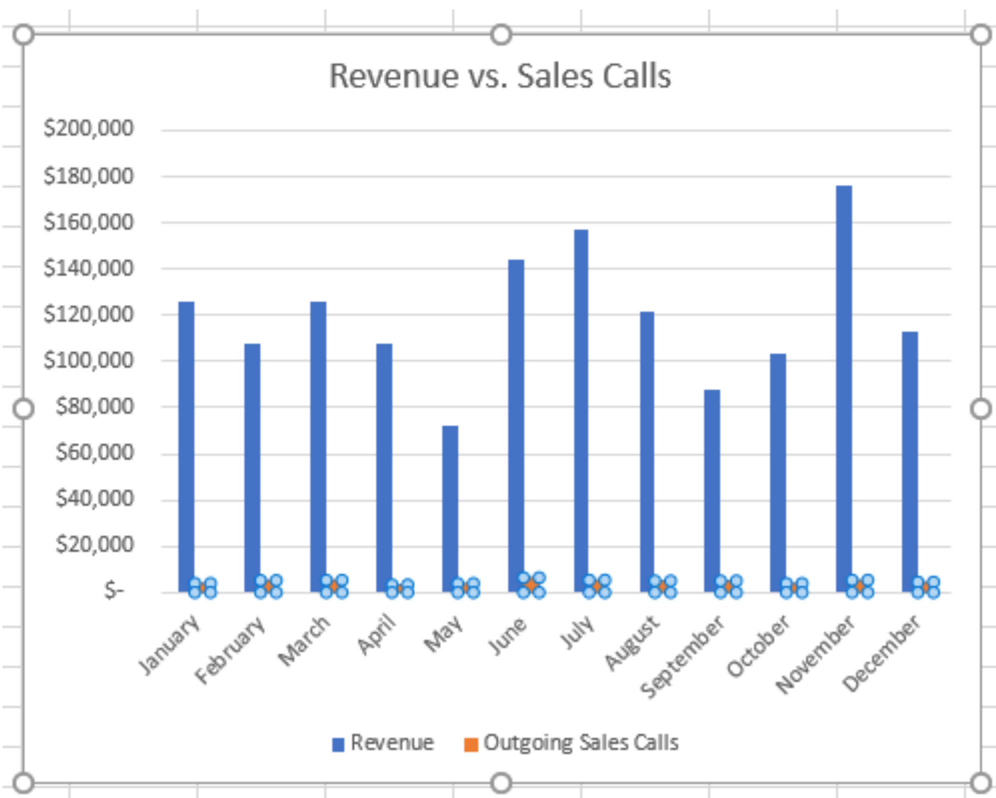
- About combination charts
- About dual axis charts
- How to create custom chart templates

Combination Charts

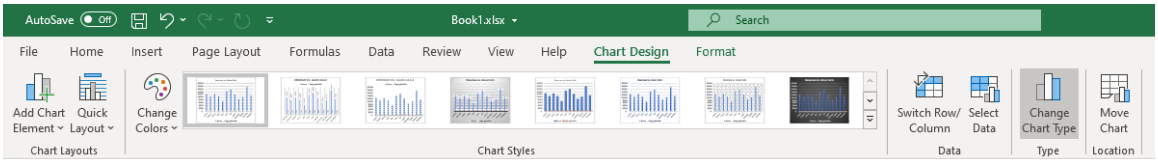
When you are working with more than one kind of information in a data set it can be challenging to represent it clearly in one chart. It can also be confusing for the audience who need to understand the information. **Combination charts** provide an effective way of presenting different, but related, data series in a single graphic.

As an example, if you want to compare your company's sales results over time against the number of outgoing sales calls, over the same period, it is difficult to see how a single chart could represent this data. Using two different chart types in the same graphic, though, could provide a clear comparison that is simple and easy to understand.

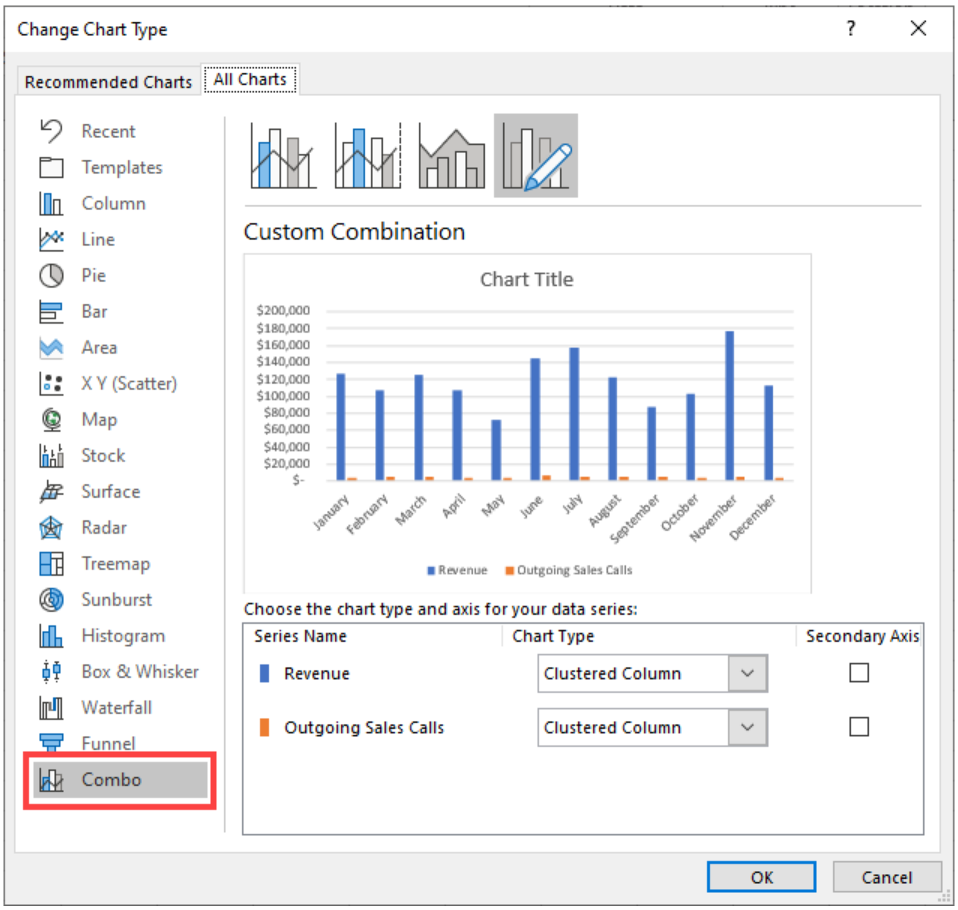
To create a combination chart, you must first have your data in an existing chart of a single type. You would then select one of the data series by clicking on one of the elements:



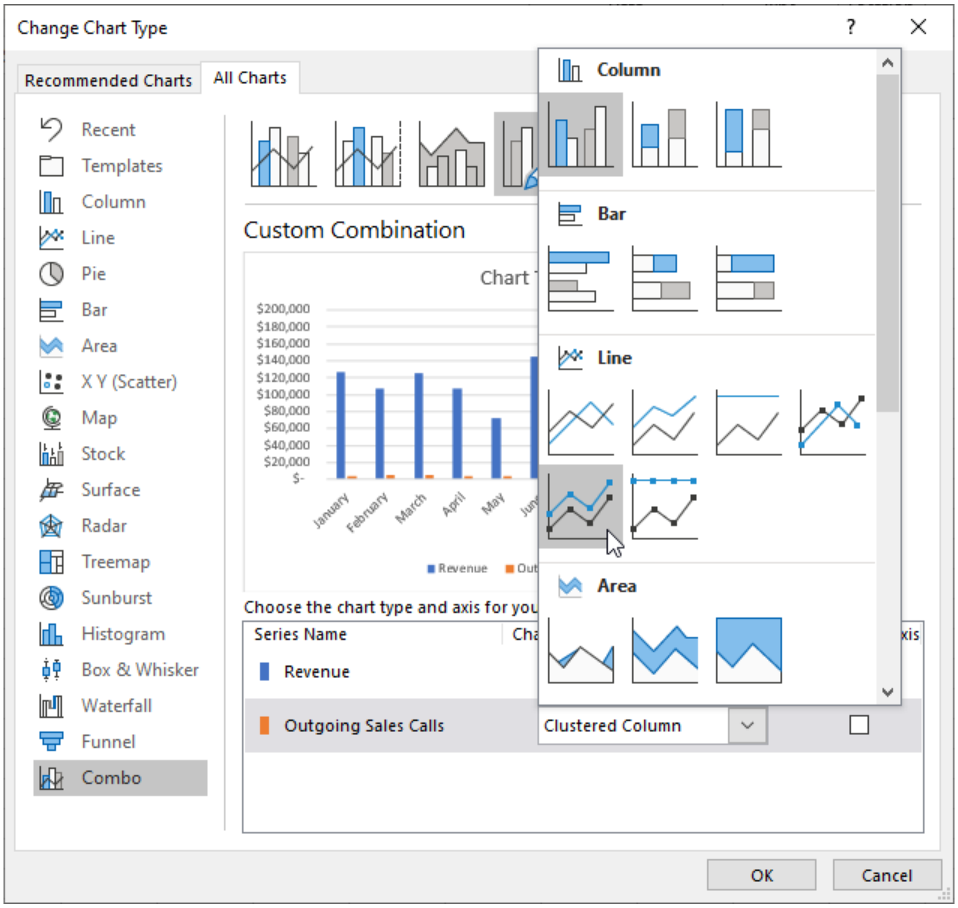
You would then click **Chart Design → Change Chart Type**:



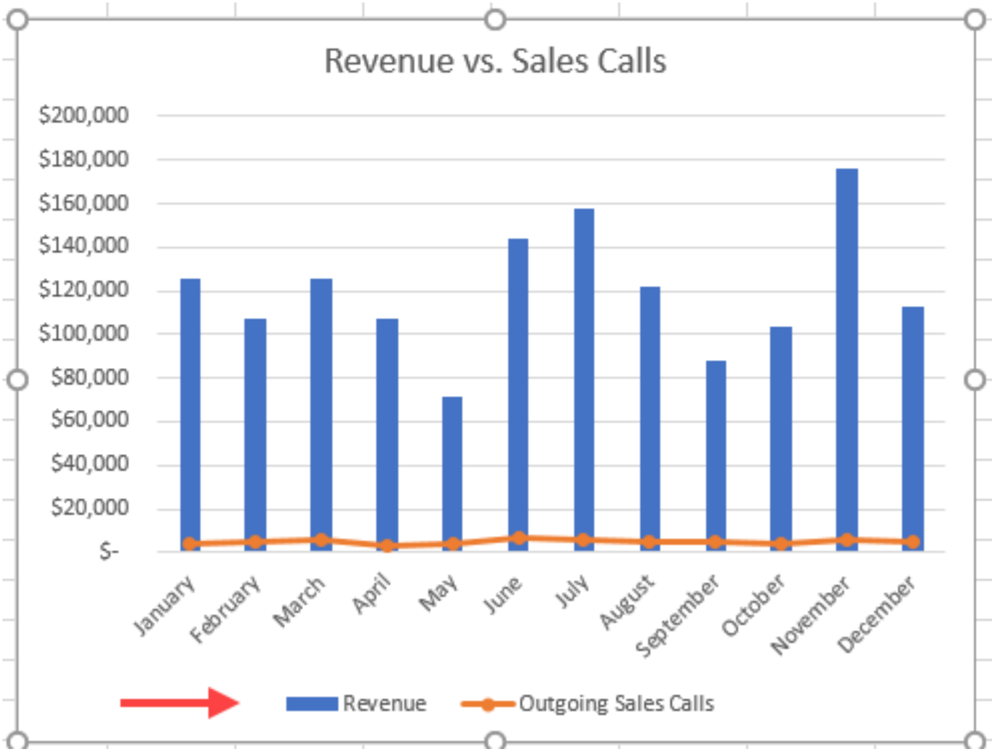
The **Change Chart Type** dialog box opens, and the **Combo** category should be selected automatically:



In the “**Choose the chart type and axis for your data series**” window, you can now select a different chart type for either of the data series by clicking on the “**Chart Type**” drop-down menu for the chosen “**Series Name**”:



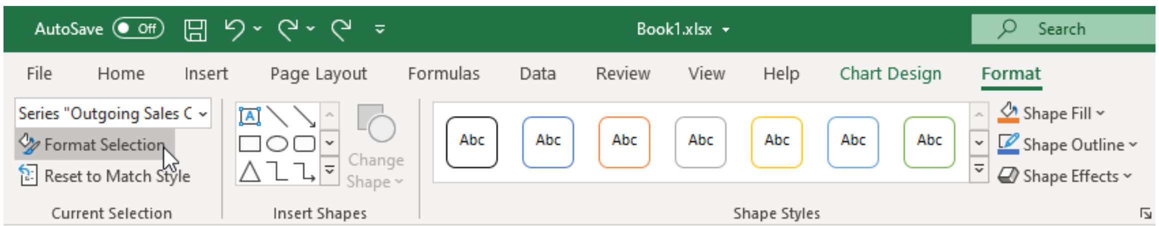
Once you have selected the desired chart type, clicking **OK** closes the Change Chart Type dialog box and your chart now contains a different chart type for each data series, as indicated in the legend:



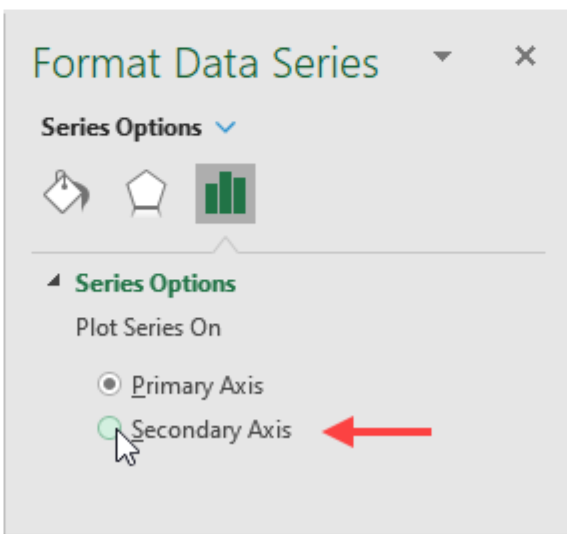
Dual Axis Charts

When using combination charts, it is often helpful to use a unique axis for each of the data series, so it is easier to compare, and understand. In our previous example, the number of outgoing sales calls is significantly less than the revenue values, resulting in a chart that does not clearly show the relationship between the two values. By adding another axis for the sales call volume, we can make the comparison clearer for the viewer.

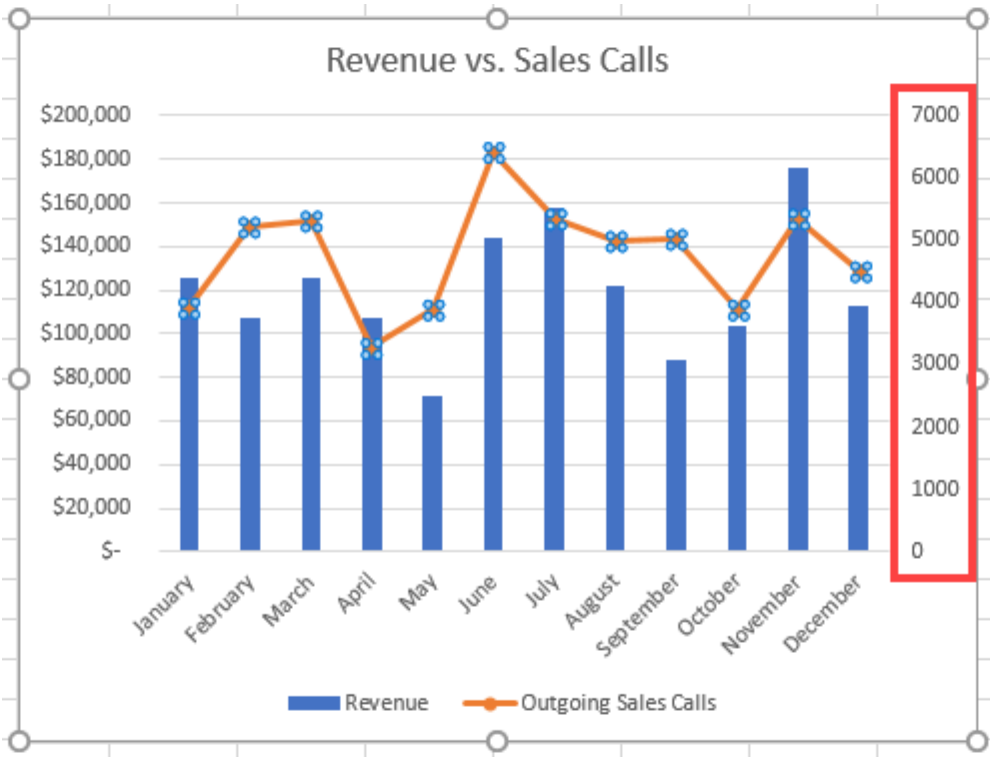
To add a secondary axis to your chart, first select the data series you want to use, then click **Format → Format Selection**:



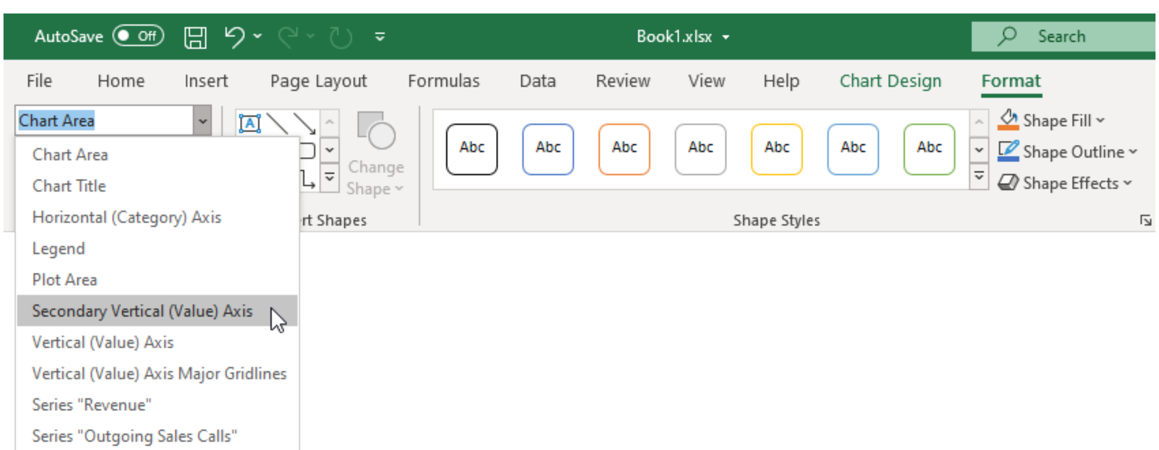
This opens the **Format Data Series** task pane, where you can click the **Secondary Axis** radio button:



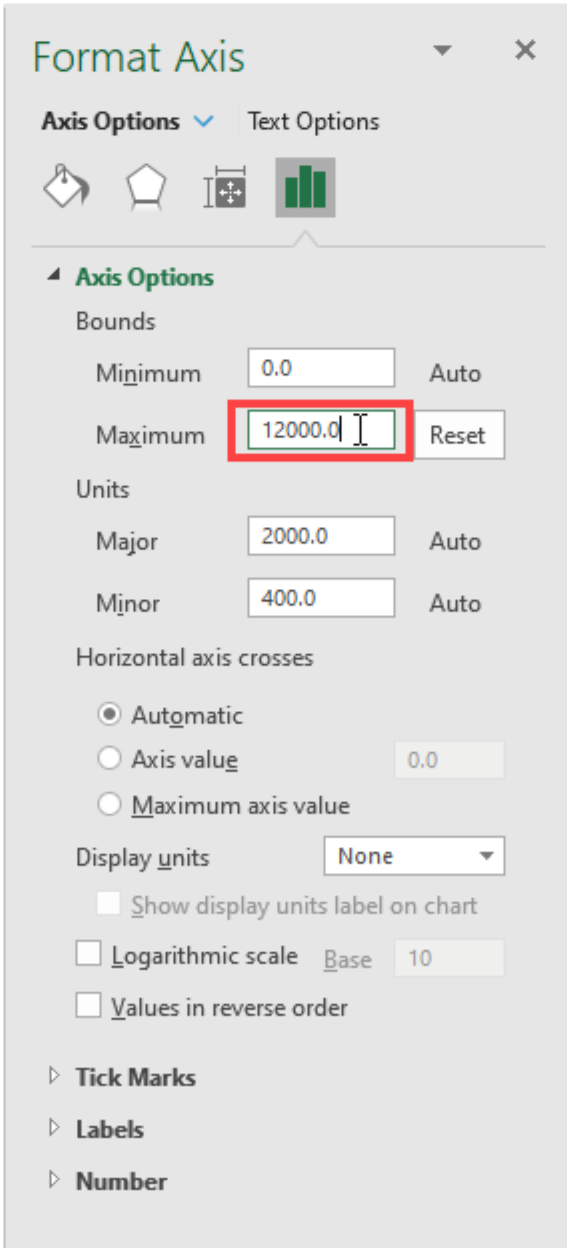
A second axis now appears for the chosen data series, opposite to the primary axis:



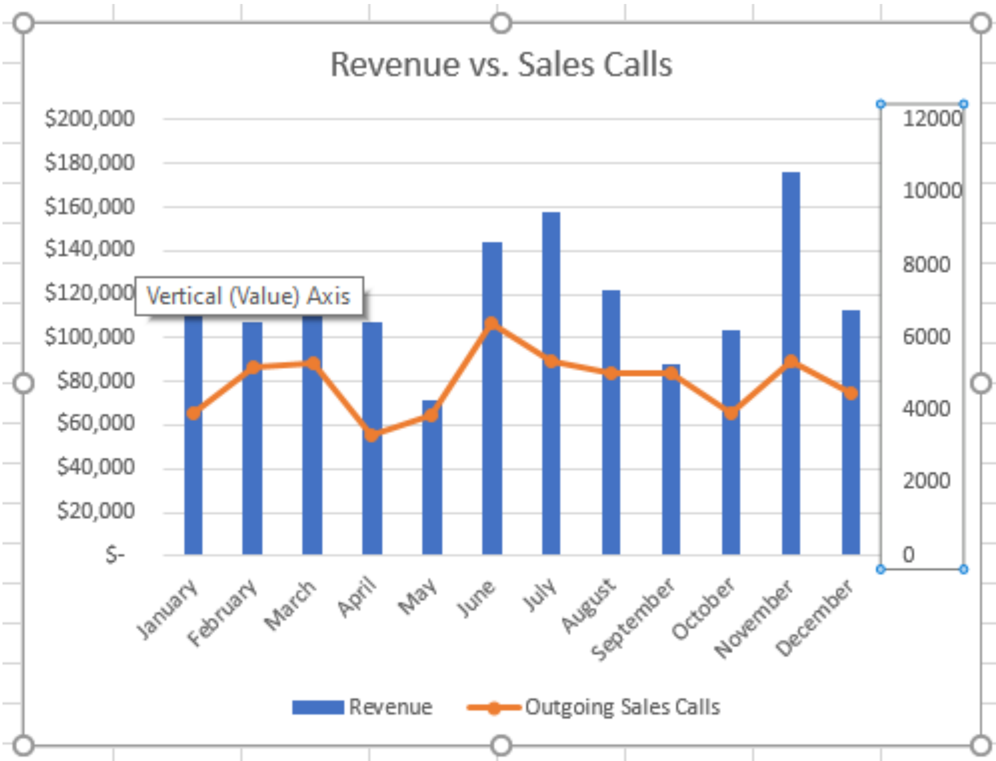
To adjust the positioning of the data points, relative to the other axis, first click to select the secondary axis on your chart, or, with your chart selected, you can click on the Chart Elements drop down menu in the Current Selection group of the Format contextual tab, and select the **Secondary Vertical (Value) Axis**:



This launches the **Format Axis** task pane, where you can click the **Axis Options** icon and adjust the bounds of the axis to determine how the data is displayed. In this example, increasing the maximum bounds widens the axis and move the stacked line lower, compared to the revenue axis. As you can see, there are many options in the Format Axis task pane that you can explore and experiment with, to achieve your desired result:



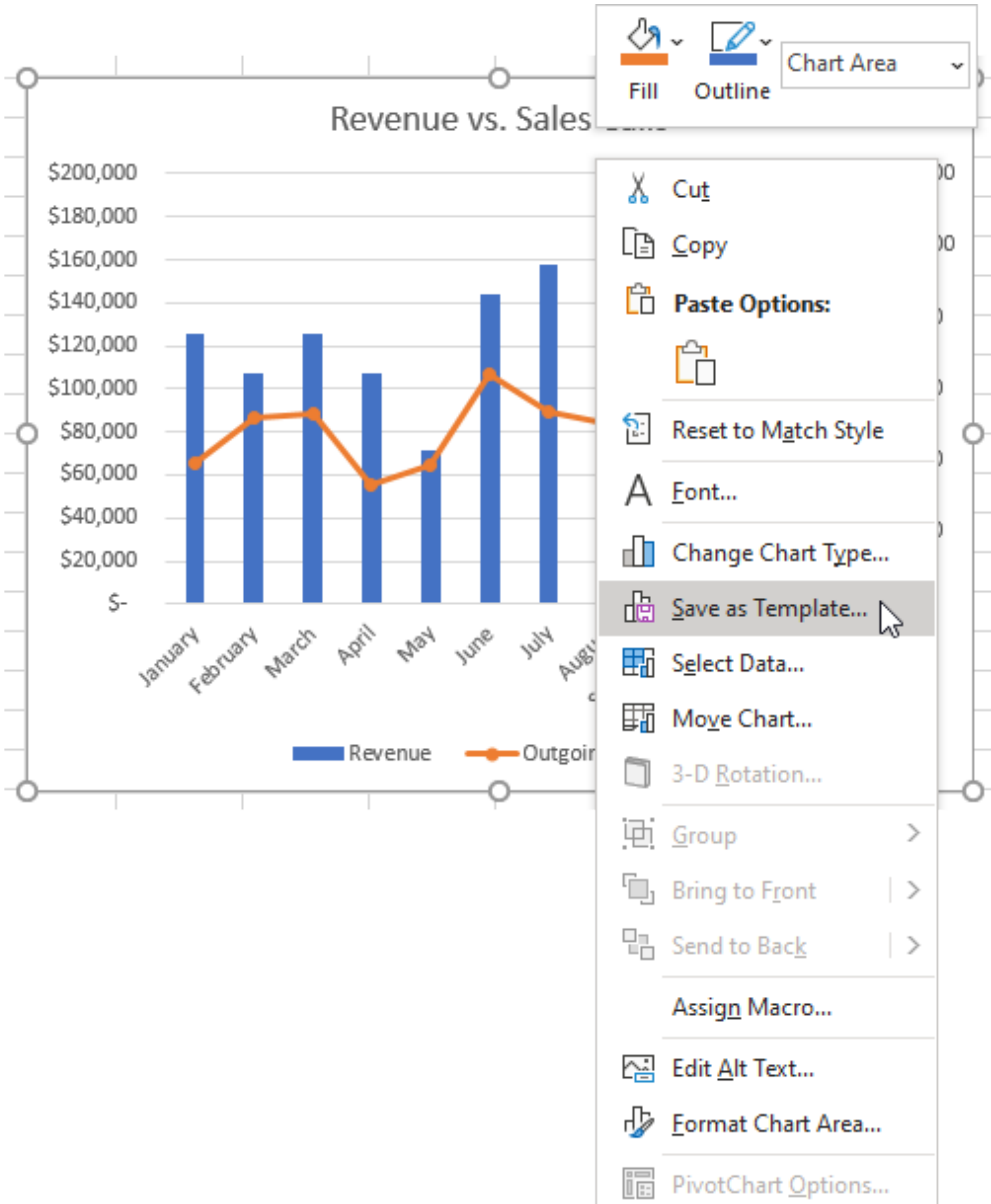
The chart now more clearly shows how the volume of sales calls compares to the revenue:



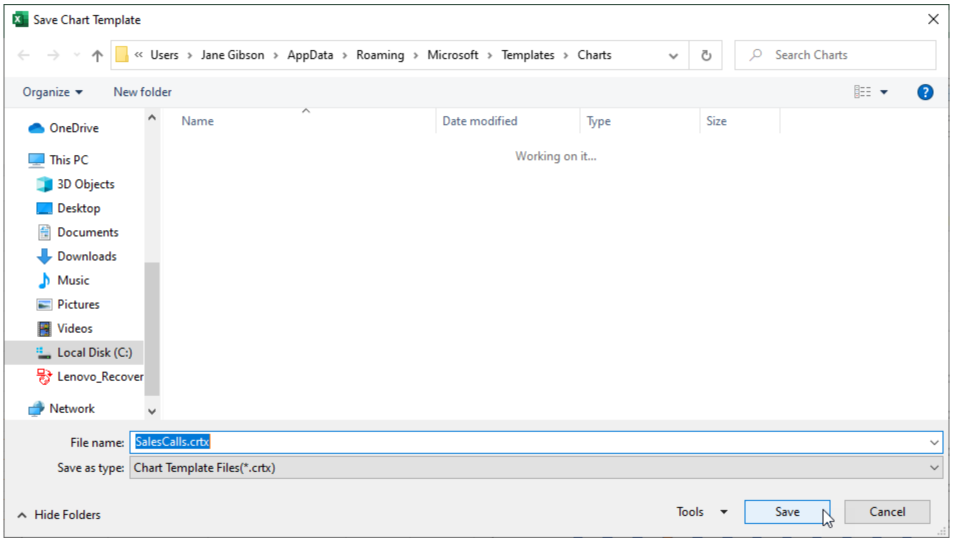
Creating Custom Chart Templates

As you have seen in the previous example, it can take a long time to create a fully customized chart to suit your exact needs. Excel includes the ability to save an existing chart as a **chart template** (.crtx). This allows you to quickly recreate this type of chart again, using a different data set.

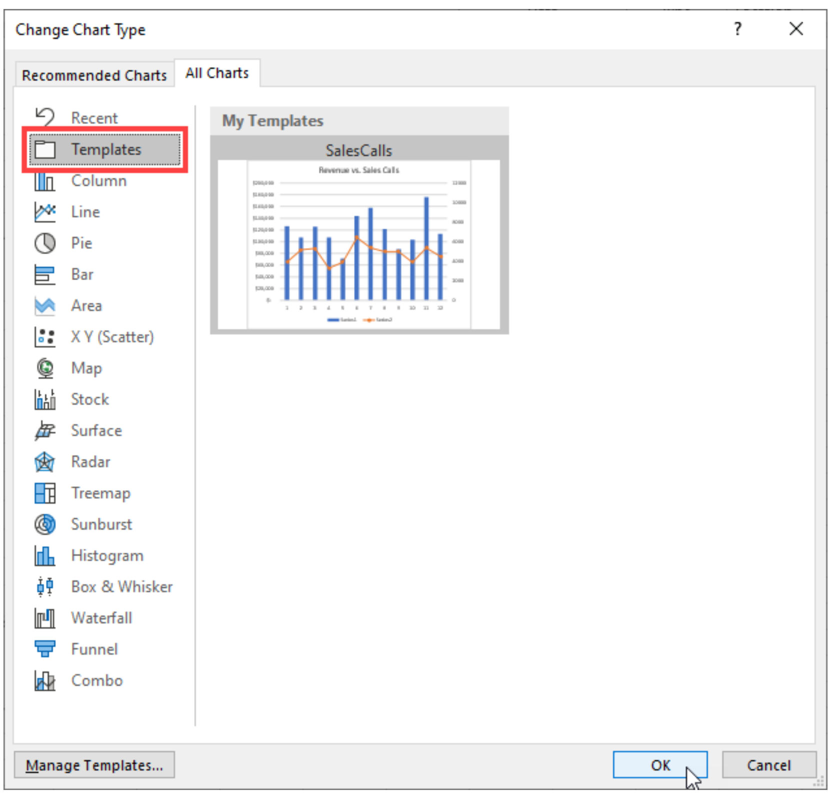
To create a custom chart template, first click to select the chart that you want to work with. Next, right-click this chart and then click **Save as Template**:



This action displays the **Save Chart Template** dialog box, with the Charts folder already open. In the **File name** text box, enter a name for this new template and then click **Save**:



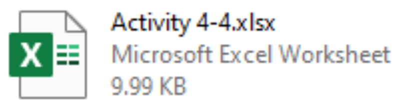
Now, with the new custom chart template saved, you can create new charts using this template by selecting the **Templates** category of the **All Charts** tab in the **Change Chart Type** dialog box, then clicking on the desired template, and clicking **OK**:



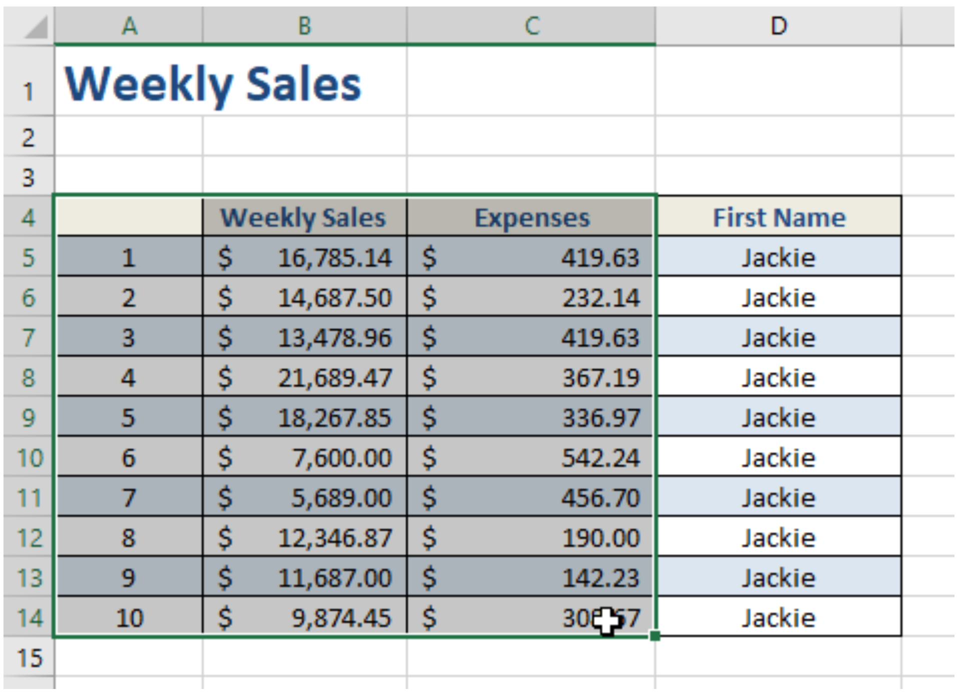
Activity 4-4: Creating Advanced Charts

Using weekly sales data, you would like to create a dual axis chart to compare sales and expenses, and then save the finished chart as a template.

1. To begin, open Activity 4-4 from your Exercise Files folder:



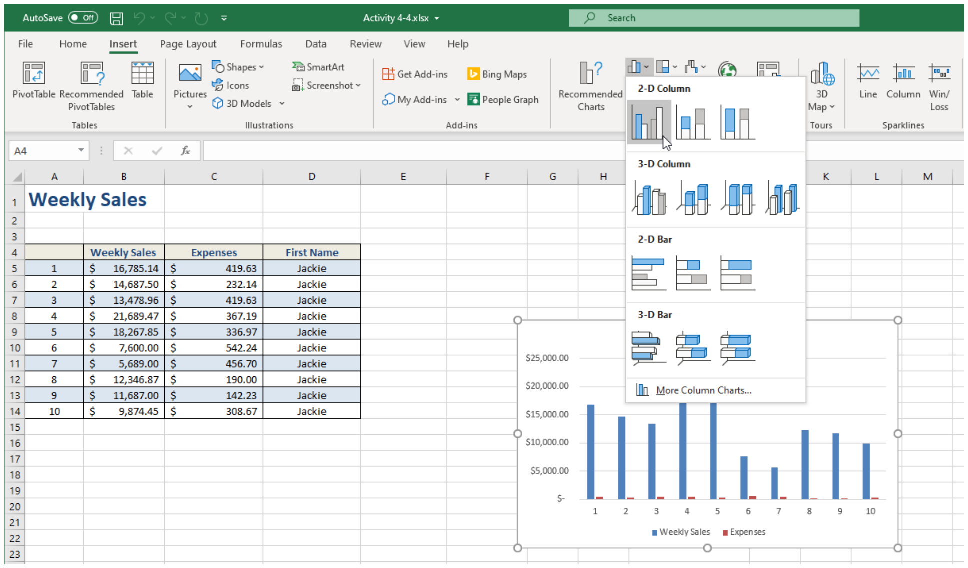
2. Use your cursor to select cells **A4:C14** on the current worksheet:



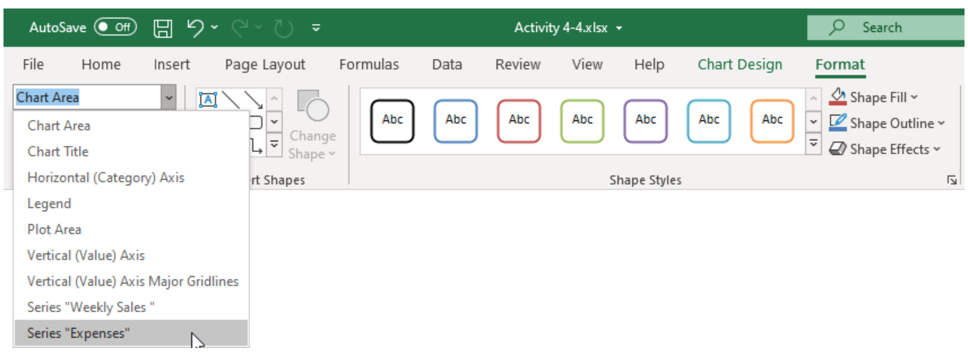
Weekly Sales

	Weekly Sales	Expenses	First Name
1	$ 16,785.14	$ 419.63	Jackie
2	$ 14,687.50	$ 232.14	Jackie
3	$ 13,478.96	$ 419.63	Jackie
4	$ 21,689.47	$ 367.19	Jackie
5	$ 18,267.85	$ 336.97	Jackie
6	$ 7,600.00	$ 542.24	Jackie
7	$ 5,689.00	$ 456.70	Jackie
8	$ 12,346.87	$ 190.00	Jackie
9	$ 11,687.00	$ 142.23	Jackie
10	$ 9,874.45	$ 30[illegible]7	Jackie

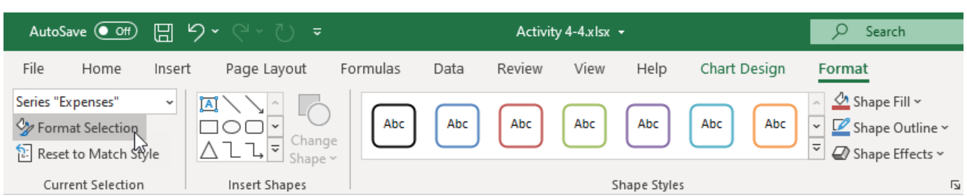
3. Click **Insert → Insert Column or Bar Chart → Clustered Column**:



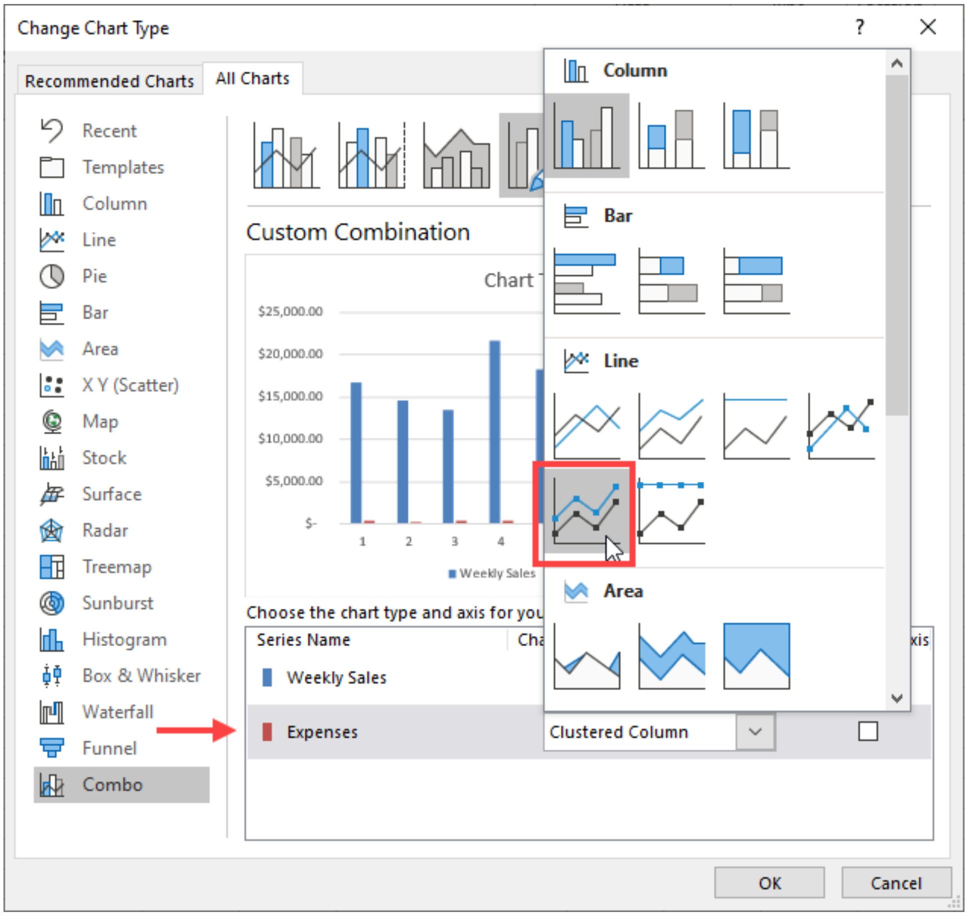
4. With the chart now added, you need to select the second data series. Click **Format → Chart Elements → Series "Expenses"**:



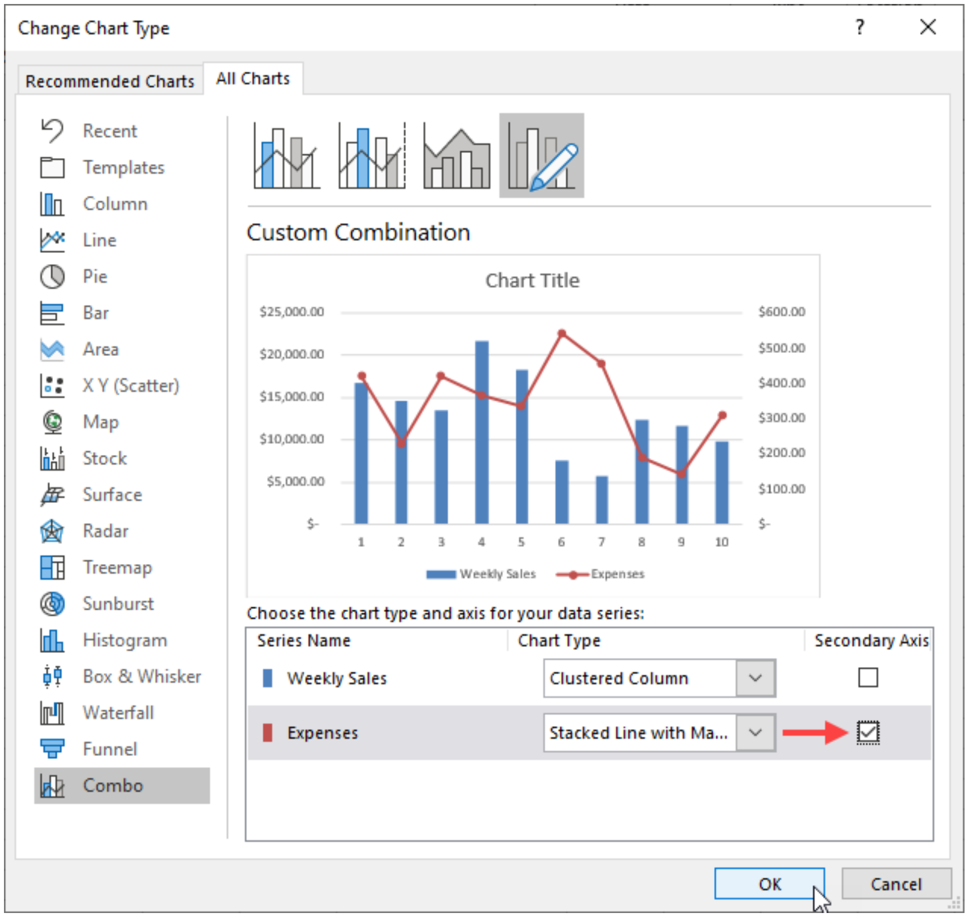
5. Next, click **Chart Design → Change Chart Type**:



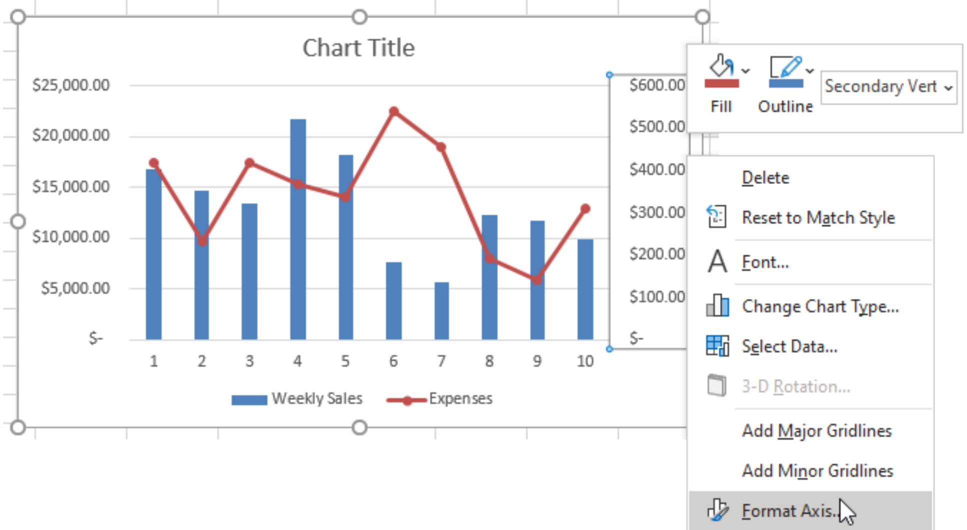
6. In the Change Chart Type dialog box, click the "**Chart Type**" drop-down menu for the "**Expenses**" series and select "**Stacked Line with Markers**" from the **Line** category:



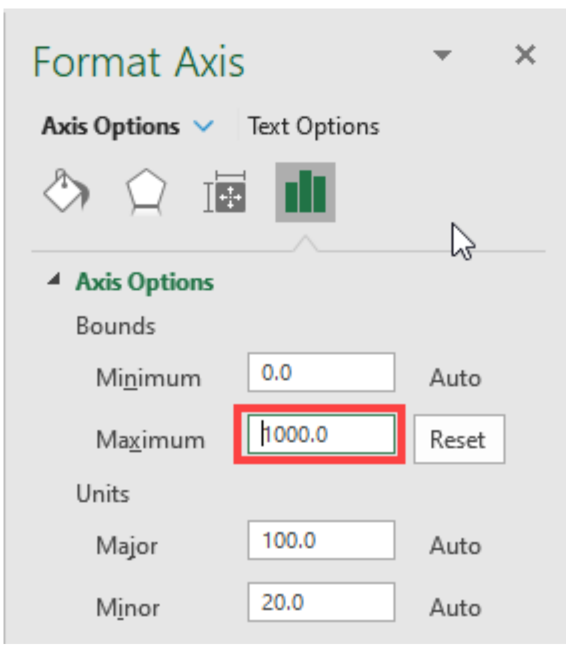
7. Now click to select the "**Secondary Axis**" checkbox for the "**Expenses**" series, then click **OK**:



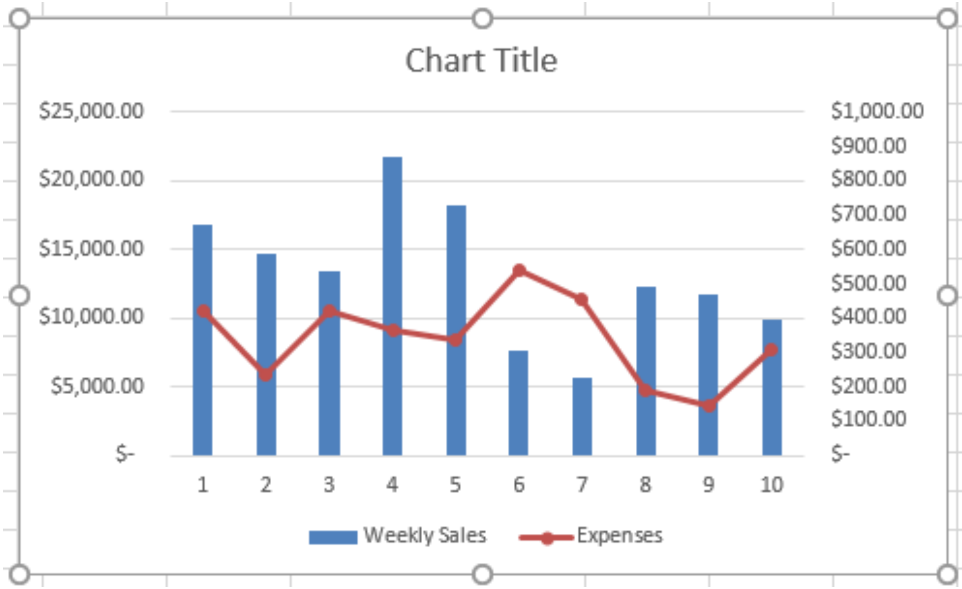
8. **Right-click on the secondary axis** of your chart and then click **Format Axis**:



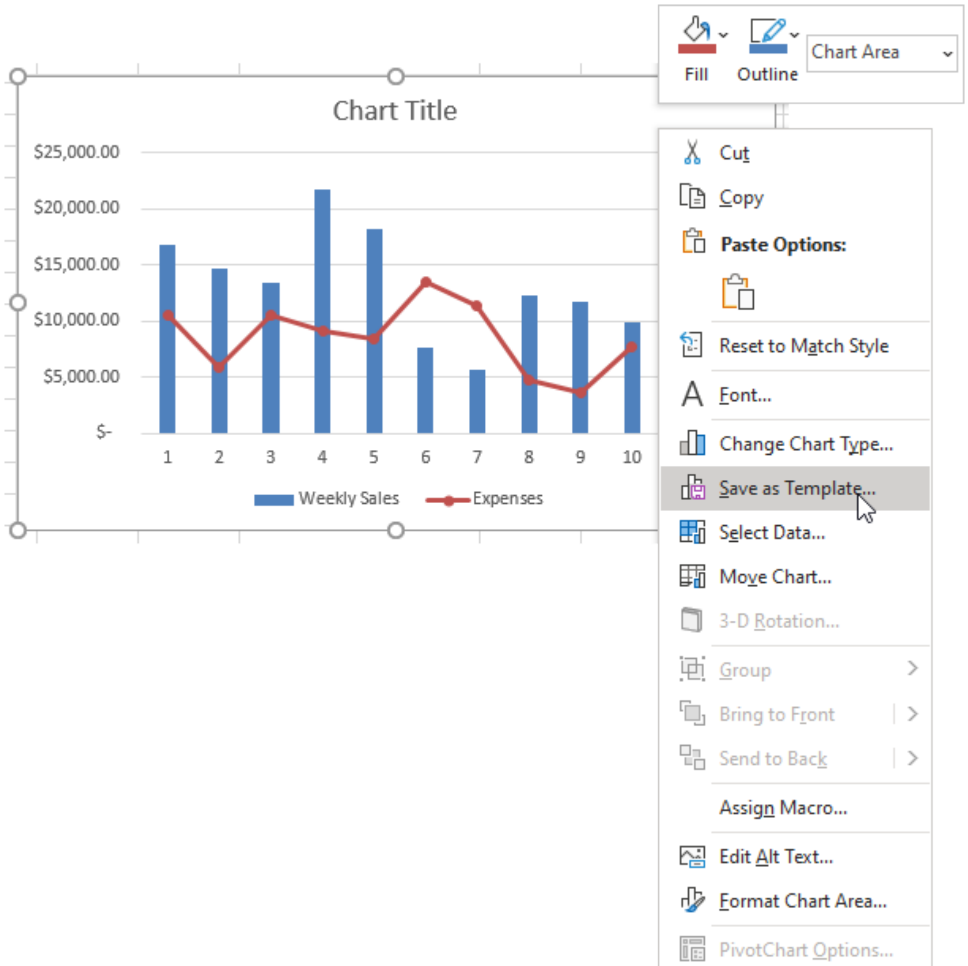
9. In the Format Axis task pane, type “**1000**” in the Maximum window of the of the Axis Options Bounds, then press **Enter**:



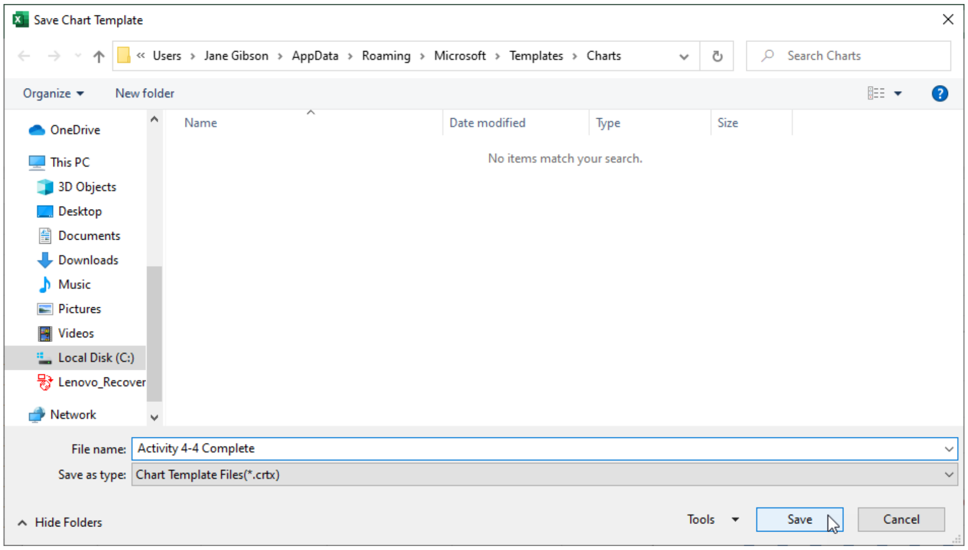
10. The chart is complete, showing the comparison of weekly sales to expenses:



11. Now, to save your chart as a template, right-click the chart, then click **Save as Template**:



12. The Save Chart Template dialog box is now displayed. Type "**Activity 4-4 Complete**" into the File name text box and then click **Save**:



13. Save the current workbook as Activity 4-4 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

This lesson taught you how to insert charts into worksheets as well as the best way to format charts to meet your specific needs and those of your audience. Additionally, you learned about the wide variety of charts that are available to you depending upon the data with which you are working. You should now feel comfortable modifying as well as formatting existing charts. You should also understand how to work with dual axis charts and create custom chart templates.

Review Questions

1. **What are charts?**

2. **What is a line chart typically used for?**

3. **What is the difference between modification and formatting?**

4. **When is the Chart contextual tab displayed?**

5. **What is the command sequence to add a trendline using the ribbon?**

LESSON 5: ANALYZING DATA WITH PIVOTTABLES, SLICERS, AND PIVOTCHARTS

Lesson Objectives

In this lesson you will learn how to:

- Create a PivotTable
- Filter data using slicers
- Analyze data using PivotCharts

TOPIC A: Create a PivotTable

One of the most powerful tools that you have at your disposal when analyzing data in Excel is the PivotTable. While extremely useful and interactive, they can be somewhat cumbersome to use properly and are often misused. For this reason, it is important to understand how they work and gain some fundamental understanding of their purpose before creating PivotTables of your own data.

Topic Objectives

In this session, you will learn:

- About PivotTables
- How to start with questions and end with structure
- About the Create PivotTable dialog box
- About the PivotTable Fields task pane
- How to summarize data in a PivotTable
- About the "Show value as" functionality
- How to format a PivotTable
- About using external data with PivotTables
- About PowerPivot
- About PowerPivot functions

PivotTables

Why are **PivotTables** called PivotTables? Because they let you move data around easily (by dragging and dropping fields) to perform a sort of rotation on the structure of your table and at the same time, change your view of the data. With PivotTables, columns can become rows and rows can become columns, all without altering the original data.

When a PivotTable is created, you are given the option to place it on the worksheet that you currently have open or on a new one. In either case, once the PivotTable is created you can pivot, re-pivot, sort, and summarize your data without affecting it directly. You are able to choose the level of detail that you want to view depending on your needs. Additionally, you have access to all of the summary functions in Excel to complete your data analysis.

Below you can see an example of a very simple PivotTable:

Row Labels	Sum of Quantity	Sum of Value
47	178	1,600.22
147	1,305	169,636.95
235	110	62,698.90
354	50	37,500.00
1358	90	449.10
1459	178	3,024.22
1478	8,191	4,013.59
1547	20	2,691.60
1567	70	10,331.30
1574	135	403.65
2358	292	116,797.08
5167	90	3,825.00
Grand Total	**10,709**	**412,971.61**

In this case, the SKU (first column), Quantity, and Value columns have been pivoted to appear as rows. A summary of each numerical column in this PivotTable is displayed by default.

Start with Questions, End with Structure

Before you even create a PivotTable, you need to think of the **questions** that you are trying to answer by using it. Just like when you are working with functions or formulas, half of the work in data analysis is finding the right questions. This process is especially important for PivotTables because how you construct them depends on the question that you are asking. Once you know the question that you would like the PivotTable to answer, you can start constructing the PivotTable. While there are no hard and fast rules to constructing a PivotTable, there are some ways to make it easier.

Here are a few tips to keep in mind when constructing your PivotTable.

- First, it is usually best to create rows and columns using fields that have a relatively low set number of entries. Using entries that span a huge swath of data (such as five years of transaction numbers) to create rows and columns can only cause confusion rather than answer any specific questions.
- Next, it is almost always a good idea to create a row out of a field that you need an answer from and then create a column out of that criterion to narrow down the answer.

Examine the worksheet below. You will see a range that contains 34 rows of data about product SKUs, their warehouse location, their quantities, and their value:

	A	B	C	D	E
1	Warehouse	SKU	Unit Price	Quantity	Value
2	Warehouse A	1574	$ 2.99	5	$ 14.95
3	Warehouse B	2358	$ 399.99	5	$ 1,999.95
4	Warehouse B	1478	$ 0.49	1587	$ 777.63
5	Warehouse A	2358	$ 399.99	54	$ 21,599.46
6	Warehouse B	147	$ 129.99	214	$ 27,817.86
7	Warehouse A	1358	$ 4.99	45	$ 224.55
8	Warehouse C	1574	$ 2.99	65	$ 194.35
9	Warehouse A	5167	$ 42.50	45	$ 1,912.50
10	Warehouse C	2358	$ 399.99	89	$ 35,599.11
11	Warehouse A	1547	$ 134.58	8	$ 1,076.64
12	Warehouse B	235	$ 569.99	55	$ 31,349.45
13	Warehouse A	1567	$ 147.59	35	$ 5,165.65
14	Warehouse B	1459	$ 16.99	89	$ 1,512.11
15	Warehouse A	1478	$ 0.49	854	$ 418.46
16	Warehouse A	147	$ 129.99	475	$ 61,745.25
17	Warehouse A	47	$ 8.99	89	$ 800.11
18	Warehouse A	354	$ 750.00	25	$ 18,750.00
19	Warehouse B	1547	$ 134.58	2	$ 269.16
20	Warehouse B	1478	$ 0.49	4876	$ 2,389.24
21	Warehouse A	2358	$ 399.99	54	$ 21,599.46
22	Warehouse B	147	$ 129.99	145	$ 18,848.55
23	Warehouse A	1358	$ 4.99	45	$ 224.55
24	Warehouse C	1574	$ 2.99	65	$ 194.35
25	Warehouse A	5167	$ 42.50	45	$ 1,912.50
26	Warehouse C	2358	$ 399.99	90	$ 35,999.10
27	Warehouse A	1547	$ 134.58	8	$ 1,076.64
28	Warehouse B	235	$ 569.99	55	$ 31,349.45
29	Warehouse A	1567	$ 147.59	35	$ 5,165.65
30	Warehouse B	1459	$ 16.99	89	$ 1,512.11
31	Warehouse A	1478	$ 0.49	874	$ 428.26
32	Warehouse A	147	$ 129.99	471	$ 61,225.29
33	Warehouse A	47	$ 8.99	89	$ 800.11
34	Warehouse A	354	$ 750.00	25	$ 18,750.00
35	Warehouse B	1547	$ 134.58	2	$ 269.16
36					

A PivotTable created from this dataset answers the question, "**What is the total value of the products stored in each warehouse?**"

Row Labels	Sum of Value
Warehouse A	222,890.03
Warehouse B	118,094.67
Warehouse C	71,986.91
Grand Total	**412,971.61**

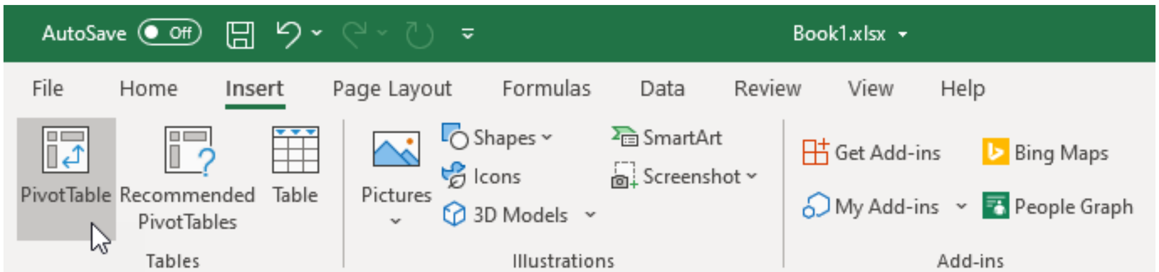
As you can see, the warehouses are listed by row and the value (the criterion) is listed as a column. A SUM function automatically totals the value of each SKU stored by each warehouse.

To answer a question, you can change the function that is used by the PivotTable. For example, suppose you want to see how many different products each warehouse has, not a total count. You could do this by adding the SKU field as a column and applying the COUNT function:

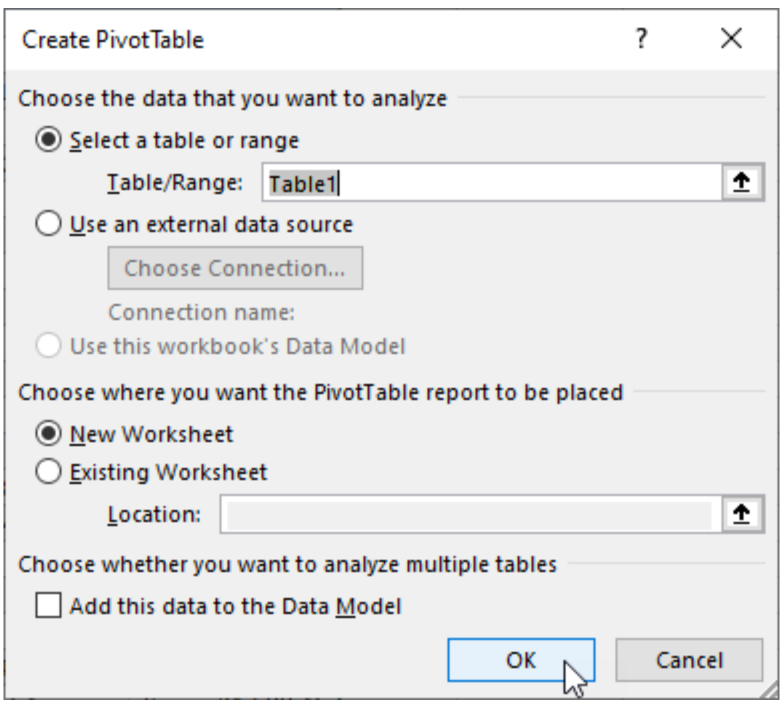
Row Labels	Count of SKU
Warehouse A	19
Warehouse B	11
Warehouse C	4
Grand Total	**34**

The Create PivotTable Dialog Box

The first step to creating a PivotTable is to open the Create PivotTable dialog box by clicking **Insert → PivotTable**:



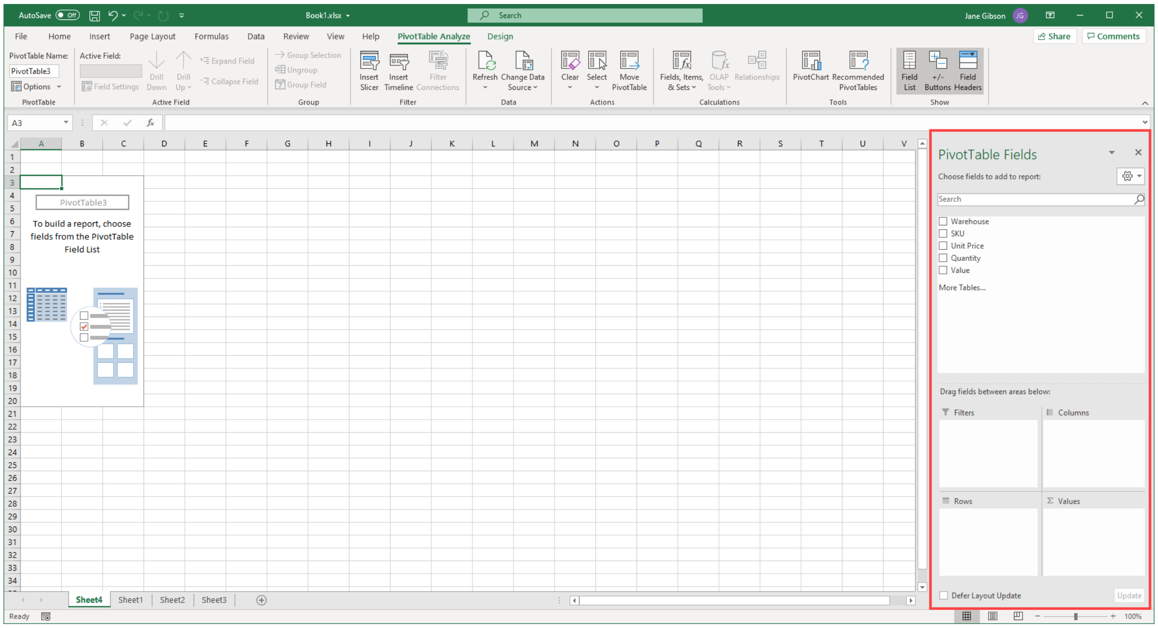
The controls in the Create PivotTable dialog box are used to choose the dataset (or data source) for the new PivotTable that you are creating, and where you want it to be placed. By default, new PivotTables are placed on new worksheets, but you do have the option of adding them to existing worksheets in your workbook:



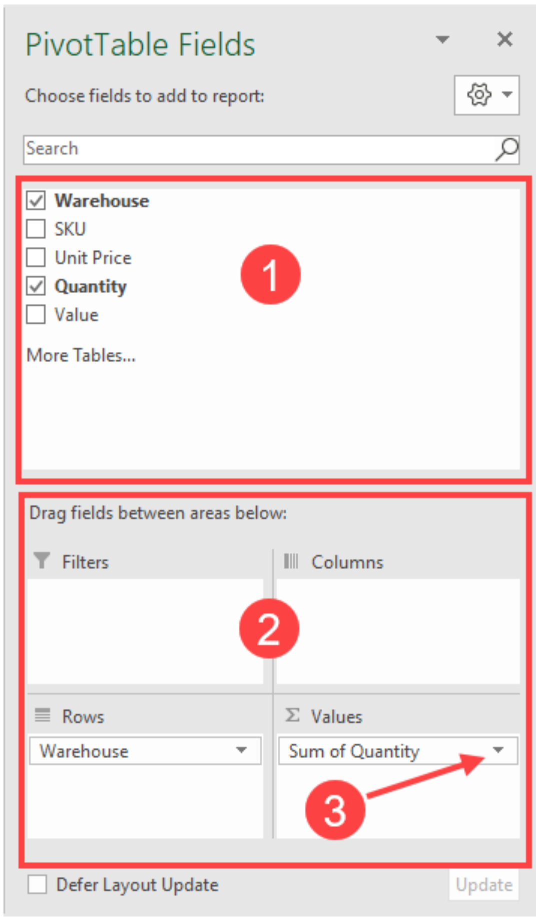
Once you have set your options, click **OK** to create the PivotTable.

The PivotTable Fields Task Pane

When you insert a PivotTable into your workbook, the **PivotTable Fields** task pane is automatically displayed on the right hand-side of the Excel 365 window:



The PivotTable Field task pane is the primary tool that you will use to configure PivotTables. (Note that it is hidden when the PivotTable is not selected.) The **top portion of this pane (1)** lists all of the fields from the dataset that you can add to the PivotTable. To add or remove a field from the PivotTable, toggle the corresponding checkbox. Alternatively, to give you more control over field placement on the PivotTable, you can click and drag these fields to the PivotTable itself. Note that field names are derived from the column header in the dataset:



The bottom half of this pane is comprised of **four areas (2)**: Filters, Columns, Rows, and Values. If you drag fields between these areas, you are able to change the structure of the PivotTable and choose the values that will be used to make calculations.

Here is an overview of these four areas.

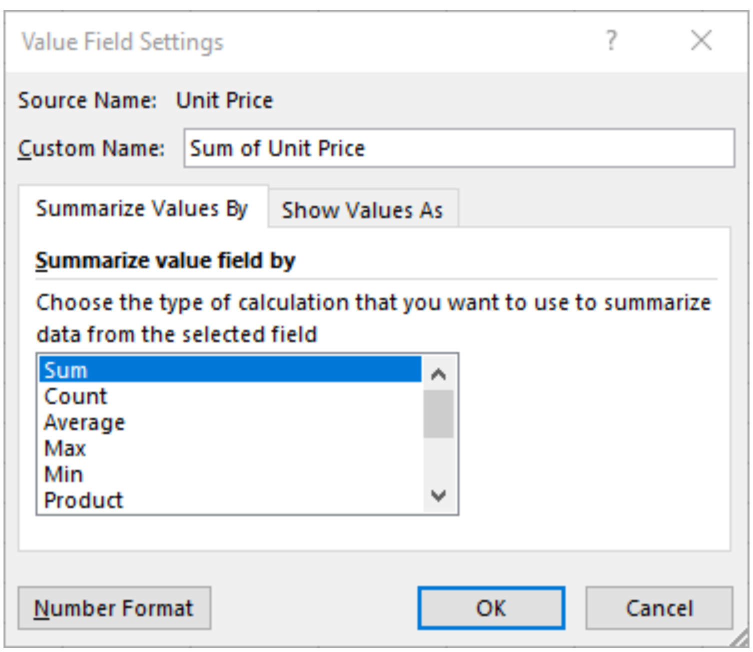
- Adding fields to the **Filters area** will include those field values as filter criteria.
- The **Columns area** will create columns out of unique field entries.
- Similarly, the **Rows area** will create rows out of unique field entries.

- Finally, fields that are dragged to the **Values area** will have calculations performed on them or their values summarized.
- Note that any fields that appear in these four areas will include a **pull-down arrow (3)** that gives you access to a number of different settings, and the Field Settings dialog box, which you can use to further customize your PivotTable.

Remember that any changes that you make in the PivotTable Field task pane are applied dynamically.

Summarize Data in a PivotTable

Combining options from the **Summarize Values By** and the **Show Values As** tabs on the Value Field Settings dialog box will provide further insight into your data. For example, suppose that you want to calculate the total unit price of all the products that each warehouse is storing. You can do this by dragging the Unit Price field to the Values area of the PivotTable Field task pane. Next, you click the drop-down arrow for this field and click the Field Settings option to open the Value Field Settings dialog box. Inside the Value Field Settings dialog box, ensure that the Sum function was selected:



The PivotTable then displays the sum of the unit prices found in each warehouse:

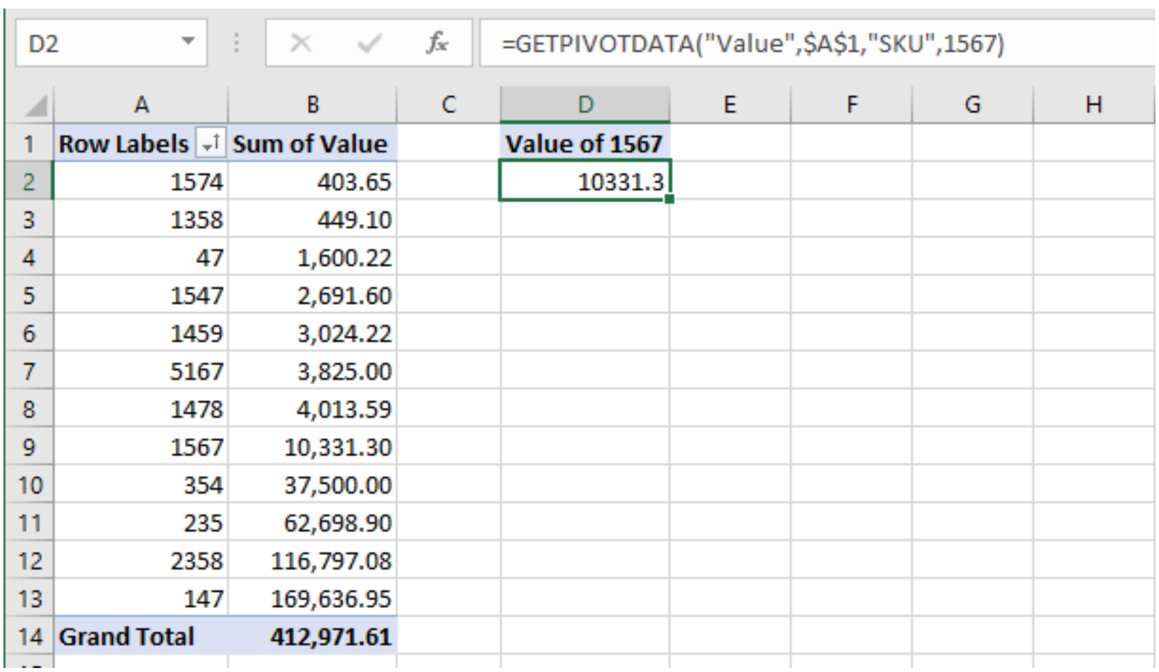
Row Labels	Sum of Unit Price
Warehouse A	3241.23
Warehouse B	2104.07
Warehouse C	805.96
Grand Total	**6151.26**

As you can see, Pivot Tables are an excellent tool to quickly summarize large amounts of data, but because they are dynamic, it may seem difficult to use the PivotTable results in other parts of your workbook. Fortunately, Excel has a function to do just that. You can retrieve results from PivotTables in other parts of your workbook using the **GETPIVOTDATA** function. The syntax is as follows:

```
GETPIVOTDATA(data_field, pivot_table, [field1, item1, field2, item2], ...)
```

While this syntax seems complicated, Excel simplifies the process of building the function by automatically inserting it. When you select a cell outside of the pivot table, even in another worksheet, or workbook, and type the equal sign (**=**), then click on the field in the Pivot Table that contains the value you want to retrieve, Excel automatically inserts the GETPIVOTDATA function, with the correct syntax.

In the following example, selecting cell D2, typing “=”, then clicking on cell B9 (which contains the sum of the value of the SKU 1567), will create the GETPIVOTDATA function automatically:

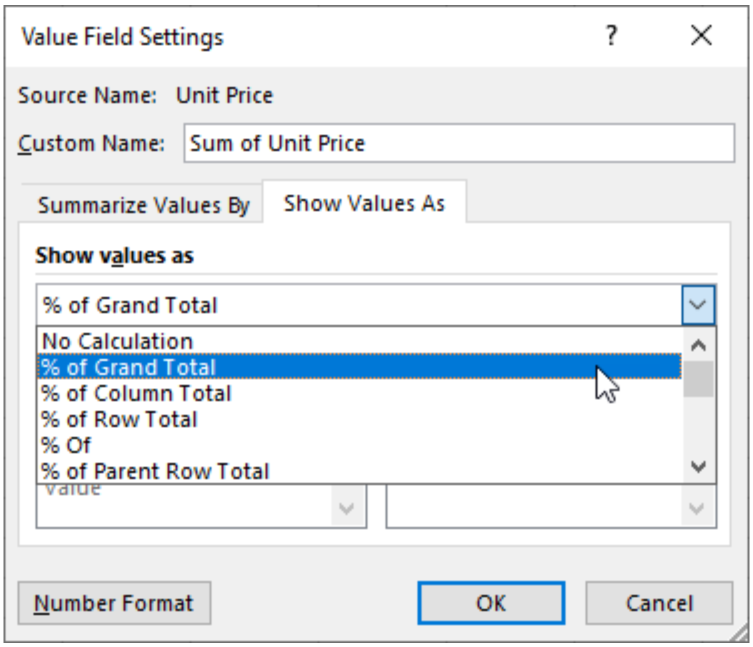


	A	B	C	D	E	F	G	H
1	Row Labels	Sum of Value		Value of 1567				
2	1574	403.65		10331.3				
3	1358	449.10						
4	47	1,600.22						
5	1547	2,691.60						
6	1459	3,024.22						
7	5167	3,825.00						
8	1478	4,013.59						
9	1567	10,331.30						
10	354	37,500.00						
11	235	62,698.90						
12	2358	116,797.08						
13	147	169,636.95						
14	Grand Total	412,971.61						

The value of this function is that it will return the correct value, as long as it remains visible in the Pivot Table.

The “Show Values As” Functionality of a PivotTable

Now that we have seen how to use the Summarize Values By tab or the Value Field Settings dialog box, let’s use the same example and suppose that you want to see the percentage of the total inventory value that each warehouse holds. While you could do this calculation manually, it would be easier to change how the values are shown. Within the **Show Values As** tab of the Value Field Settings dialog box, you would click the **% of Grand Total** option from the **Show values as** drop-down menu:

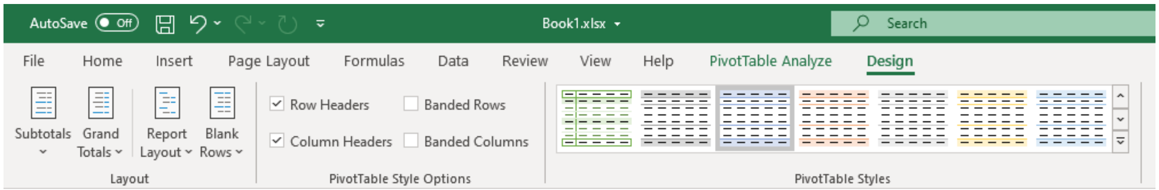


You will now see what percentage of the grand total each warehouse holds. In this case you can see that Warehouse A contains products with a larger value, while Warehouse C has the lowest value:

Row Labels	Sum of Unit Price
Warehouse A	52.69%
Warehouse B	34.21%
Warehouse C	13.10%
Grand Total	**100.00%**

Format a PivotTable

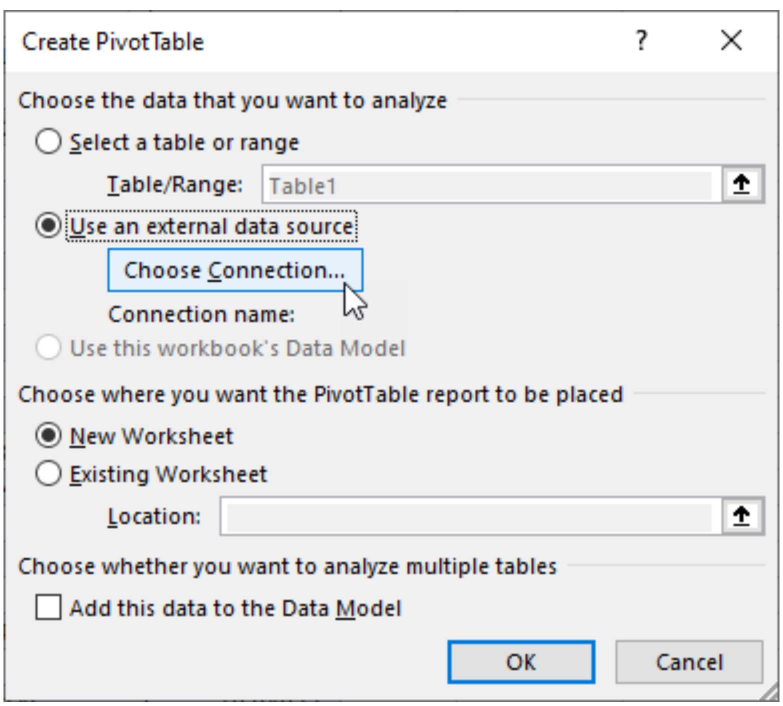
When you are working with PivotTables, you will see two contextual tabs. One of these is the **Design** tab:



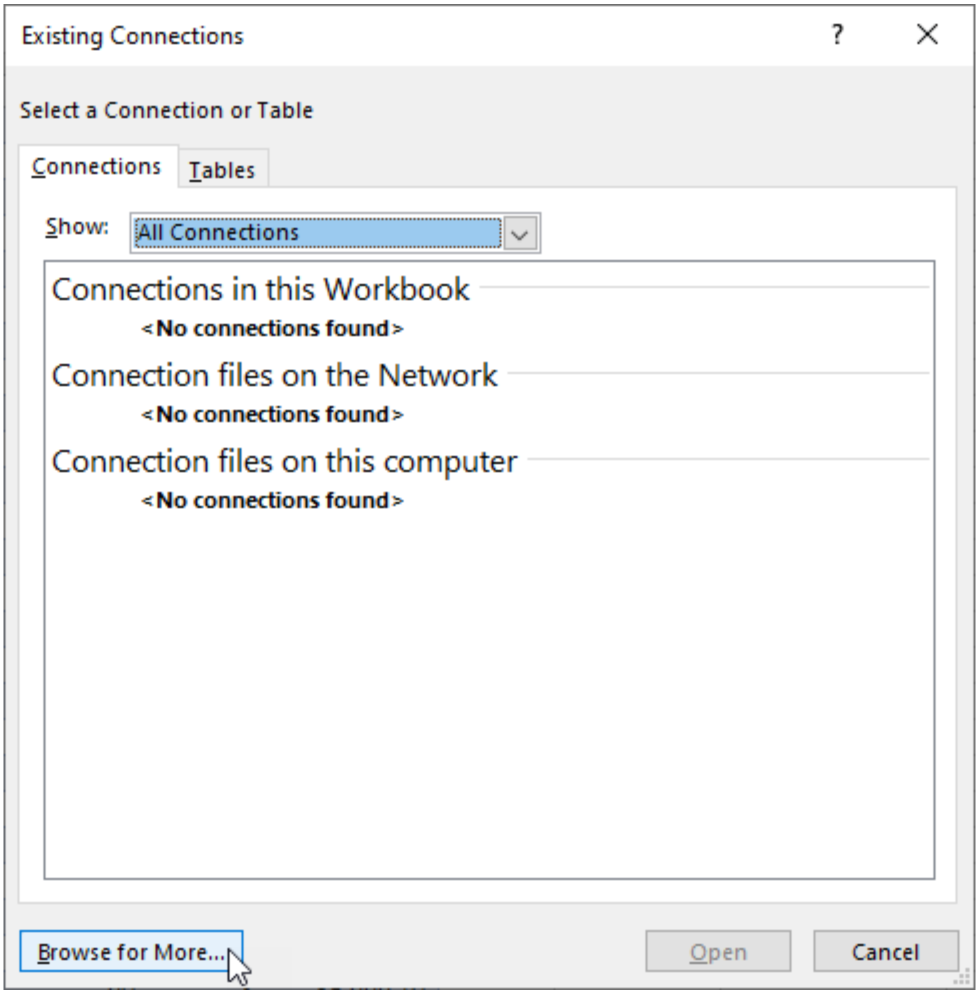
This tab allows you to add layout elements to your PivotTable, customize style options, and apply a style (in the same way that you would with a regular table). You can modify these options at any time.

External Data

If the data that you would like to analyze exists outside of Excel, such as in a Microsoft Access database, you can still use PivotTables to summarize it. To do this, you need to create a connection to that external data by opening the Create PivotTable dialog box and then clicking the **Use an external data source** radio button. Next, click the **Choose Connection** button:



The **Existing Connections** dialog box then allows you to choose from existing connections that exist, as well as browse for more connections:



PowerPivot

PowerPivot is an add-in that is available for Excel 365. It is additional software that is included with some editions of Excel 365, but by default, it is not enabled. In cases where it is not included, it can be added later if required. Once installed, this additional software extends the functionality of Excel to allow for greater data analysis.

What makes PowerPivot special is that is uses compression and processing algorithms that allow you to work efficiently with large amounts of data. This facilitates analysis with data that would otherwise be too cumbersome to work with. Additionally, PowerPivot also facilitates the integration of data from multiple sources and has been designed with extra features and flexibility for environments that rely on Microsoft SharePoint and/or Microsoft SQL servers.

PowerPivot Functions

DAX (Data Analysis Expression) is a type of formula language that is used to create custom calculations inside calculated columns in a PowerPivot table. It is also used to create measures inside a PivotTable. This means that PowerPivot provides you with additional functions using DAX that can be used to work with relational data in a much more powerful manner.

Arguments in a DAX function commonly use tables and columns. For example, below you can see a DAX function that uses the Totals and Date columns from the Employee Sales table as arguments:

```
=TOTALQTD(SUM(‘Employee Sales’[Totals]), ‘Employee Sales’[Date])
```

While there are lots of DAX functions that you can choose from, each is classified under one of the following categories:

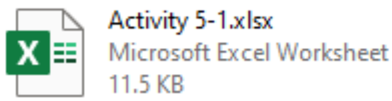
- **Data and Time functions**: Functions of this type are used to manipulate date and time values. As such, they are similar to the data and time functions that can be used in Excel.
- **Filter functions**: These functions are used to manipulate data and filter it dynamically.

- **Information functions**: This type of function is used to scan the values inside a cell range and match them against an expected data type.
- **Logical functions**: Typically, these functions are used to validate expressions and values, and then work with other data that is based upon the evaluation.
- **Math and Trigonometric functions**: Functions of this type are used to perform mathematical calculations.
- **Statistical functions**: These functions are used to generate statistical data such as minimum and maximum values, as well as averages.
- **Time Intelligence functions**: This type of function is used to manipulate data using time periods. It can be used to compare data of one time period against another.

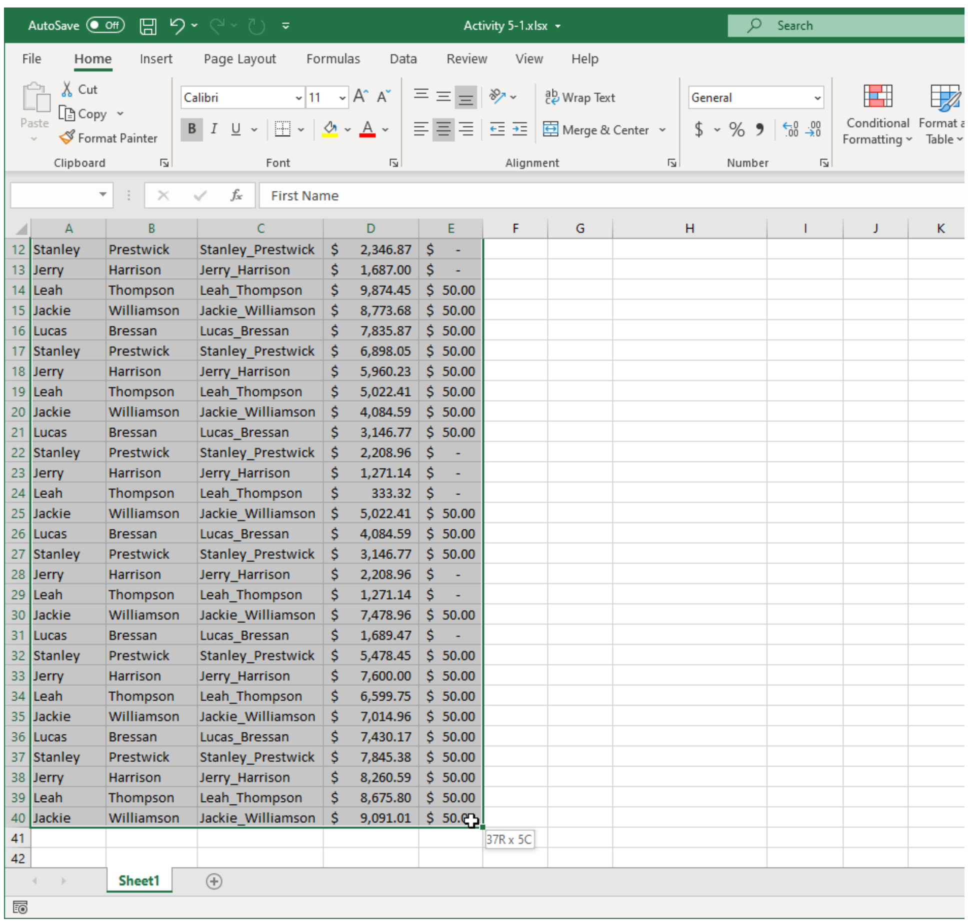
Activity 5-1: Creating PivotTables

You have been given the raw transactional data for the daily sales numbers of your sales staff. To determine the total sales numbers for each sales associate, you would like to create a PivotTable using this data.

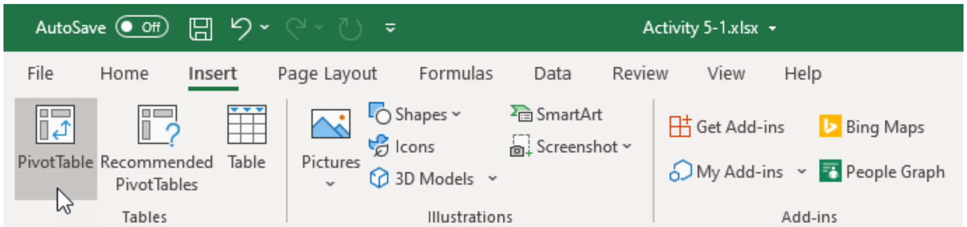
1. To begin, open Activity 5-1 from your Exercise Files folder:



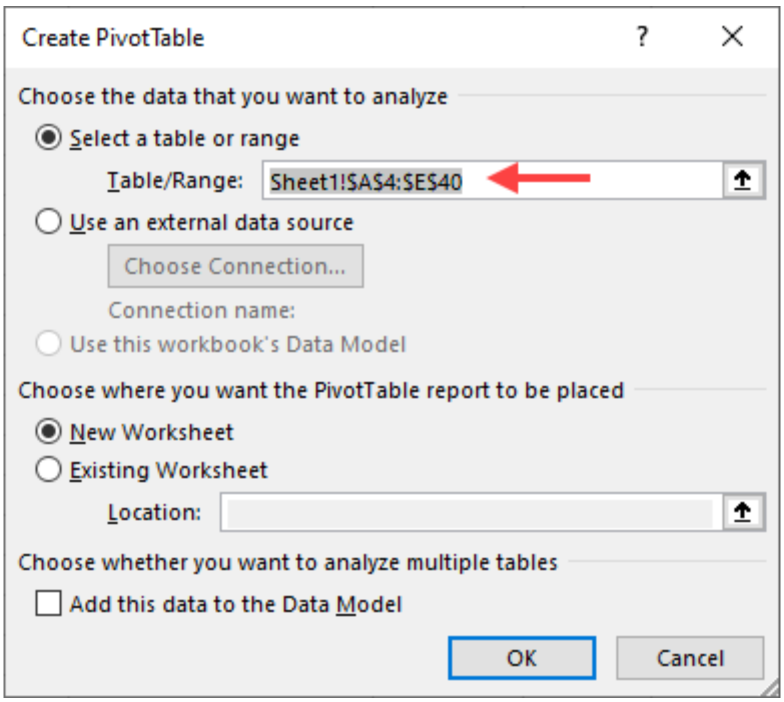
2. Use your cursor to select cells **A4:E40**:



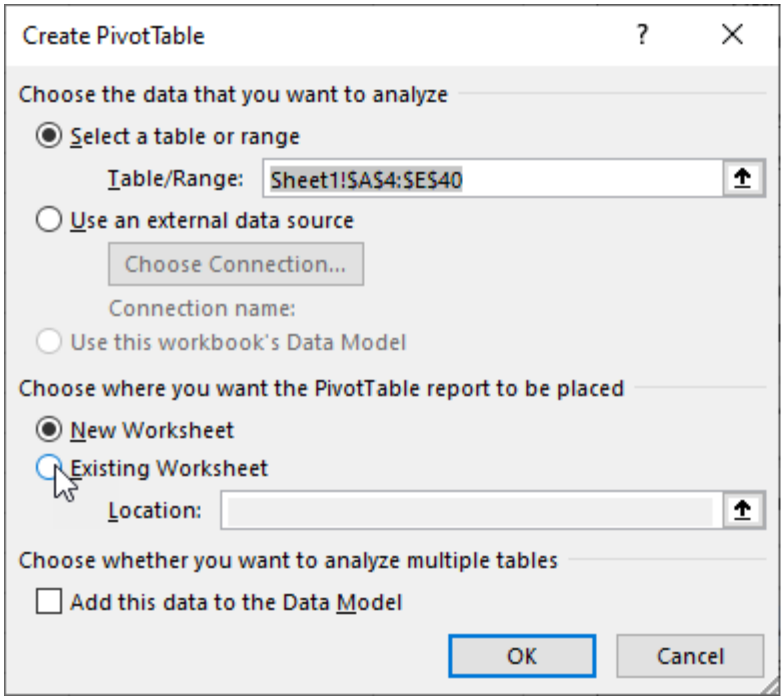
3. Next, click **Insert → PivotTable**:



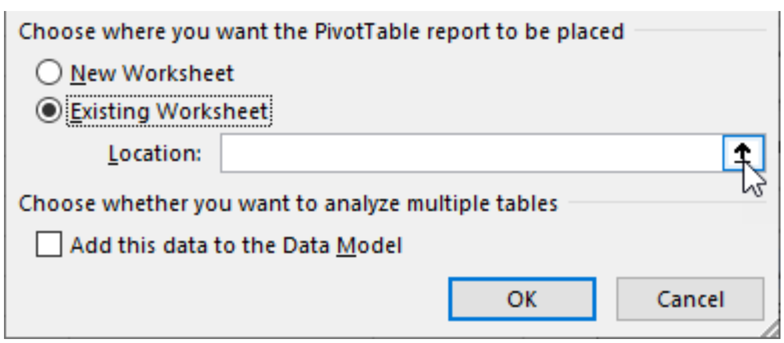
4. The Create PivotTable dialog box is now displayed. The data range that you previously selected is shown within the Table/Range text box:



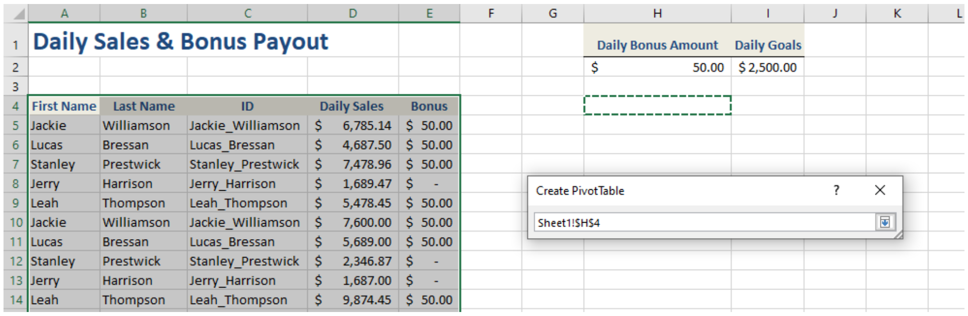
5. You want this new PivotTable to be inserted into the current worksheet, so click the **Existing Worksheet** radio button:



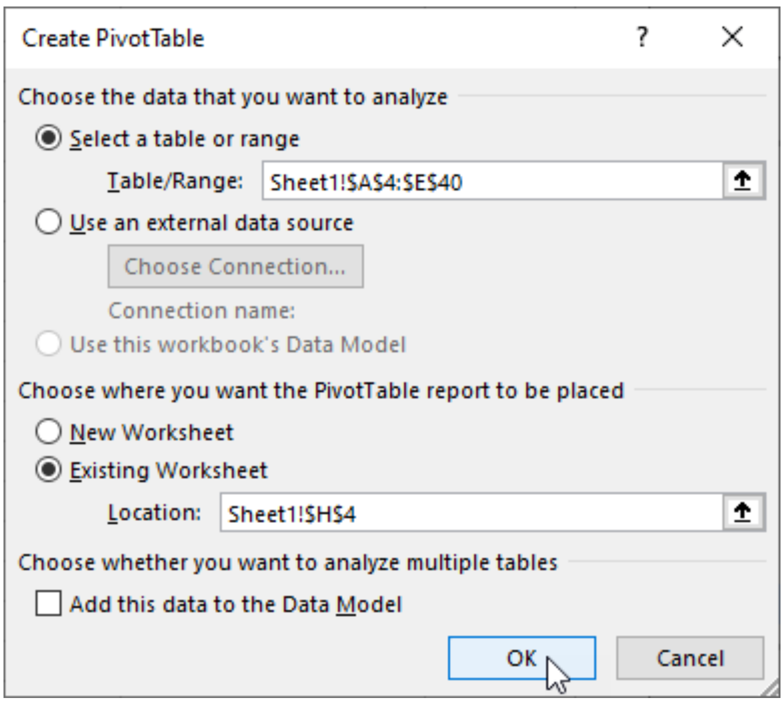
6. Inside the **Location** text box, click the **range picker** button:



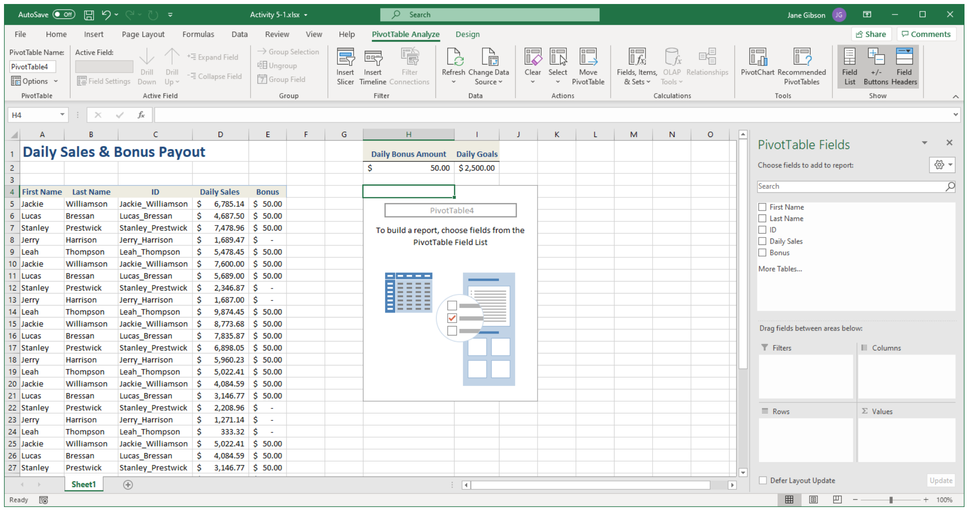
7. Use your cursor to select cell **H4**:



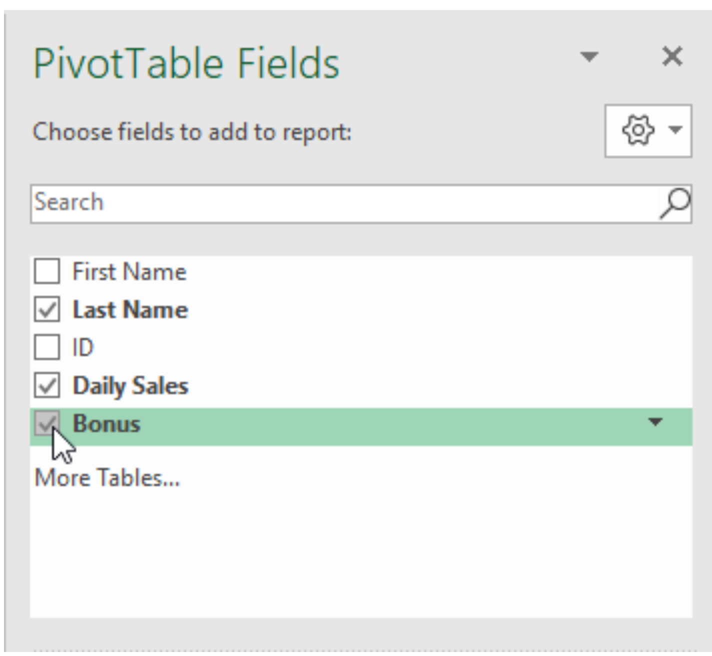
8. Press **Enter** to apply the new location. Back at the Create PivotTable dialog box, click **OK** to apply the new settings:



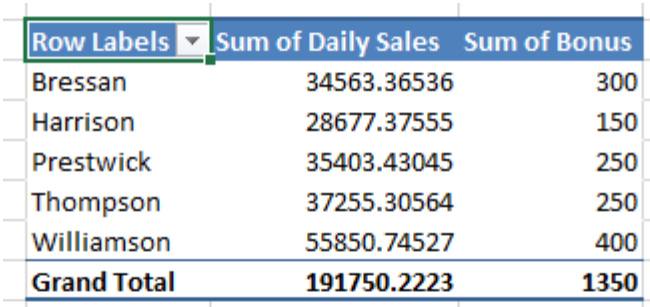
9. The PivotTable is now added to the current worksheet in the location that you previously set:



10. In the Pivot Table Fields task pane, click the **Last Name**, **Daily Sales** and **Bonus** field checkboxes:

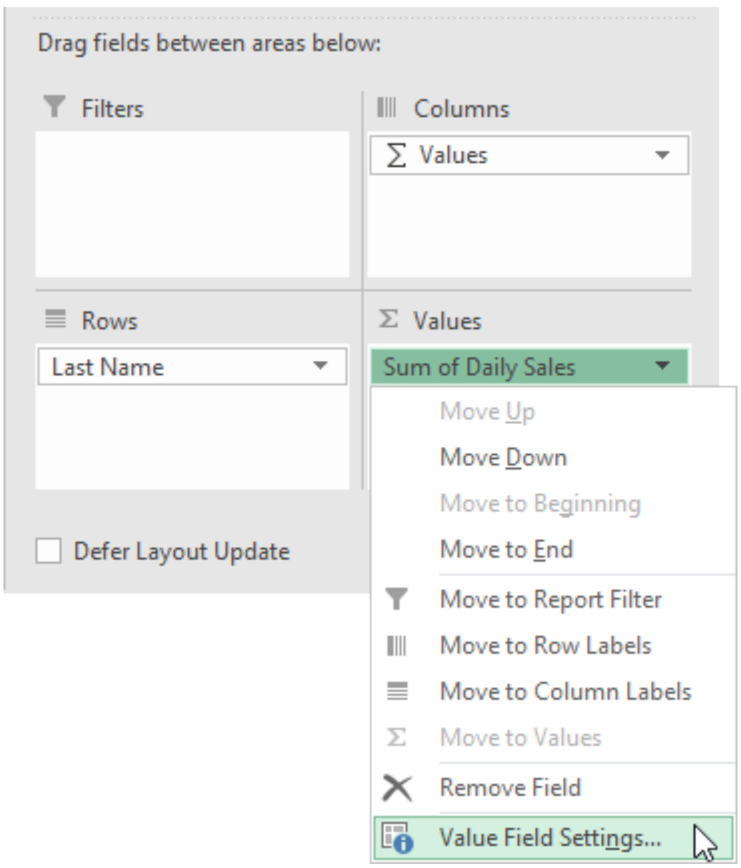


11. You will see that the daily sales and bonuses have been summarized by Sales Representative:

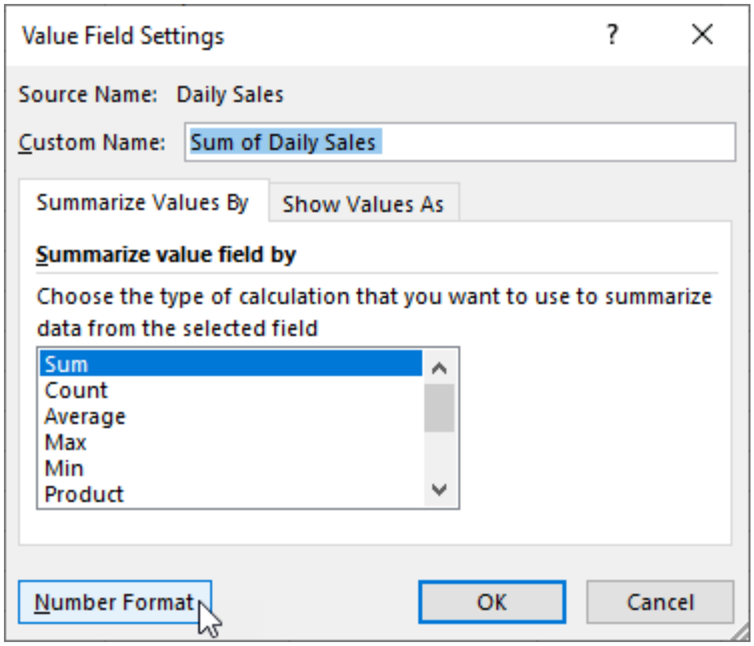


Row Labels	Sum of Daily Sales	Sum of Bonus
Bressan	34563.36536	300
Harrison	28677.37555	150
Prestwick	35403.43045	250
Thompson	37255.30564	250
Williamson	55850.74527	400
Grand Total	**191750.2223**	**1350**

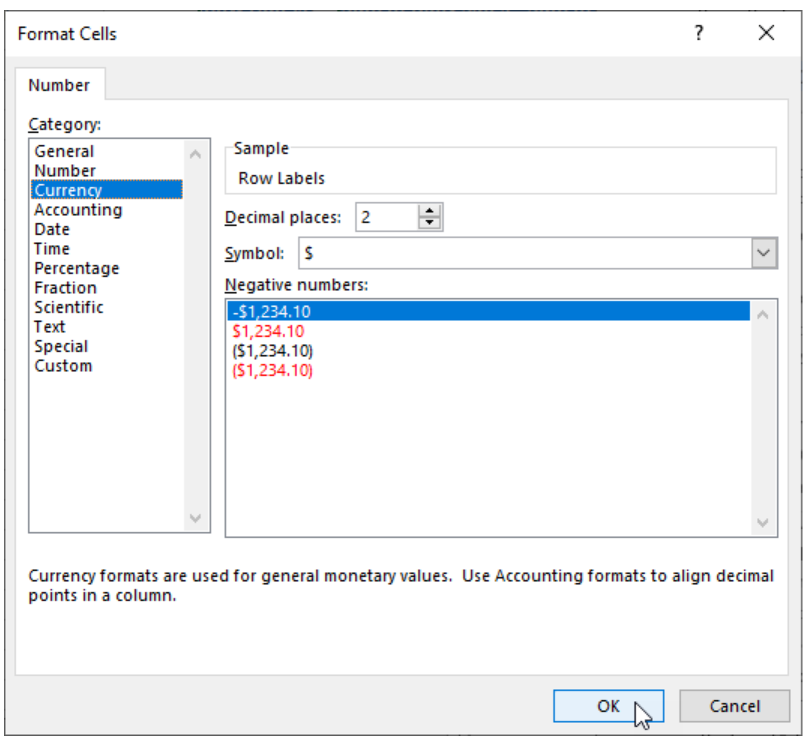
12. To improve the number formatting, click the **Sum of Daily Sales** drop-down arrow in the Values area and select **Value Field Settings**:



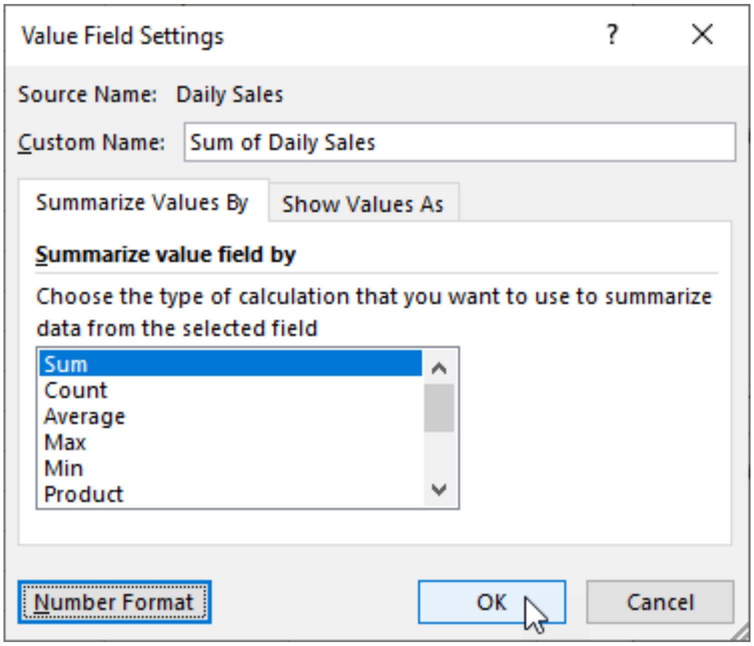
13. Now click **Number Format:**



14. In the Format Cells dialog box, click **Currency**, then click **OK**:



15. Click **OK** in the Value Field Settings dialog box:



16. Repeat the steps for the **Bonus** column. Once complete, the daily sales and bonus values should be formatted correctly:

Row Labels	Sum of Daily Sales	Sum of Bonus
Bressan	$34,563.37	$300.00
Harrison	$28,677.38	$150.00
Prestwick	$35,403.43	$250.00
Thompson	$37,255.31	$250.00
Williamson	$55,850.75	$400.00
Grand Total	**$191,750.22**	**$1,350.00**

17. Save the current workbook as Activity 5-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Filter Data Using Slicers

While regular filters can be effective in obtaining more detail from your data, they can quickly become a chore to manage. Between having to clear existing filters before applying new ones and trying to determine which data is actively being filtered out, filters definitely have some downsides. To give you more control over filtering capabilities, Excel provides slicers. These are easy-to-use filters that can be applied multiple times without negative effects on the data's readability. Throughout this topic you will learn about slicers and how to use them to filter data in a PivotTable.

Topic Objectives

In this session, you will learn:

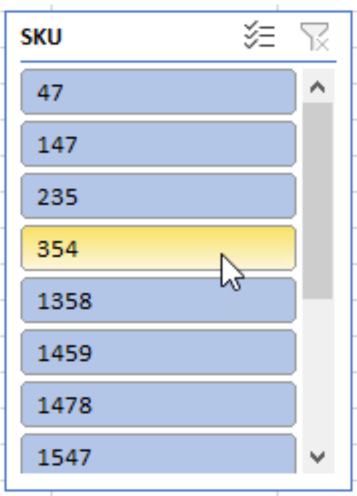
- About slicers
- About the Insert Slicer dialog box

Slicers

Slicers can be a great help when working with PivotTable data. While the main purpose of PivotTables is to help you analyze information and find patterns or trends that might be difficult to spot in a large volume of raw data, the Slicer tool takes this idea to the next level.

Slicers can be created out of any field that exists within the dataset for the PivotTable. These slicers can then be used to filter each field by its unique entries. For example, if you wanted to filter out data from one of the three warehouses in a worksheet that tracks inventory, a slicer would be able to do that for you easily. Slicers can also be linked to more than one PivotTable. Typically, this occurs when using raw transactional data as a dataset and multiple PivotTables exist for that data.

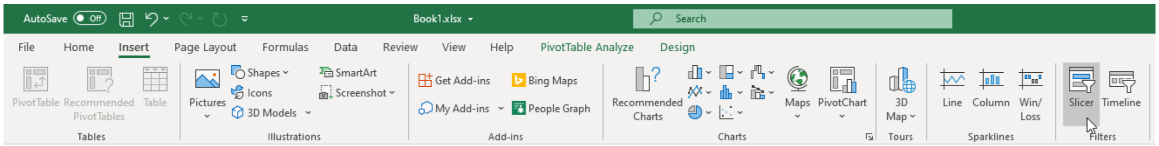
Slicers are displayed graphically as a small pane that contains a series of buttons that represent each unique value from the field that the slicer is associated with. To toggle between filtering and not filtering unique values from the field, you can simply click these buttons:



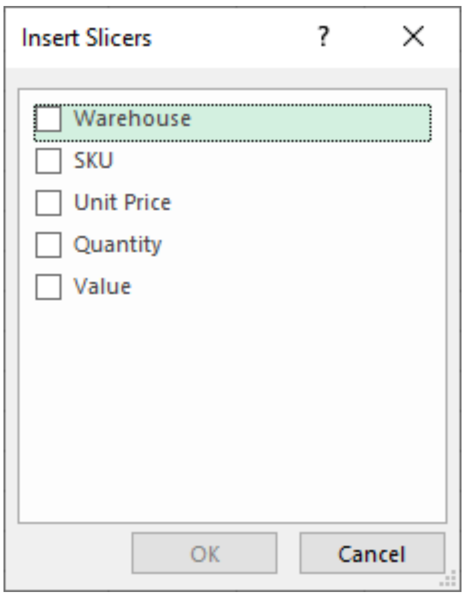
Filters in a slicer that are not applied appear blue, while those that are white are active. Should a filter button appear grayed out, this indicates that an already active filter has removed the values represented by this filter from view. Multiple filters that exist in the same slicer can be applied at once by holding down the Ctrl key and clicking on each filter that you would like to apply. Additionally, the Clear Filter button in the top right-hand corner of a slicer will deactivate all of its filters.

The Insert Slicers Dialog Box

To create a slicer, first click anywhere in the PivotTable to display the PivotTable Tools tabs. Next, click **Insert → Slicer**:

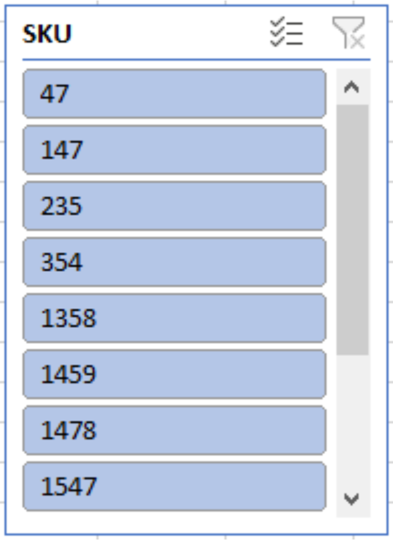


This action displays the **Insert Slicers** dialog box:



This dialog box lists each field in the PivotTable with a checkbox. To create a slicer from a field, check its associated checkbox. Once you have finished choosing the fields that you would like to appear as filters, click OK to apply your settings.

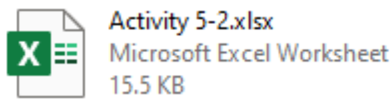
Returning to the worksheet, you will now see the slicer(s) placed there:



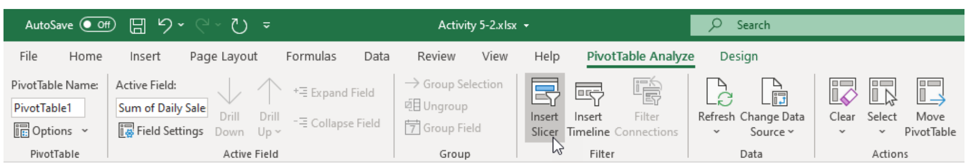
Activity 5-2: Filtering Data Using Slicers

You have constructed a PivotTable that displays the total sales made by each sales associate, as well as the total amount of bonuses they each received. Jerry Harrison and Leah Thompson are going to form their own sales department that sells a specialty product. In an effort to estimate bonus payouts and sales goals you would like to use slicers to display only their data in the PivotTable.

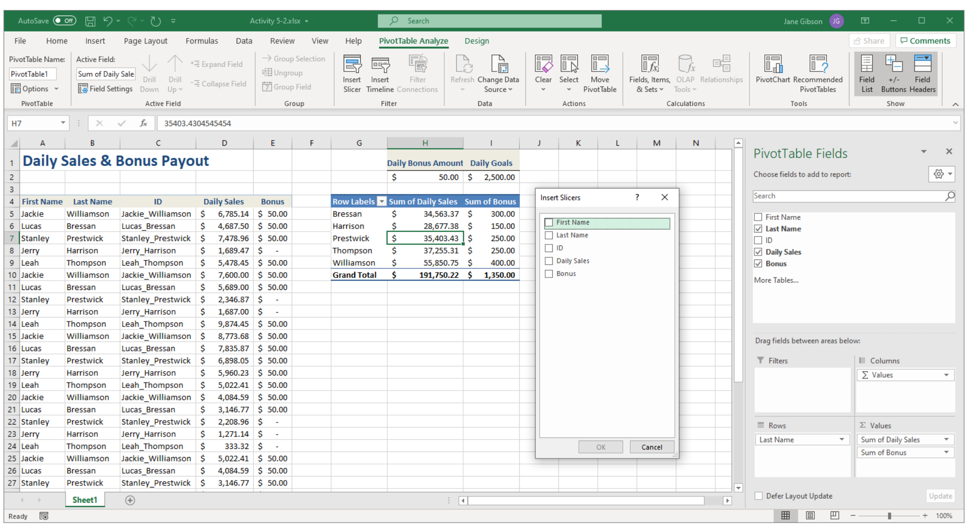
1. To begin, open Activity 5-2 from your Exercise Files folder:



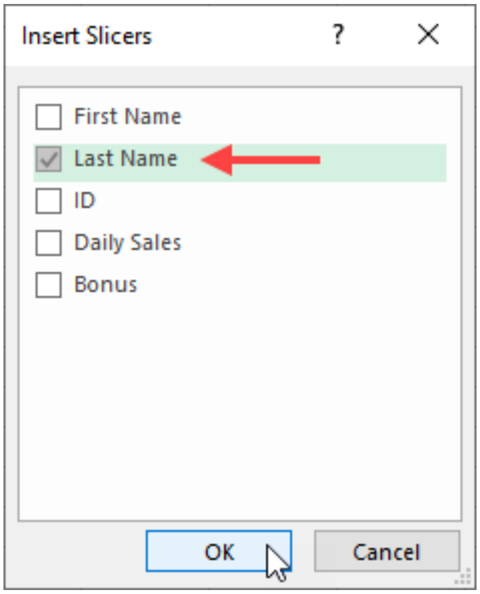
2. Click inside the PivotTable to display the PivotTable Tools contextual tabs. Next, click **PivotTable Analyze → Insert Slicer**:



3. The Insert Slicer dialog box is now displayed:

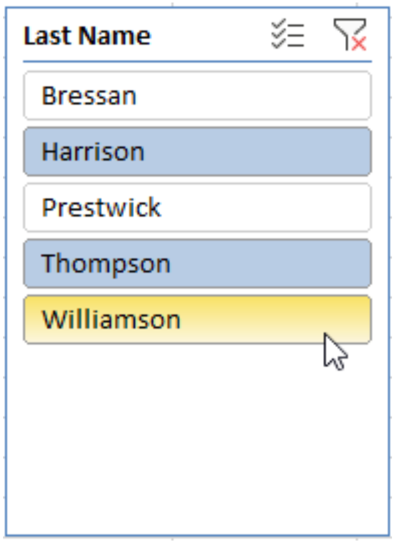


4. Check the **Last Name** checkbox and then click **OK**:

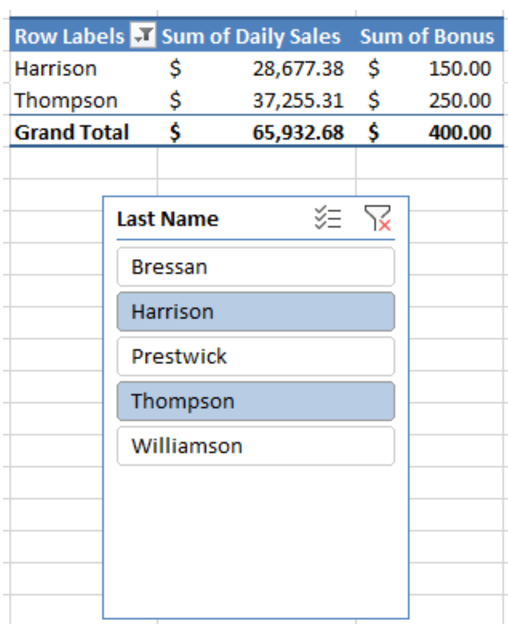


5. A slicer for the Last Name field now appears on your worksheet:

6. For this exercise you want to filter out everyone except for Jerry Harrison and Leah Thompson. While **holding down the Ctrl key**, click the **Bressan**, **Prestwick**, and **Williamson** buttons:



7. The entries that you clicked on in the slicer are now filtered out of the PivotTable:



Row Labels	Sum of Daily Sales	Sum of Bonus
Harrison	$ 28,677.38	$ 150.00
Thompson	$ 37,255.31	$ 250.00
Grand Total	**$ 65,932.68**	**$ 400.00**

8. Save the current workbook as Activity 5-2 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC C: Analyze Data with PivotCharts

PivotTables are fantastic at helping you analyze your data, but they are not so great at being able to quickly convey it. To solve this problem, PivotTable data can quickly be converted into charts in the same way as regular datasets. In this topic you will learn how to use PivotCharts to present PivotTable data visually.

Topic Objectives

In this session, you will learn:

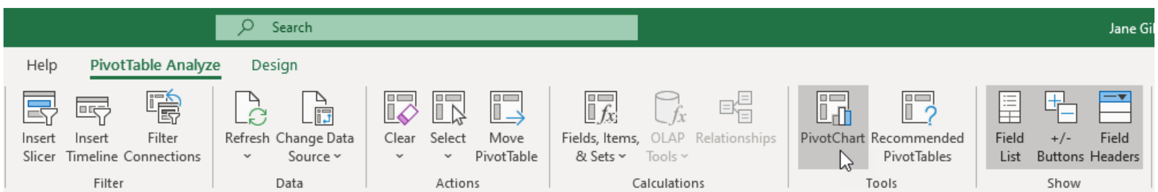
- About PivotCharts
- How to create PivotCharts
- How to apply a style to a PivotChart

PivotCharts

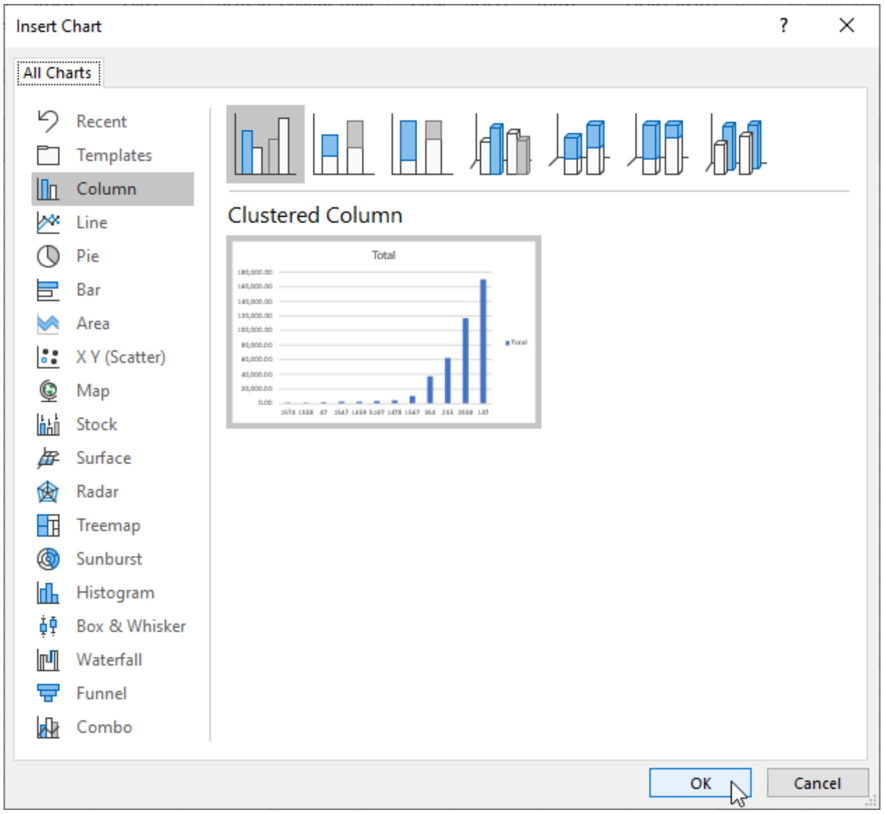
PivotCharts are just like regular charts in that they are designed to convey data analysis in a visual form. The primary difference is simply that PivotCharts are linked to PivotTables, while charts are linked to data ranges or tables. Despite this difference, both PivotCharts and regular charts share many of the same features, such as dynamic updating, lots of chart types to choose from, and easy creation.

Creating PivotCharts

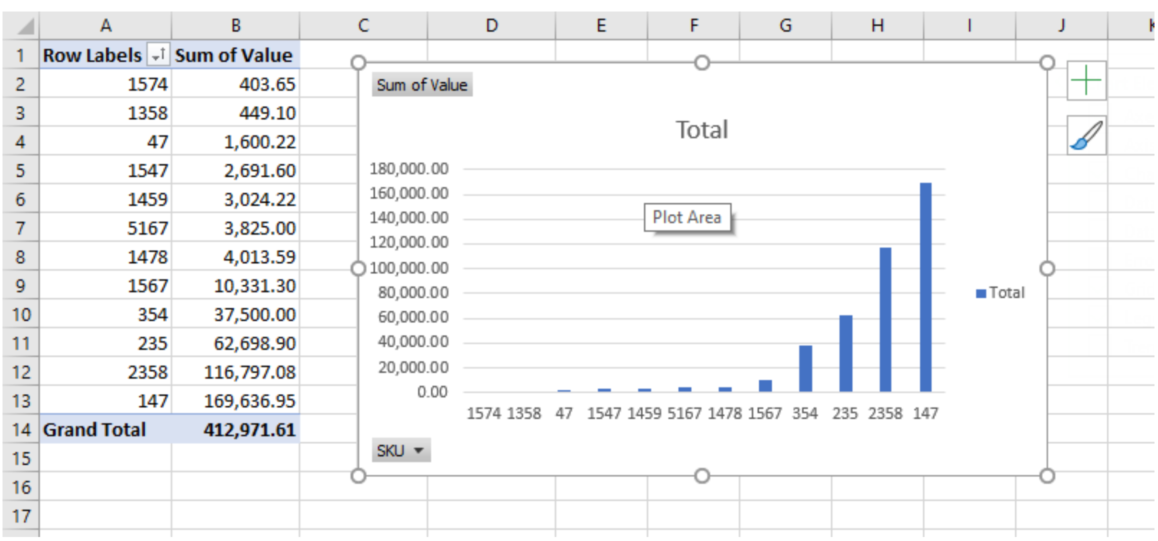
To insert a PivotChart into your worksheet, first click to select the PivotTable that you would like to work with. Next, click **PivotTable Analyze → PivotChart**:



This action displays the **Insert Chart** dialog box. Just like when you are working with regular charts, you need to consider what chart type best suits your data. For this example, the Clustered Column chart type has been selected:



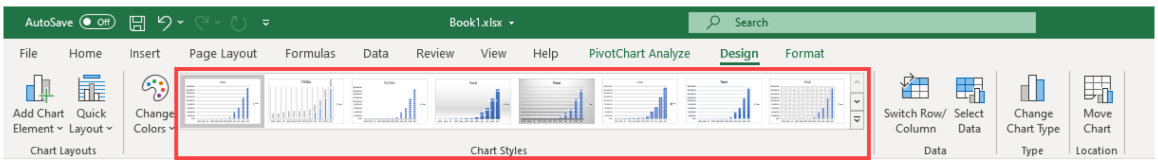
Once you click OK, the PivotChart is added to the current worksheet, displaying data from the selected PivotTable:



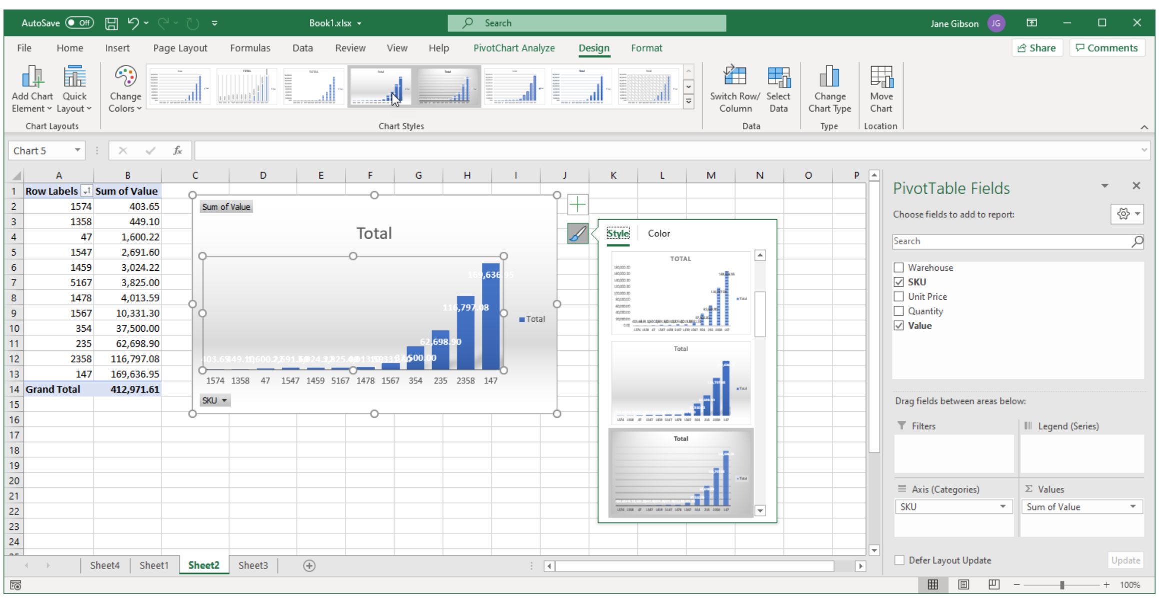
Applying a Style to a PivotChart

PivotChart styles are used to slightly adjust how a chart is laid out without changing the primary color scheme. This is excellent for adding visual flair to your chart and on occasion, a new chart style can also help a chart's readability.

To format a PivotChart with a style, first click to select the PivotChart and then click the Pivot Chart **Design** contextual tab. Examine the Chart Styles group and you will see a gallery of different chart styles that you can choose from:



Move your cursor over these chart styles and you will see a preview of how these styles will look once applied to your chart. Clicking on a style applies it:

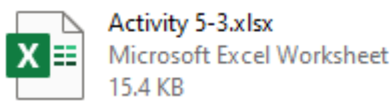


You can also find these styles by clicking the Chart Styles button that appears to the top right of a selected chart.

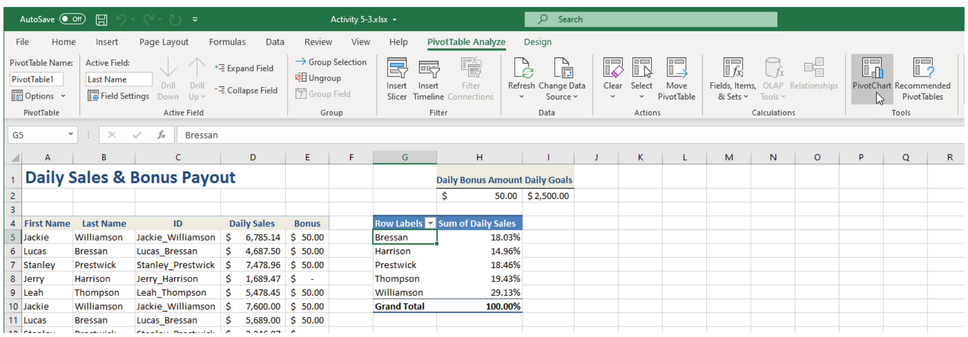
Activity 5-3: Analyzing Data with PivotCharts

Now that you have completed a PivotTable, you would like to visualize its results using a PivotChart.

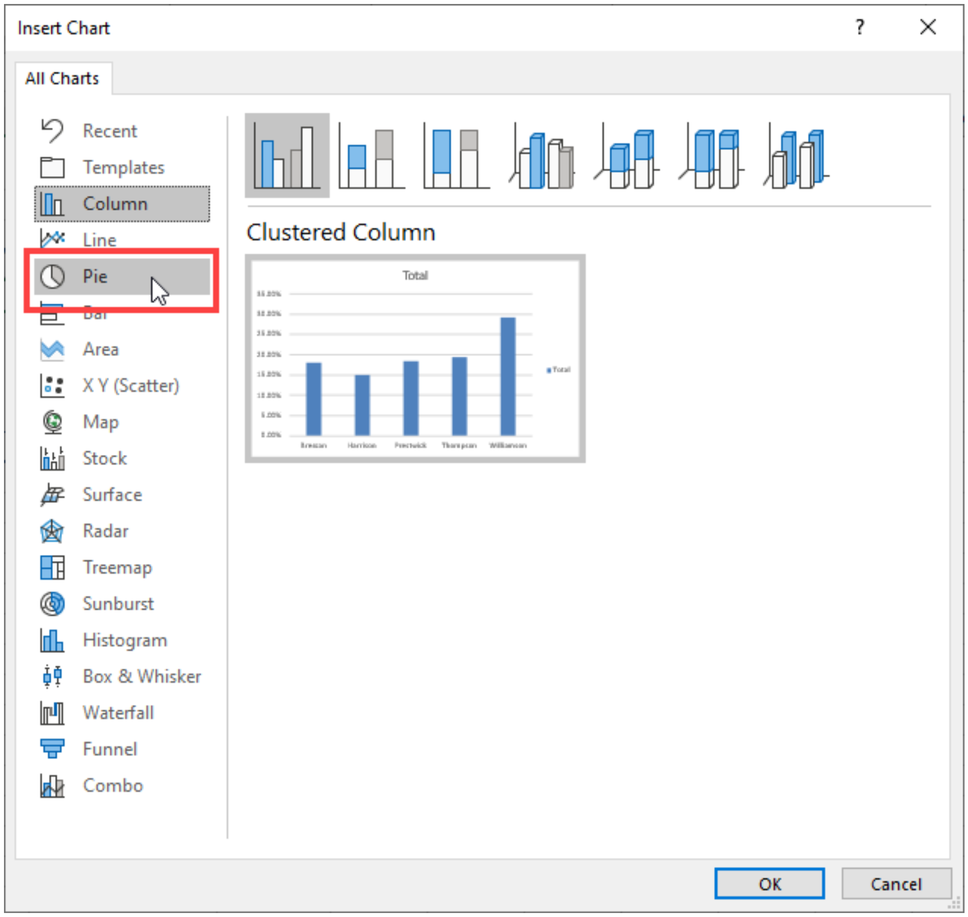
1. To begin, open Activity 5-3 from your Exercise Files folder:



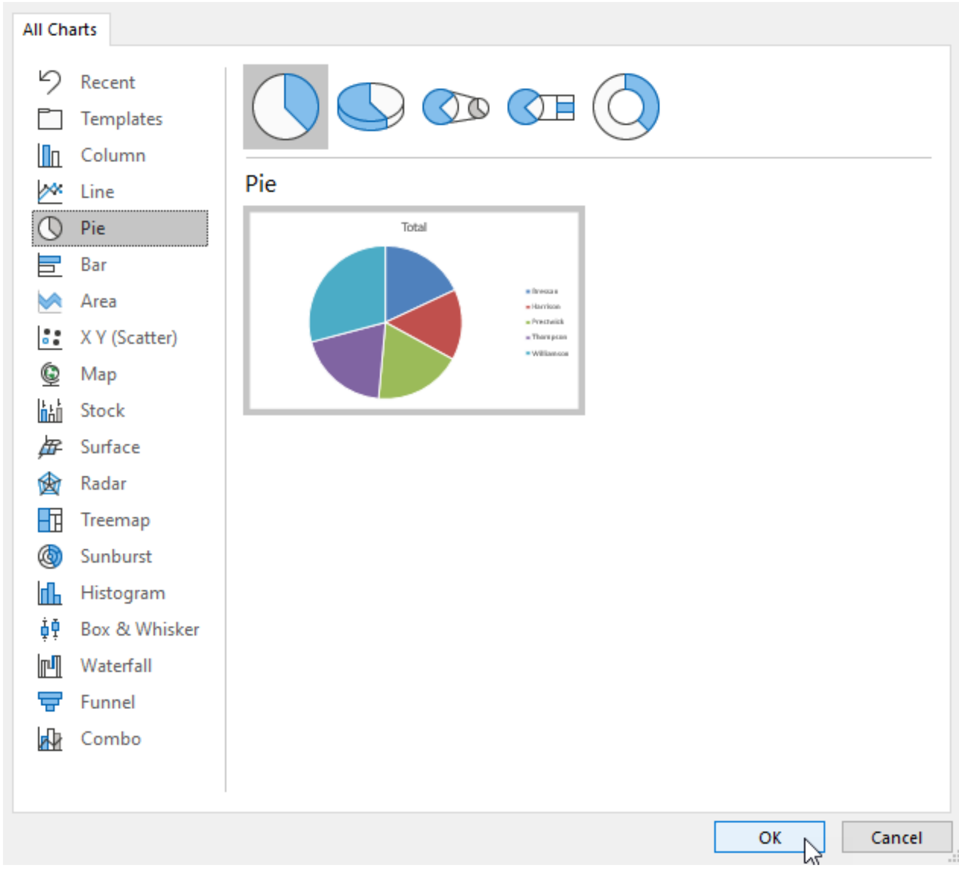
2. Click inside the PivotTable to select it and then click **PivotTable Analyze → PivotChart**:



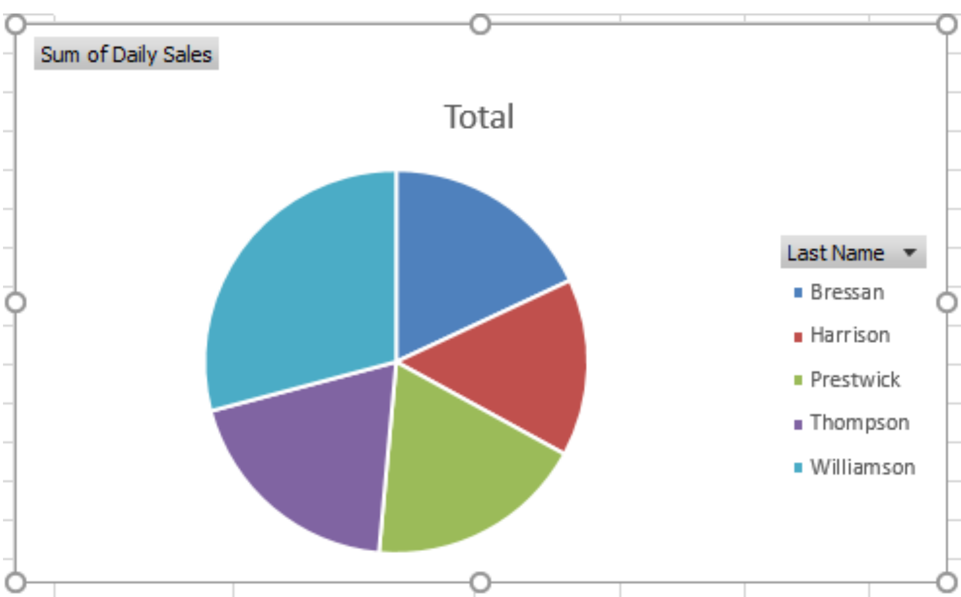
3. The Insert Chart dialog box is now displayed. For this exercise, click the **Pie** category:



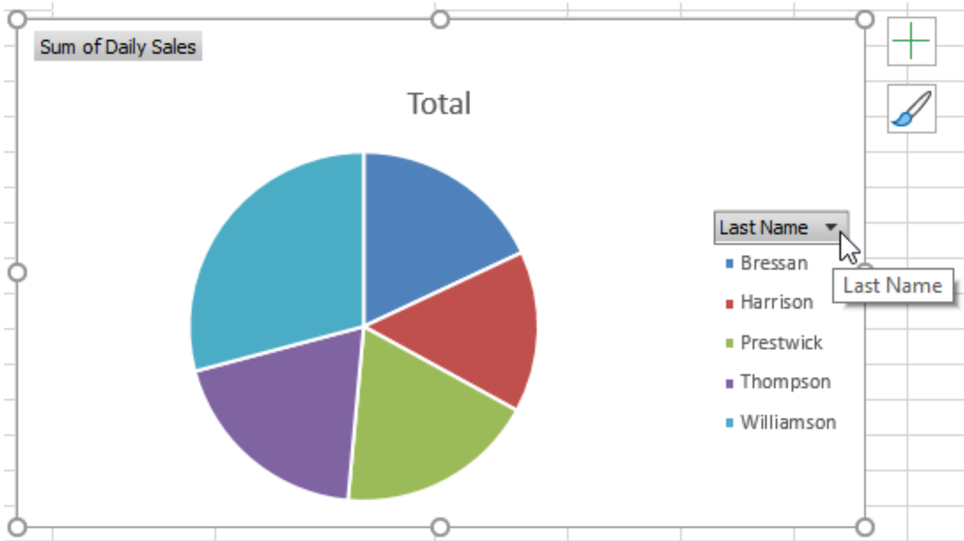
4. With the default pie chart selected, click **OK** to apply the new settings:



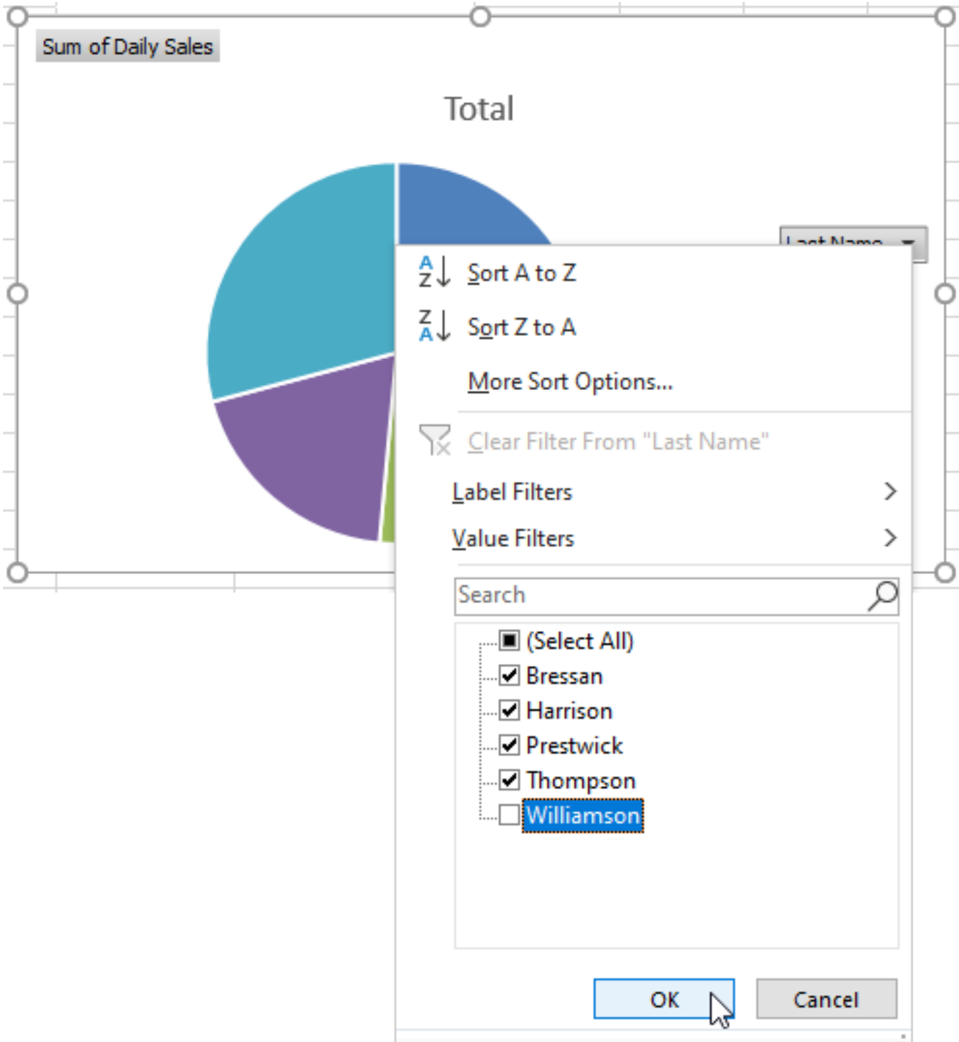
5. The new PivotChart now appears on your worksheet:



6. As you can see, Williamson generated most of the total sales, so you should filter his results out to focus on the remaining associates. On the PivotChart, click the **Last Name** drop-down list:

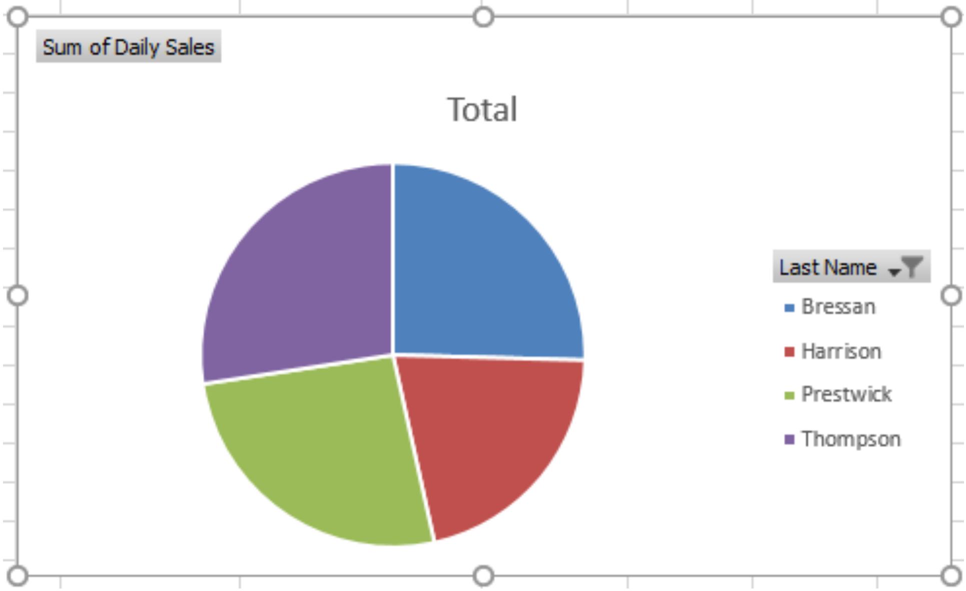


7. On the menu that appears, deselect the **Williamson** checkbox and then click **OK**:



8. The results for Williamson are no longer displayed on the PivotChart or the PivotTable:

Row Labels	Sum of Daily Sales
Bressan	25.43%
Harrison	21.10%
Prestwick	26.05%
Thompson	27.41%
Grand Total	**100.00%**



9. Save the current workbook as Activity 5-3 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

In this lesson you learned what PivotTables are and how they can be best used to answer different types of questions related to your data. You now know how to insert a PivotTable, as well as how to add and remove fields from it. Additionally, you are able to generate PivotCharts from a PivotTable, and use slicers to selectively filter out unique field entries.

Review Questions

1. **What is pivoting in Excel?**

2. **Where do the field names come from in the Choose fields to add to report section of the PivotTable Fields task pane?**

3. **What happens to fields that are dragged to the Values area on the PivotTable Field task pane?**

4. **What is the command sequence to insert a PivotChart?**

5. **What do the buttons on a slicer represent?**

LESSON 6:
WORKING WITH GRAPHICAL OBJECTS

Lesson Objectives

In this lesson you will learn how to:

- Insert and modify graphical objects
- Layer and group graphical objects
- Incorporate SmartArt into your workbooks

TOPIC A: Insert and Modify Graphic Objects

While the default appearance of your worksheets can be quite plain, Excel offers you access to a variety of graphical objects that you can use to enhance their visual appeal. In this topic, you will learn all about the various types of graphical objects that you can add to your worksheets, as well as the contextual tabs that are used to work with them.

Topic Objectives

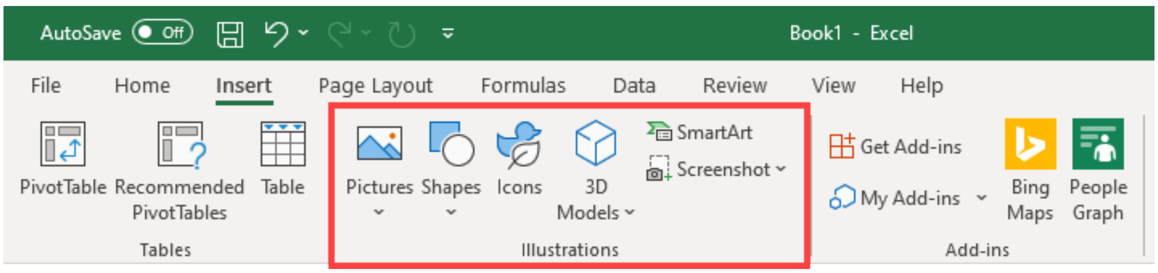
In this session, you will learn:

- About graphical objects
- How to insert shapes
- How to insert WordArt
- How to insert text boxes
- How to insert images
- About the Picture Format contextual tab
- About the Shape Format contextual tab
- About the SmartArt contextual tabs

Graphical Objects

In Excel there are six types of **graphical objects** that can be inserted into a workbook: pictures, shapes, icons, 3D models, SmartArt, and screenshots. While each graphical object type is mostly tailored to a specific purpose, all of them behave in the same way once they are placed on a worksheet. For example, they are all able to be resized, changed, and moved using the same techniques.

The commands to insert graphical objects are located in the **Illustrations** group on the Insert tab:

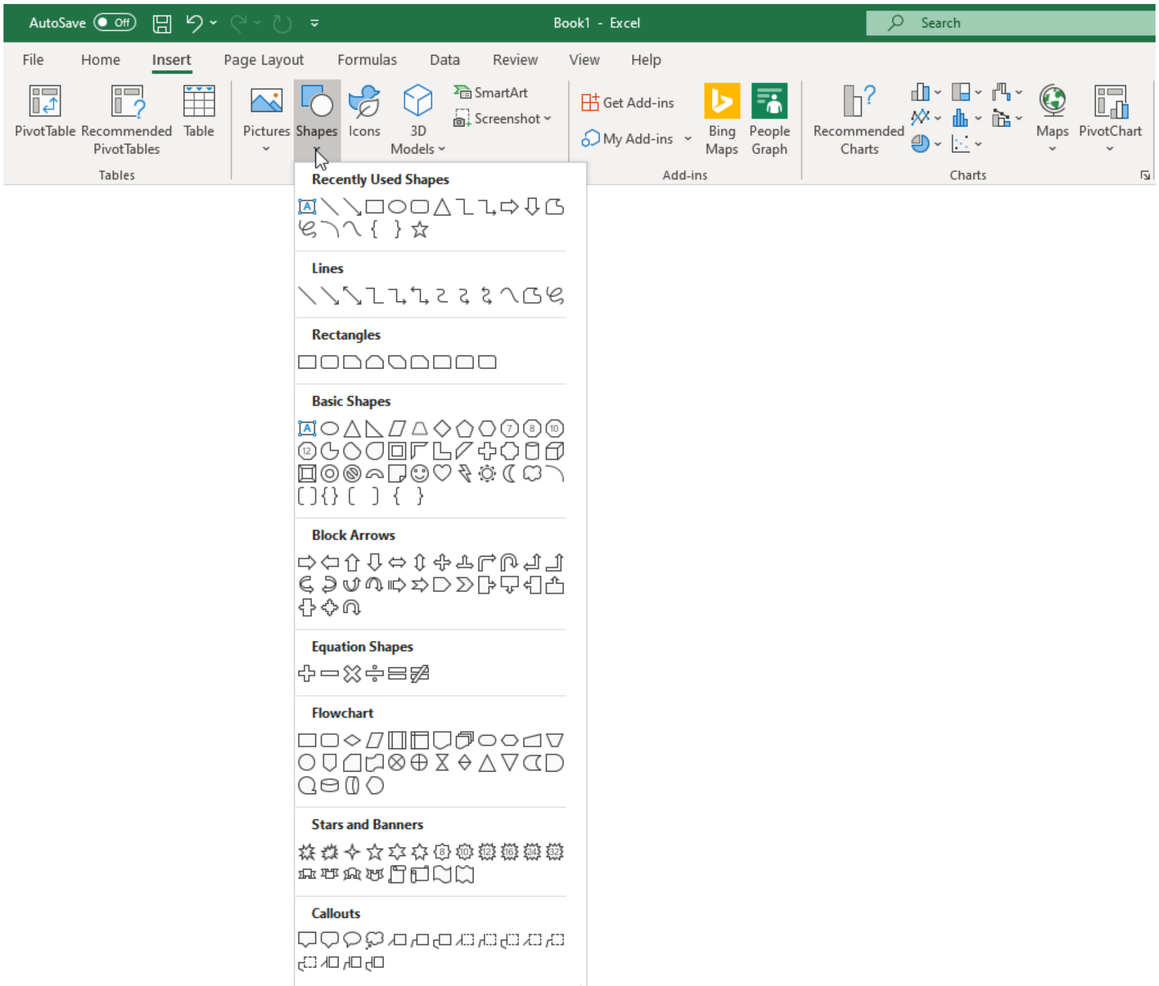


Here is an overview of these commands:

- The **Pictures** drop-down command allows you to insert image files from outside of Excel into your worksheet. These can be pictures on your device, from a stock library, or from online. Most common image formats are supported.
- The **Shapes** drop-down command inserts basic shapes, including circles, squares, rectangles, text callouts, and arrows. You can customize all of these objects in a variety of ways.
- The **Icons** command allows you to select from a wide array of available icons, searchable by category.
- The **3D Models** drop-down command allows you to insert 3D models from your own device or from a Microsoft online library, searchable by category.
- The **SmartArt** command allows you to choose and insert a SmartArt graphic. These types of graphics are pre-configured and are typically used to graphically represent text-based content, such as flowcharts and lists.
- Finally, the **Screenshot** drop-down command allows you to take a screenshot of any open window or your desktop. This screenshot is then inserted into the current worksheet.

Inserting Shapes

To insert a shape into the current worksheet, first click **Insert → Shapes**:

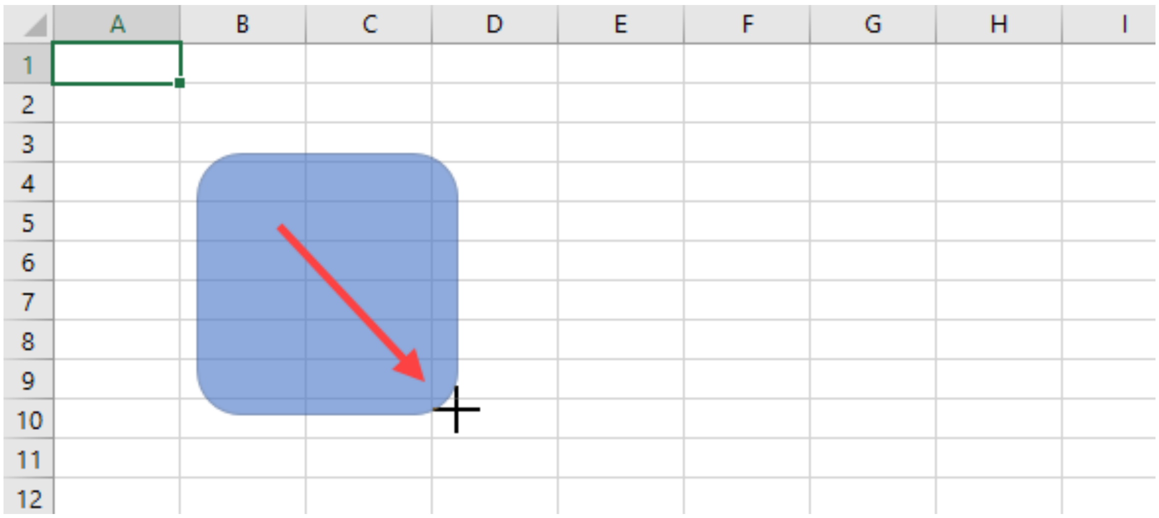


This dropdown command reveals that there are nine major categories in the Shapes menu:

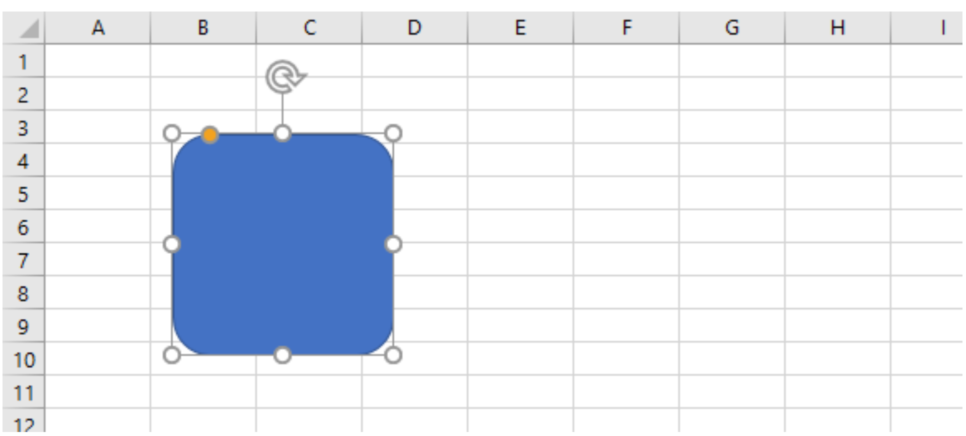
- **Recently Used Shapes:** Contains the most recently used shapes (up to the last 24).
- **Lines:** Create a variety of lines and plain arrows.
- **Rectangles:** Create a variety of rectangular shapes.
- **Basic Shapes:** Create basic shapes, such as circles and triangles. Fun shapes such as smiley faces are also included here.
- **Block Arrows:** Create block-style arrows and lines.
- **Equation Shapes:** Create mathematical shapes.

- **Flowchart:** Create shapes used in flowcharts, such as decision points and terminators.
- **Stars and Banners:** Offers 20 different types of these shapes.
- **Callouts:** Annotate other drawings and images.

Once you decide on the shape that you would like to insert, click on its listing in the drop-down menu. This action causes your cursor to change into a crosshair. You can then click once to add the shape using its default dimensions or click and drag over the worksheet area to add it using custom dimensions of your own selection:

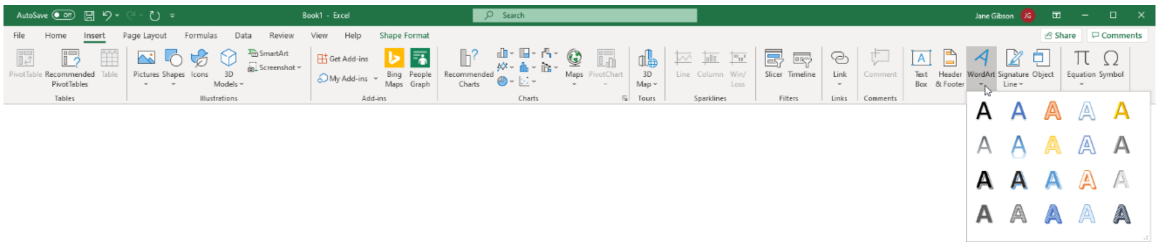


Upon releasing your mouse button, the shape now appears on the worksheet. You can then manipulate and work with it as you would any other object in Excel:



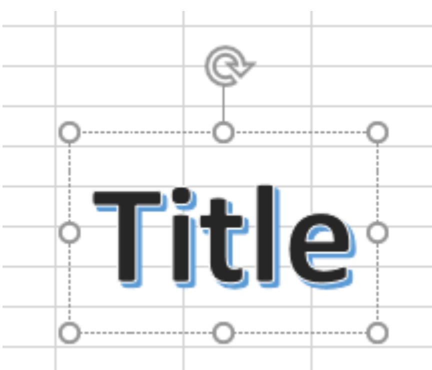
Inserting WordArt

WordArt is special text that you can add to your workbook that includes decorative flair such as drop-shadows and other accents. To insert WordArt into the current worksheet, click **Insert → WordArt → [WordArt Style]**:



The WordArt is then added in its own text box using the style that you selected:

Click inside of this text box and type the content that you would like to appear inside of it:

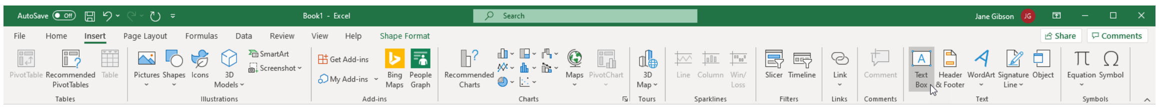


You can then move this text around on the current worksheet in the same manner as you would move any other object in Excel.

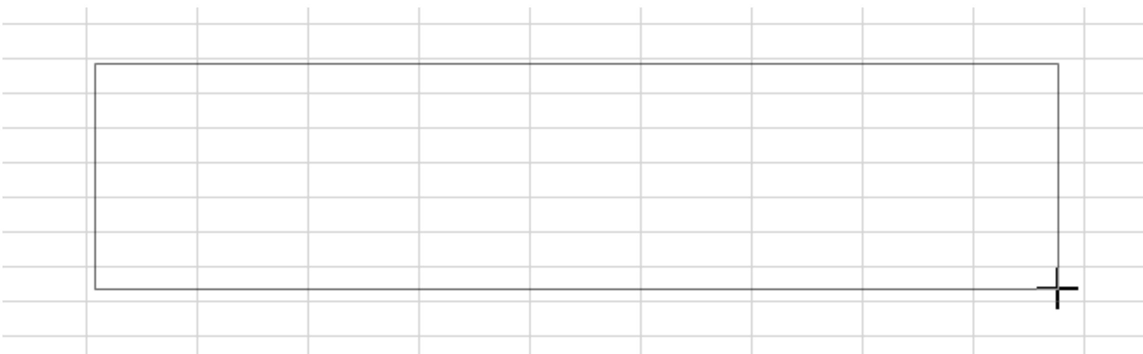
Inserting Text Boxes

As the name suggests, **text boxes** are simply boxes that you can add to a worksheet that are used to display text without having to embed that text directly within a cell. This provides some added flexibility when designing your worksheets and it is commonly used to add additional information without interfering with the data.

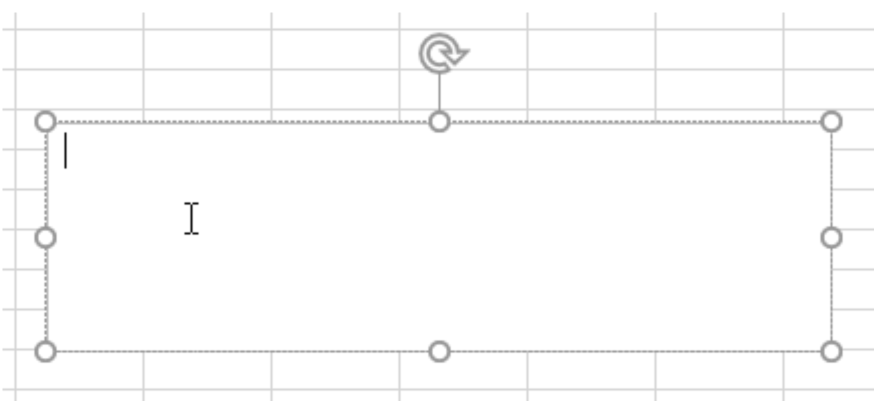
To insert a text box into a worksheet, click **Insert → Text Box:**



This action changes the shape of your cursor. Use your cursor to draw the text box on the current worksheet through the click and drag method:

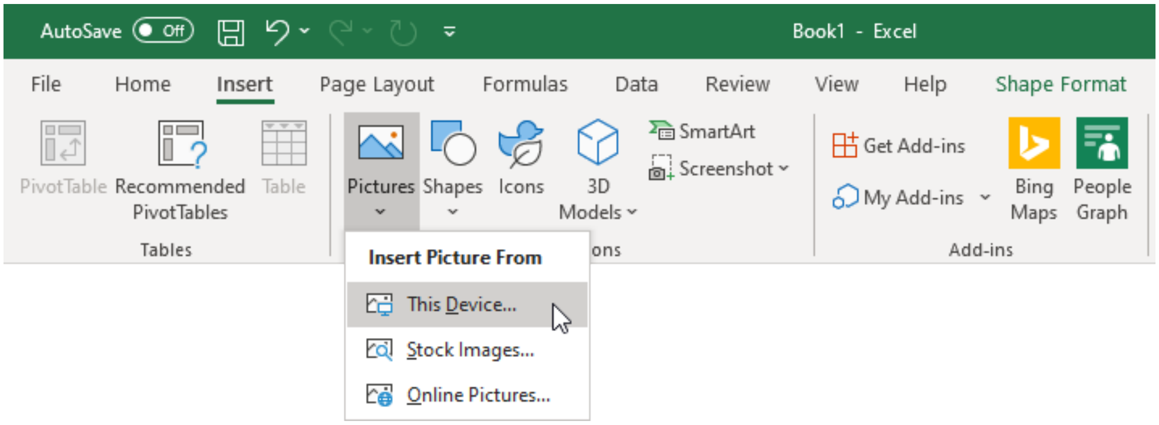


Upon releasing your mouse button, the new text box is added and selected. Inside this text box, you can immediately begin adding any text that you want included:

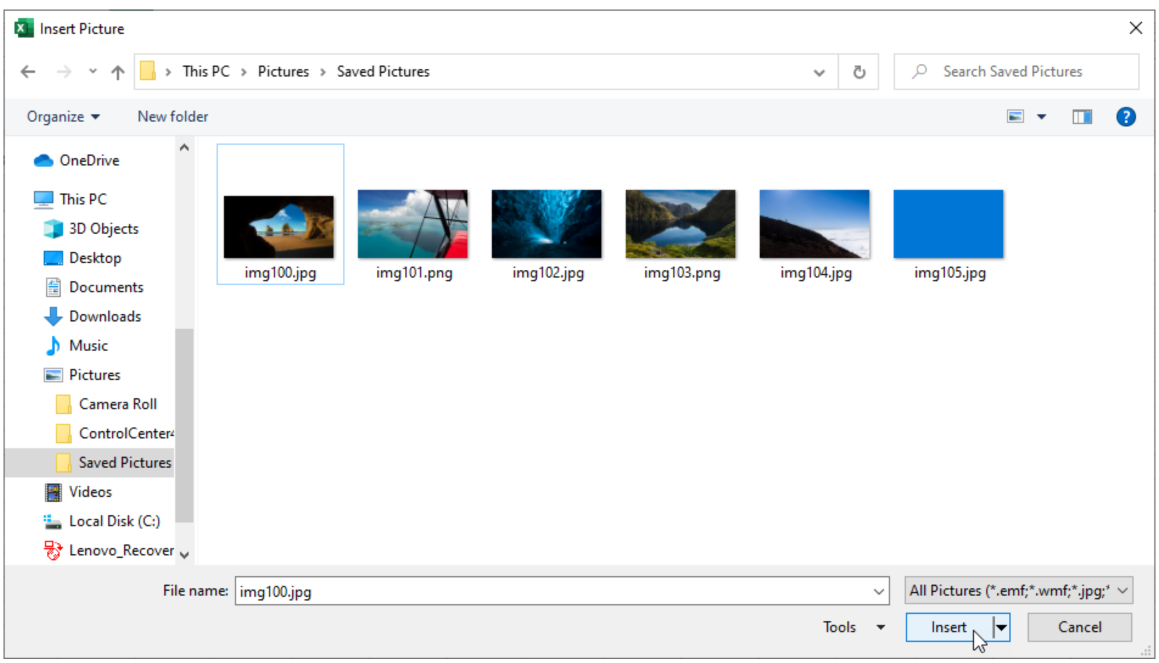


Inserting Images

Images are able to be inserted into your workbooks from your computer or from online sources. To insert images from your computer, first click **Insert → Pictures → This Device**:

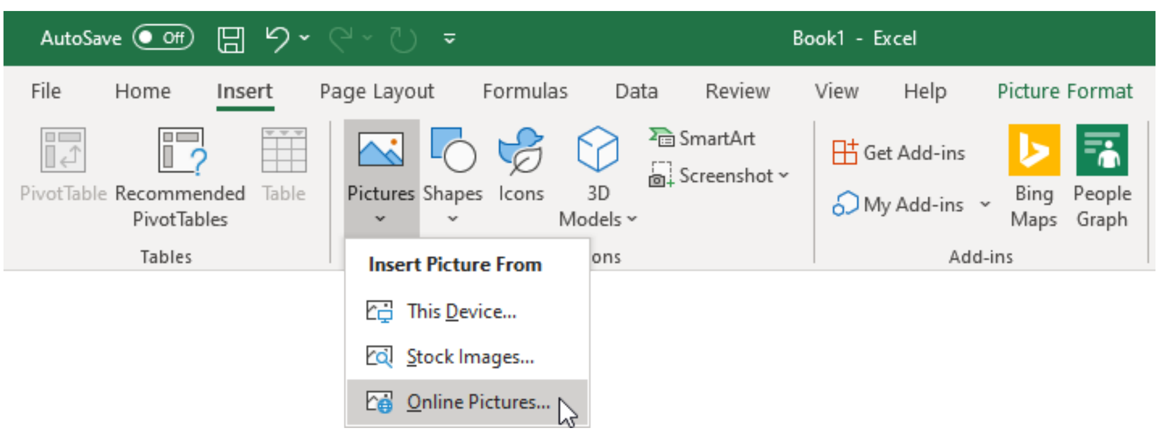


This action displays the **Insert Picture** dialog box. Use its controls to browse to the location on your computer where the image that you would like to insert is located. Click to select the image and then click **Insert**:

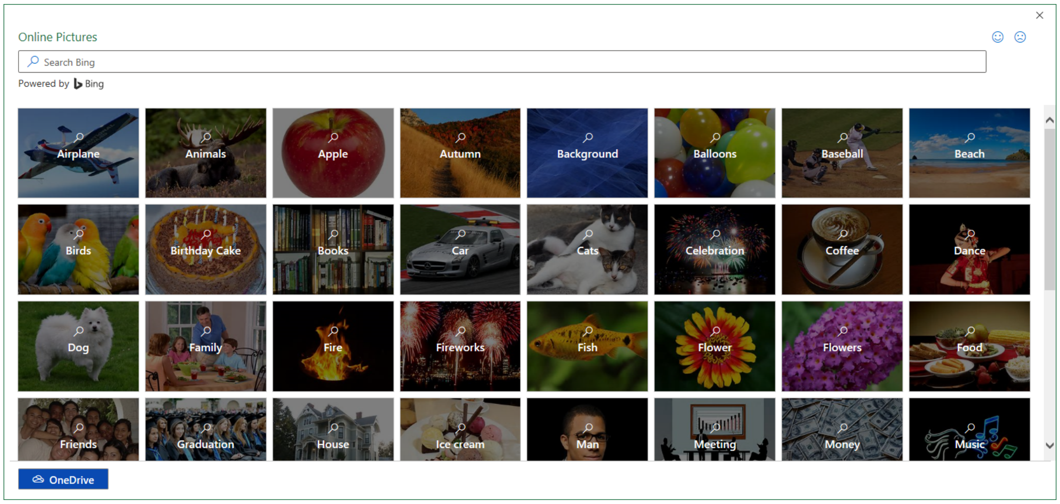


The picture is then inserted into your worksheet where you can move and resize it like any other object in Excel:

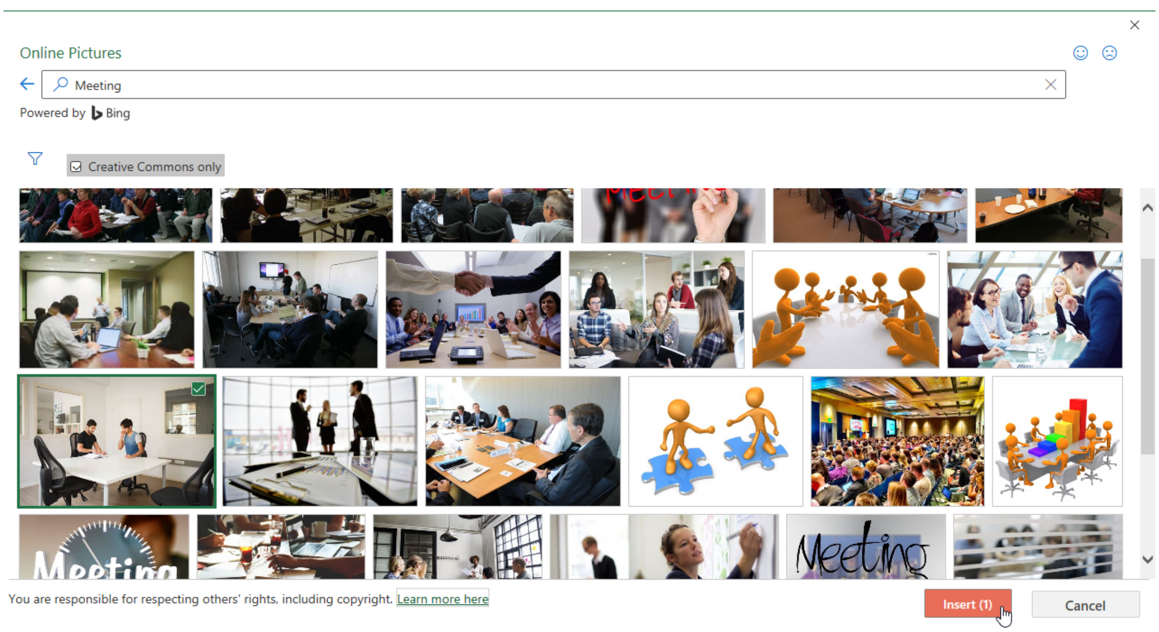
To insert an online picture, click **Insert → Pictures → Online Pictures**:



This action displays the **Online Pictures** dialog box. Listed inside you will see the option to search the web for images using Bing. You will likely also see an image library, which is searchable by category, as well as a link to your OneDrive account:



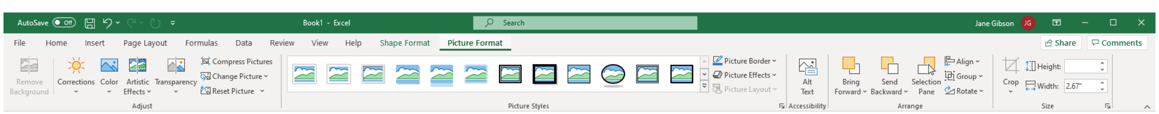
To use the Bing image search functionality, type keywords into the provided text box and press Enter. Results from you search are displayed. Click to select the result that you would like to add to the current worksheet and then click **Insert**:



The selected image is then inserted into the current worksheet. You can then work with this image in the same way you would work with any other graphical object in Excel:

The Picture Format Contextual Tab

The **Picture Format** contextual tab is displayed whenever a graphical object that is considered a picture is selected. This tab displays many of the tools and commands that you will need to format and edit a picture in Excel:

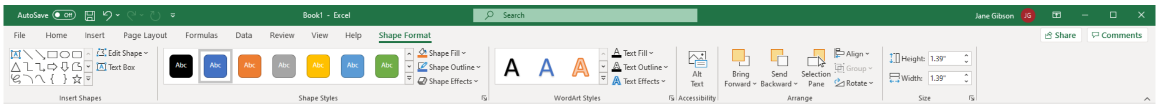


This tab contains the following groups:

- The **Adjust group** contains image editing tools, including options to remove the background and touch up the picture.
- The **Picture Styles group** contains pre-configured styles that you can apply to an image, as well as menus to customize the border, layout, and effects applied to the image.
- The **Arrange group** allows you to manage the position of images.
- The **Size group** gives you control over the height and width of the image.

The Shape Format Contextual Tab

The **Shape Format** contextual tab is displayed whenever a graphical object that is considered a drawing (such as a shape) is selected. This tab displays many of the tools and commands that you will need to format and edit a drawing in Excel:



This tab contains five groups with commands that can be used to edit drawings in some way:

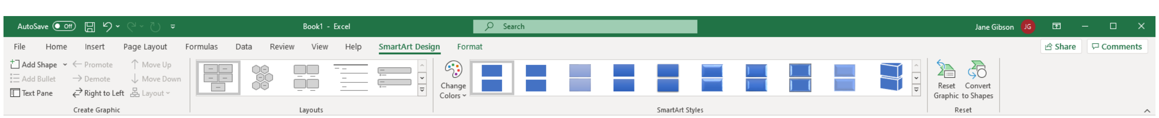
- The **Insert Shapes group** allows you to insert more shapes into the current worksheet, as well as insert text boxes and change the type of shape.
- The **Shape Styles group** includes a gallery that contains a variety of pre-configured styles from which you can choose. You can also customize the fill, outline, and effects of a selected shape.
- The **WordArt Styles group** also contains a gallery, but this one includes a variety of WordArt styles that can be added to drawings. You can also customize the fill, outline, and effects of the WordArt.
- The **Arrange group** allows you to adjust how objects are placed on a worksheet and the order in which they appear if they overlap.
- Finally, the **Size group** includes two increment boxes that are used to change the width and height of a selected object.

The SmartArt Contextual Tabs

The **SmartArt** contextual tab set is displayed whenever a SmartArt graphic is selected. This contextual tab set consists of two tabs: SmartArt Design and Format.

The SmartArt Design Tab

The **SmartArt Design** tab is comprised of four groups that contain commands to change the structure of SmartArt graphics, apply styles, and more:

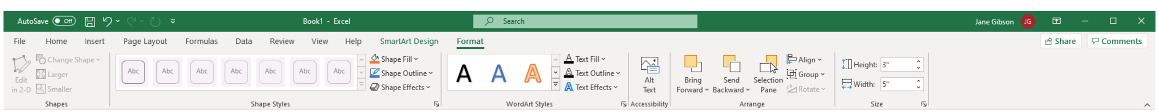


Let's look at each of these groups:

- The first group on the SmartArt Design tab is the **Create Graphic group**. This is where you will find commands to add SmartArt shapes and text to the selected SmartArt graphic. Additionally, this group also contains commands to position the selected SmartArt graphic in the hierarchy of other SmartArt graphics.
- The **Layouts group** contains a gallery of possible layout options from which you can choose and then apply.
- The **SmartArt Styles group** contains a gallery with styles to change the color scheme and effects of the selected SmartArt graphic. You can also change the overall color scheme from this group.
- Finally, the commands inside the **Reset group** are used to remove customization from the selected graphic, as well as convert SmartArt graphics into basic Excel shapes.

The Format Tab

The **Format** tab is comprised of five groups. Most of the commands on this tab are used to customize individual shapes within a SmartArt graphic:



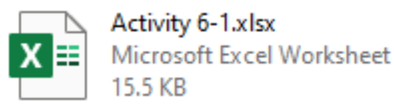
Let's look at each of these groups:

- The **Shapes group** contains commands to change the shape and size of individual SmartArt shapes.
- The **Shape Styles group** includes a gallery of styles that can be applied to a selected SmartArt shape.
- The **WordArt Styles group** also contains a gallery, but this is used to apply formatting to text inside a SmartArt shape.
- The **Arrange group** includes commands for customizing how shapes are arranged and placed on the worksheet.
- The **Size group** contains increment controls to change the size of the selected SmartArt shape.

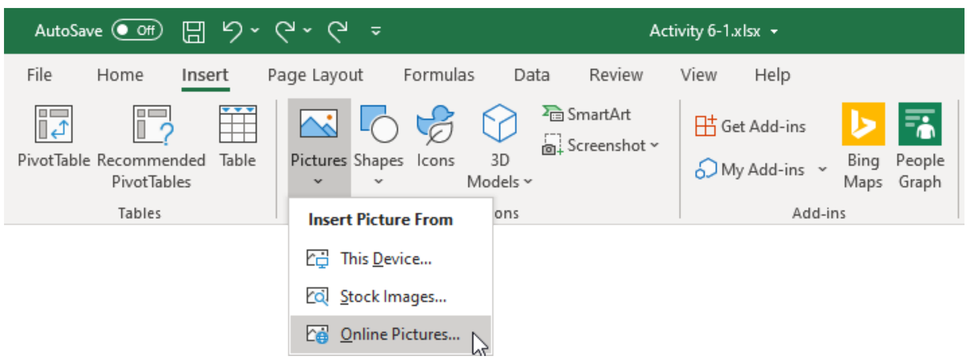
Activity 6-1: Inserting Graphical Objects

To add visual flair to one of your workbooks, you would like to insert a few graphical objects.

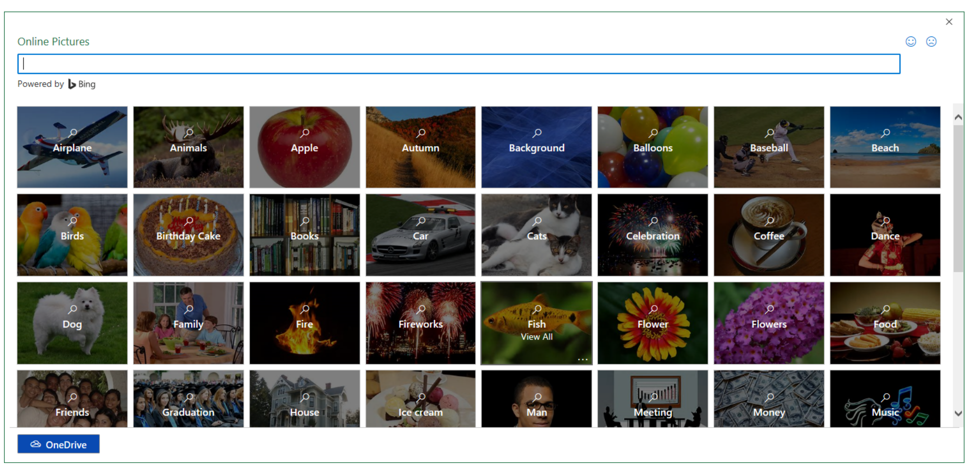
1. To begin, open Activity 6-1 from your Exercise Files folder:



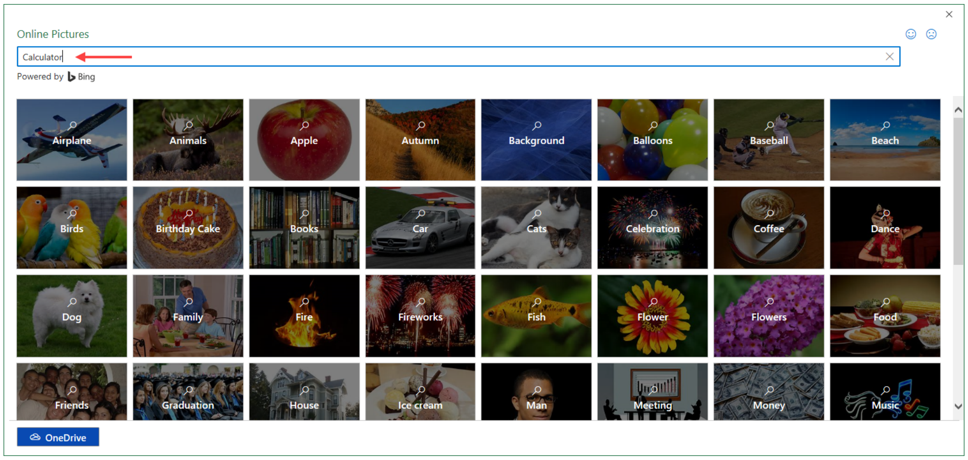
2. Let’s start by inserting some online pictures. Click **Insert → Pictures → Online Pictures**:



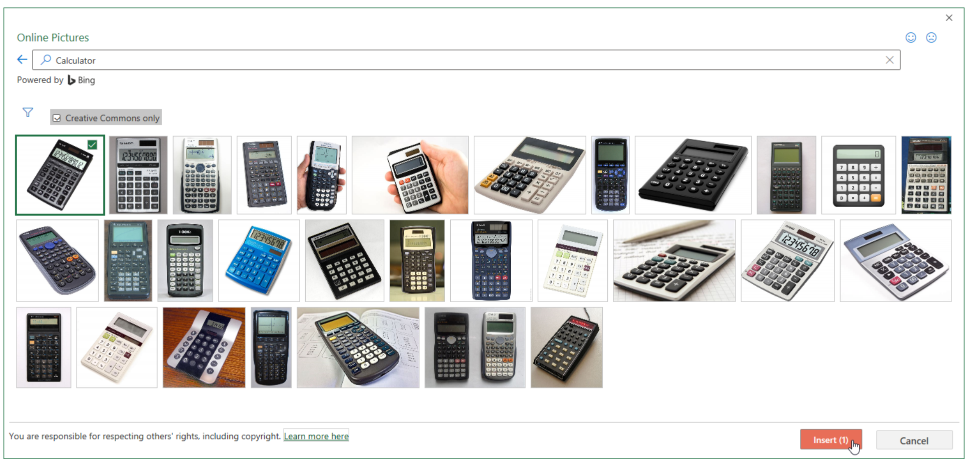
3. The Insert Pictures dialog box is now displayed:



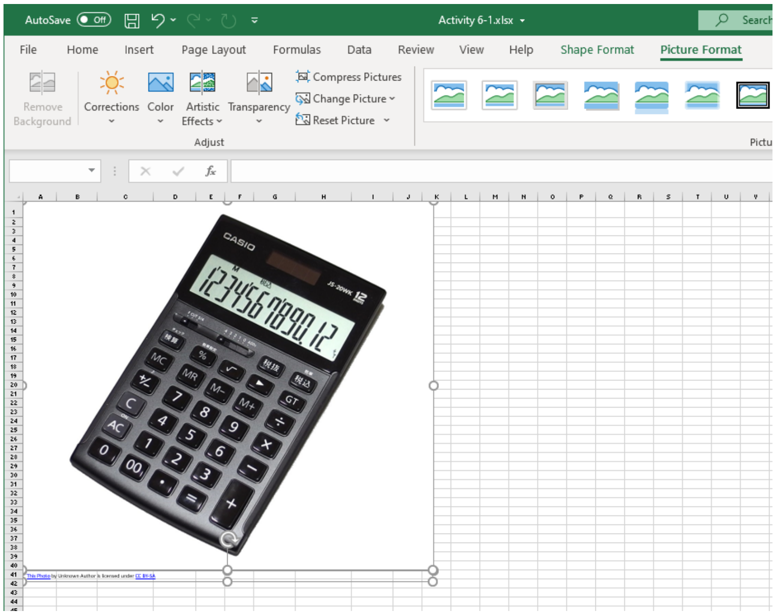
4. Click inside the search text box and type "**Calculator**." Execute the search by pressing **Enter**:



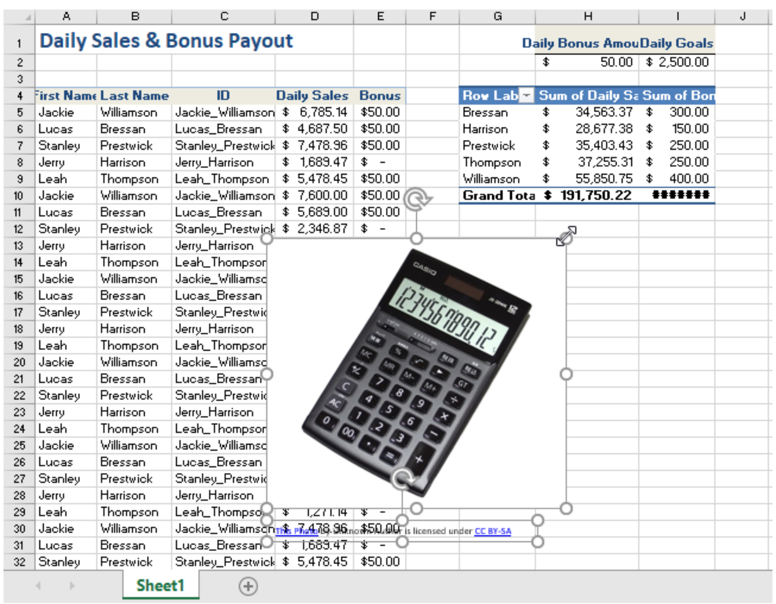
5. The results from the search are now displayed. **Click any result** that you like, then click **Insert**:



6. The selected Clip Art is placed on the current worksheet:

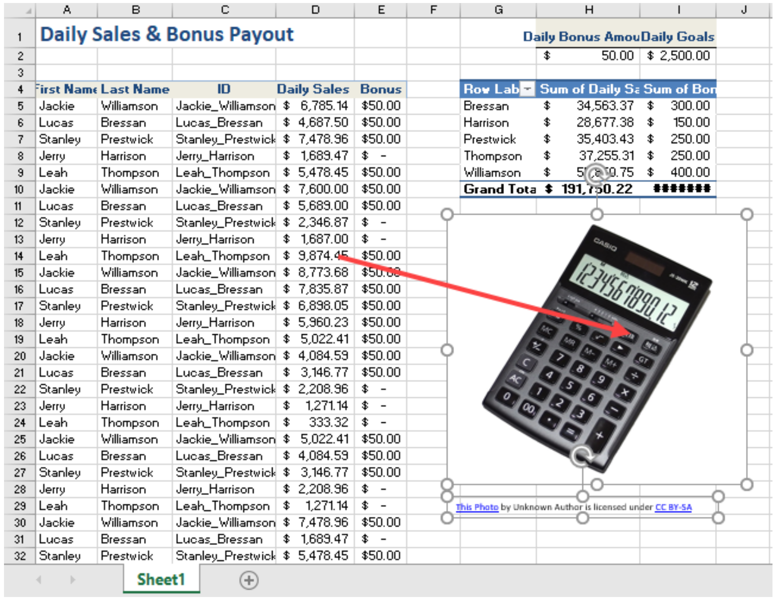


7. If necessary, click and drag the top right-hand corner handle of the image to make the image about the same size as the example shown below:

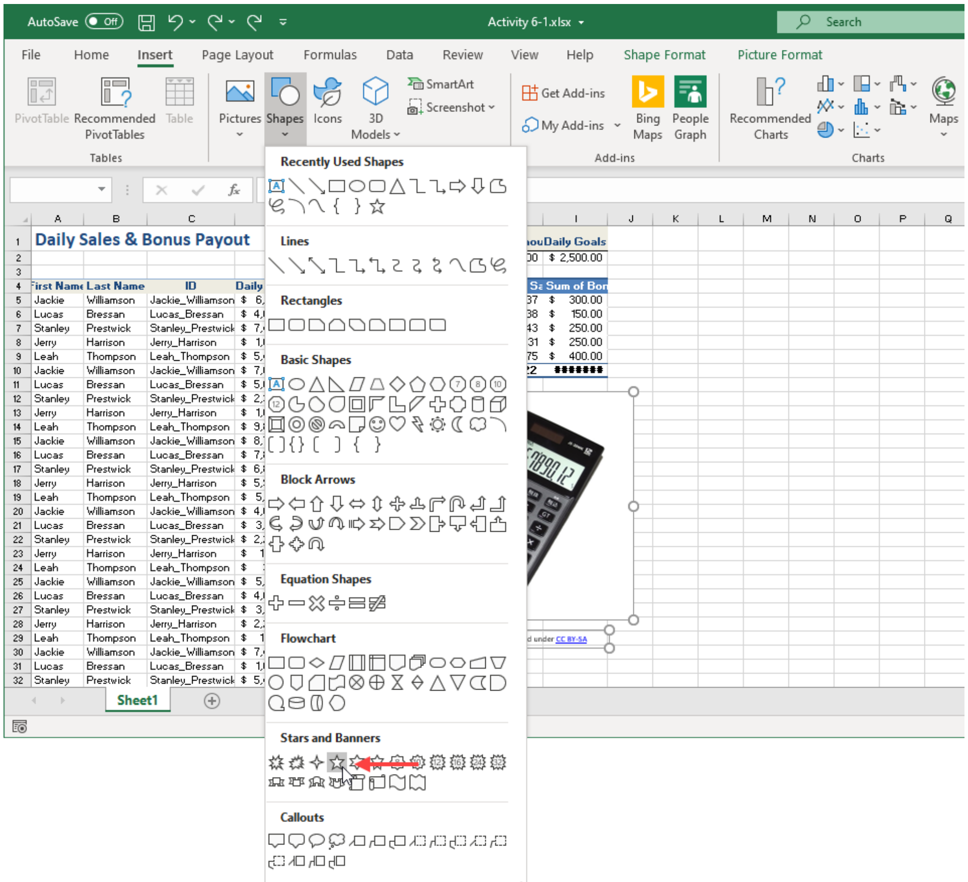


(You may be able to skip this step if you picked a small image.)

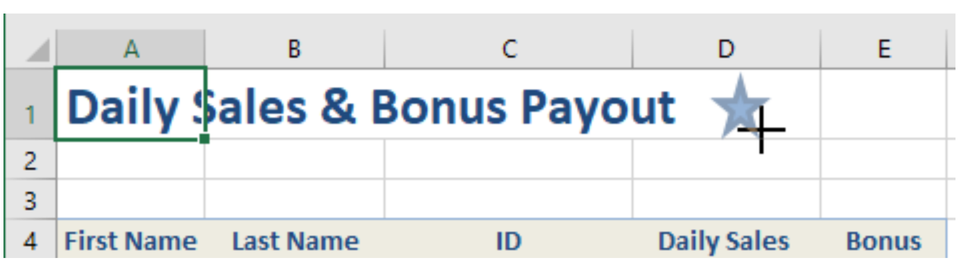
8. Now, **click and drag the image** so that it appears just under the existing PivotTable:



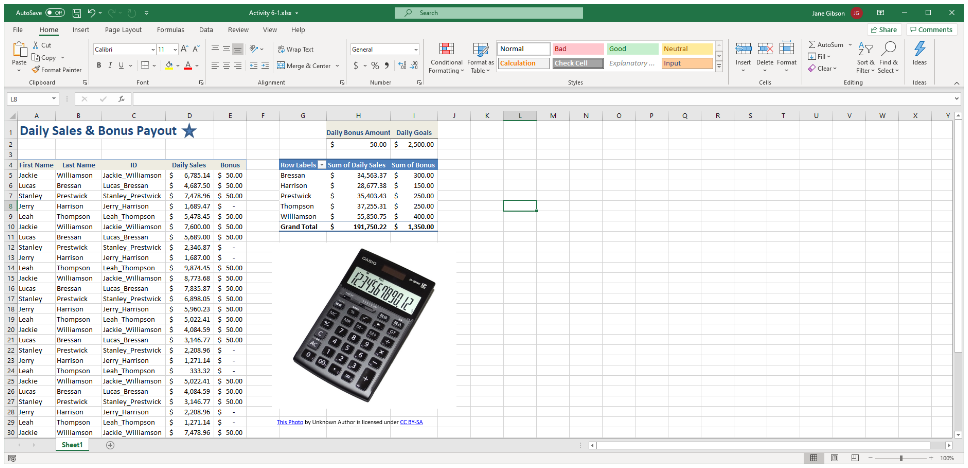
9. Now, you just need to add a small shape to the title. Click **Insert → Shapes → 5-Point Star**:



10. Your cursor turns into a crosshair. Just to the right of the title, click and drag until the star shape is roughly the same height as row 1:



11. **Release your mouse** button to add the shape. **Click on a blank area** of the worksheet to deselect the new shape. The worksheet now looks similar to this:



12. Save the current workbook as Activity 6-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Layer and Group Graphical Objects

Once you have added graphical objects to a worksheet, it is important to know how to organize their positioning in relation to one another. Using layers, you can choose which object overlaps another, while grouping allows you to group multiple graphical objects together so that you can adjust their properties all at the same time. In this topic, you will learn all about layering and grouping graphical objects in Microsoft 365 Excel.

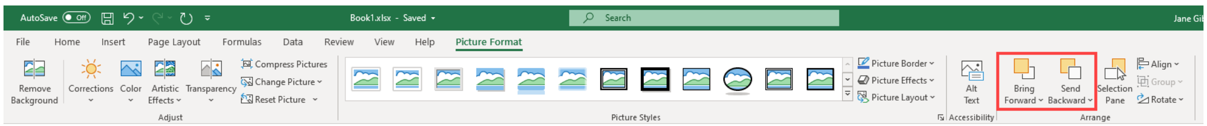
Topic Objectives

In this session, you will learn:

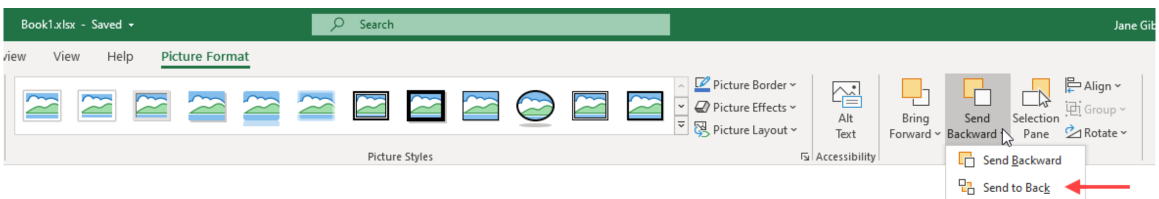
- About layering objects
- About grouping objects
- About positioning objects

Layering Objects

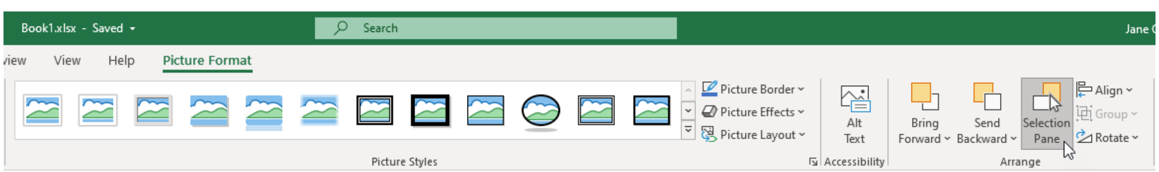
When a graphical object is added to a worksheet, it is added to its own layer so that it can overlap any existing objects. You can manipulate a layer and how it interacts with others by moving it forward or backward in the stack of layers – just like moving the top-most card in a deck below the next and vice-versa. To do this, first click to select the object that you would like to work with and then click **Picture Format (or Drawing Format) → Bring Forward or Send Backward**:



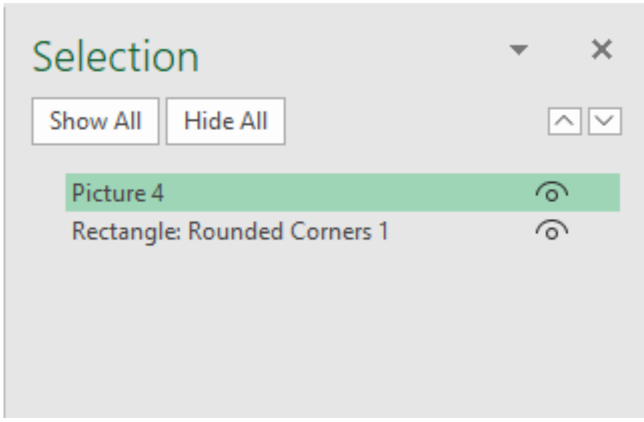
If you would instead like to move a selected graphical object to the bottom or top of the stack of layers, the **Bring Forward → Bring to Front,** or **Send Backward → Send to Back** commands can be used:



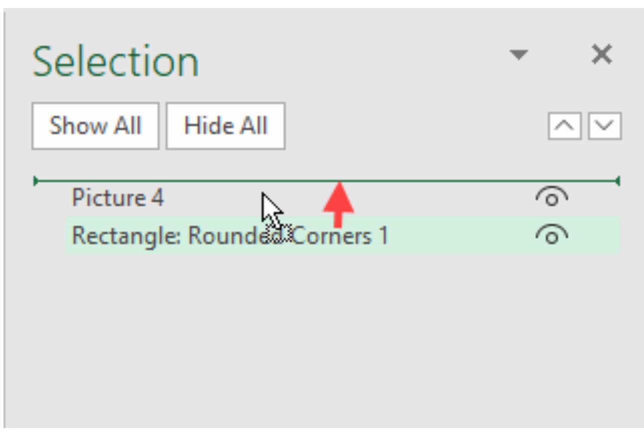
Alternatively, you can view and interact with the various graphical objects that exist on layers within the worksheet by opening the Selection task pane. To do this, click **Picture Format (or Shape Format) → Selection Pane**:



This **Selection** task pane lists all of the graphical objects that exist on the current worksheet and how they are currently arranged:

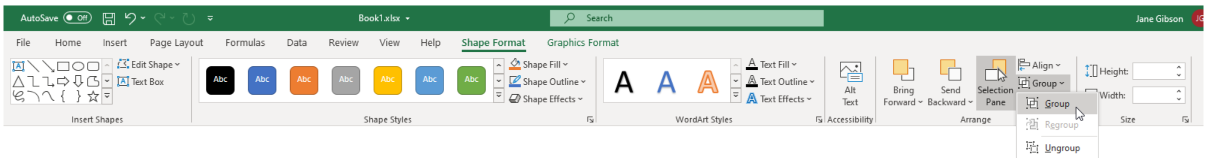


If you would like to change how these objects are arranged, click and drag them around in this list to shift their location:

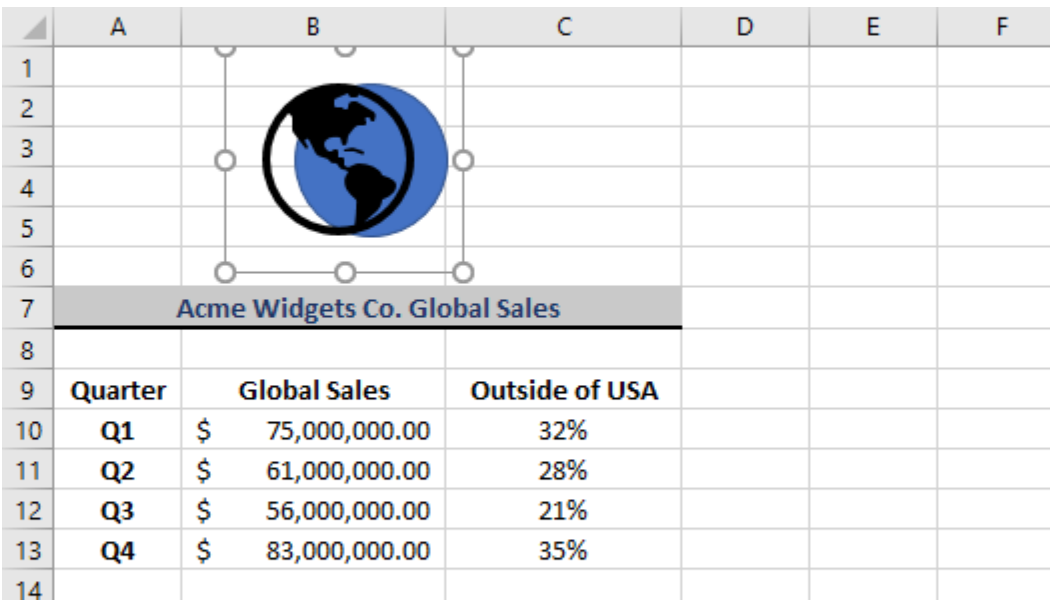


Grouping Objects

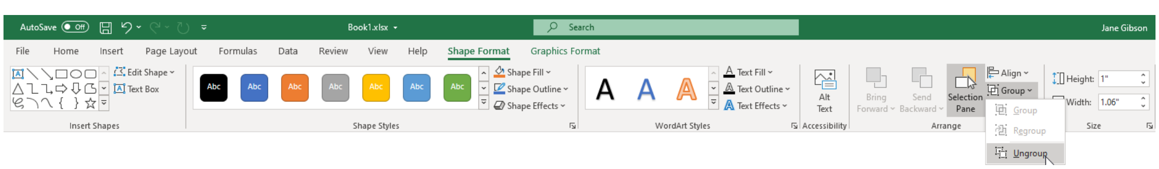
If you would like to work with multiple objects as a **group**, such as moving them all at the same time, you can group them together. To do this, select each graphical object that you would like to group (hold the Ctrl key while clicking on each object). Next, click **Picture Format (or Shape Format) → Group → Group**:



Once two or more graphical objects are grouped together, any changes made to the group are applied to all of its members – including size, position, and more:



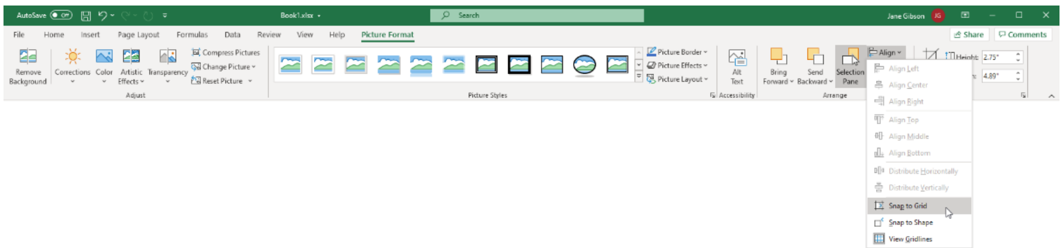
To ungroup any objects that have been grouped together, first click to select the group and then click **Picture Format (or Shape Format) → Group → Ungroup**:



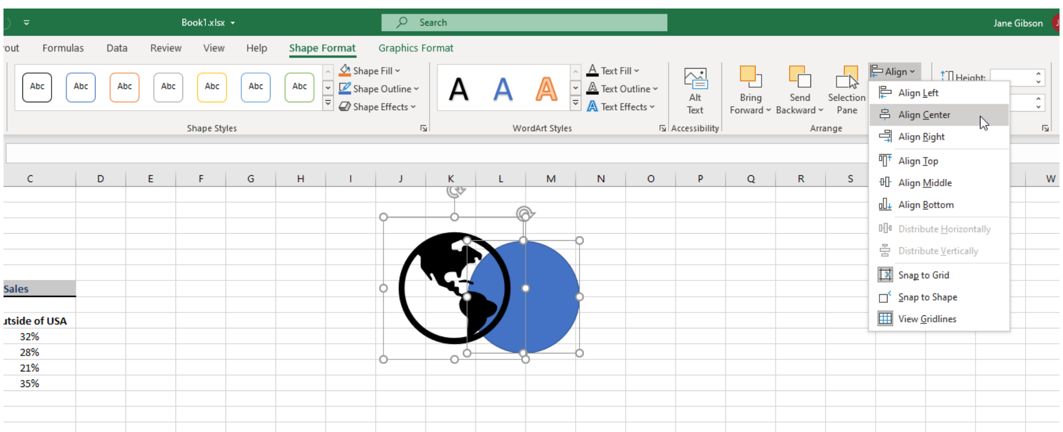
After ungrouping a group, you can quickly reform it by selecting one of the objects that was a member of the previous group and clicking **Picture Format (or Shape Format) → Group → Regroup.**

Positioning Objects

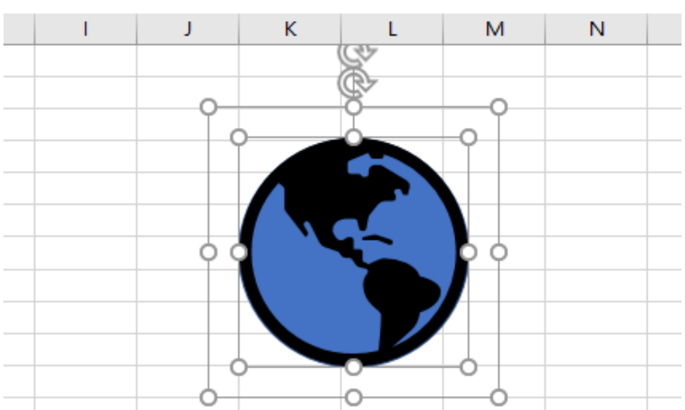
Objects can be **positioned** in relation to the grid of the worksheet, as well as in relation to other shapes that appear on it. You can enable either of these options by clicking **Picture Format → Align → Snap to Grid (or Snap to Shape)** while the object that you would like to work with is selected:



To align objects in relation to themselves, select the objects you wish to align, then click **Shape Format → Align,** then select from the available options:



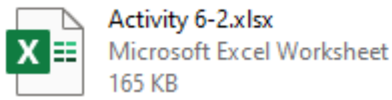
In this example, selecting Align Center aligns the two shapes horizontally, then repeating the process and selecting Align Middle, aligns the shapes vertically, centering one over the other:



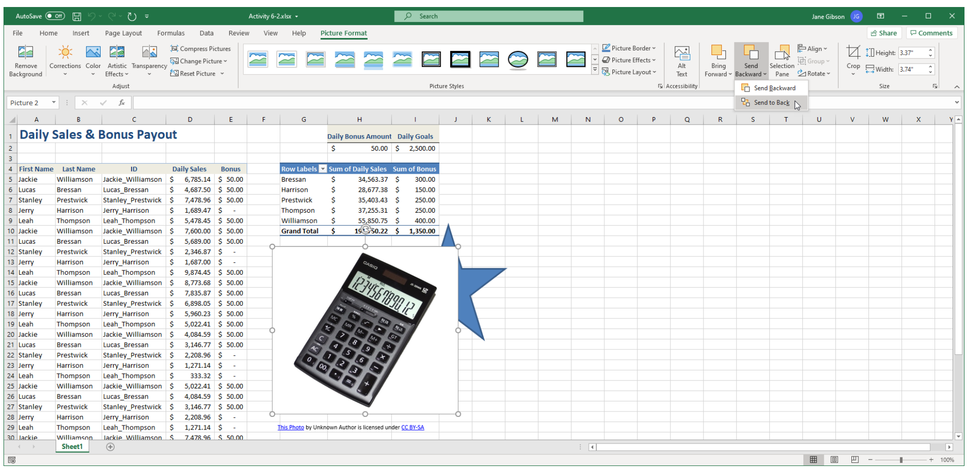
Activity 6-2: Layering and Grouping Shapes

The workbook that you have been working on includes multiple shapes. You would like to arrange how these objects are layered, as well as group them together.

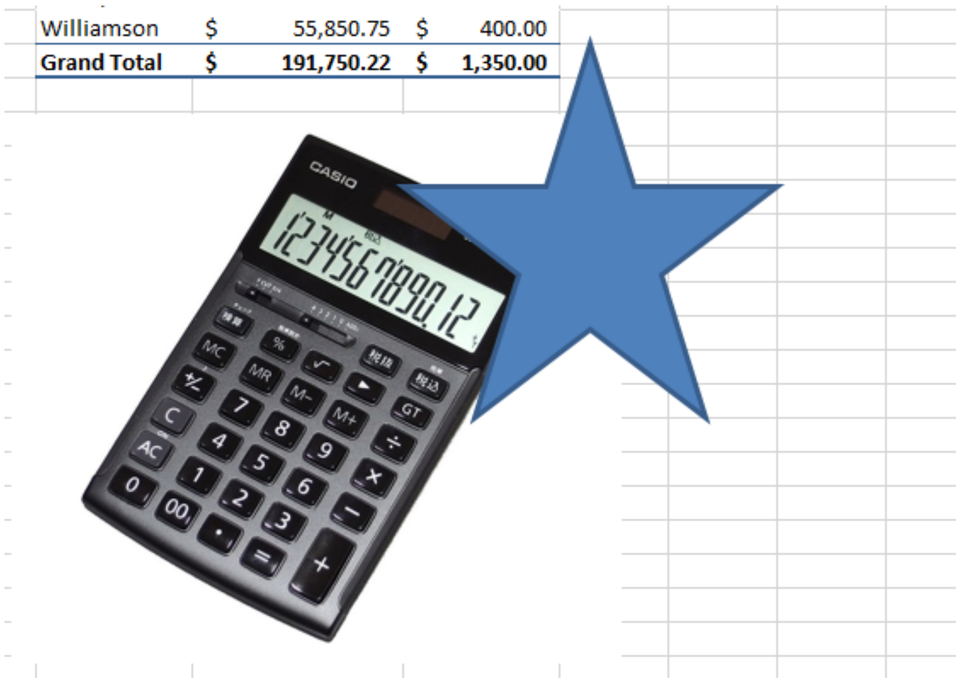
1. To begin, open Activity 6-2 from your Exercise Files folder:



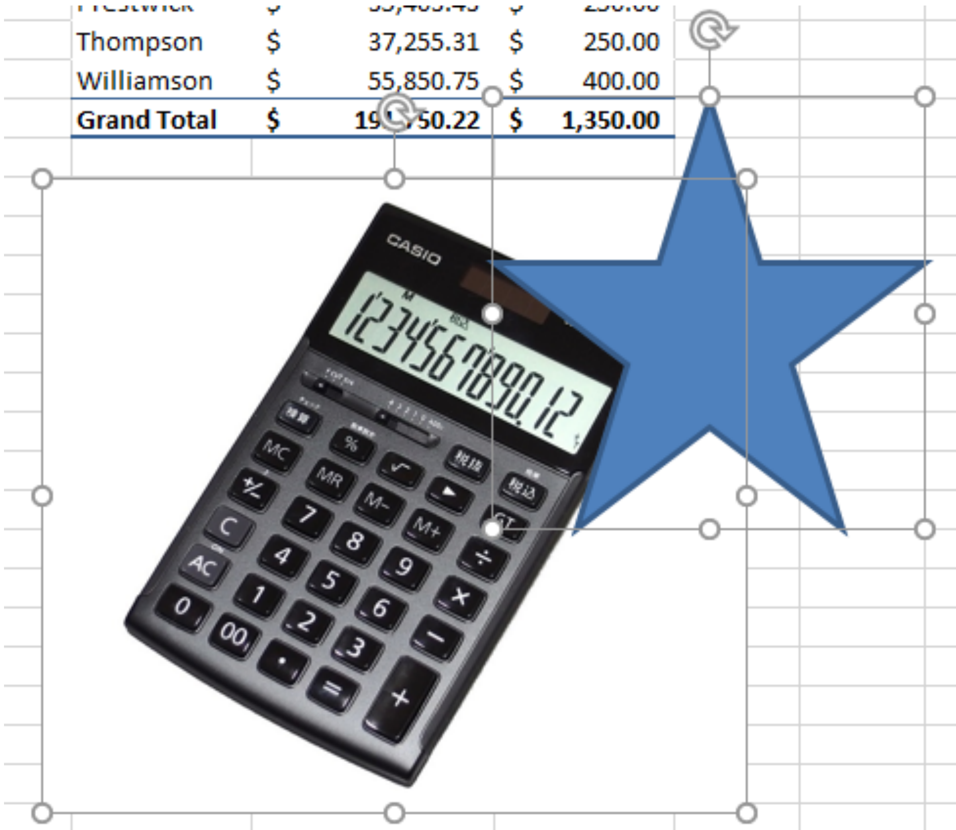
2. First, you need to move the star shape so that it appears in front of the calculator drawing. Click to **select the calculator image** and then click **Picture Format → Send Backward → Send to Back**:



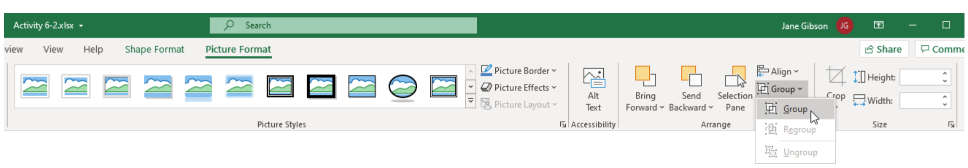
3. The star shape layer now appears above the calculator drawing:



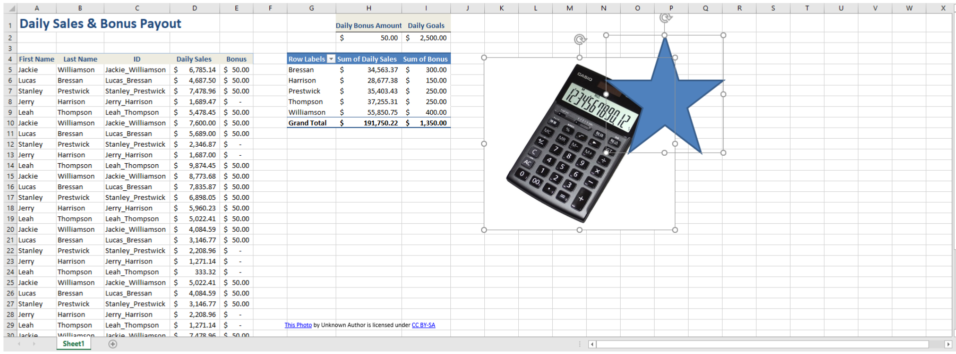
4. While **holding down the Ctrl key**, click to select both the **calculator** drawing and the **star** shape:



5. Click **Picture Format → Group → Group:**



6. The two graphical objects are now grouped together. **Click and drag this group** so that it is placed to the right of the table:



7. Save the current workbook as Activity 6-2 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC C: Incorporate SmartArt

SmartArt combines text-based information with graphics to create a more appearance-driven look. Using Excel's tools, you will be able to create SmartArt that can be used enhance the presentation of your text-based information. During this topic, you will learn how to insert SmartArt into your workbooks, and how to customize it.

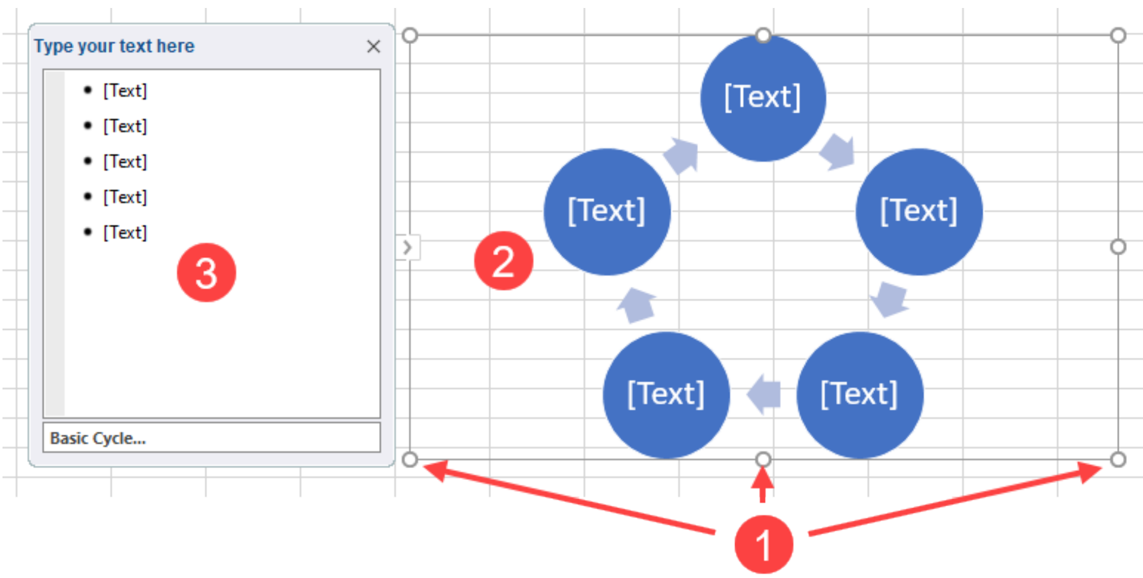
Topic Objectives

In this session, you will learn:

- About SmartArt graphics
- About the Choose a SmartArt Graphic dialog box
- About the Text pane

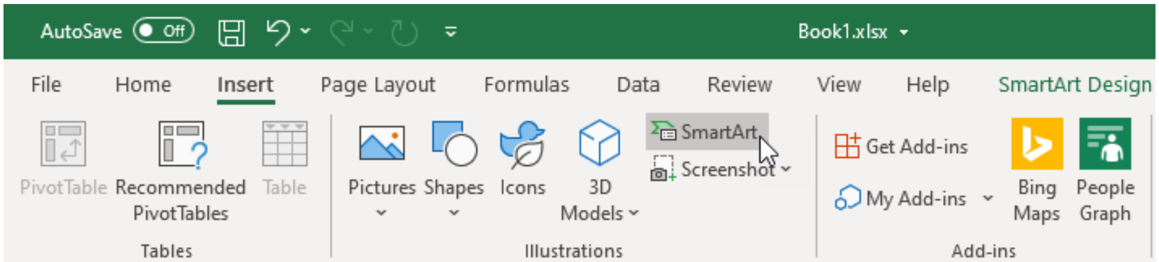
About SmartArt

SmartArt graphics are used to visually represent text-based content. A great example of this is a flowchart or hierarchy diagram. While you can describe these things, it is much more intuitive to the reader to see a graphic that describes and separates each step. Just like other graphical objects, SmartArt graphics are individual objects on a worksheet that can be moved and modified as group when needed. Some of these changes are made using the **sizing handles (1)**. The **Text Pane (3)** allows you to quickly add text. This pane is toggled by clicking the **arrow button (2)** that appears on the left side of a SmartArt object:

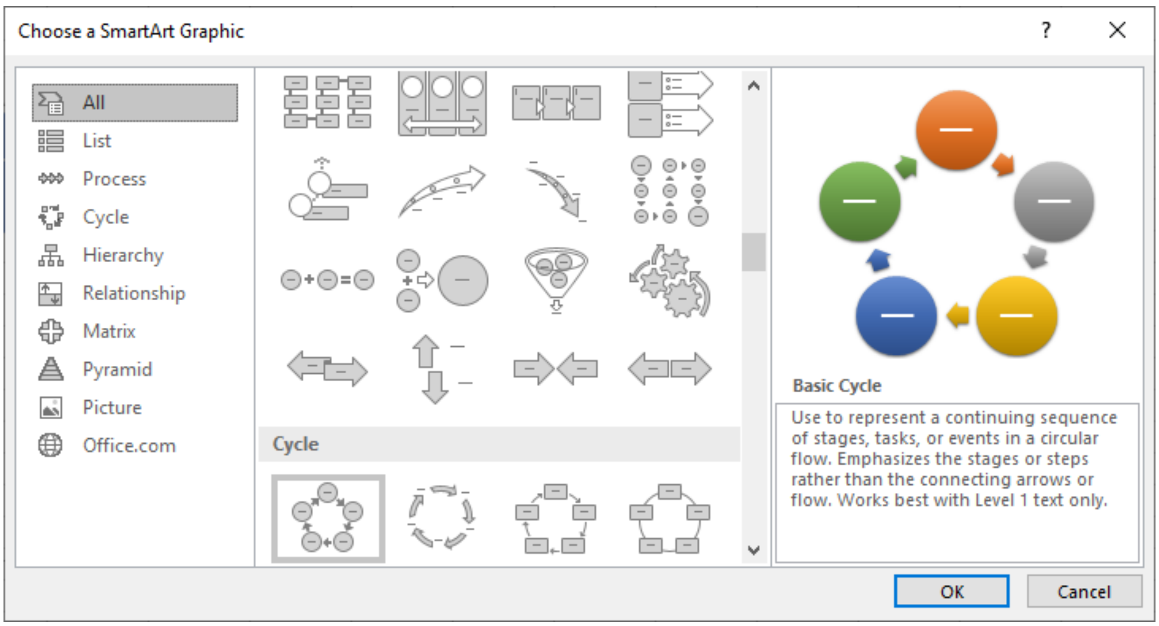


The Choose a SmartArt Graphic Dialog Box

To insert SmartArt into a worksheet, click **Insert → SmartArt**:



This action displays the **Choose a SmartArt Graphic** dialog box:



The Choose a SmartArt Graphic dialog box is divided into several categories of graphics, each of which is displayed in a panel on the left. Here is an overview of each of these categories.

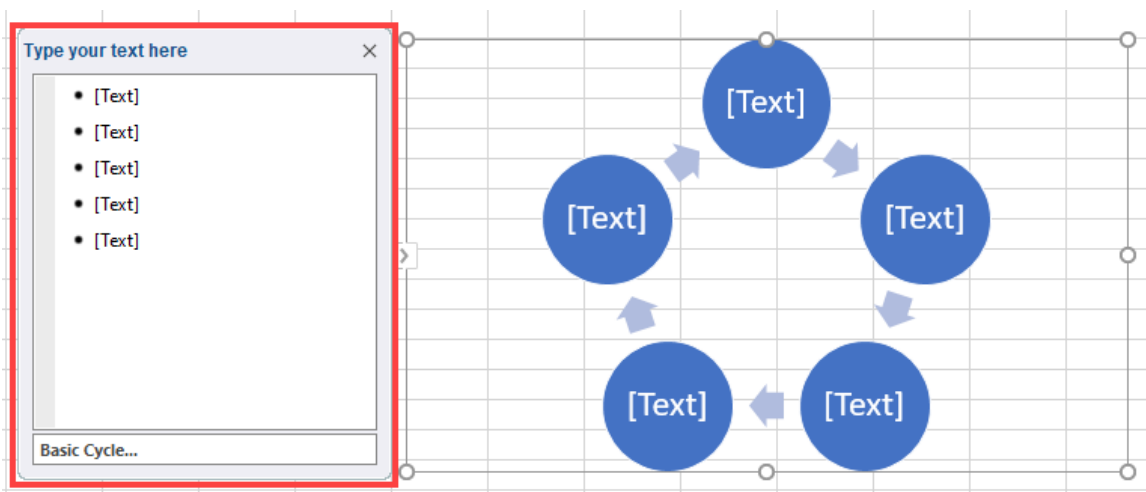
- The **List category** is used to create bulleted lists with some visual flair
- The **Process category** is used to illustrate information in sequential order, such as a series of steps to complete a task
- The **Cycle category** is intended to illustrate continuous processes
- The **Hierarchy category** will display the steps in a process or the people in an organizational chart

- The **Relationship category** is used to show how elements can connect to each other
- The **Matrix category** is used to show how elements in a system relate to it
- The **Pyramid category** is used to create diagrams that display how elements of varying importance, size, or power relate proportionally to each other
- The **Picture category** is used to create diagrams that display content using a combination of text and graphics
- The **Office.com category** displays additional layouts that are available on Office.com.

Clicking on these categories changes which type of SmartArt layouts are displayed in the middle pane. Clicking the thumbnail for a SmartArt graphic displays a preview for that graphic as well as a brief description for it. With the thumbnail still selected, click **OK** to insert this graphic.

About the Text Pane

When you first insert SmartArt into a worksheet, the **Text** pane is displayed beside it:



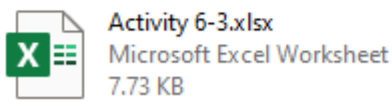
Using this pane, you are able to enter text into the SmartArt graphic. While you are still able to enter text directly into the graphic by clicking on the placeholder text and typing over it, the Text pane offers broader control.

For example, if you are working with bulleted lists, the Text pane gives you a clear indication where you are inserting text in relation to the other bullet points. Additionally, because each bullet point represents a graphic, adding new graphics is usually as simple as adding another bullet point inside the Text pane. (However, note that not all SmartArt graphics work this way. Depending upon exactly which SmartArt graphic that you are working with, adding new bullet points may just add a bullet point to the text within the shape.)

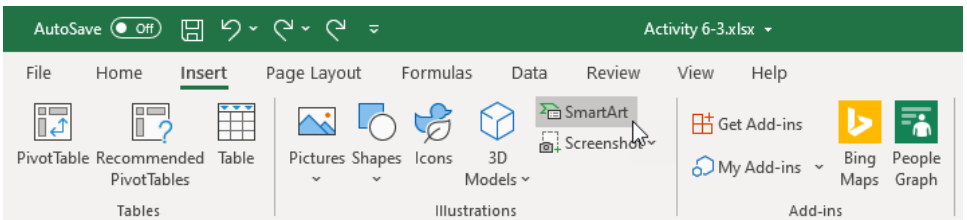
Activity 6-3: Incorporating SmartArt

You need to create a simple SmartArt graphic that lists all of the sales associates in your department.

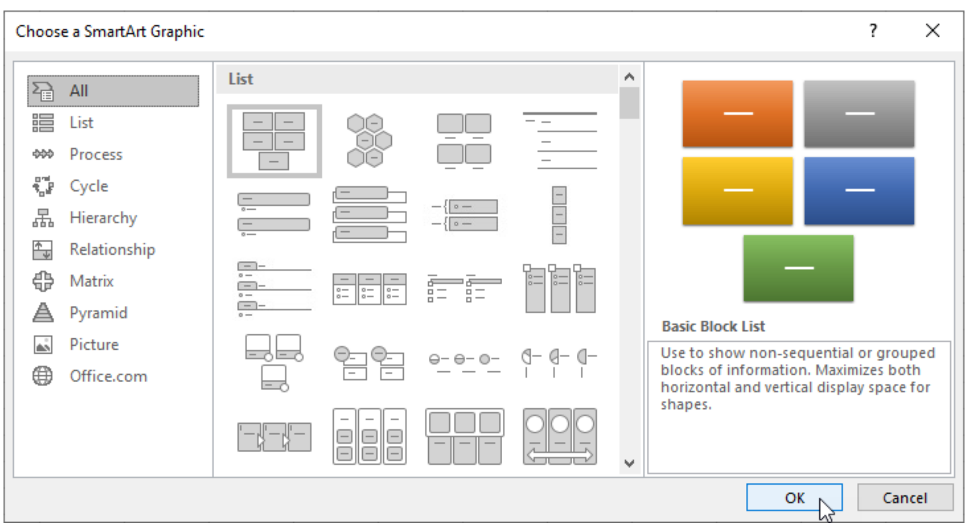
1. To begin, open Activity 6-3 from your Exercise Files folder:



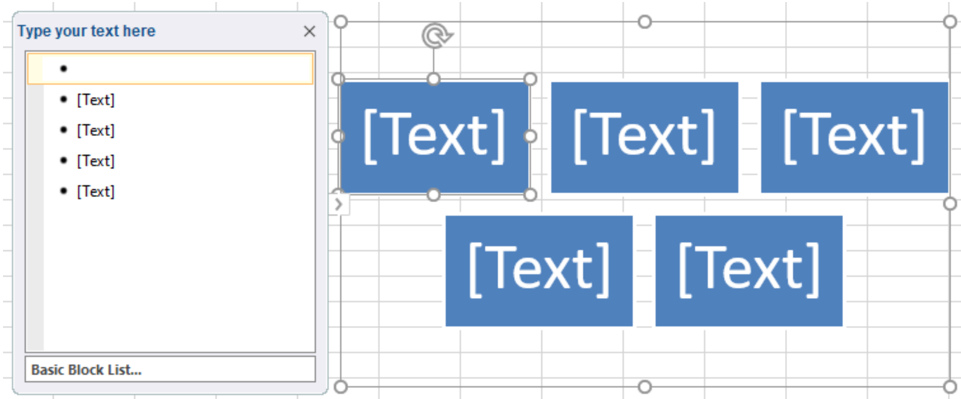
2. Click **Insert → SmartArt**:



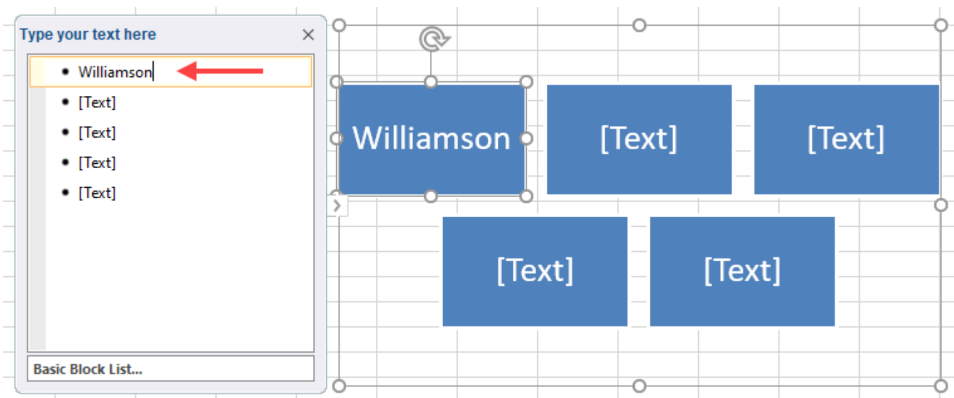
3. The Choose a SmartArt Graphic dialog box is now displayed. Ensure that either the **All or List** category has been chosen and then ensure that the **Basic Block List** graphic has been selected. Click **OK**:



4. The SmartArt graphic is now placed on the current worksheet:

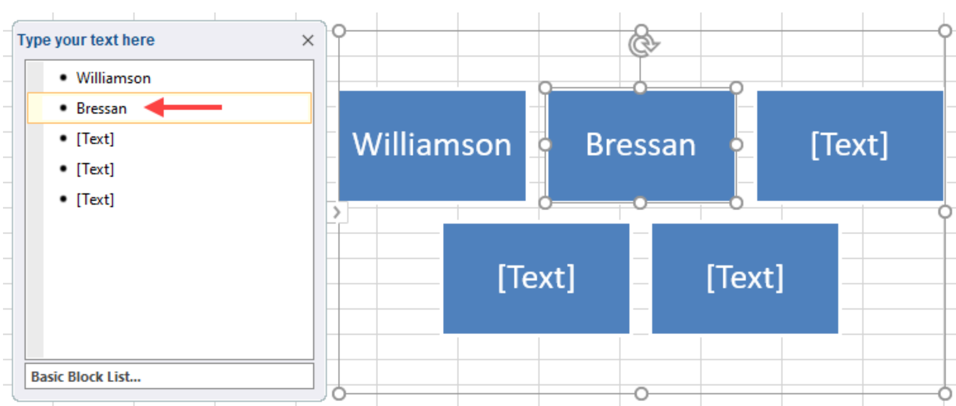


5. Inside the Text pane, type "**Williamson**":

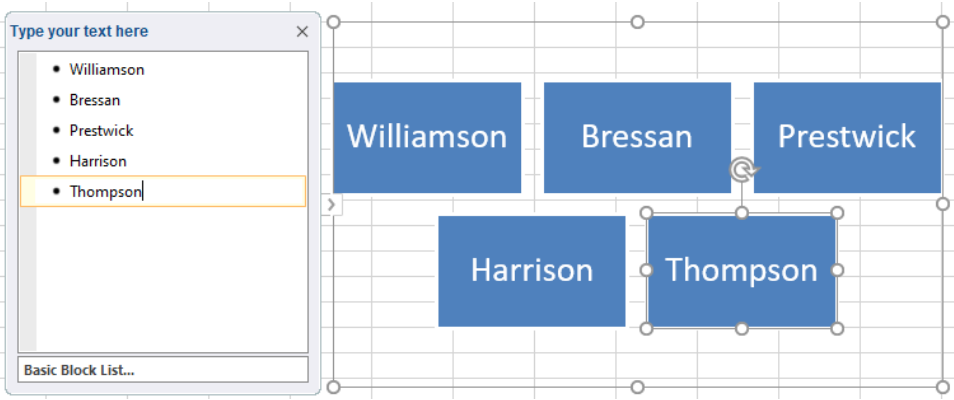


(If you do not see the Text pane, click **SmartArt Design → Text Pane.**)

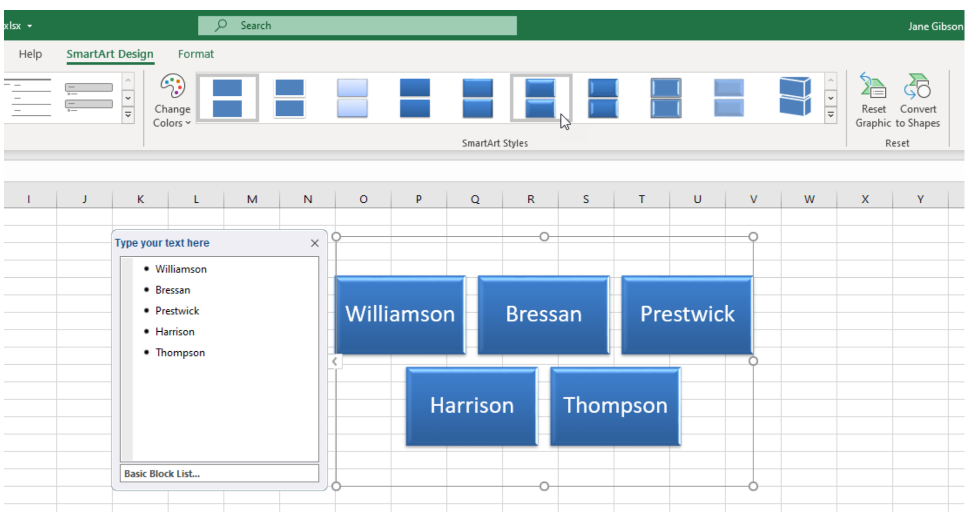
6. Click to **select the next bullet point** in the list. This time type "**Bressan**":



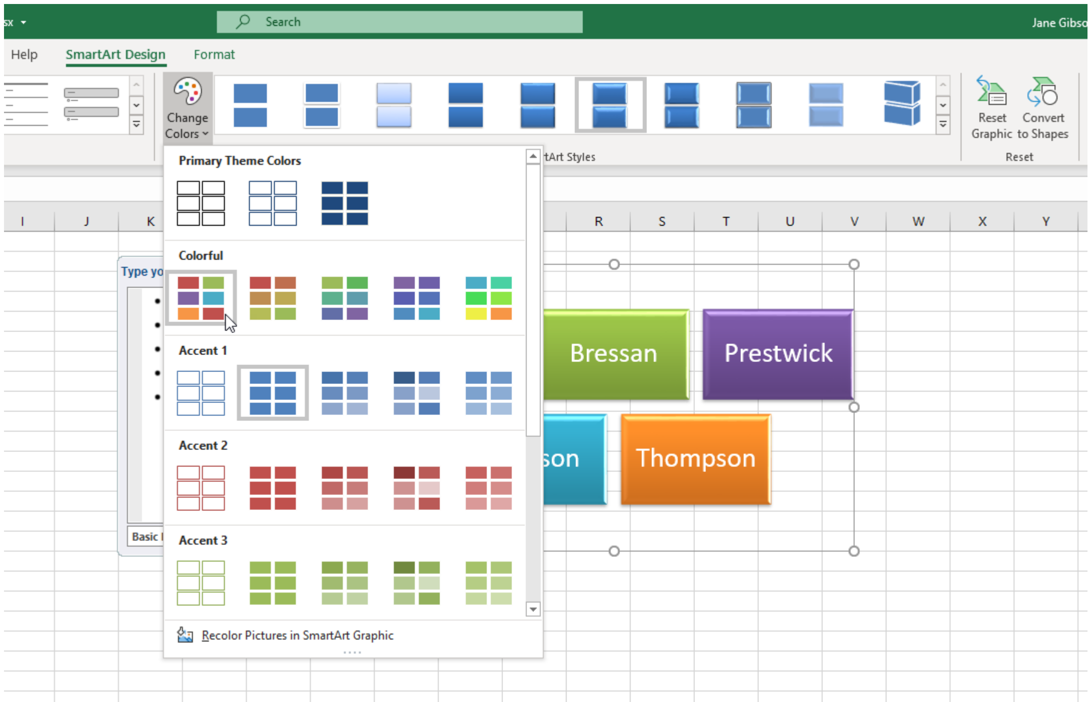
7. Repeat the above steps until the Text pane looks like the example shown here:



8. With the SmartArt still selected, click **SmartArt Design** contextual tab, then hover your mouse over the various styles in the SmartArt Styles group. Click the **Polished** style:



9. Now click **SmartArt Design → Change Colors → Colorful – Accent Colors**:



10. Save the current workbook as Activity 6-3 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

This lesson showed how graphical objects can be used to enhance the appearance of your workbooks. You learned how to insert different types of graphical objects into worksheets as well as how to modify them to suit your needs. Additionally, you learned about SmartArt, how it works, and how to add it to a worksheet.

Review Questions

1. **What are the six types of graphical objects that can be inserted into Excel workbooks?**

2. **Are shapes considered pictures or drawings?**

3. **How do you open the Selection pane?**

4. **What are SmartArt graphics used for?**

5. **How do you open the Choose a SmartArt Graphic dialog box?**

LESSON 7: ENHANCING WORKBOOKS

Lesson Objectives

In this lesson you will learn how to:

- Customize workbooks
- Manage themes
- Protect files
- Prepare a workbook for audiences

TOPIC A: Customize Workbooks

Your workbooks can be customized in a number of different ways. In this topic, we will focus on customization through the addition of notes, comments, watermarks, and background pictures.

Topic Objectives

In this session, you will learn:

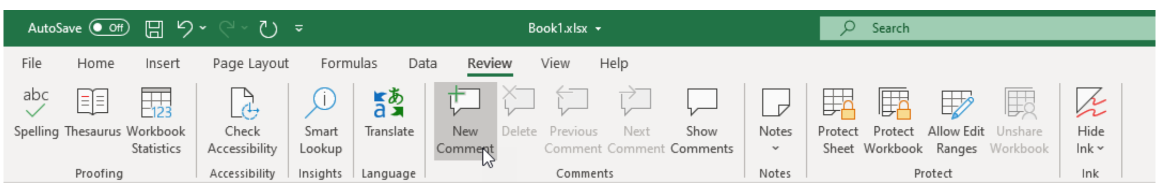
- About notes and comments
- About watermarks
- About background pictures

Notes and Comments

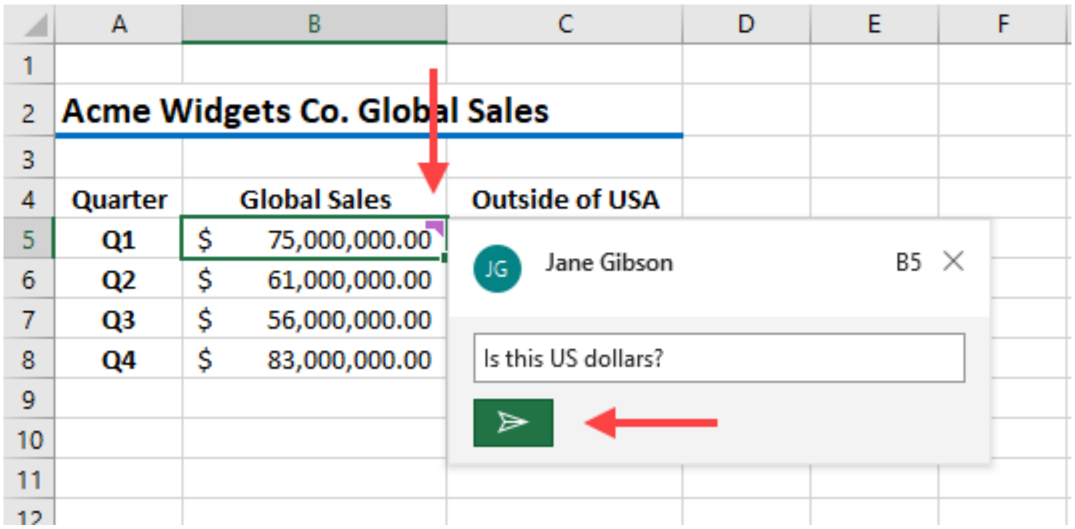
The information and analysis contained in Excel workbooks is often meant to be shared with and used by individuals other than the author. Making sure that the information is clear and easily understood by other users can often be challenging, especially when you are dealing with large amounts of data and often complex analysis. Fortunately, Excel 365 provides two ways to communicate additional information related to a specific cell in a spreadsheet, helping you collaborate and eliminating confusion. **Comments** allow for a threaded conversation about the data with multiple users, and **Notes** allow for making annotations, which are typically used to add additional context to a cell.

Comments

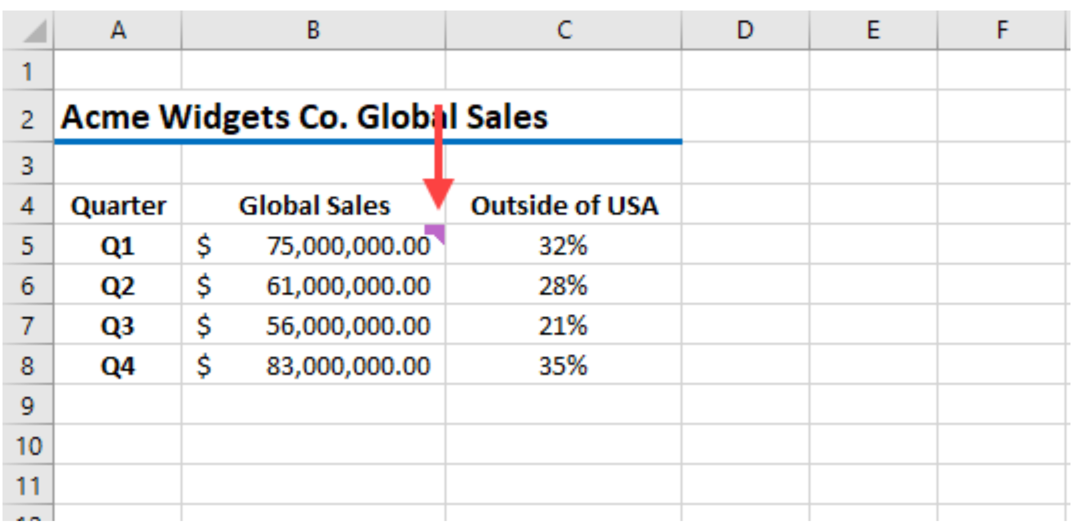
To add a comment, first select the cell to which you would like to add the comment. Next, click **Review → New Comment**:



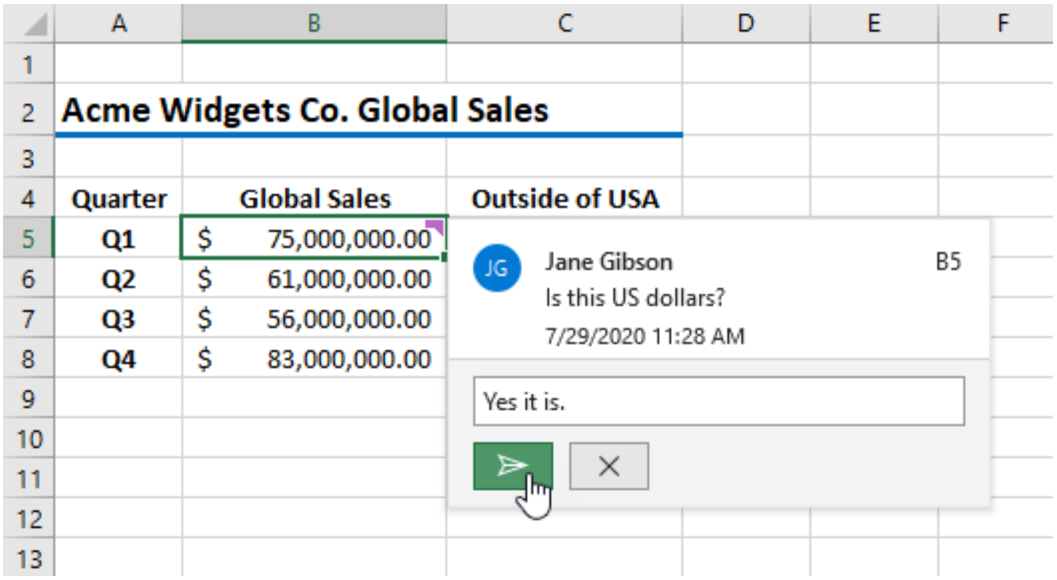
This action creates a new comment dialog box and a violet comment indicator appears in the upper right-hand corner of the currently selected cell. The new comment is labeled with the current user's name and the cell reference. To add text to the comment, type inside the provided text area, then press the **Post** () icon:



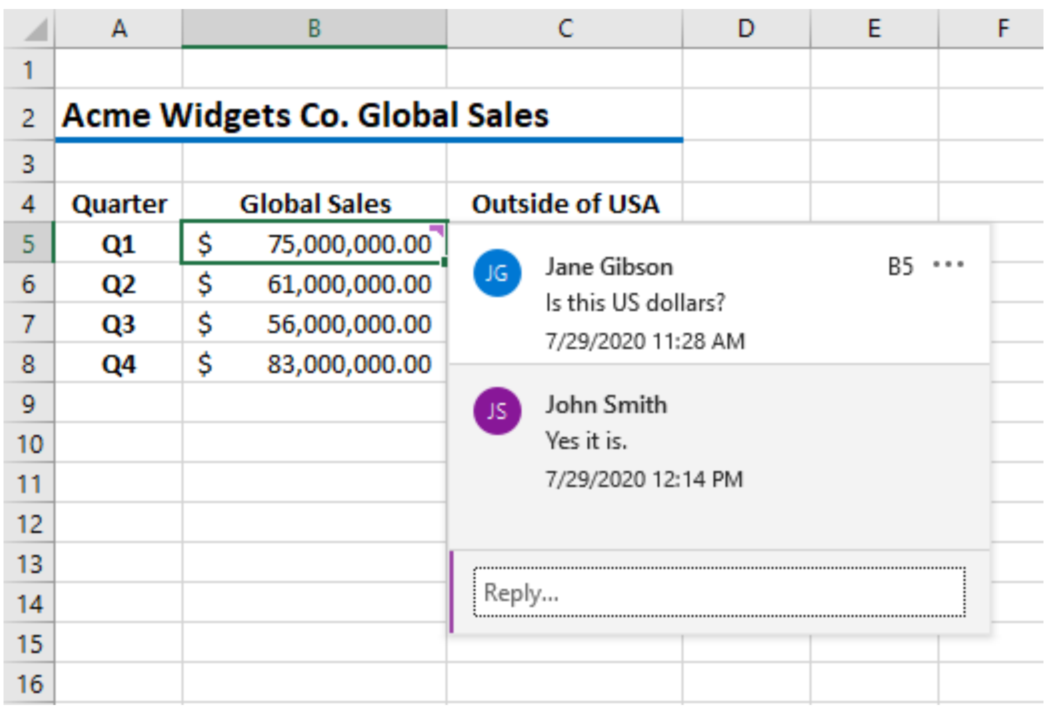
Once you are done, click anywhere outside of the comment dialog box to hide it. The violet comment indicator remains visible:



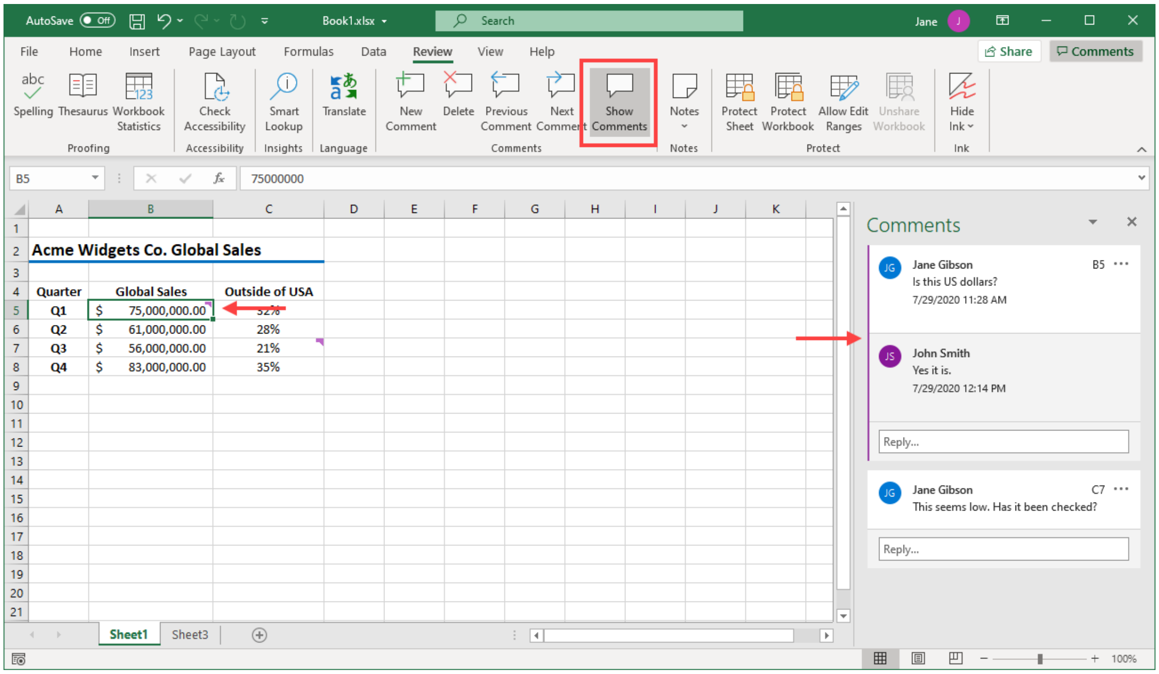
Other users can now respond to the comment by hovering the cursor over the commented cell, selecting the reply field, then typing the comment, and pressing **Post**:



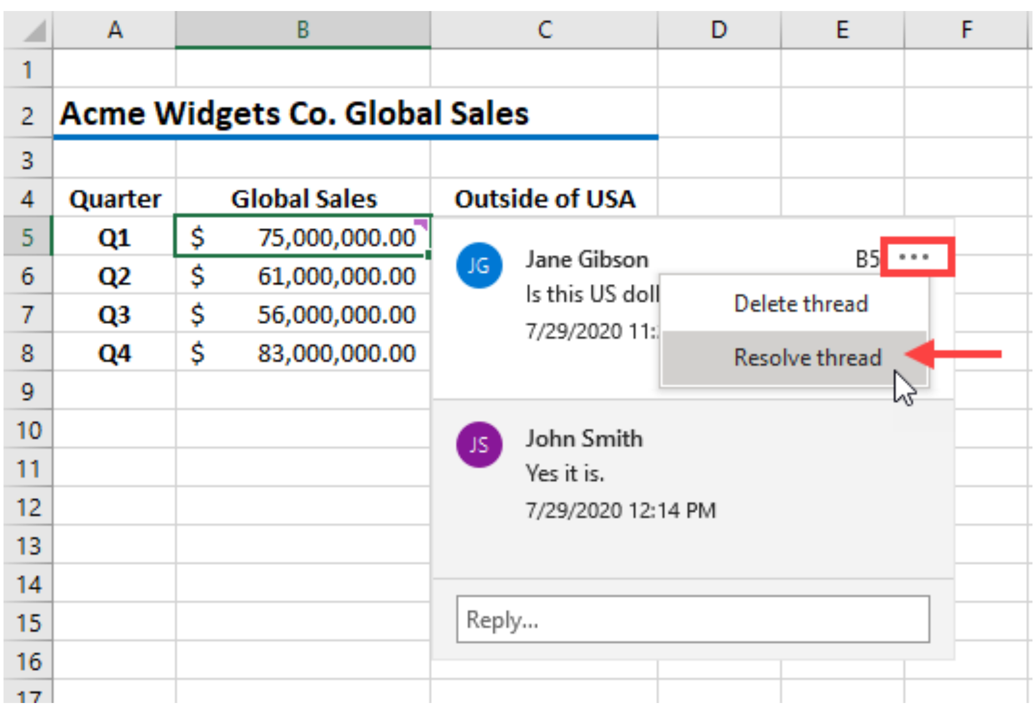
The comment now contains the response, including the user name, and the date and time of the reply:



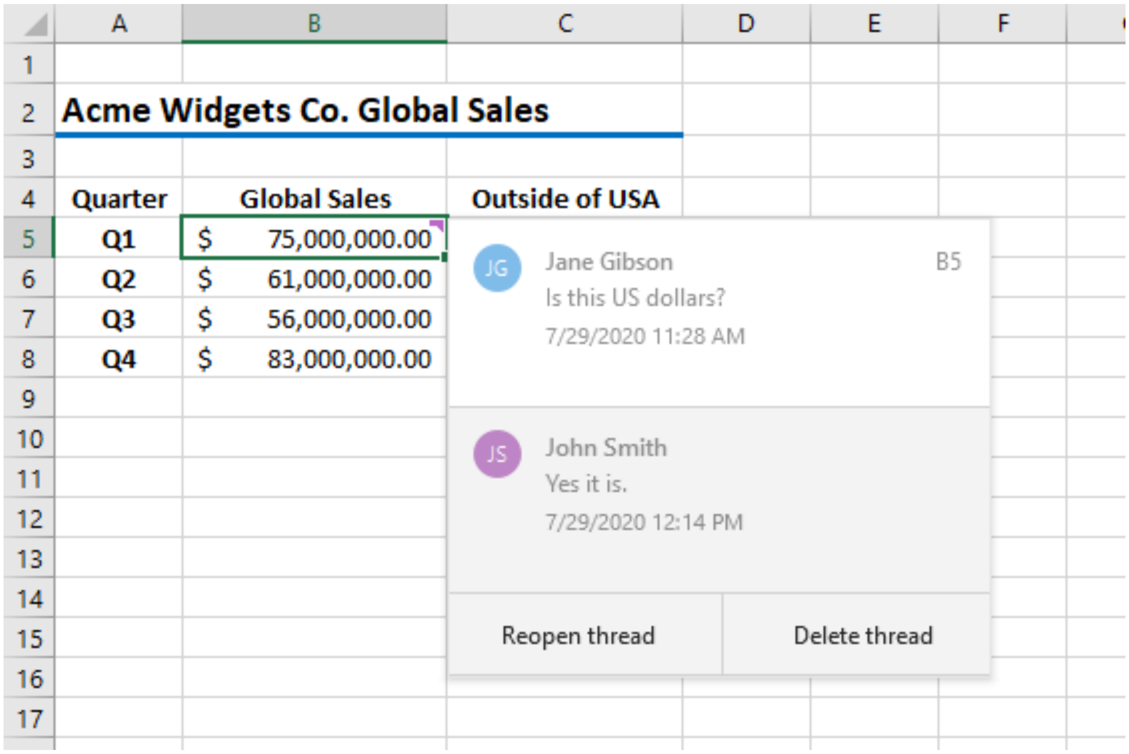
Clicking **Review → Show Comments** opens the Comments task pane on the right side of the worksheet. It displays all of the comment threads in the worksheet. If a cell with a comment is selected, that comment is highlighted by a violet bar to the left of the comment:



To close a conversation, hover over the commented cell, select more actions (**…**), then click **Resolve thread**:



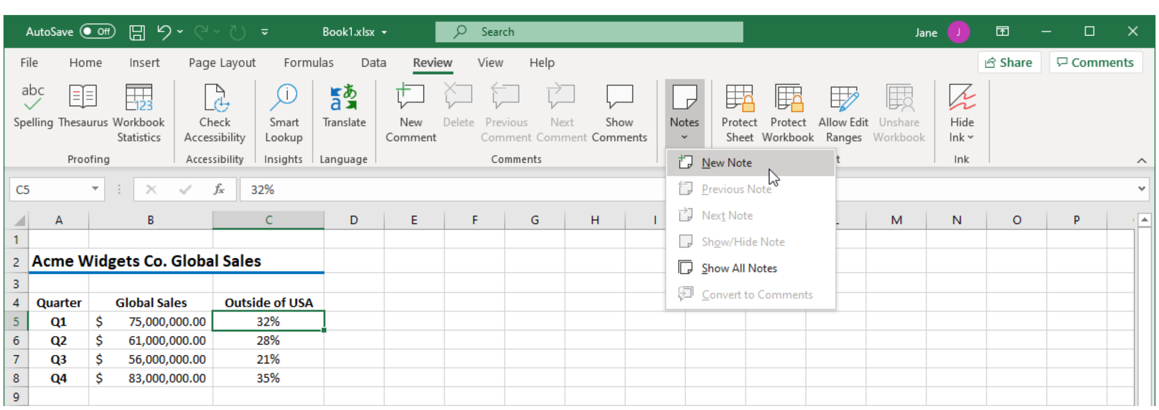
Now, the violet indicator, and all of the comments in the thread, are grayed. You still have the option to either reopen the thread, or delete the thread:



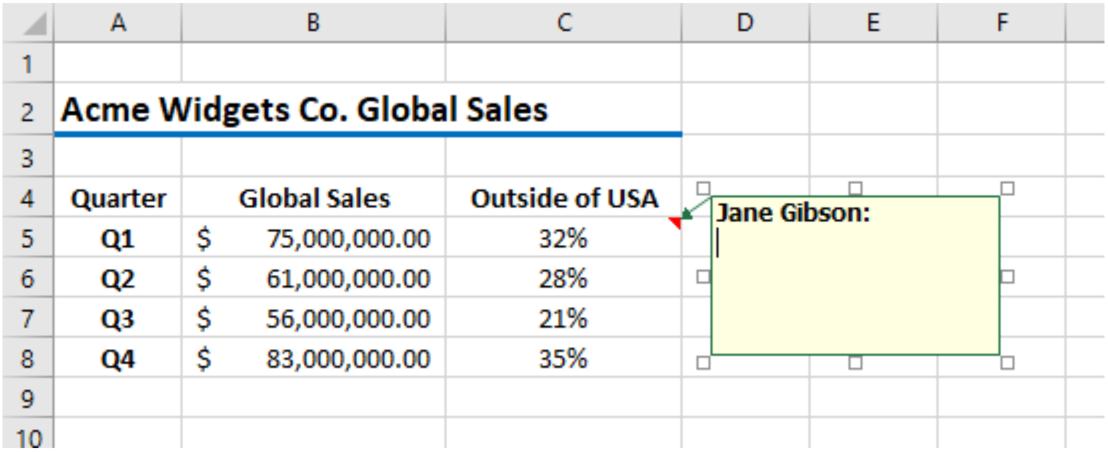
You can also delete a comment by clicking **Review → Delete,** clicking **Delete thread** in the Comments task pane, or by right-clicking the commented cell and selecting Delete Comment.

Notes

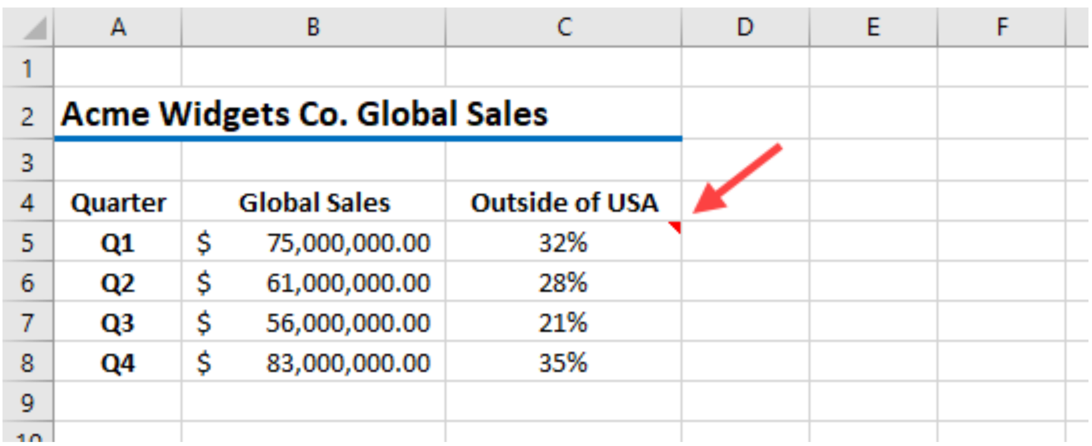
To add a note to a cell, first select the cell, then click **Review → Notes → New Note**:



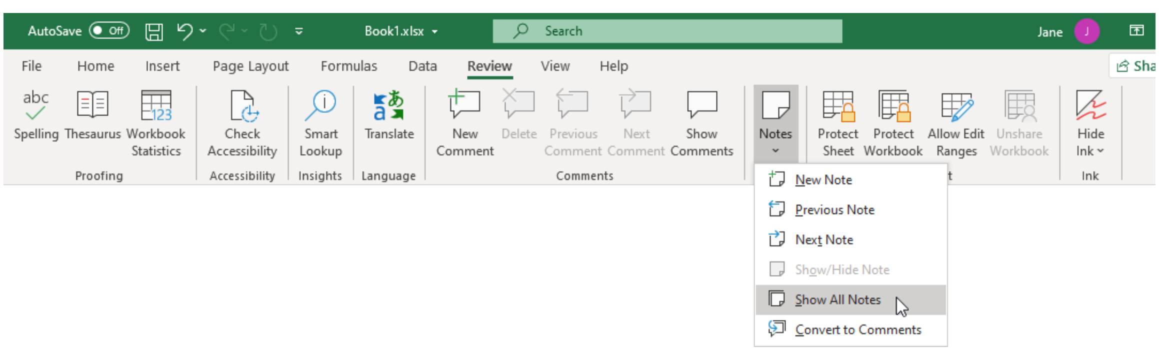
A new note is created, and a red note indicator appears in the upper right-hand corner of the currently selected cell. The note is labeled with the current user's name:



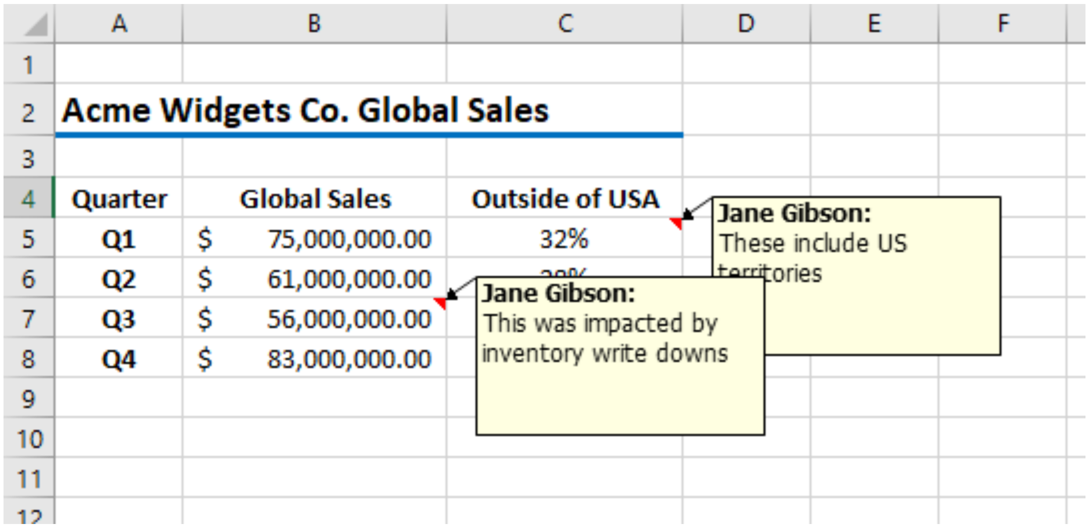
To complete the note, type the desired information, then click outside of the cell. The note is hidden but the red note indicator remains:



To show all notes on a worksheet, click **Review → Notes → Show all Notes**:

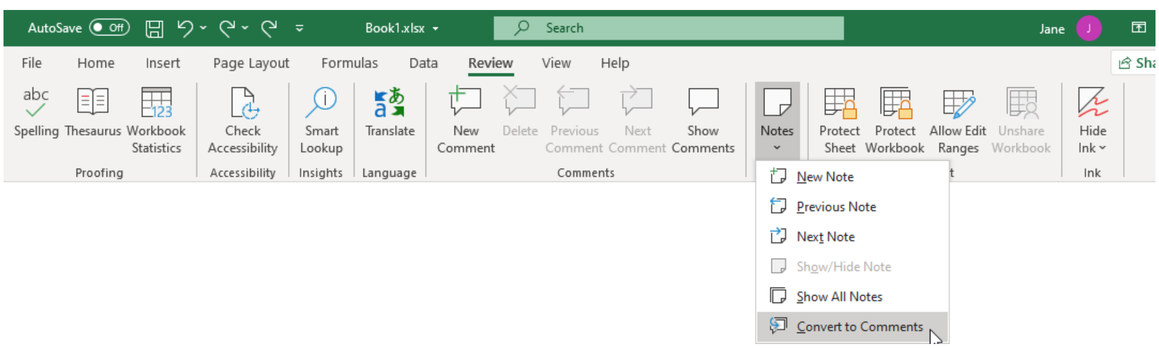


All notes on the worksheet are displayed:

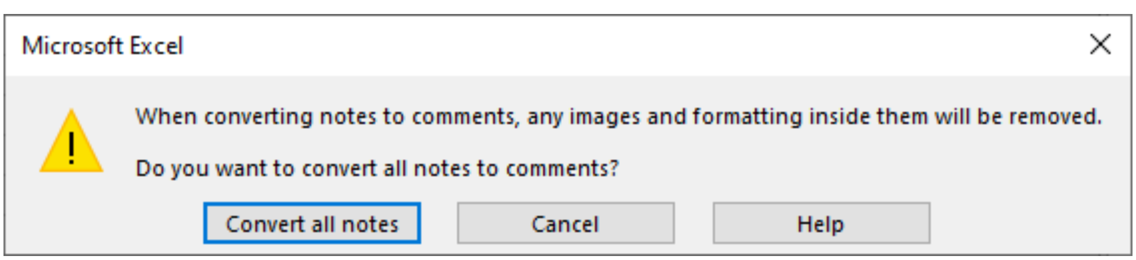


Clicking **Review → Notes → Show all Notes** again hides all notes on the worksheet.

Finally, you can convert all notes to comments by clicking **Review → Notes → Convert to Comments**:

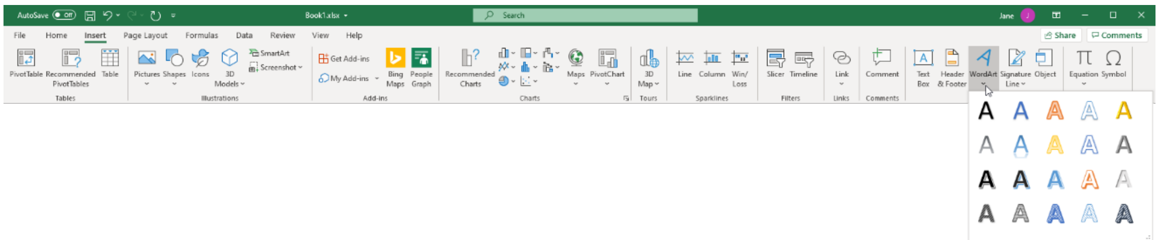


You will receive a warning that converting notes to comments will remove any formatting or images within the notes:



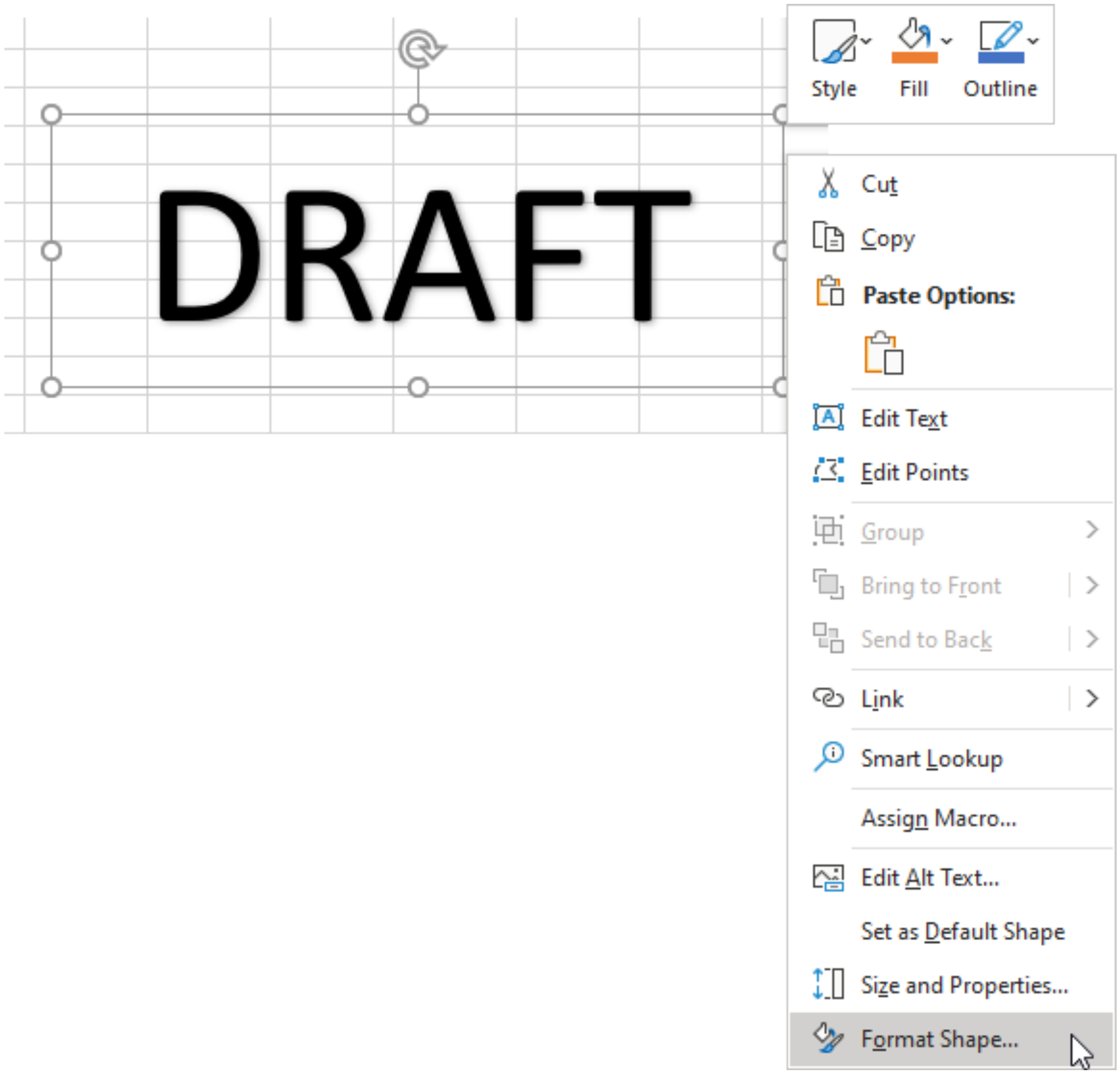
Watermarks

While Excel 365 does not include a direct way to create **watermarks**, there is a way that you can add them, using WordArt. To do this, first insert WordArt by clicking **Insert → WordArt → [WordArt Style]**:

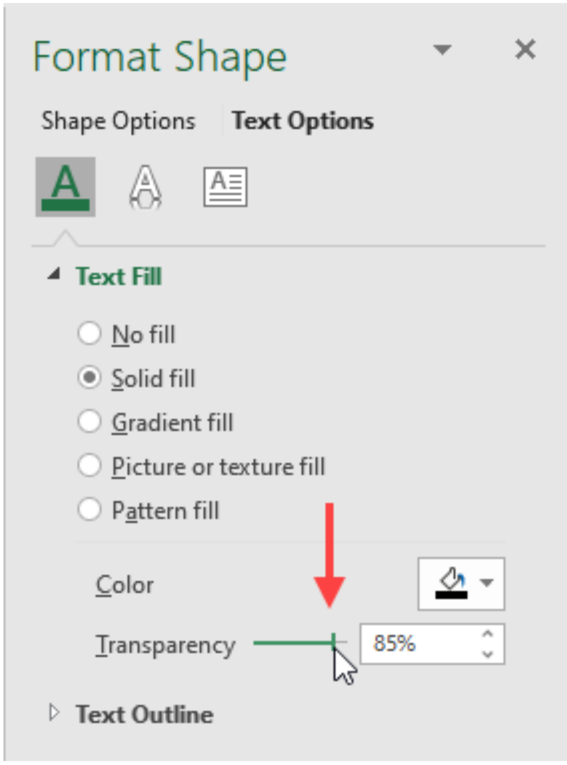


Next, type the text for the watermark:

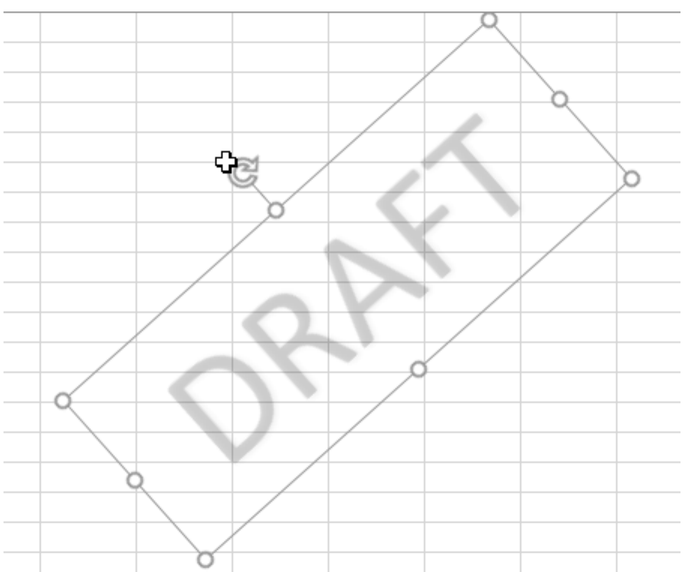
With the WordArt selected, right-click and then click **Format Shape**:



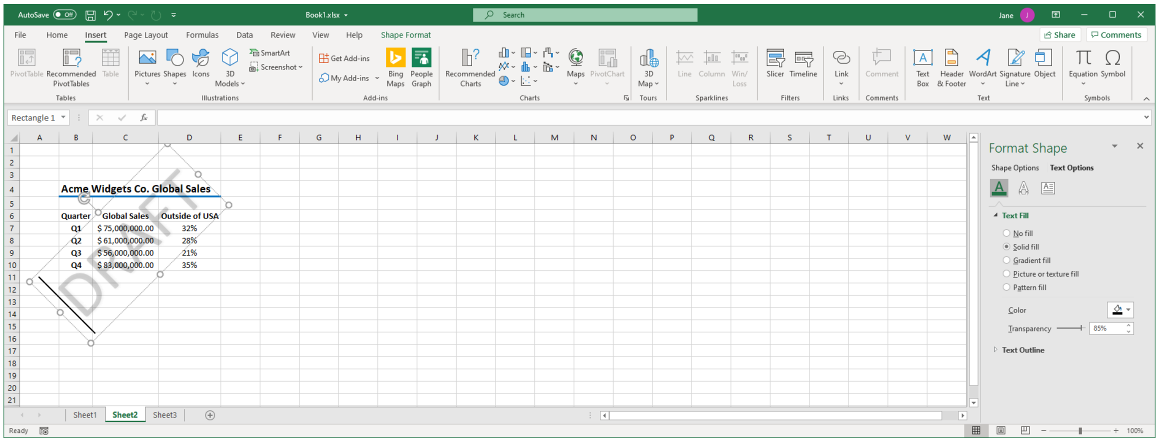
The **Format Shape** task pane opens to the right of the worksheet. In the Text Fill & Text Outline category of the Text Options section, adjust the Transparency slider:



You can also rotate the WordArt Shape by clicking and holding the rotation handle at the top of the shape. Holding Ctrl while doing so will limit the adjustment to preset increments:



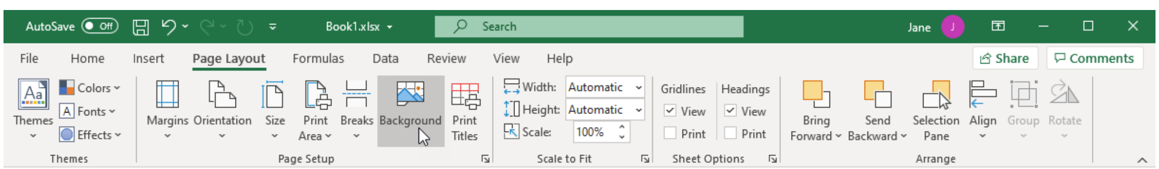
The watermark is now ready, and you can reposition it as needed:



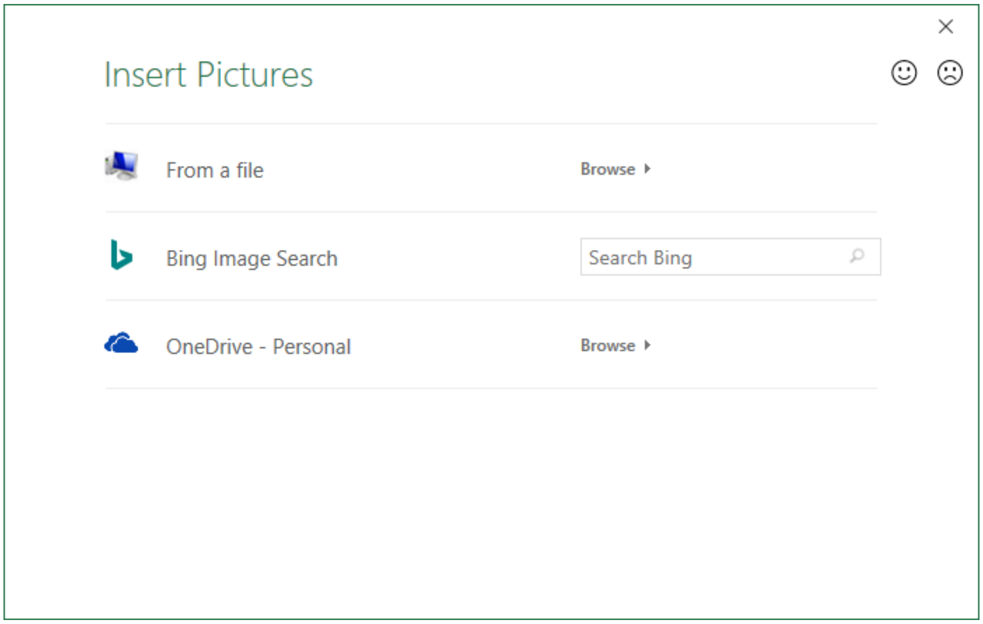
Background Pictures

To add design elements to your workbooks, you have the option to add **background pictures**. These pictures appear entirely in the background of a worksheet without interfering with the contents of the cells.

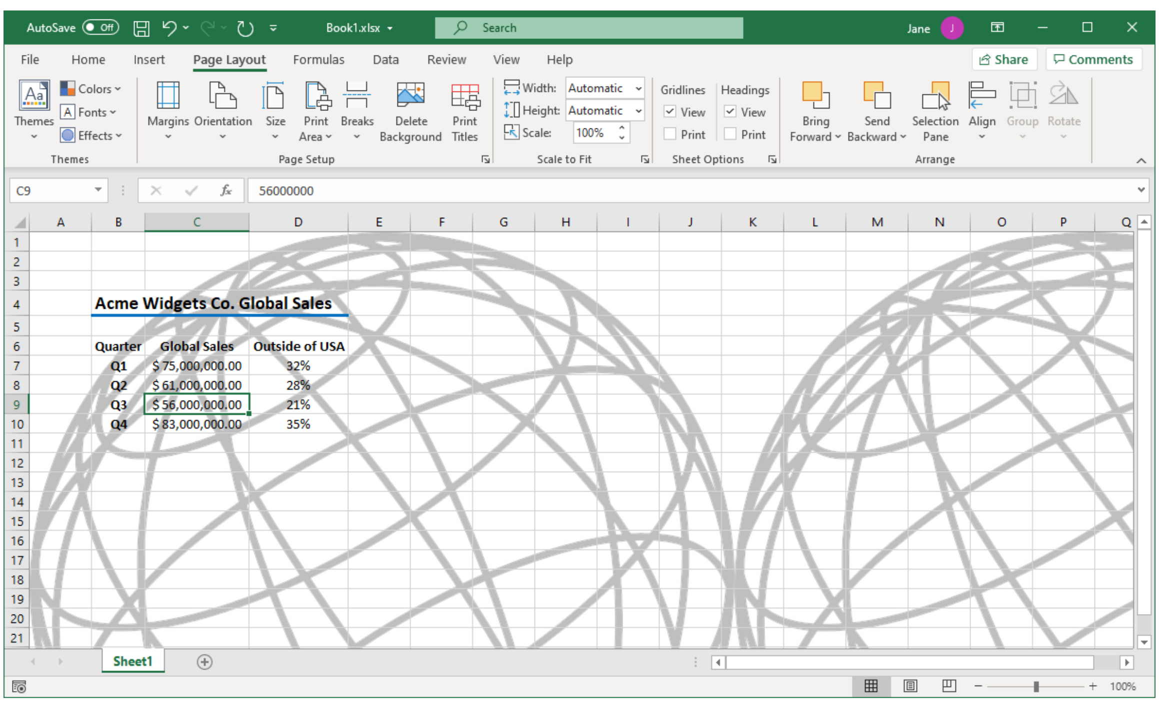
To insert a background picture, click **Page Layout → Background**:



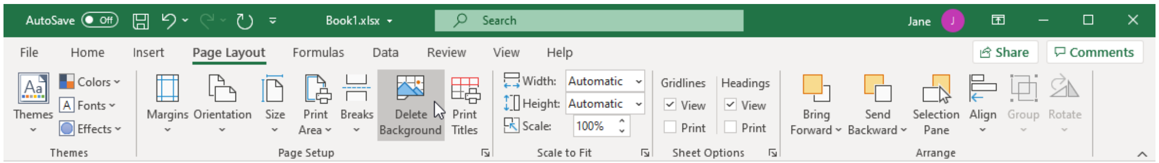
This action displays the **Insert Pictures** dialog box. Using the options provided here, you can insert a picture that resides on your computer or local network, or a picture from a web search, your OneDrive storage, or even Facebook and Flickr if you are using a Microsoft account:



Once you find and select a background picture, it is added to the current worksheet. If the image does not span the entire dimensions of the worksheet, it is tiled automatically:



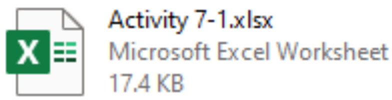
To remove a background image, click **Page Layout → Delete Background**:



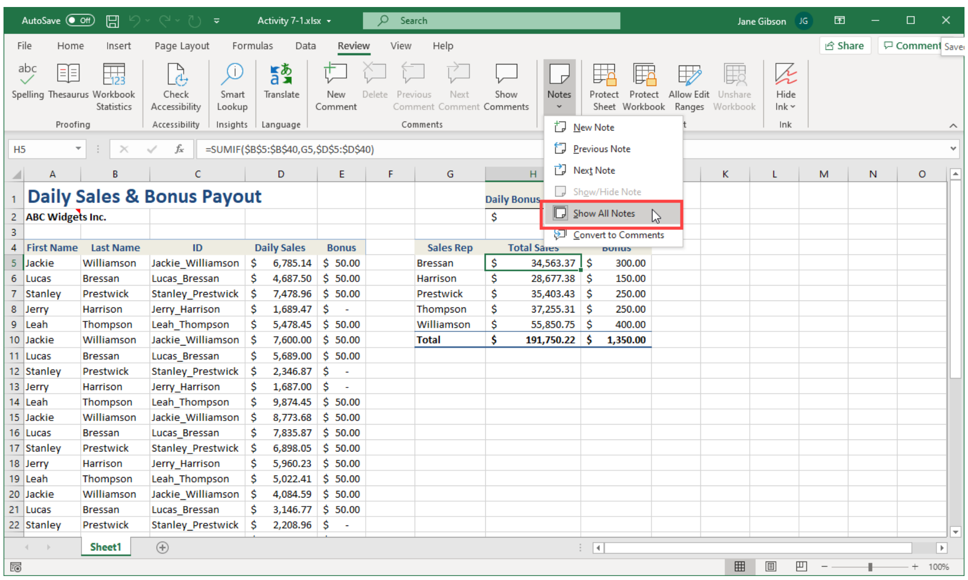
Activity 7-1: Customizing Workbooks

Your supervisor has sent you a workbook with notes indicating his requests.

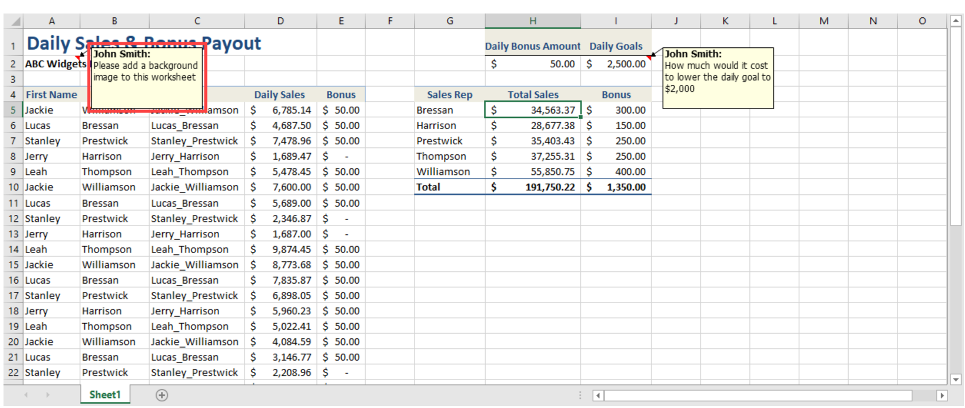
1. To begin, open Activity 7-1 from your Exercise Files folder:



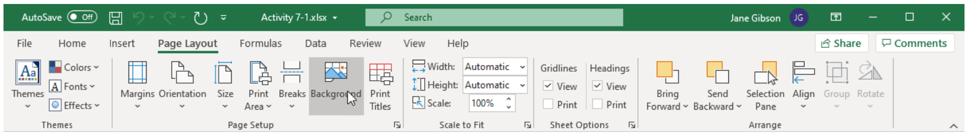
2. First, you would like to view all the notes on the worksheet. Click **Review → Notes → Show All Notes**:



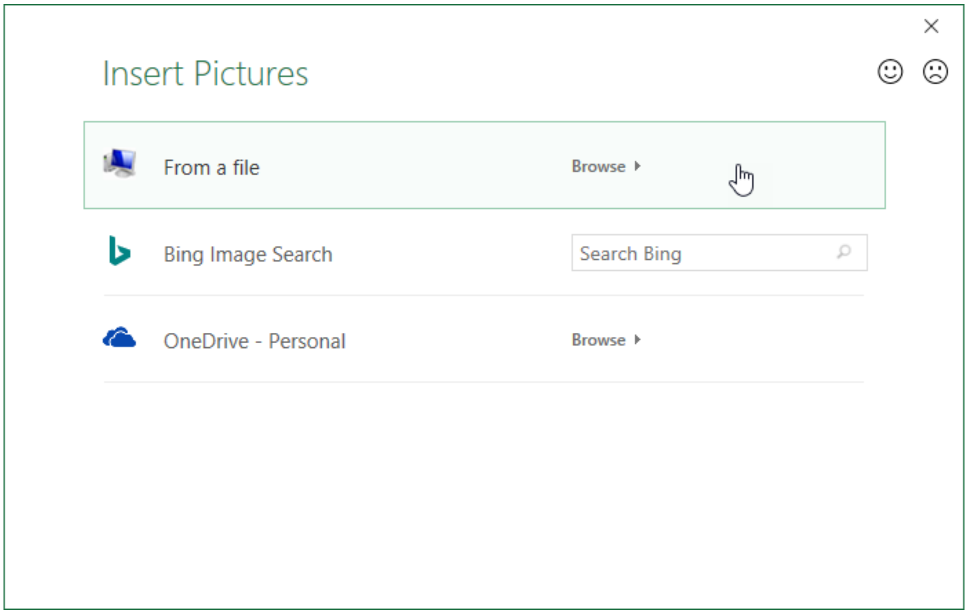
3. There are two notes from John Smith. The first, in cell A2, asks you to add a background to the worksheet:



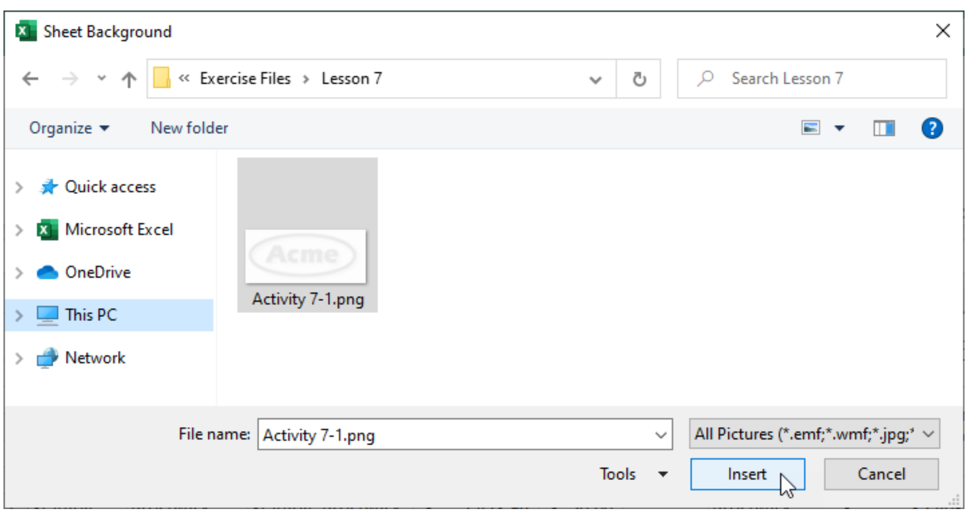
4. Click **Page Layout →Background**:



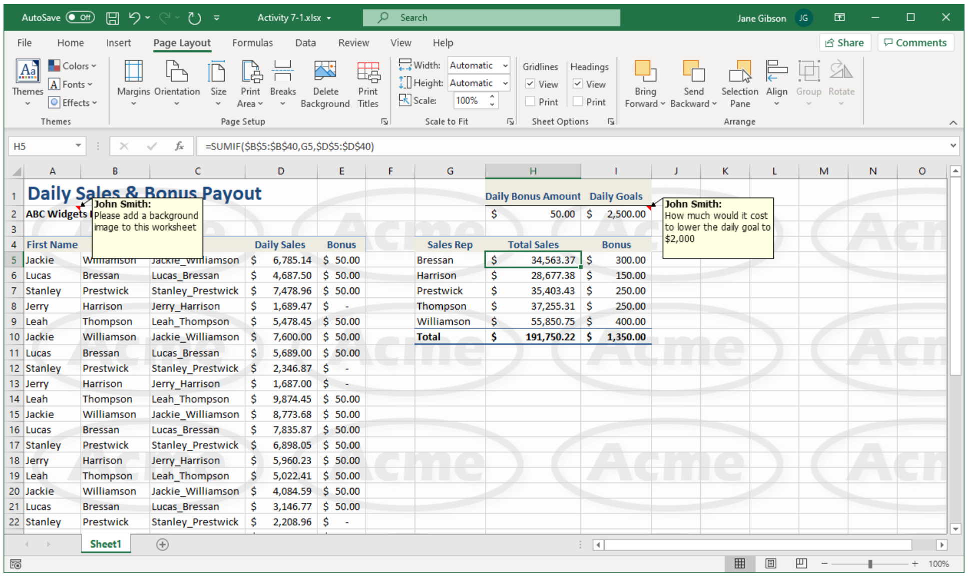
5. The Insert Pictures dialog box opens. Click **From a file**:



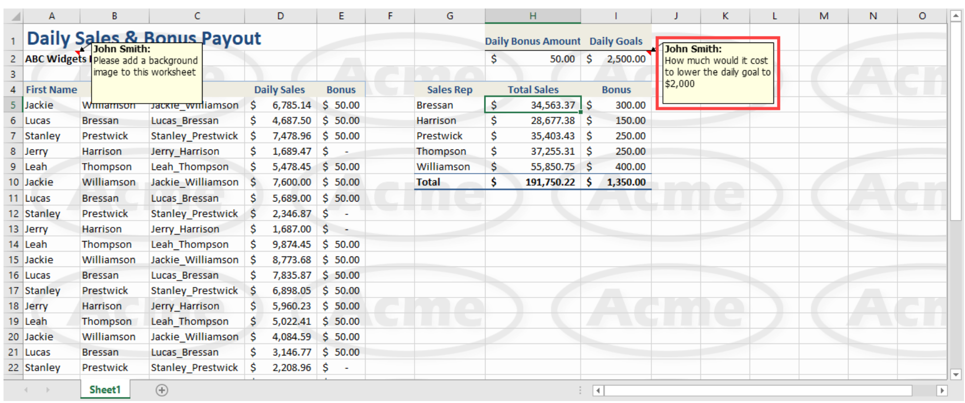
6. Browse to your exercise folder and select **Activity 7-1.png**, then click **Insert**:



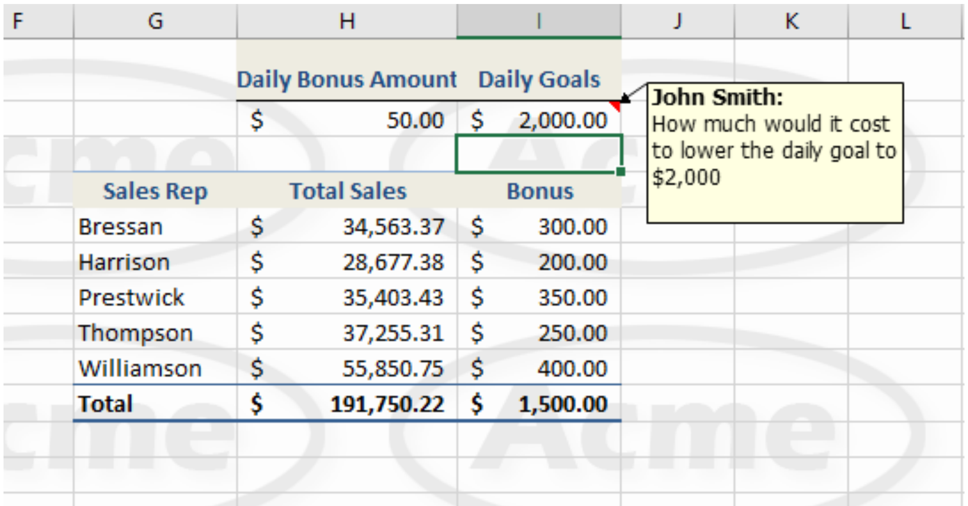
7. The background picture is added to the worksheet:



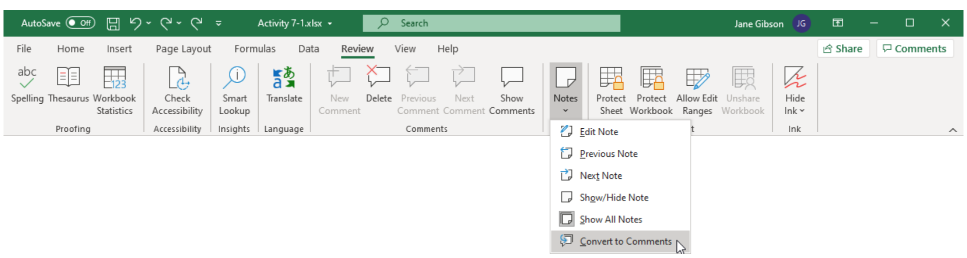
8. The second note asks how much it would cost to lower the daily sales goal to $2,000:



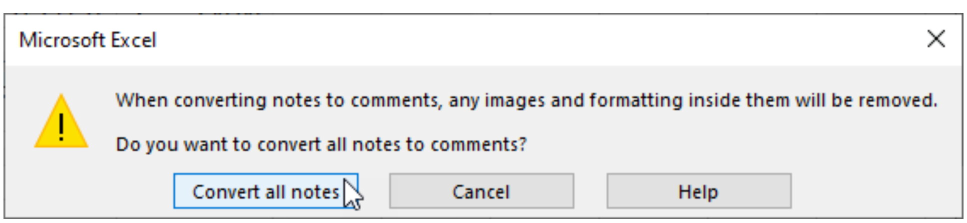
9. First note that the total of bonuses in cell I10 are $1,350. Now click cell **I2** and type "**2000**" to change the daily goals value, then press **Enter**:



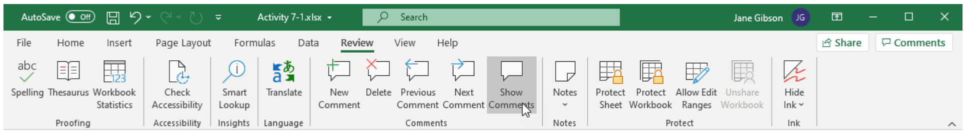
10. The calculated total bonuses in cell I10 is now $1,500. It would cost $150 to lower the daily sales goal. Press **Ctrl + Z** to undo the change made to cell I2, then click **Review → Notes → Convert to Comments** so you can add your comments to the notes:



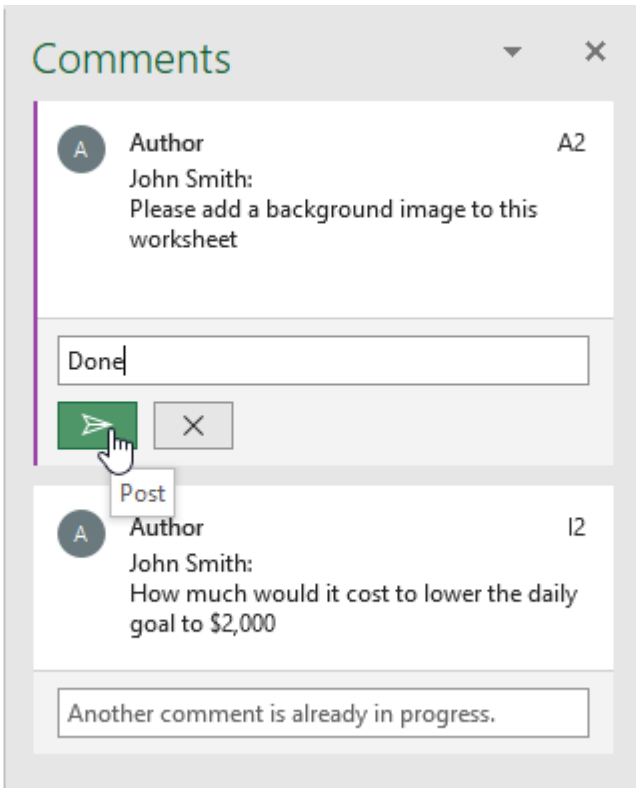
11. In the Excel alert dialog box, click **Convert all notes**:



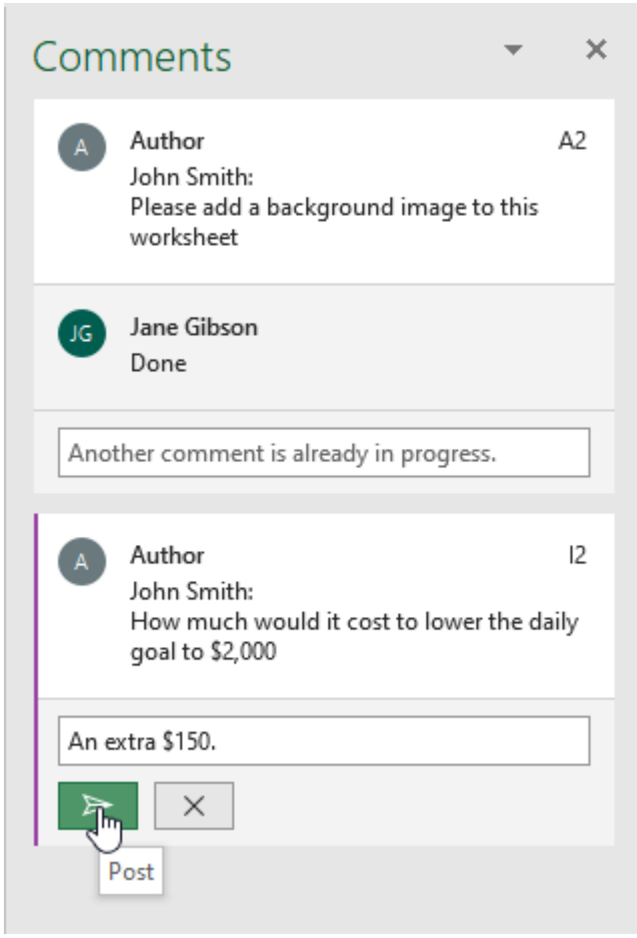
12. Now click **Review → Show Comments**:



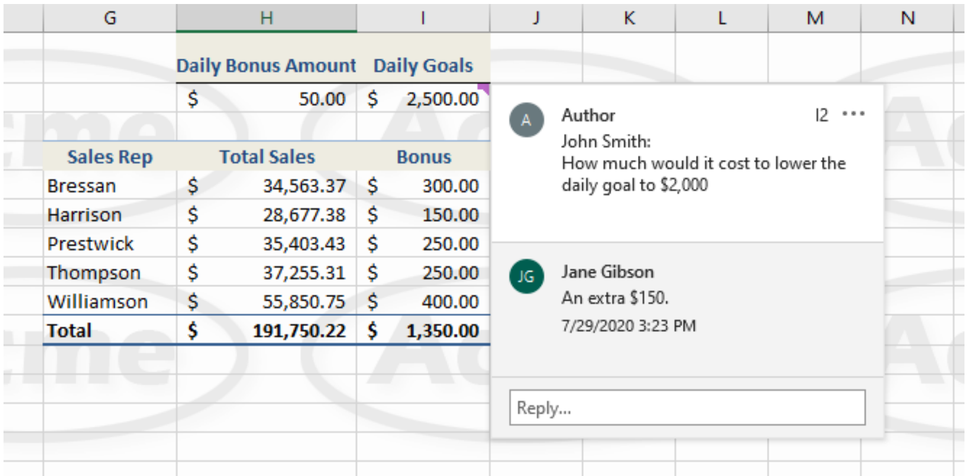
13. In the Comments task pane, in the first comment, in the reply text box, type "**Done**", then click **Post**:



14. In the second comment type “**An extra $150.**” Again, click **Post**:



15. **Close** the Comment task pane, then hover your cursor over cell **I2**. Note that only your comment has a date and time, as the previous comment was converted from a note:



16. Save the current workbook as Activity 7-1 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC B: Manage Themes

Excel offers themes to control and change the look of your workbook with the simple click of a button. Each theme consists of different colors, fonts (for headings and body), and effects for shapes and SmartArt. Changing a theme, or customizing one, can quickly and dramatically change the look and feel of your workbook. During this topic you will learn about themes in Excel 365 and how you can change and customize them.

Topic Objectives

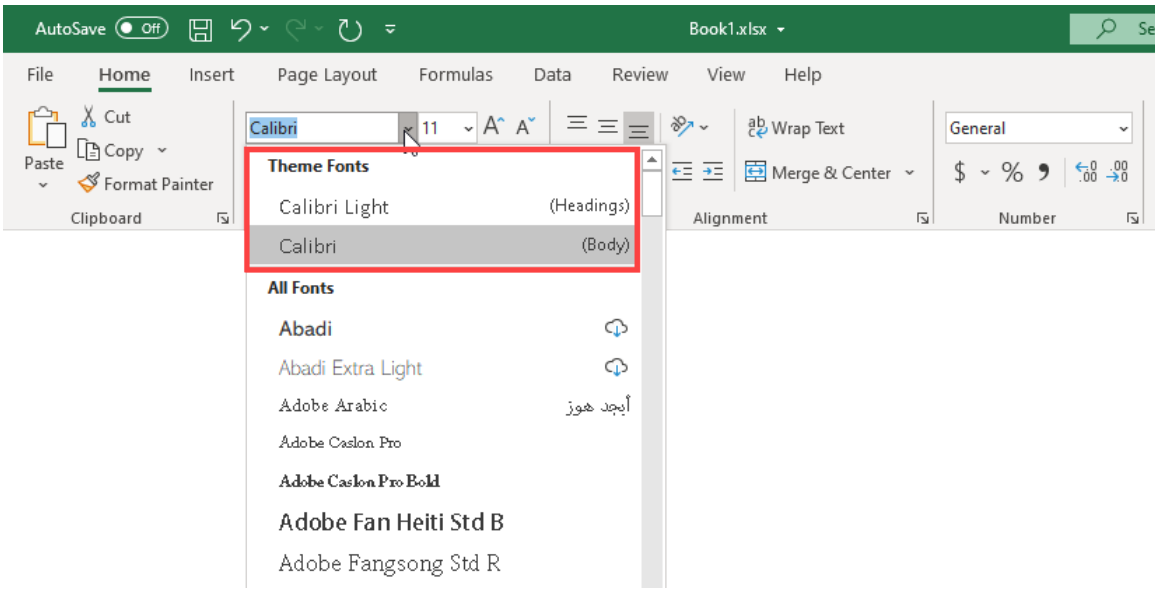
In this session, you will learn:

- About themes
- How to customize themes

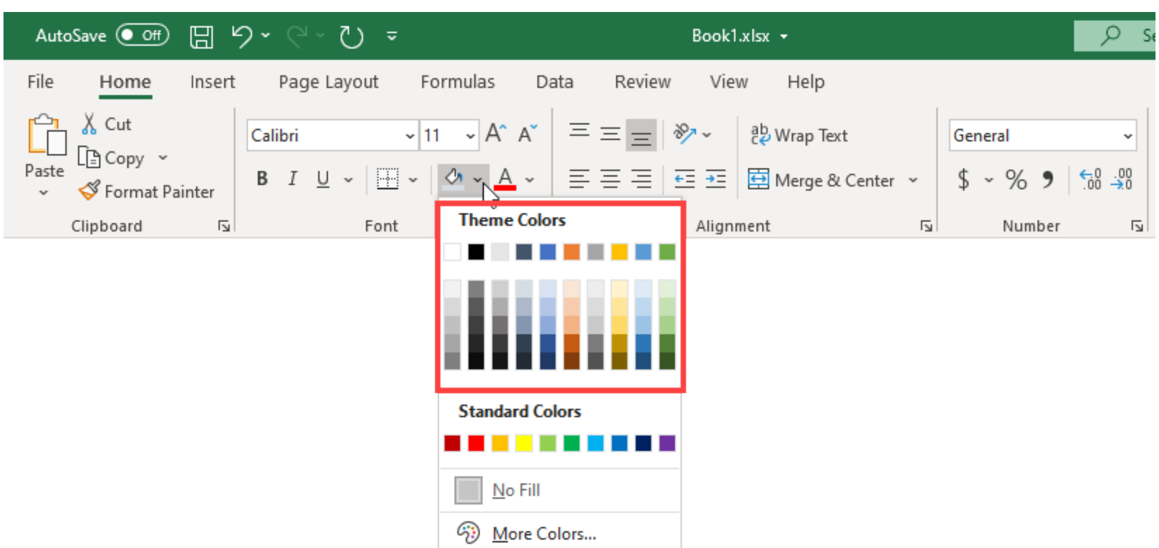
About Themes

Themes are a combination of preset colors, fonts, and effects. Each theme includes 12 colors, two fonts (Header and Body), and colors and effects for shapes and SmartArt. Much of the formatting that you apply to elements of your workbook can be changed, simply by changing the theme of the workbook.

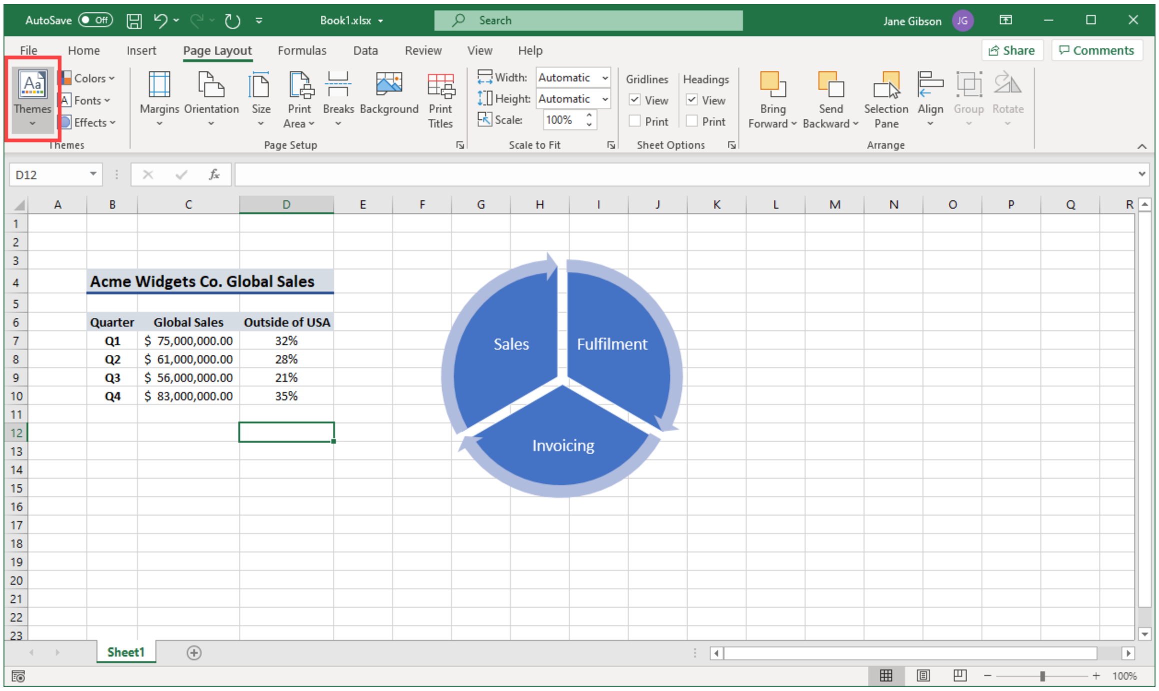
On the Home tab, in the Font group, you can see the **Theme Fonts** of the currently selected theme:



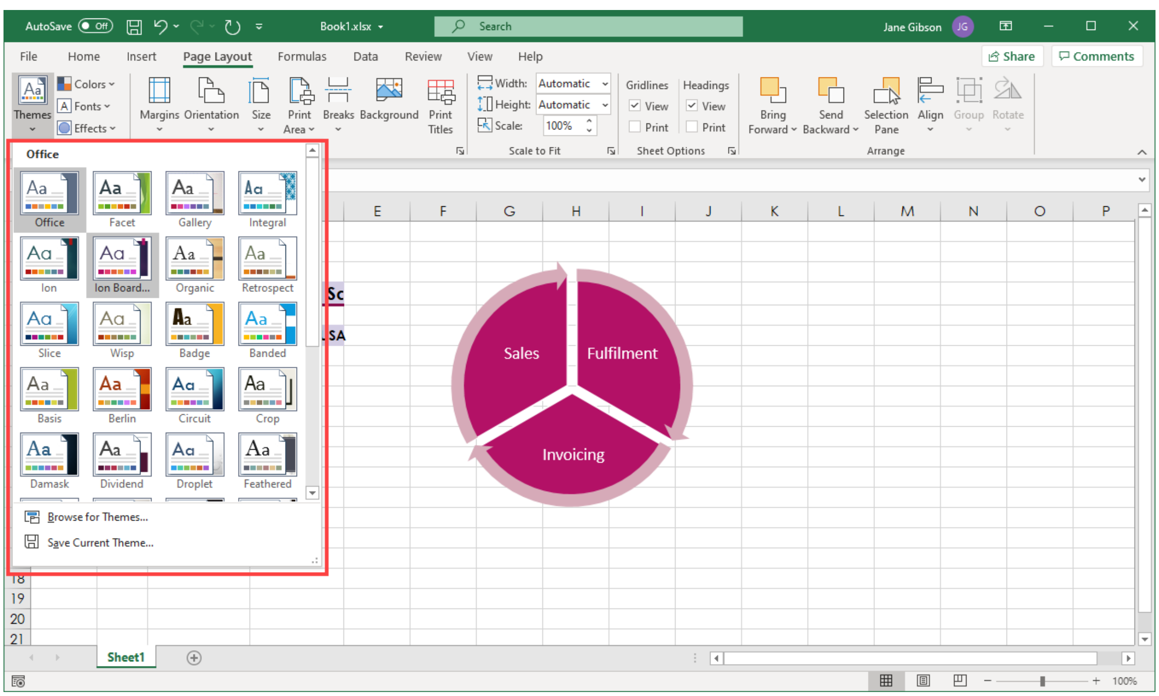
You can also see the **Theme Colors**:



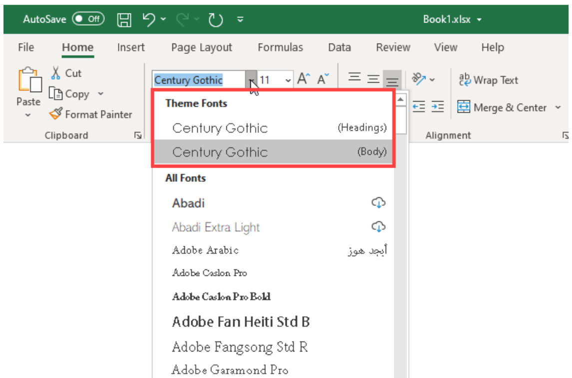
To change a workbook's theme, click **Page Layout → Themes**:

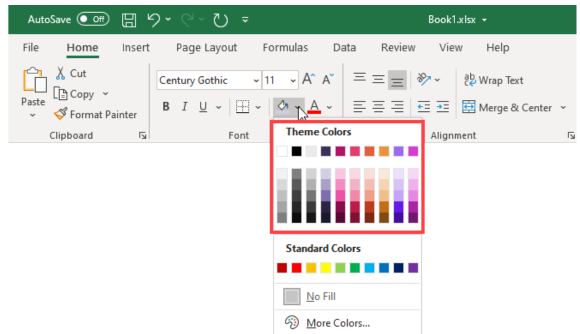


This shows a gallery of themes. As you move you mouse over each thumbnail in this gallery, you will see a preview applied to your workbook (if it has theme elements such as SmartArt, headers, or body text). Click the new theme to apply it:



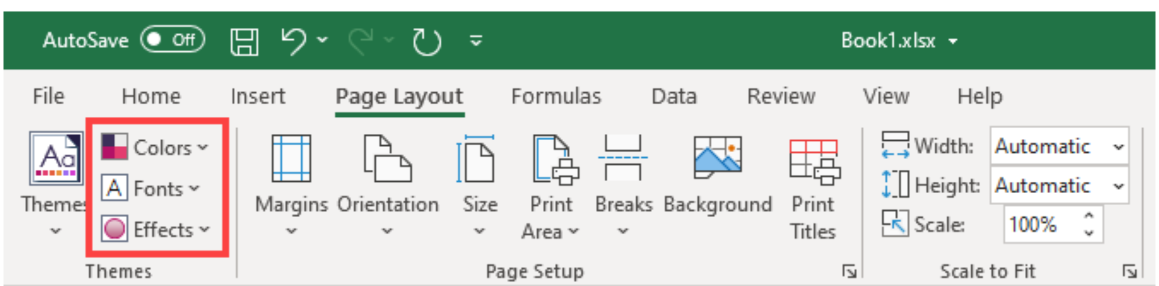
You can now see that the Theme Fonts, and the Theme Colors, have changed in the Font group on the Home tab:



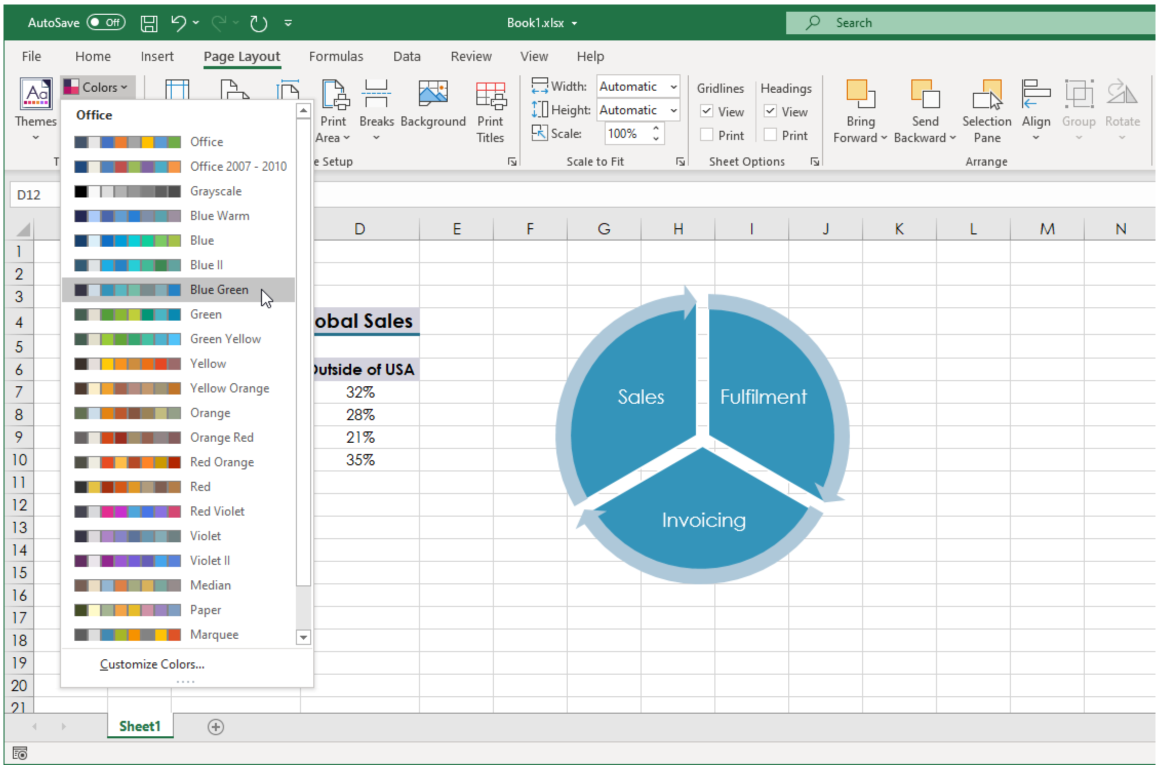


Customizing Themes

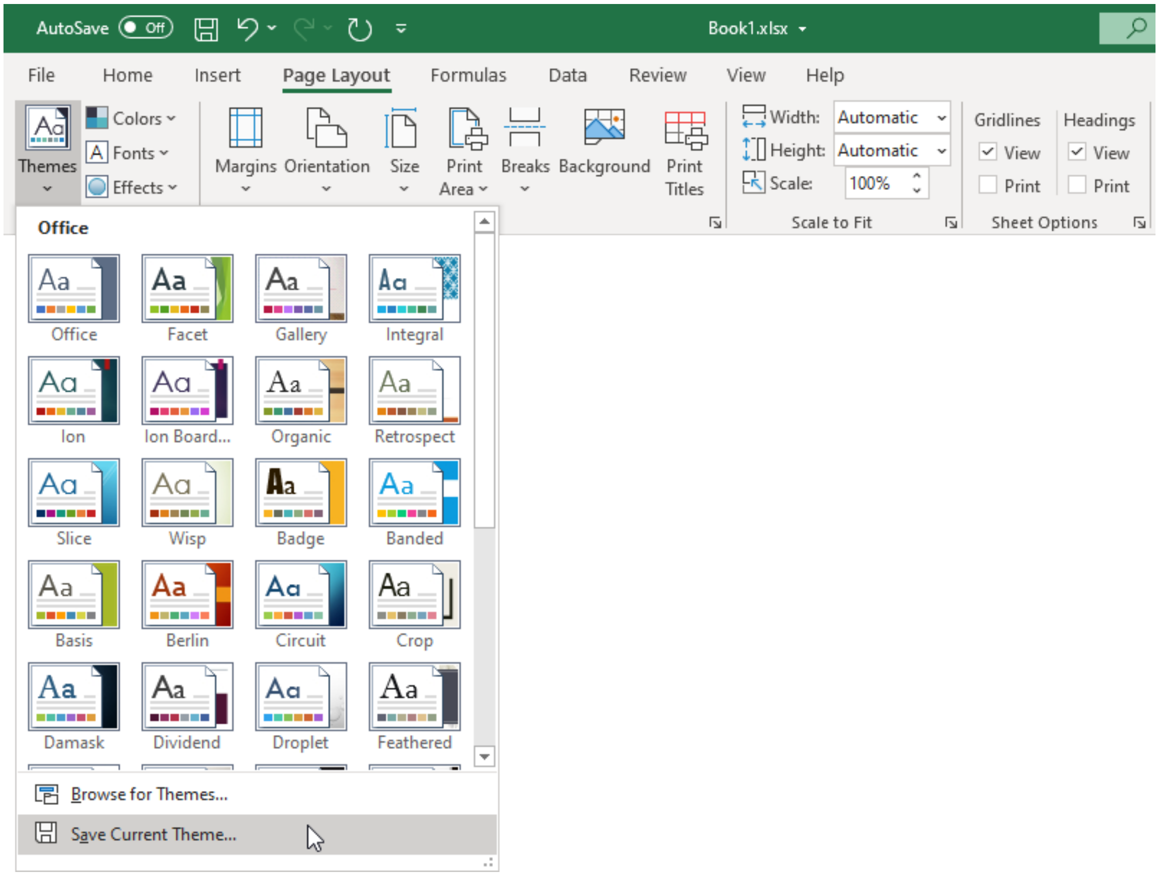
The default theme for new workbooks in Microsoft 365 Excel is Office. You can **customize** elements of this theme or any other theme that is currently applied, by choosing new style options from the Colors, Fonts, and Effects drop-down commands that are found inside the Themes group of the Page Layout tab.



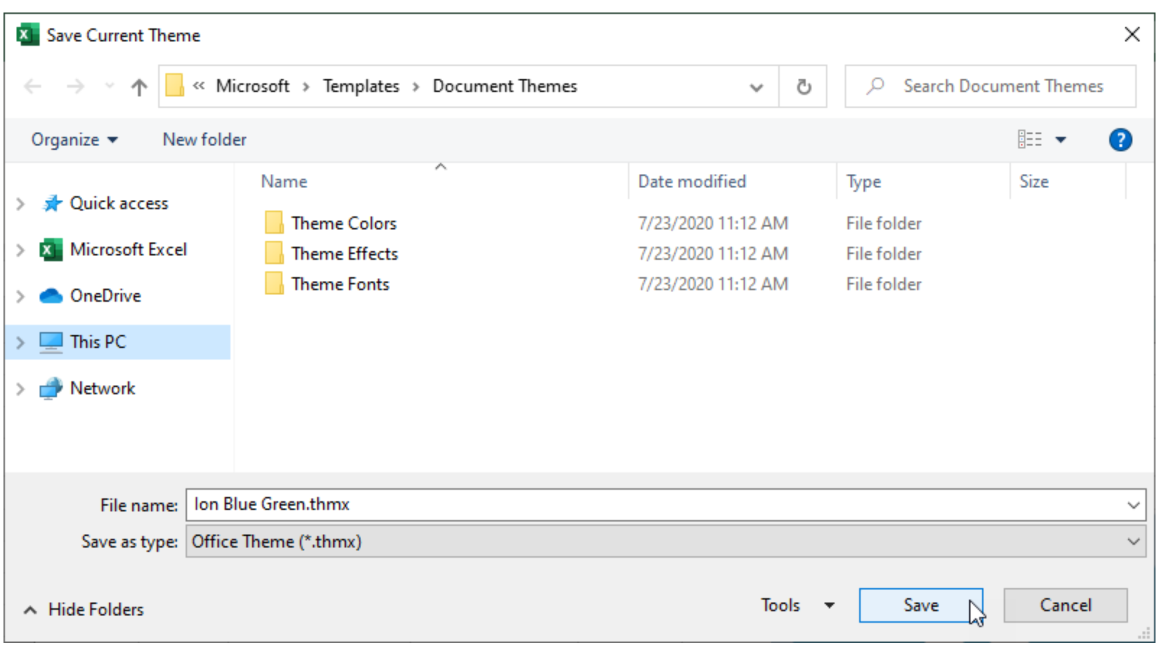
Choosing a different Color, Font, or Effects element creates a customized theme that maintains the elements of the original theme that were not changed. In the example below, selecting the Blue Green color theme changes the color elements but does not change the font and effect elements:



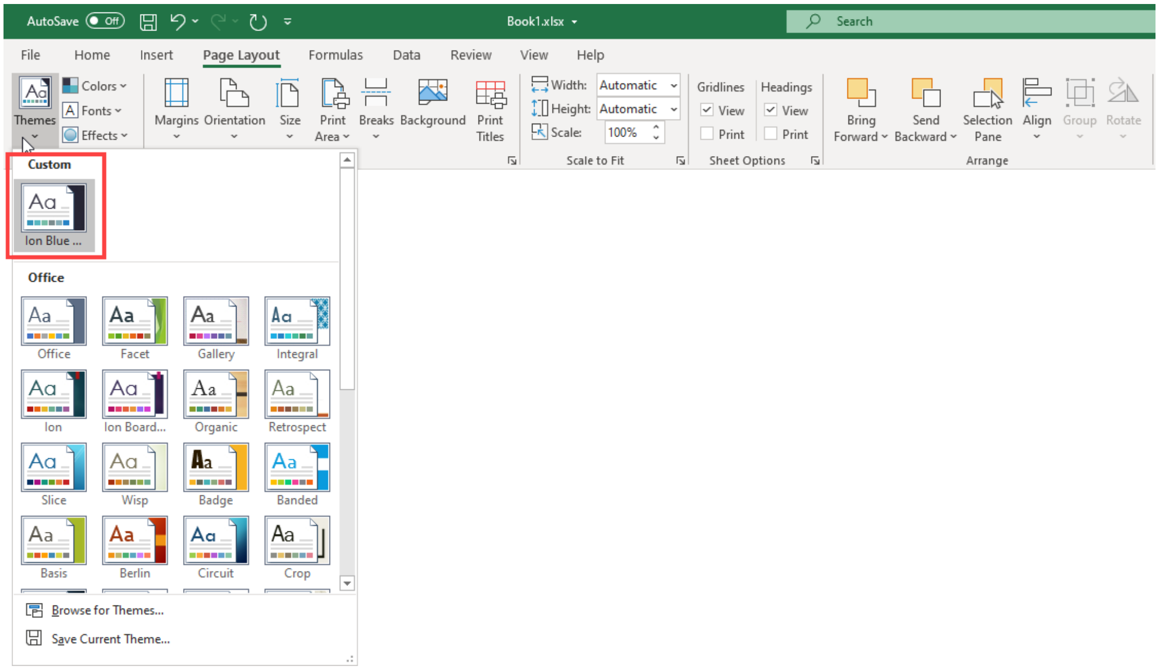
To save a customized theme, click **Theme → Save Current Theme**:



In the **Save Current Theme** dialog box, give the custom theme a unique name, then click **Save**:



The custom theme is now available in the Custom category of the Themes command drop-down gallery:



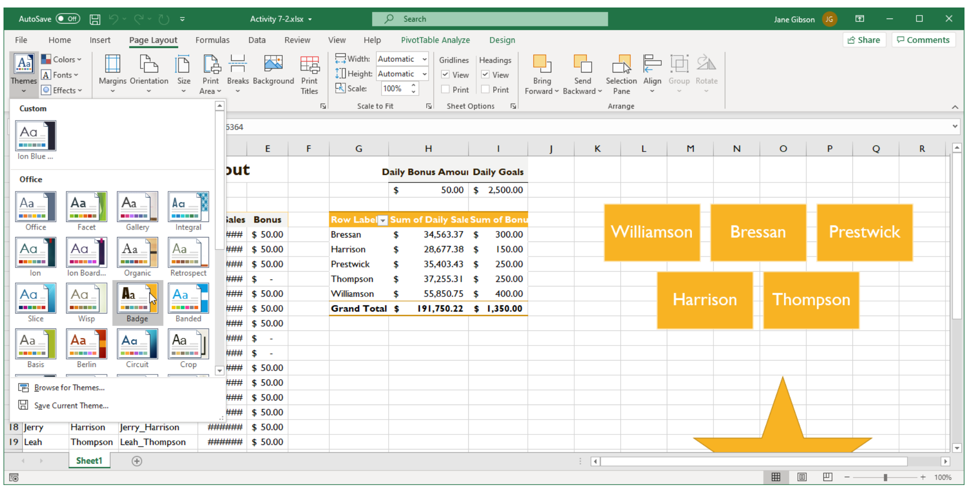
Activity 7-2: Managing Themes

You would like to apply a new theme to a workbook that you have been working on and then customize its colors.

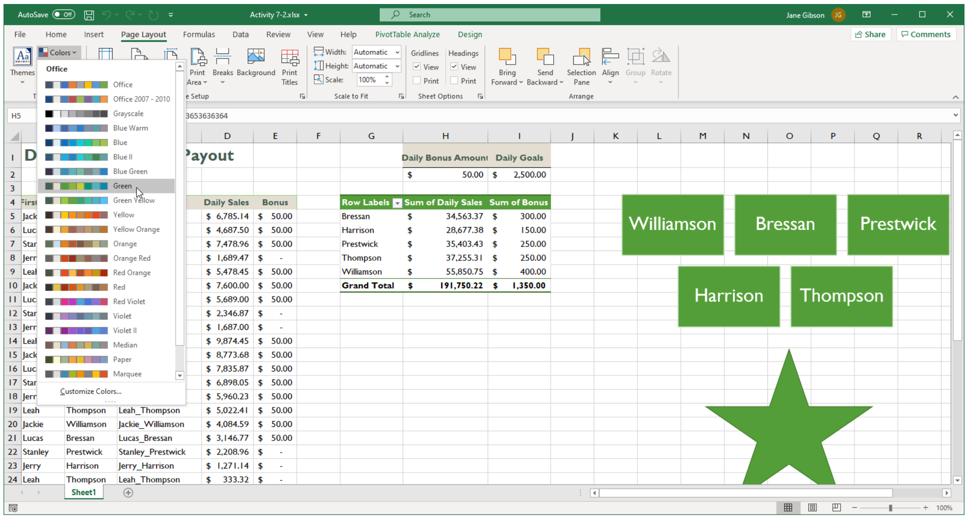
1. To begin, open Activity 7-2 from your Exercise Files folder:

   Activity 7-2.xlsx
   Microsoft Excel Worksheet
   23.7 KB

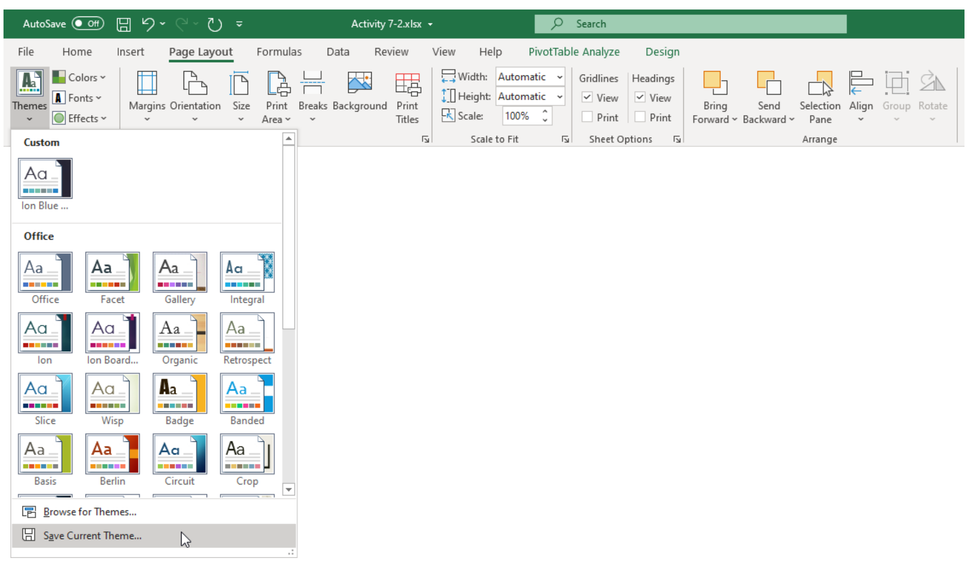
2. First, apply a new theme to this workbook by clicking **Page Layout → Themes → Badge**:



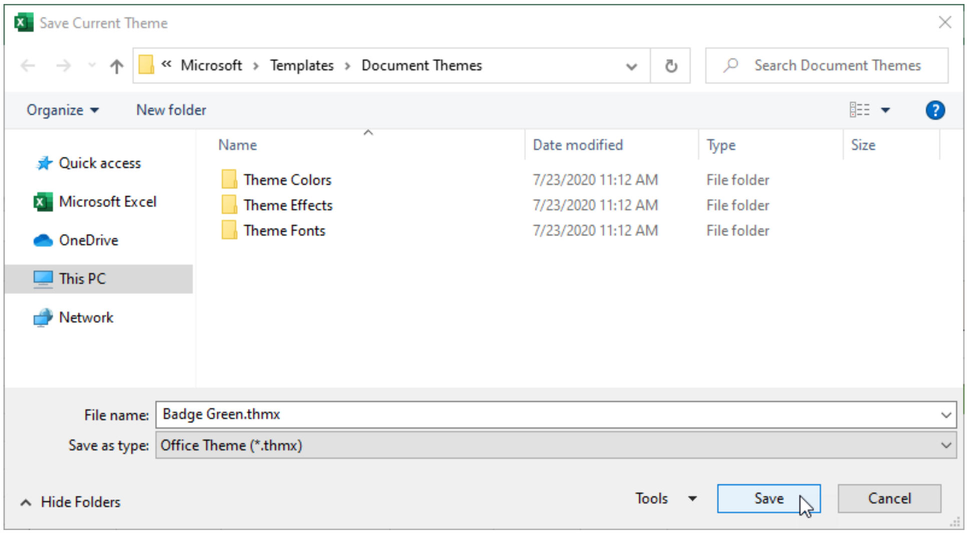
3. With the new theme applied, you will see that the primary colors and text have all been modified. While you like the font change, you would prefer a different color scheme. Customize this theme by clicking **Page Layout → Colors → Green**:



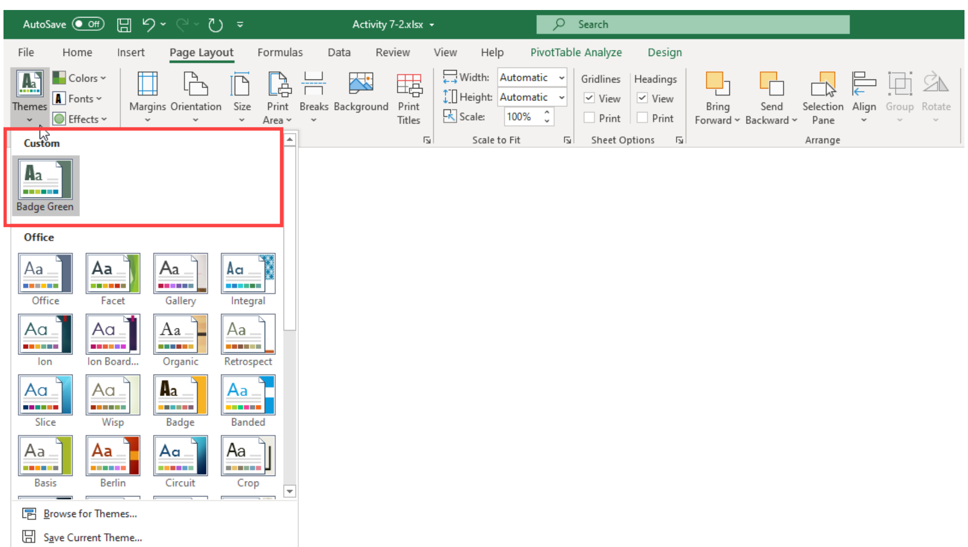
4. Examine the workbook and you will see that its colors have been updated. Now that you are satisfied with the colors, fonts, and effects, save the customized theme by clicking **Themes → Save Current Theme**:



5. In the Save Current Theme dialog box, give your customized theme a file name of "**Badge Green.thmx**" and click **Save**:



6. Confirm your customized theme has been saved by clicking the **Themes command drop-down** and looking under custom:



7. Save the current workbook as Activity 7-2 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC C: Protect Files

One of the more important aspects that you need to understand while working with your data in Excel is how to protect Excel files from data loss, as well as unauthorized access. In this topic you will learn about the various ways that Excel 365 can protect your workbooks.

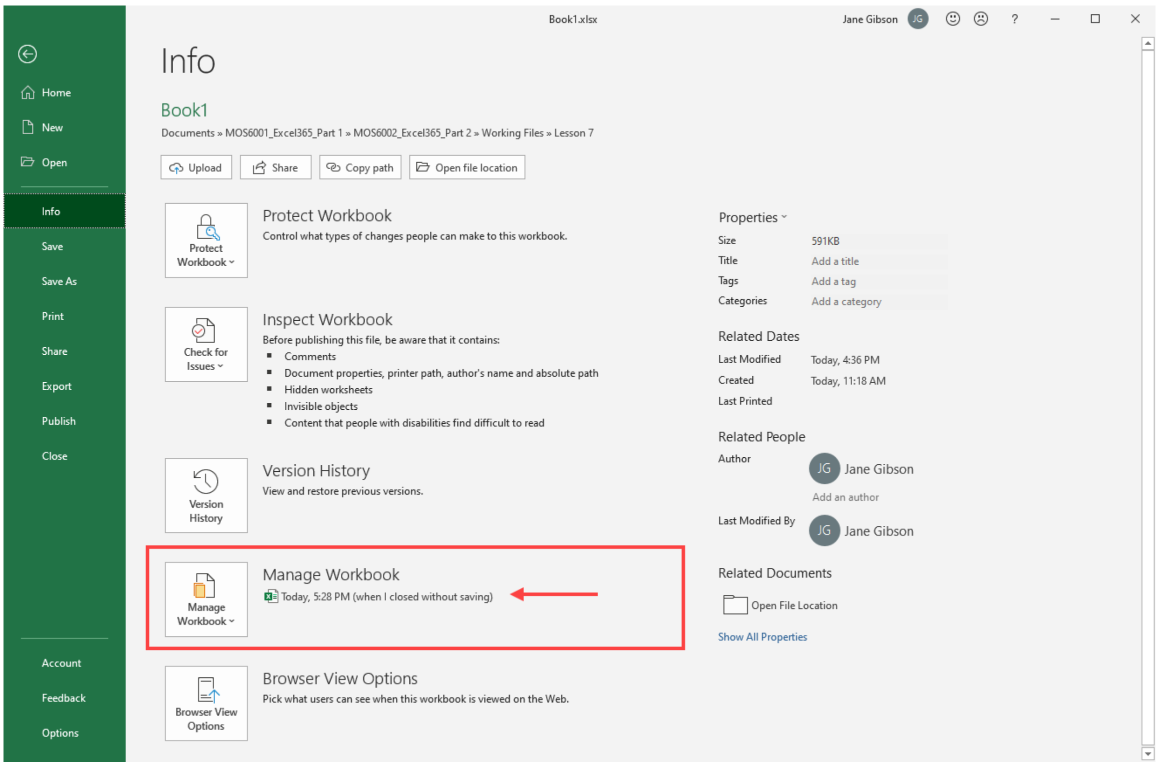
Topic Objectives

In this session, you will learn:

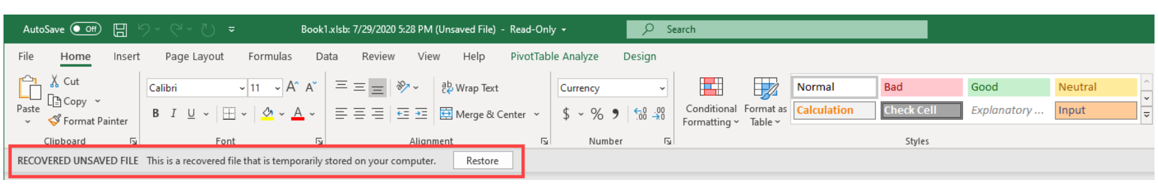
- How to recover lost data
- About the Protect group on the Review tab
- About worksheet and workbook protection
- About marking a workbook as final
- How to encrypt a workbook
- About digital signatures

Recovering Lost Data

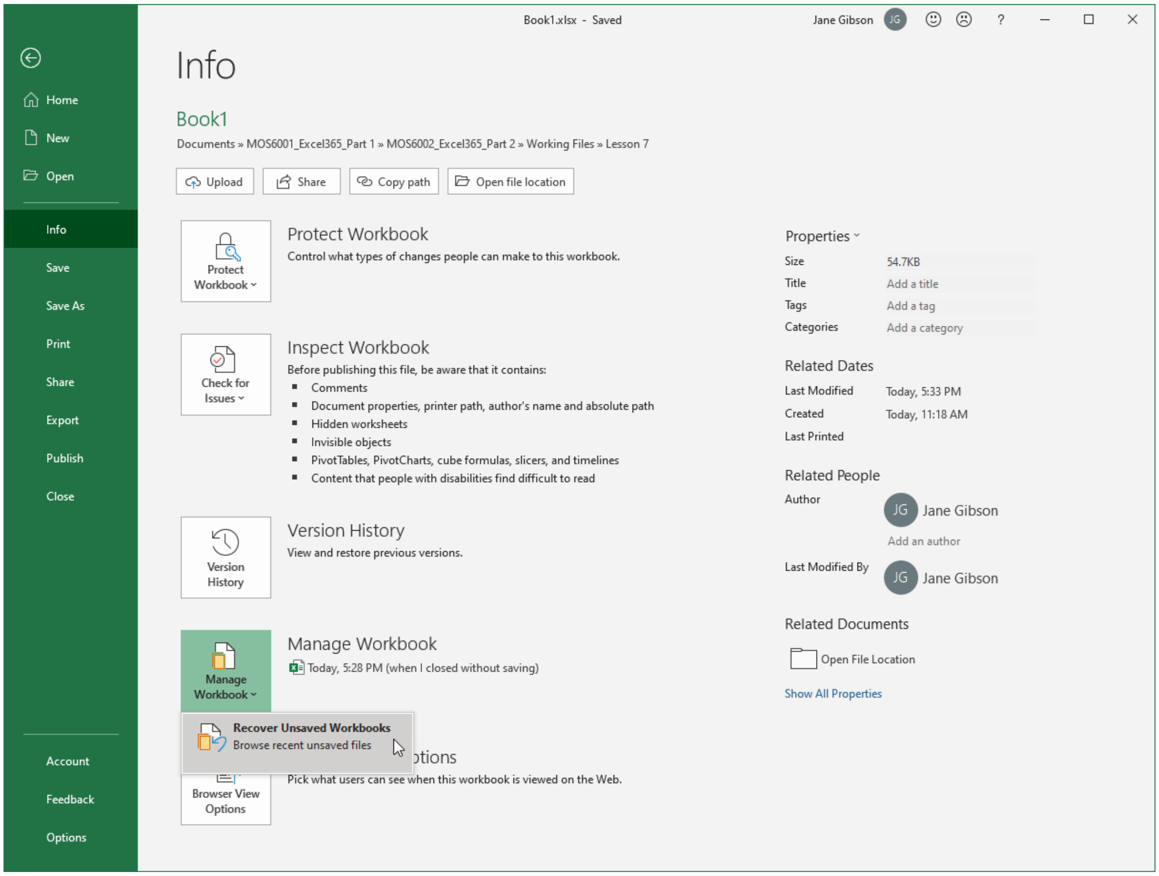
Excel 365 has an **AutoRecover** feature that works in the background to automatically save the workbook that you are working on. This saved copy of the file is called a version and it can be recovered if Excel or your computer experiences an error. If you have automatically saved versions of your workbook, you can find them by clicking **File → Info,** and then examining the **Manage Workbook** section:



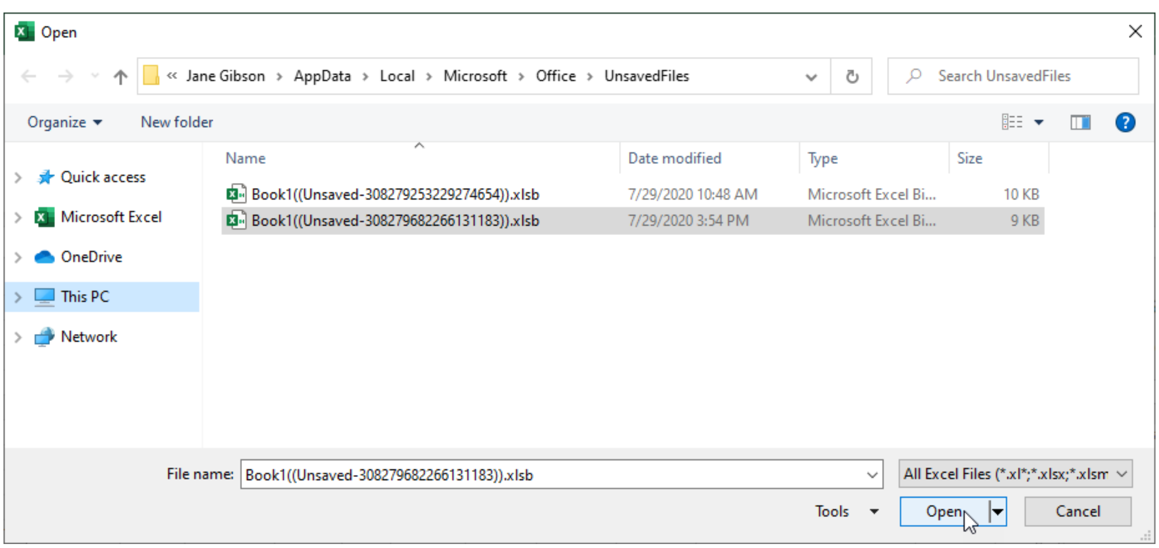
Each version listed here includes the date and time that it was saved, as well as the circumstances in which it was saved (such as closing Excel without saving the changes). Clicking on any version that is listed here opens it and you will be asked to overwrite any previously saved versions of this file by clicking the **Restore** button on the message bar:



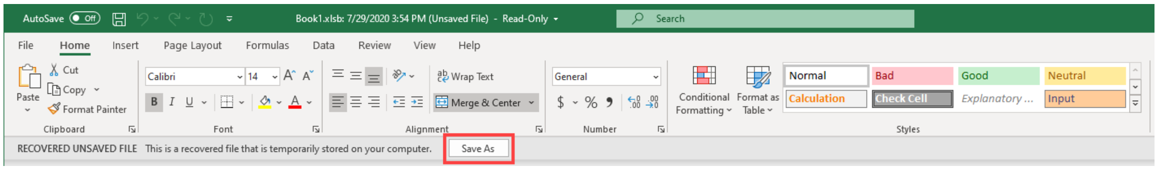
If you experience an error and have not previously saved the workbook that you have been working on at all, you may still be able to acquire a saved version of it by clicking **File → Info → Manage Workbook → Recover Unsaved Workbooks**:



This action displays the **Open** dialog box, in which you can select an unsaved version and then click **Open**:

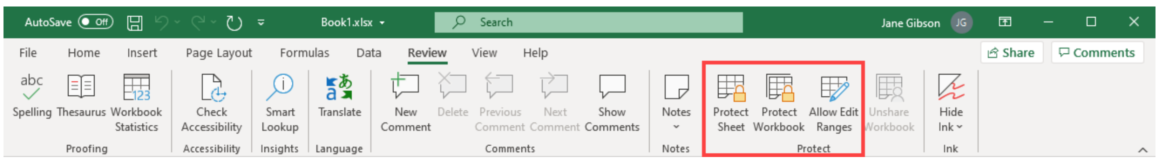


Once the version is open, you can save it to another location by clicking the **Save As** button on the message bar:



The Protect Group

Most of the commands that you need to protect your files can be found within the **Protect** group on the Review tab:



Let's look at the purpose of these commands:

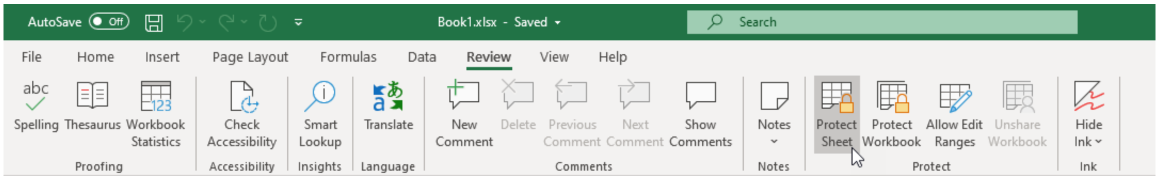
- **Protect Sheet** – This command prevents others from making unwanted changes to the current worksheet by limiting their editing options.
- **Protect Workbook** – Clicking this command prevents others from making structural changes to the current workbook, such as adding or deleting worksheets.
- **Allow Users to Edit Ranges** – Clicking this command allows users to protect specific ranges with a password.

Unshare Workbook is part of a legacy feature that has been replaced by Co-authoring and is typically grayed out.

The Protect Worksheet Option

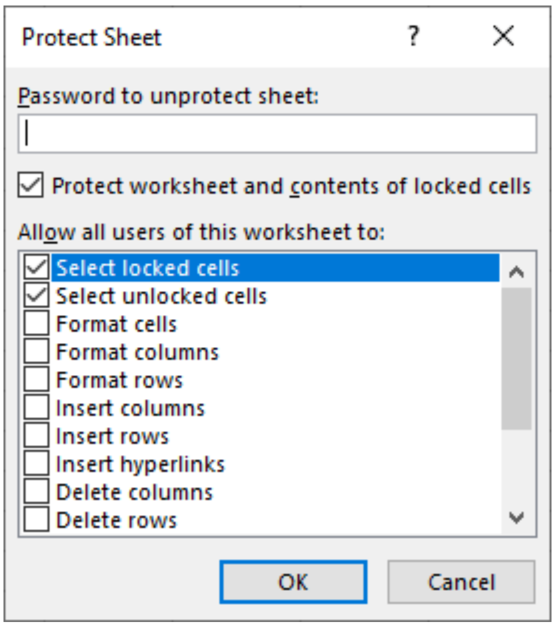
We know that workbooks (individual Excel files) are composed of one or more worksheets. Complex workbooks might make use of several worksheets, each of which might contain important data that is used by the rest of the workbook. To help protect your data, using the File menu you can choose to **protect individual worksheets** in a workbook.

To begin, make sure you are viewing the worksheet you want to protect and then click **Review → Protect Sheet**:

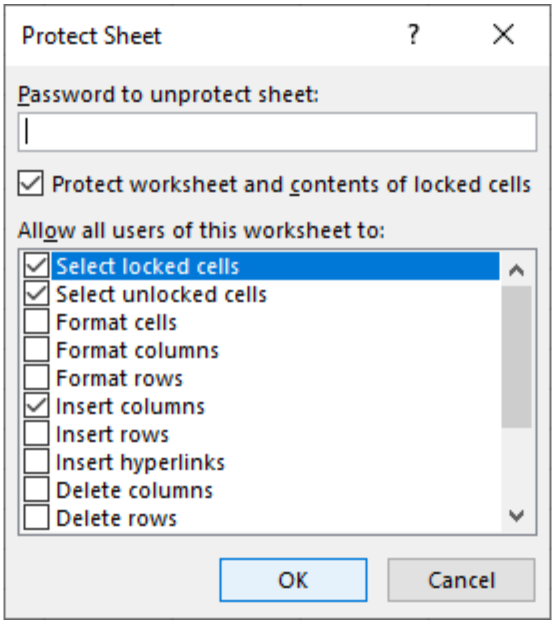


The **Protect Sheet** dialog box appears and prompts you to specify what sort of editing actions are permitted and not permitted after a worksheet has been protected.

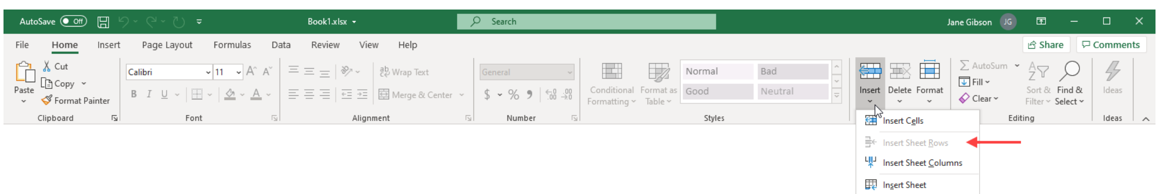
There are 15 types of editing restrictions that you can apply:



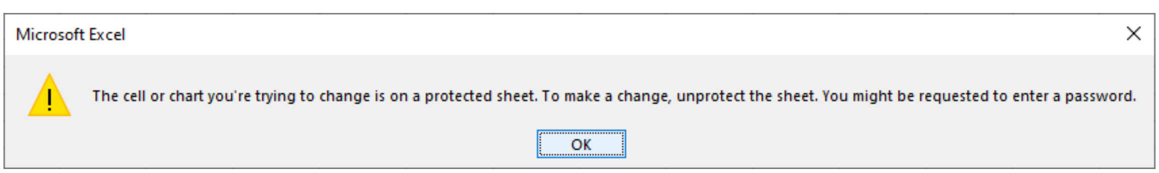
You can use this dialog box in two ways: **with or without a password**. You can simply check to allow items in the **Allow all users of the worksheet to** box and click **OK** to apply the restrictions without a password. For example, here we have checked Insert columns:



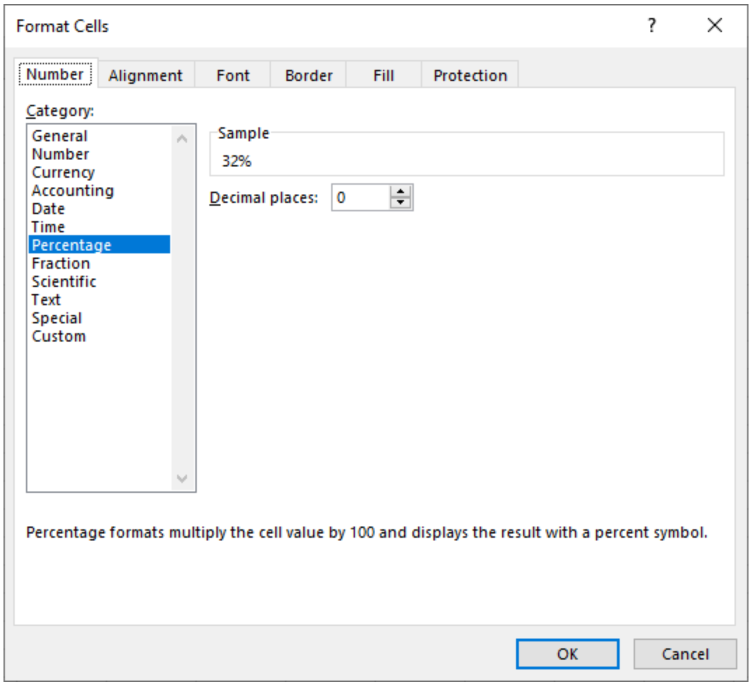
If this protection is applied, users can still insert columns, but the command to insert sheet rows are grayed out:



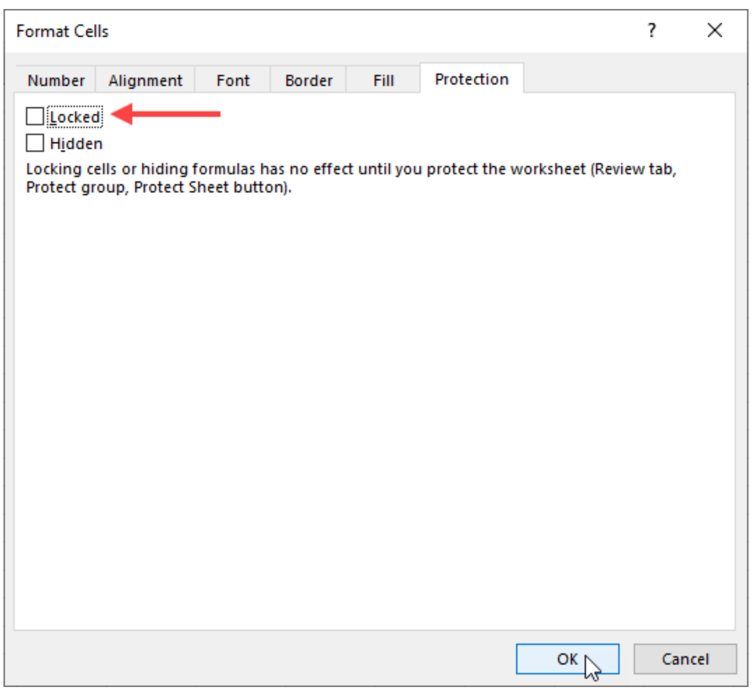
Also, if a user attempts to edit a locked cell, a warning message appears, indicating that the cell is protected and to make a change the sheet must be unprotected, and a password might be required:



By default, all cells on a worksheet are locked when a worksheet is protected. To allow specific cells to be edited when a sheet is protected, first unprotect the sheet, then select those cells and press **Ctrl + 1.** The **Format Cells** dialog box opens:

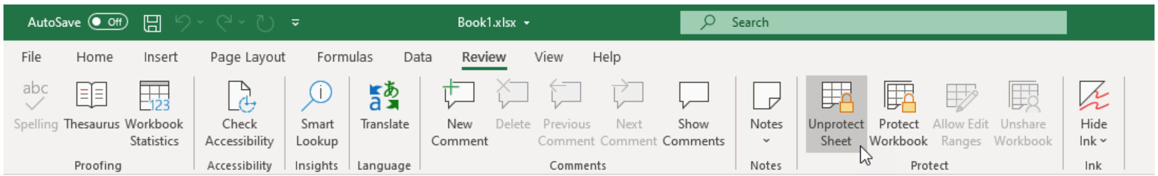


Click the **Protection** tab, uncheck the **Locked** checkbox, then click **OK**:

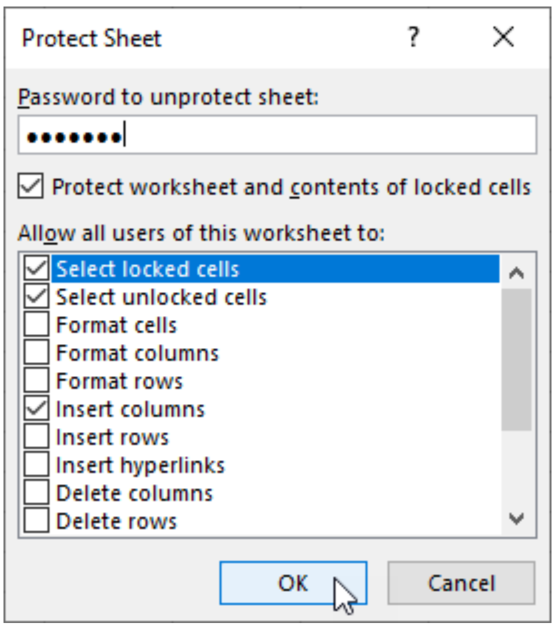


When the sheet is again protected, users are now allowed to edit those cells that have been unlocked, but the protection remains for all others.

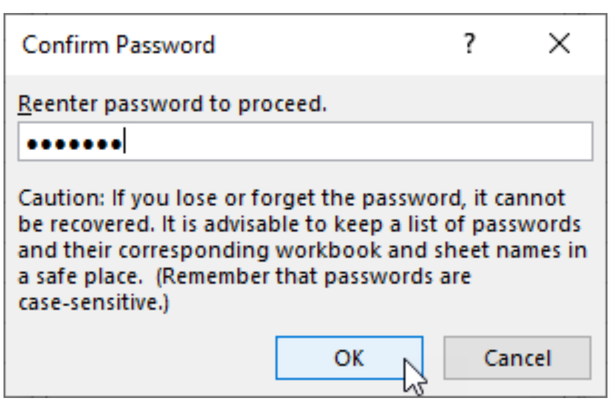
To remove the restrictions simply click **Unprotect Sheet**:



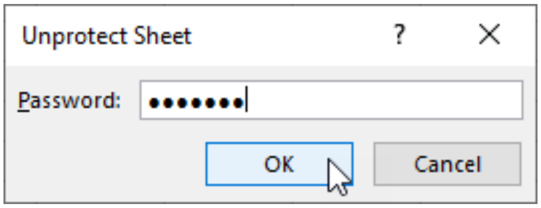
Now suppose that you would like to better protect the worksheet by assigning it a password in the **Protect Sheet** dialog box. In this case you would add a password to the **Password to unprotect sheet** text box:



When the **OK** button is clicked, a dialog box appears in which you are asked to confirm the password that you supplied:



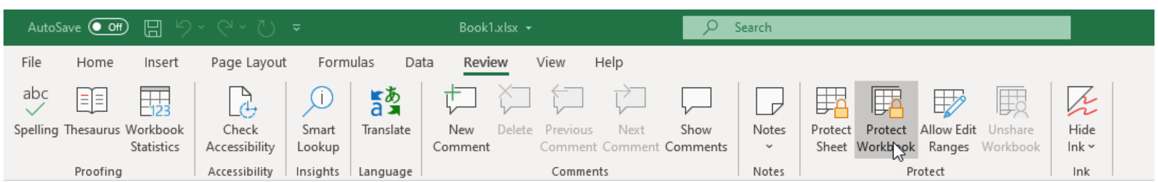
The sheet has the same restrictions as when it was protected without a password, only now, users are prompted to enter the password after clicking **Unprotect Sheet**:



The Protect Workbook Option

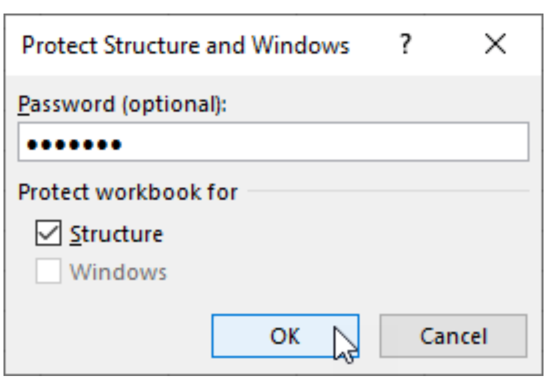
To prevent other users from viewing hidden worksheets, adding, moving, hiding, or deleting worksheets, or renaming worksheets, you can **protect your workbook structure** with a password.

To protect your workbook, click **Review → Protect Workbook**:



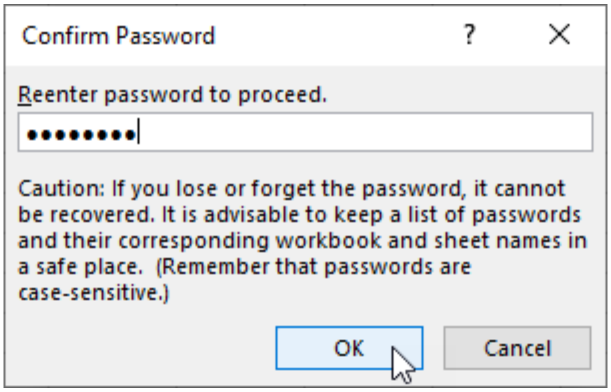
You can also complete this action by clicking **File → Info → Protect Workbook → Protect Workbook Structure**.

This action displays the **Protect Structure and Windows** dialog box. Here, you can apply a password to help prevent unauthorized changes. Enter your password and click **OK** to activate the protection:

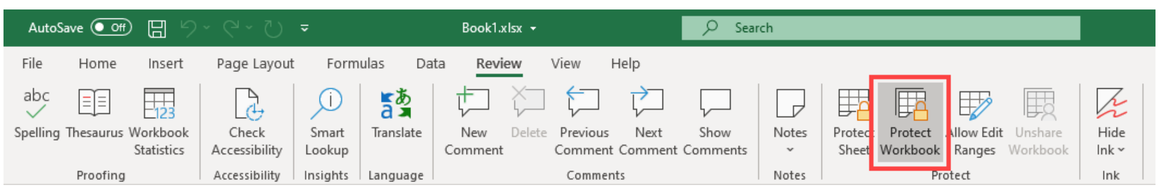


Note that the Windows option is only available for earlier versions of Excel and some Mac OS versions.

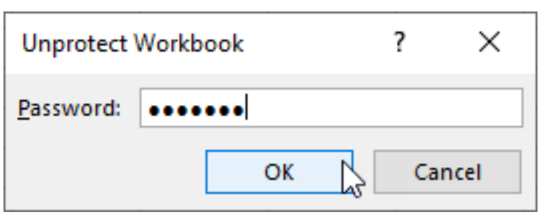
As with protecting worksheets, you will be asked to confirm your password. Reenter your password and click **OK**:



Unlike the Protect Sheet process, where the command changes to Unprotect Sheet when the sheet is protected, the **Protect Workbook** command acts as a toggle: the command remains highlighted, but the name of the command does not change, when the workbook is protected:

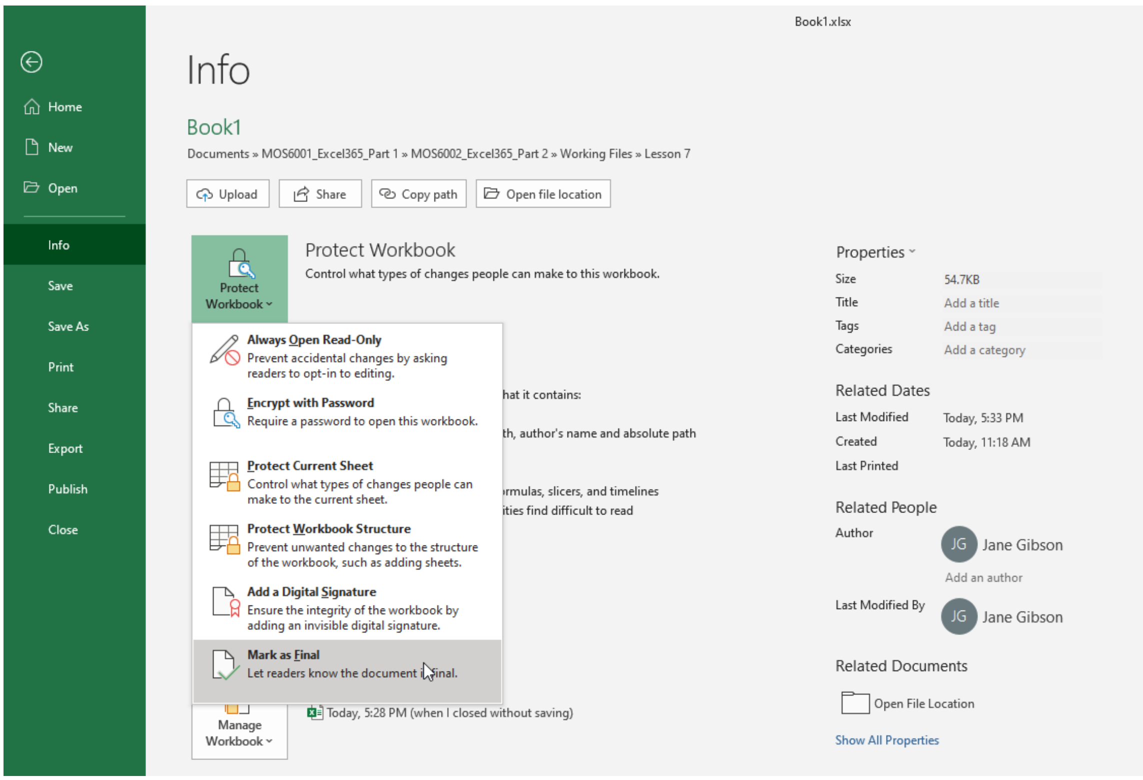


Clicking Protect Workbook when it is highlighted opens the **Unprotect Workbook** dialog box, where you can enter the password and click **OK** to unprotect the workbook:

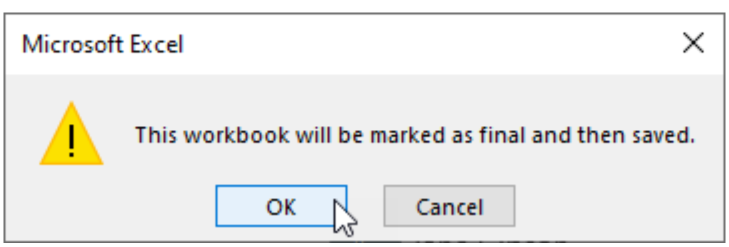


Mark Workbooks as Final

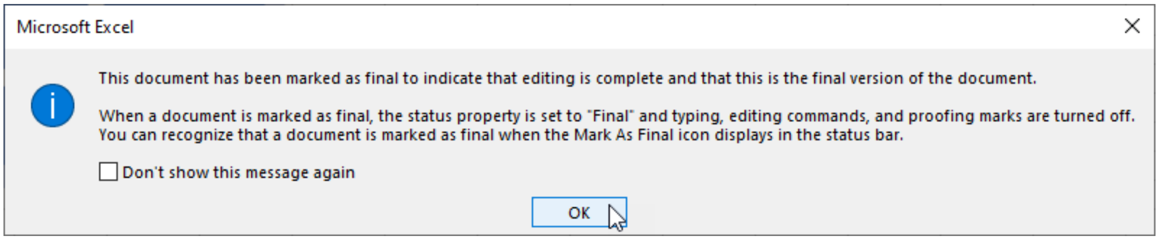
When you finish working with your workbook, and do not plan to make any further changes, you should consider marking it as **final**. This alerts others who may use your data that the work is complete, and it helps jog your memory if you have not touched the workbook in a long time. To mark your work as final, click **File → Info → Protect Workbook → Mark as Final**:



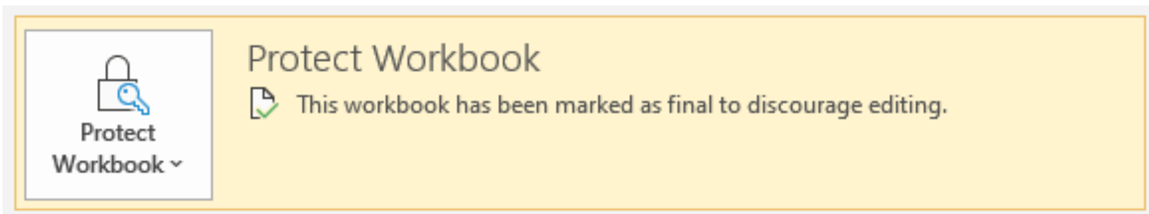
Click **OK** to confirm your choice and save the file:



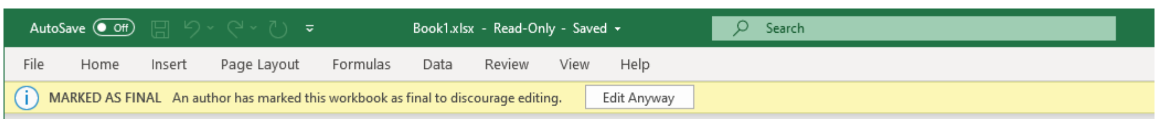
Your will receive a final notification explaining the document has been marked as final to indicate that editing is complete and that this is the final version of the document:



The Backstage menu now displays a visual warning stating the file has been marked as final:

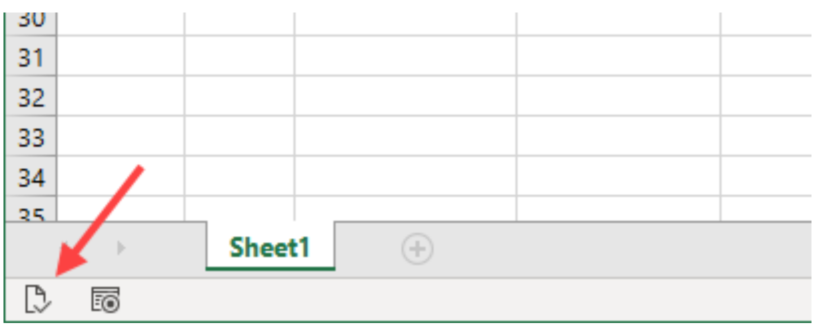


A similar warning is shown in the message bar, and the title bar shows that the file has been marked as **Read-Only**.



You can click the **Edit Anyway** button on the message bar to release the read-only lock and return the files normal status.

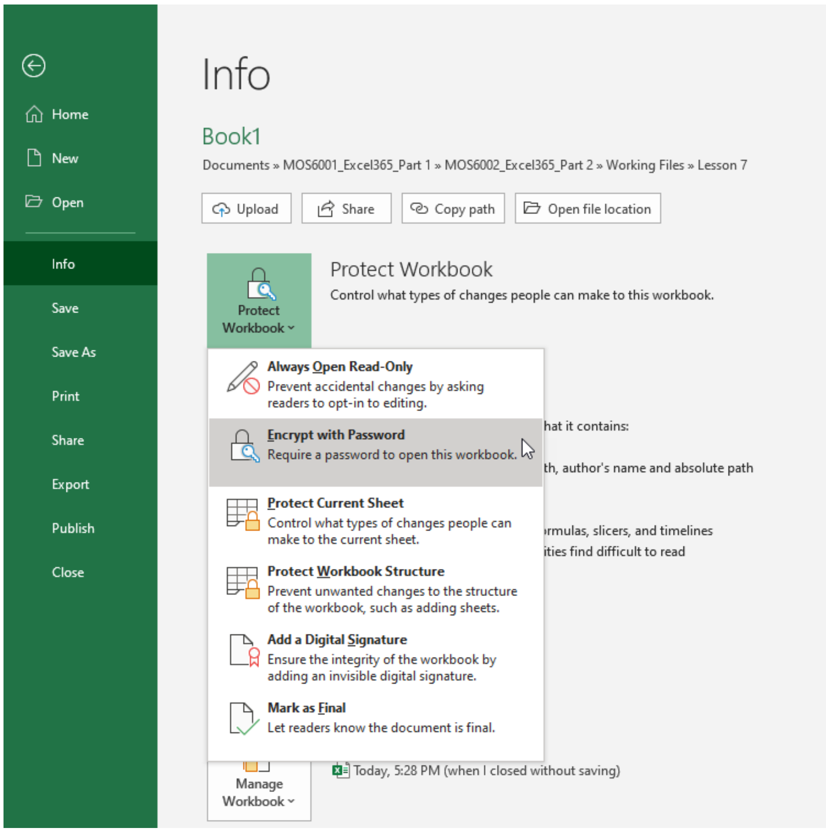
There is also a small notification in the status bar:



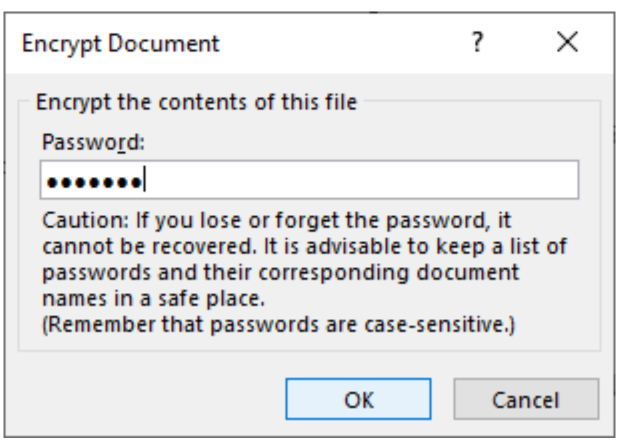
You can mark a document as final as many times as you want but keep in mind that any changes will remove this notification and status.

Encrypting a Workbook

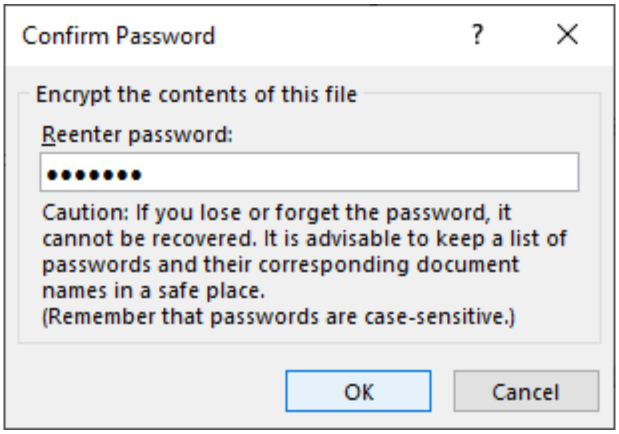
Encrypting a document with Excel 365 is very easy, despite the complexity of the underlying encryption operation. In fact, encrypting a workbook using a password is one of the easiest ways to protect sensitive information. To lock a workbook using a password, click **File → Info → Protect Workbook → Encrypt with Password**:



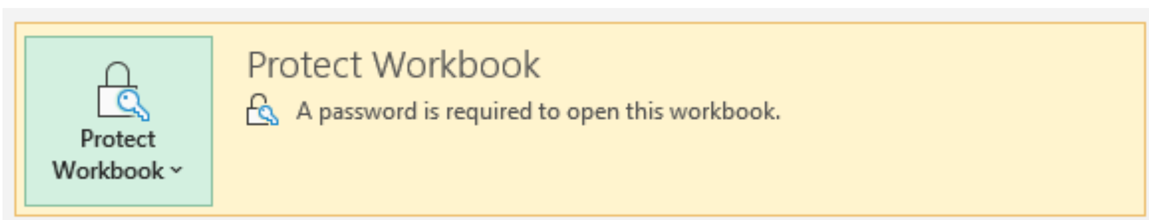
Enter a password and click **OK**:



You will be asked to confirm the password:

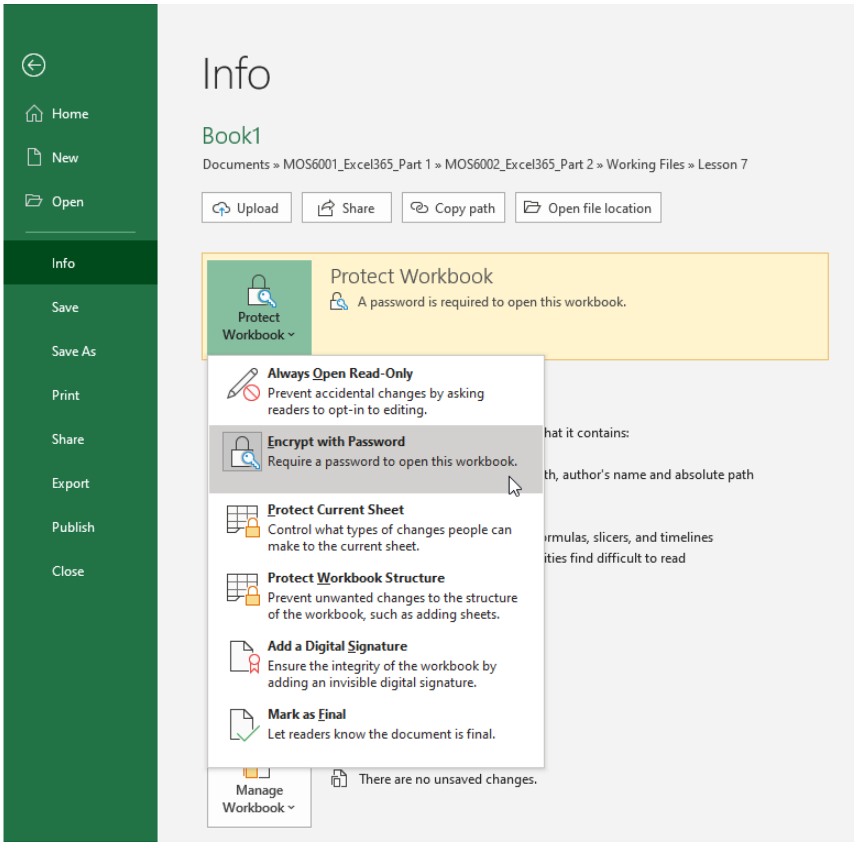


Once encrypted, the Backstage menu indicates to you that the workbook has been password-protected:

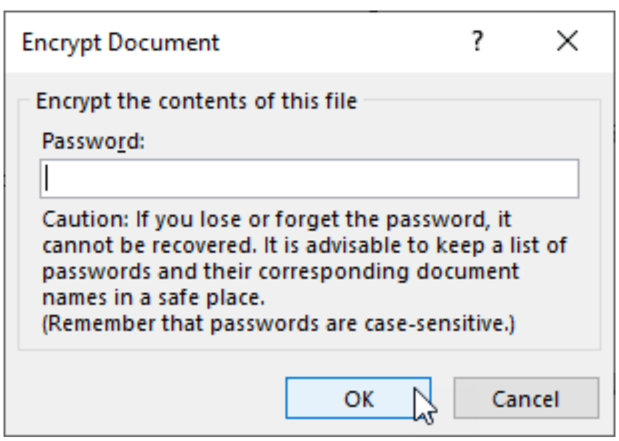


When it comes time to open the file, you (and anyone else) will be prompted for the password before you can even see the data. Enter the password and click **OK**:

To remove a password, click **File → Info → Protect Workbook → Encrypt with Password**:



All you have to do is **clear the Password field** and click **OK**:



Encryption works by using the password as a way to jumble up the contents of a file. Anyone who intercepts the encrypted file and examines the contents would only see a garbled mess. When the proper recipient enters the password, the "jumbling" process is performed backwards, and the result is a perfectly readable and usable file.

Digitally Signing a Workbook

Another way of protecting your workbook is to **digitally sign** it. A digital signature is an electronic, encrypted, certificate of authenticity. It provides reassurance to the recipient that the workbook really came from you. The actual makeup of the digital signature is directly linked to the structure of the file. If something in the file changes, the digital signature becomes corrupted. If the signature is corrupted, that means the data has somehow been intercepted and changed.

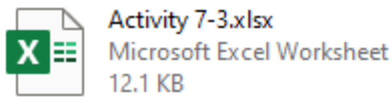
To create a digital signature, you must have a signing certificate. Certificates are issued by a certification authority, similar to a notary public. Like other types of identification, digital signatures can be revoked.

If your document requires this level of security, speak with your IT department, or contact a digital security company to determine what type of digital signature will be best for your needs.

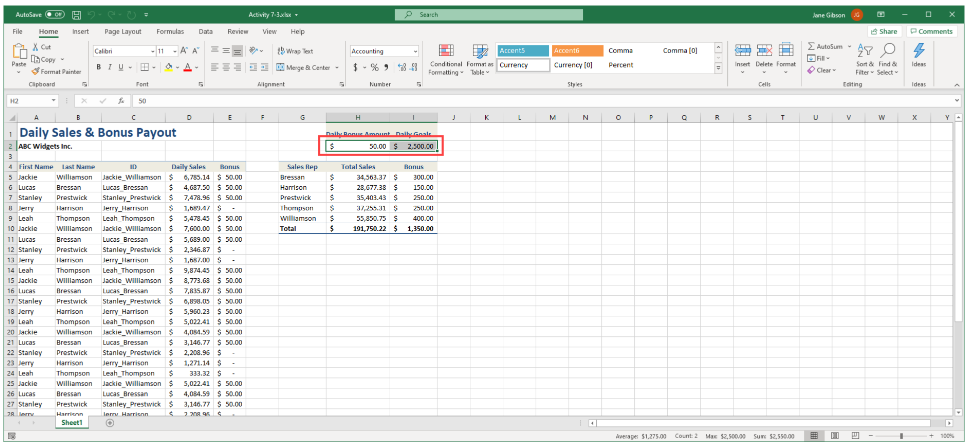
Activity 7-3: Protecting a Worksheet and a Workbook

You want to protect a worksheet from unauthorized changes.

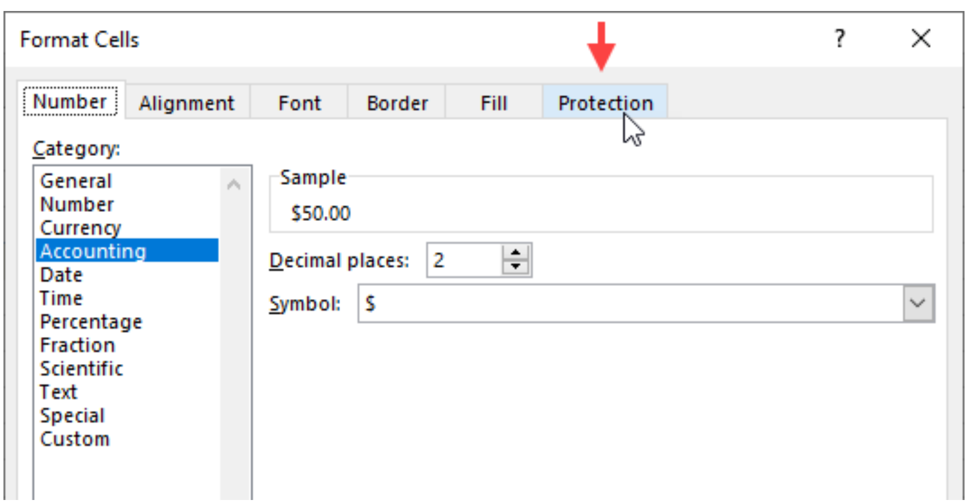
1. To begin, open Activity 7-3 from your Exercise Files folder:



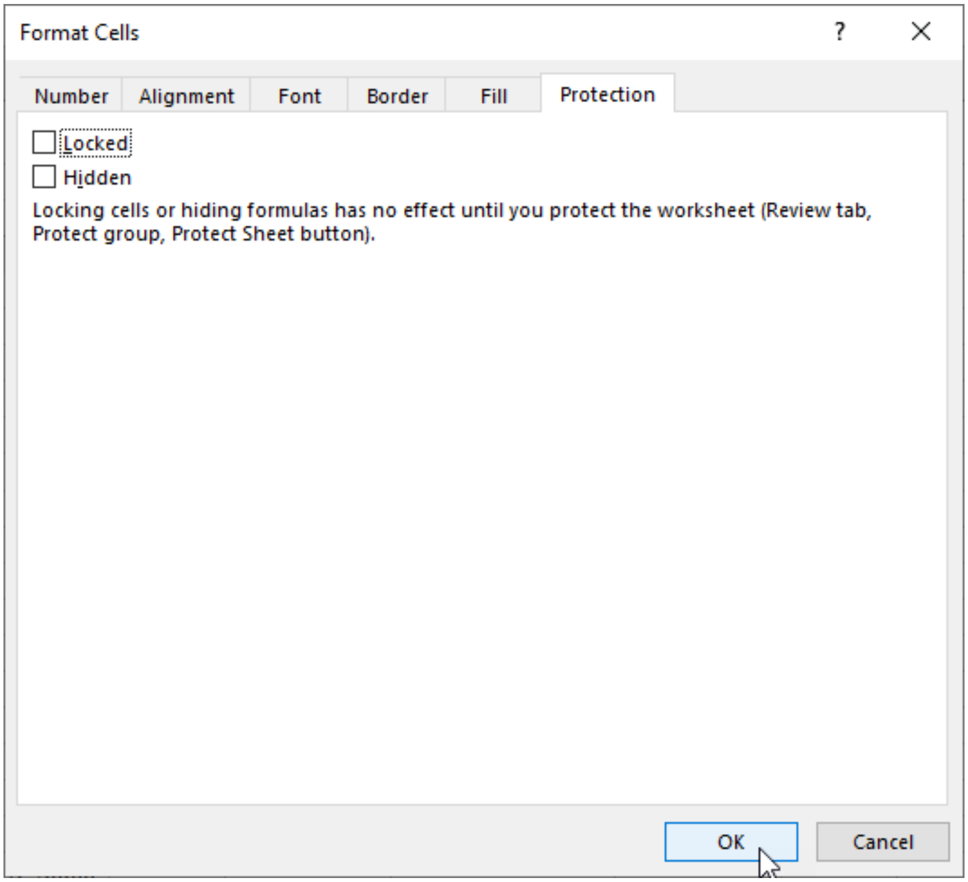
2. With the workbook open, select cells **H2** and **I2**. Press **Ctrl + 1**:



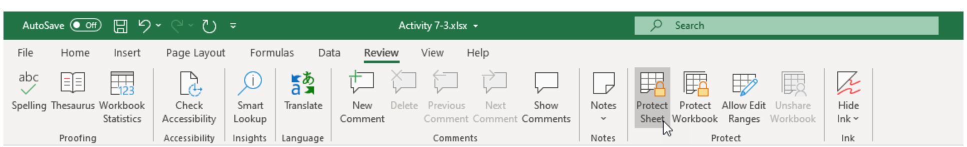
3. This opens the Format Cells dialog box. Click the **Protection** tab:



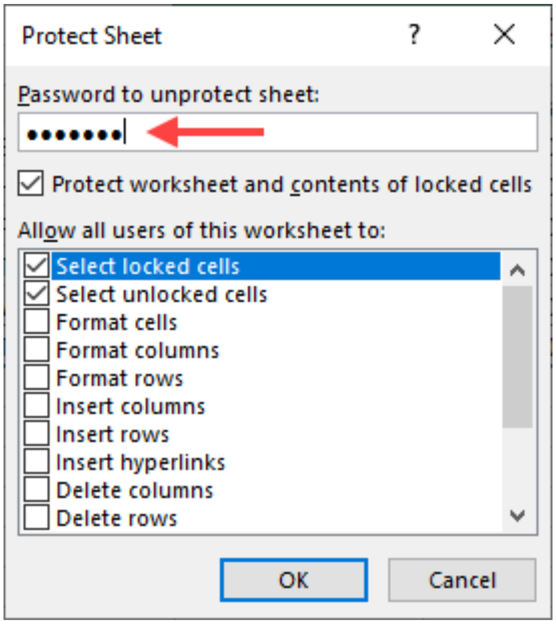
4. Click to **uncheck the "Locked" checkbox**, then click **OK**:



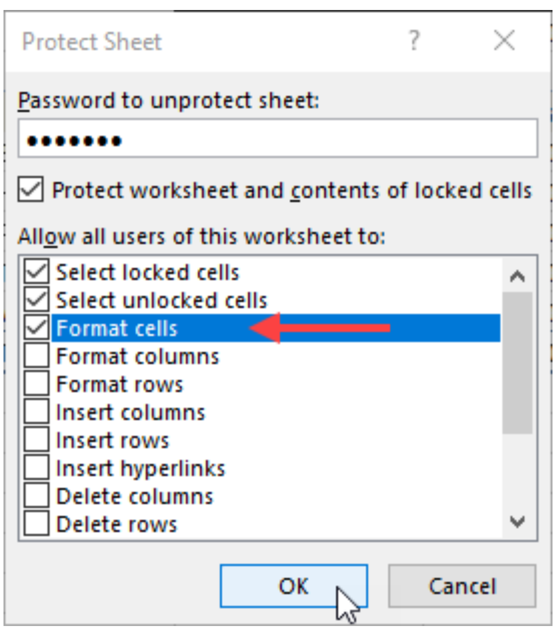
5. Now click **Review → Protect Sheet**:



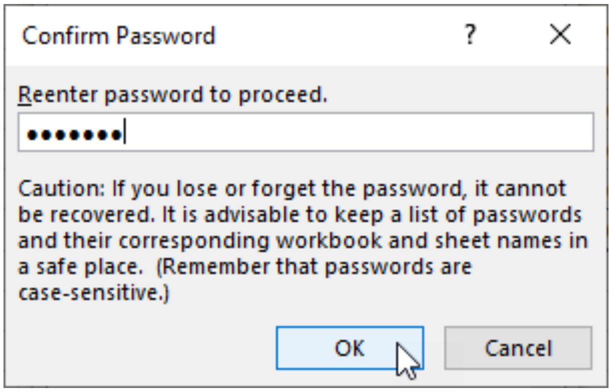
6. This action displays the Protect Sheet dialog box. **Type a memorable password** into the **Password to unprotect sheet** text box:



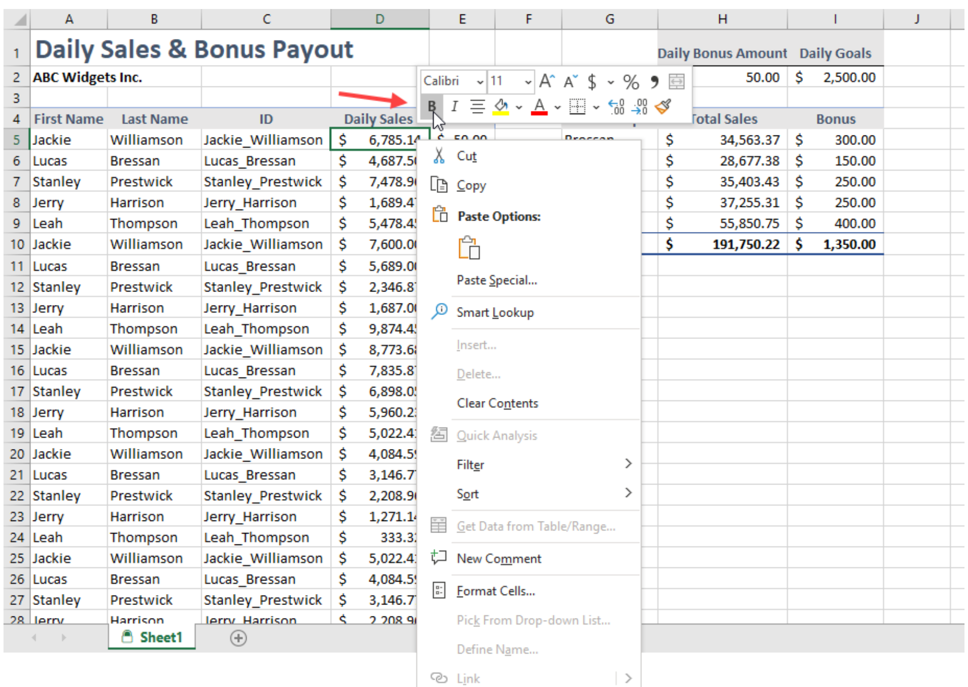
7. Check the "**Format Cells**" checkbox and then click **OK**:



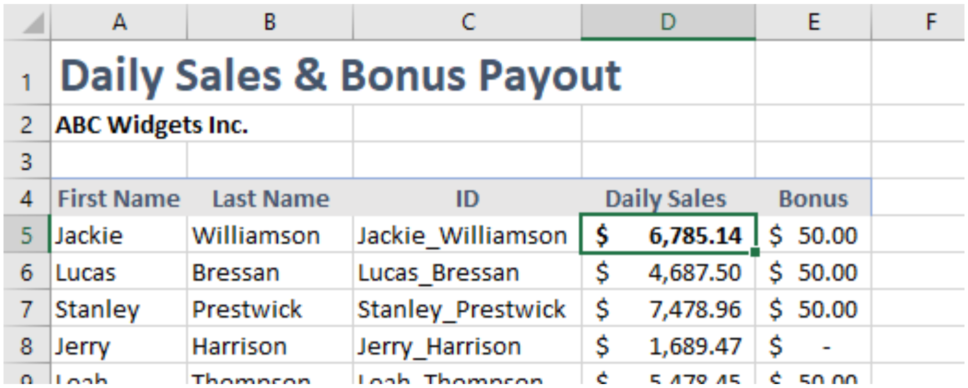
8. Next, you will be required to **re-enter the password** that you selected. Do so and then click **OK**:



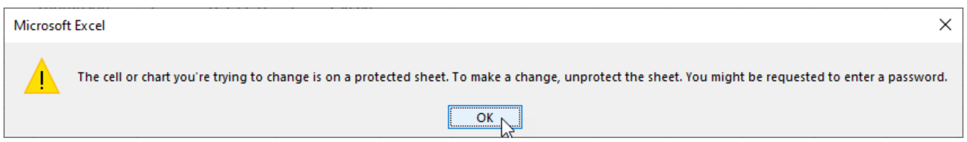
9. Back on the worksheet, right-click on cell **D5**, then click the **Bold** button on format menu:



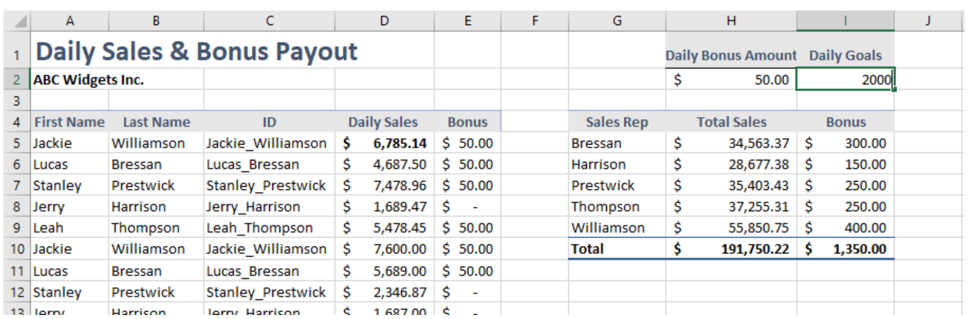
10. The contents of cell D5 are now bold: Now **try to change the value of cell D5** by typing a new value into it:



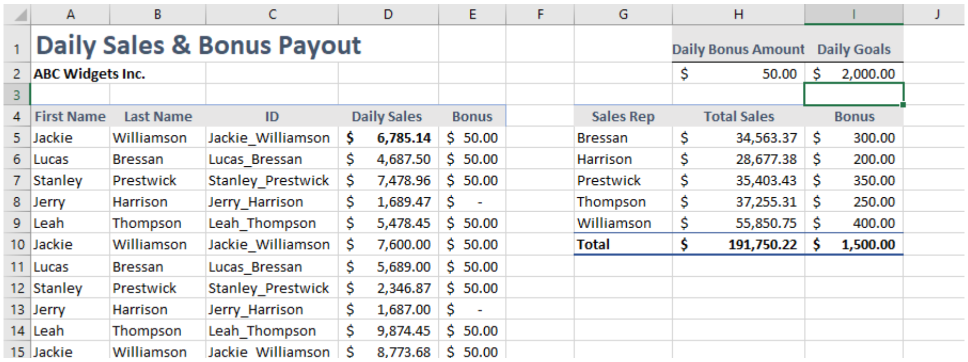
11. A warning message appears, informing you that the cell you are trying to change is protected. Click **OK**:



12. Now select cell **I2**. Type the value “**2000**” and press **Enter**:

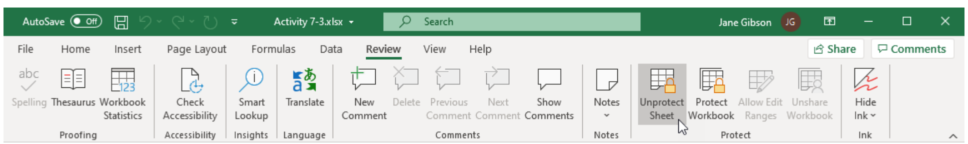


13. Because the cell has been unlocked, you are able to change the value in the cell. All the formulas that reference that cell have updated results:

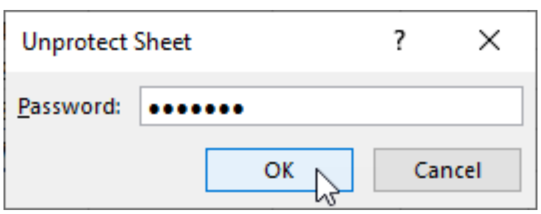


	A	B	C	D	E	F	G	H	I	J
1	Daily Sales & Bonus Payout							Daily Bonus Amount	Daily Goals	
2	ABC Widgets Inc.							$ 50.00	$ 2,000.00	
3										
4	First Name	Last Name	ID	Daily Sales	Bonus		Sales Rep	Total Sales	Bonus	
5	Jackie	Williamson	Jackie_Williamson	$ 6,785.14	$ 50.00		Bressan	$ 34,563.37	$ 300.00	
6	Lucas	Bressan	Lucas_Bressan	$ 4,687.50	$ 50.00		Harrison	$ 28,677.38	$ 200.00	
7	Stanley	Prestwick	Stanley_Prestwick	$ 7,478.96	$ 50.00		Prestwick	$ 35,403.43	$ 350.00	
8	Jerry	Harrison	Jerry_Harrison	$ 1,689.47	$ -		Thompson	$ 37,255.31	$ 250.00	
9	Leah	Thompson	Leah_Thompson	$ 5,478.45	$ 50.00		Williamson	$ 55,850.75	$ 400.00	
10	Jackie	Williamson	Jackie_Williamson	$ 7,600.00	$ 50.00		Total	$ 191,750.22	$ 1,500.00	
11	Lucas	Bressan	Lucas_Bressan	$ 5,689.00	$ 50.00					
12	Stanley	Prestwick	Stanley_Prestwick	$ 2,346.87	$ 50.00					
13	Jerry	Harrison	Jerry_Harrison	$ 1,687.00	$ -					
14	Leah	Thompson	Leah_Thompson	$ 9,874.45	$ 50.00					
15	Jackie	Williamson	Jackie_Williamson	$ 8,773.68	$ 50.00					

14. Now click **Review → Unprotect Sheet**, to remove the protection:



15. Enter your password and click **OK**:



16. Save the current workbook as Activity 7-3 Complete and then close Microsoft 365 Excel to complete this exercise.

TOPIC D: Preparing a Workbook for Multiple Audiences

One thing to keep in mind when working with and managing workbooks created by Excel 365, is that multiple audiences from other regions of the world, or with different abilities, may be required to use and understand them. For this reason, it is important to understand how you can adapt your workbooks for different audiences, when required.

Topic Objectives

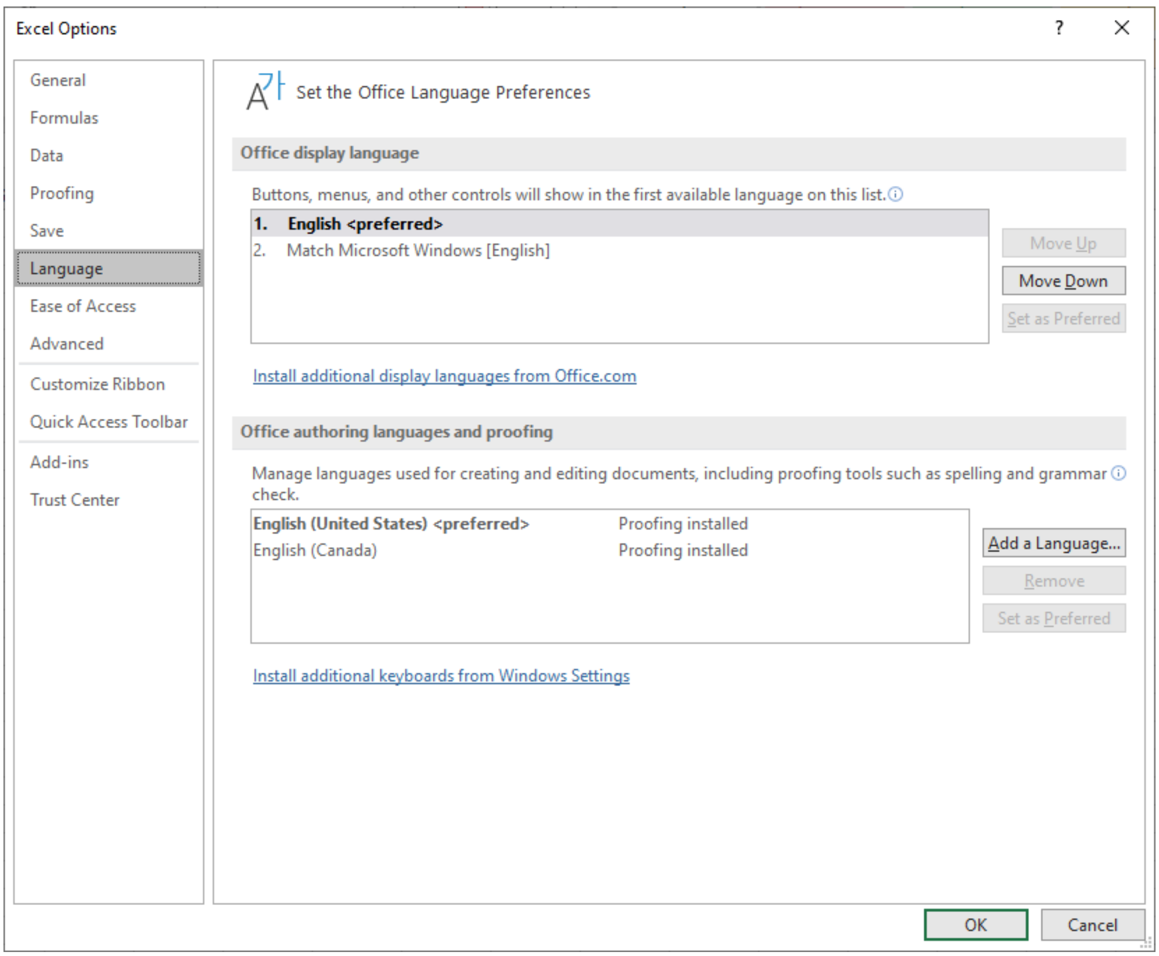
In this session, you will learn:

- How to display data in multiple international formats
- How to utilize international symbols
- How to add alternative text to objects

Displaying Data in Multiple International Formats

If you encounter data that appears in a different language or unit of measurement, Excel can accommodate this information and modify it to suit your own preferences.

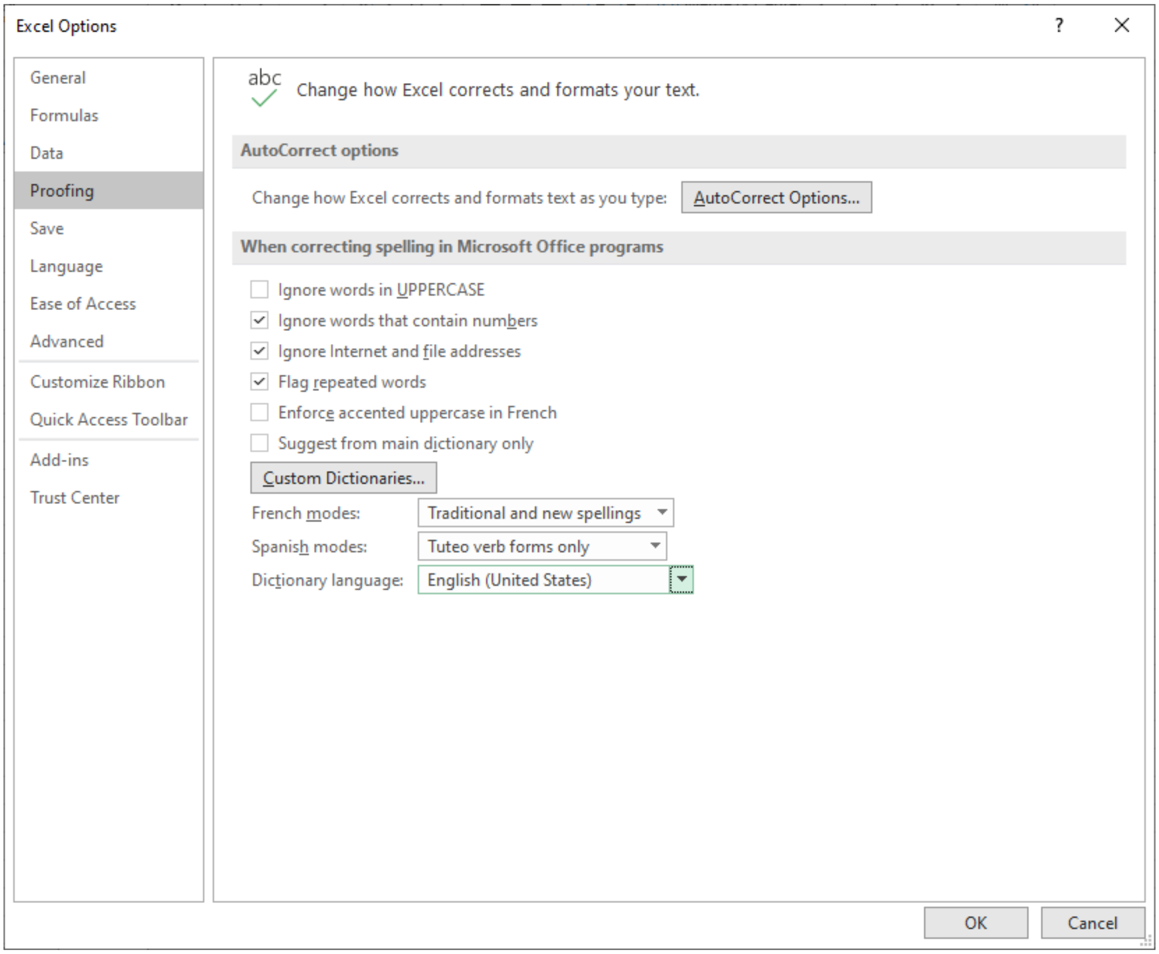
When working with other languages, you have the option to change the interface and the languages that are used for editing. You can find these settings within the Excel Options dialog box, in the **Language category**:



Within the **Office display language** section, you can choose the language for buttons, menus, and other controls. Select your preferred language and then click **Set as Preferred**. If the language you prefer is not displayed, you can click **Install additional display languages from Office.com**.

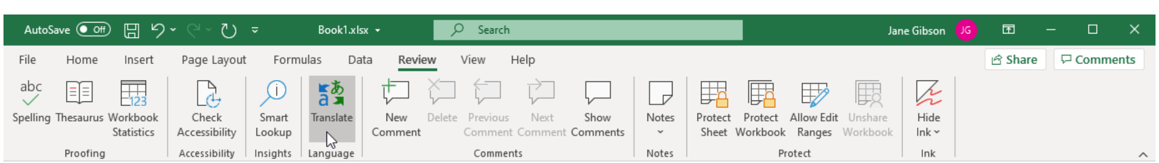
In the **Office authoring languages and proofing** section you can similarly choose languages for creating and editing documents, including proofing tools such as spelling and grammar check.

The **Proofing** category of the Excel Options dialog box includes settings for customizing dictionaries and setting modes for the French and Spanish language. You can also select the dictionary language here:

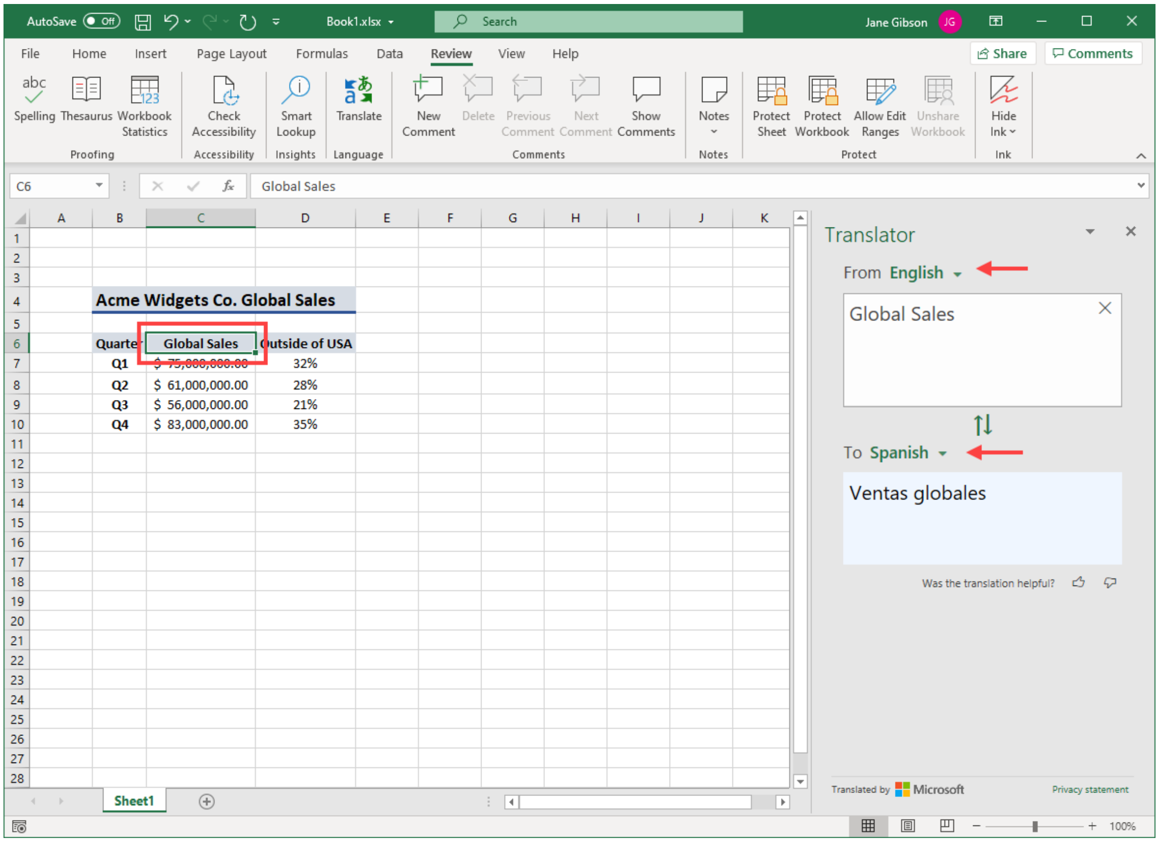


Translation

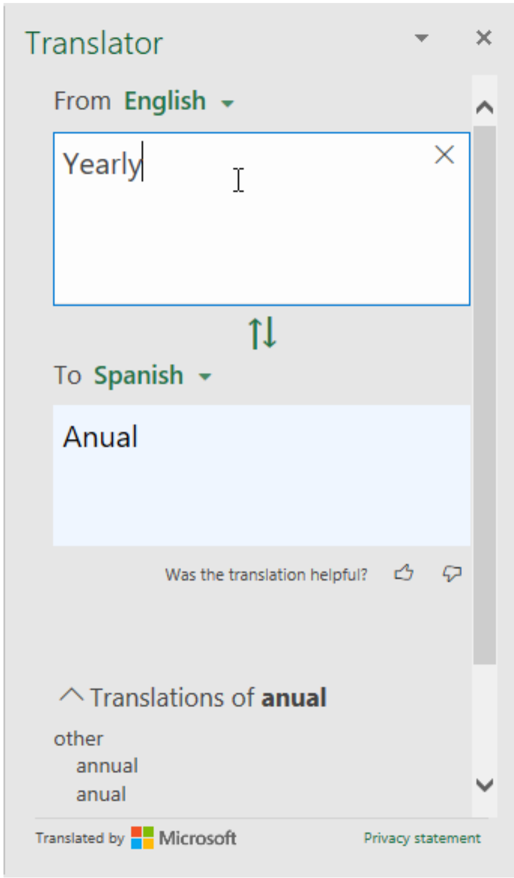
If you are dealing with other languages, Excel also has a **translation** function available, in the Review tab, allowing you to select text within your spreadsheet and translate between more than 60 languages. To launch the Translator task pane, click **Review → Translate**:



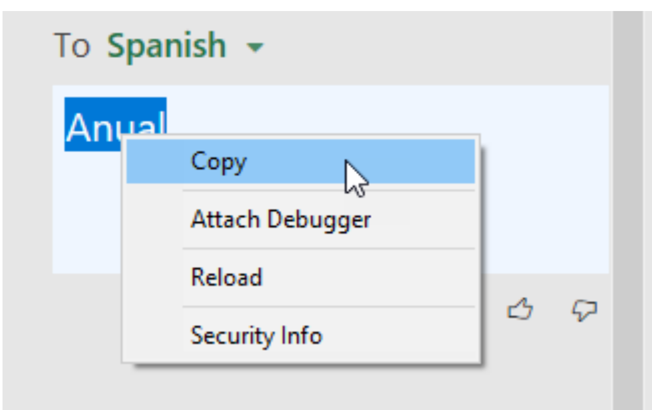
The **Translator** task pane opens on the right side of your worksheet, where you can set the **From** and **To** languages, then select cells on your worksheet that contain text to see the translation:



You can also type directly into either field to see a translation in the other field:

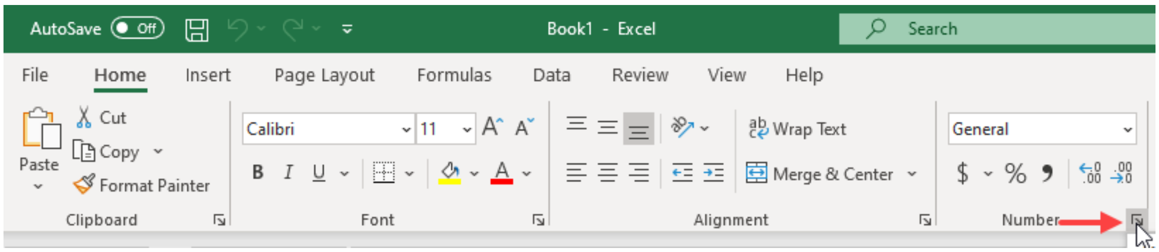


Finally, you can copy text from either field to use in your worksheet, by right-clicking the selected text, then clicking **Copy:**

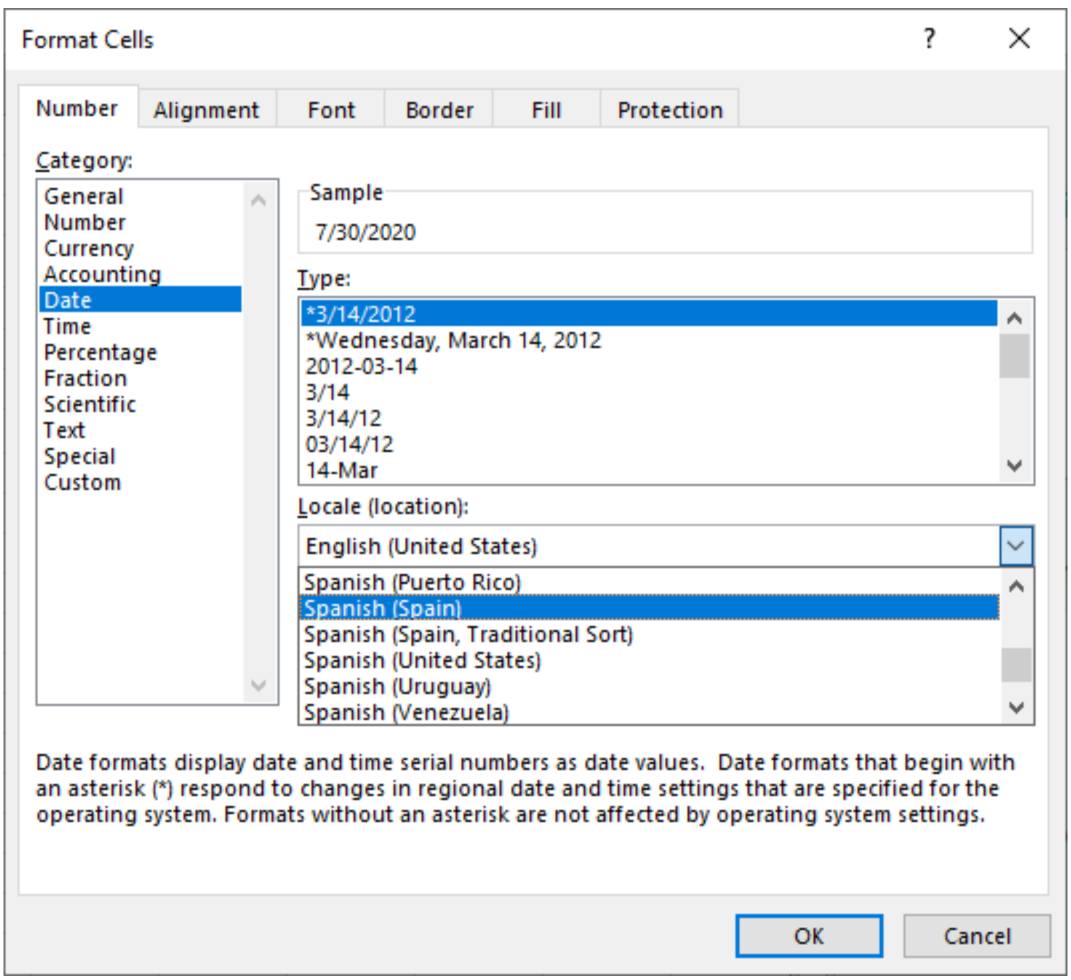


Date and Numerical Formats

Date and numerical formats can also be adjusted to international units. To do this, select the data that you would like to adjust and then click the Option button ( ) within the Number group on the Home tab:

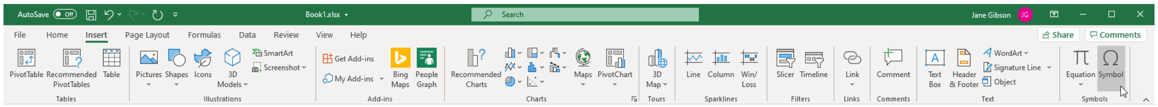


This action displays the **Format Cells** dialog box. From the list of categories on the left side of this dialog box, select the data that you are working with and you will see either the Symbol drop-down or the Locale (location) drop-down that you can use to choose a different regional option:

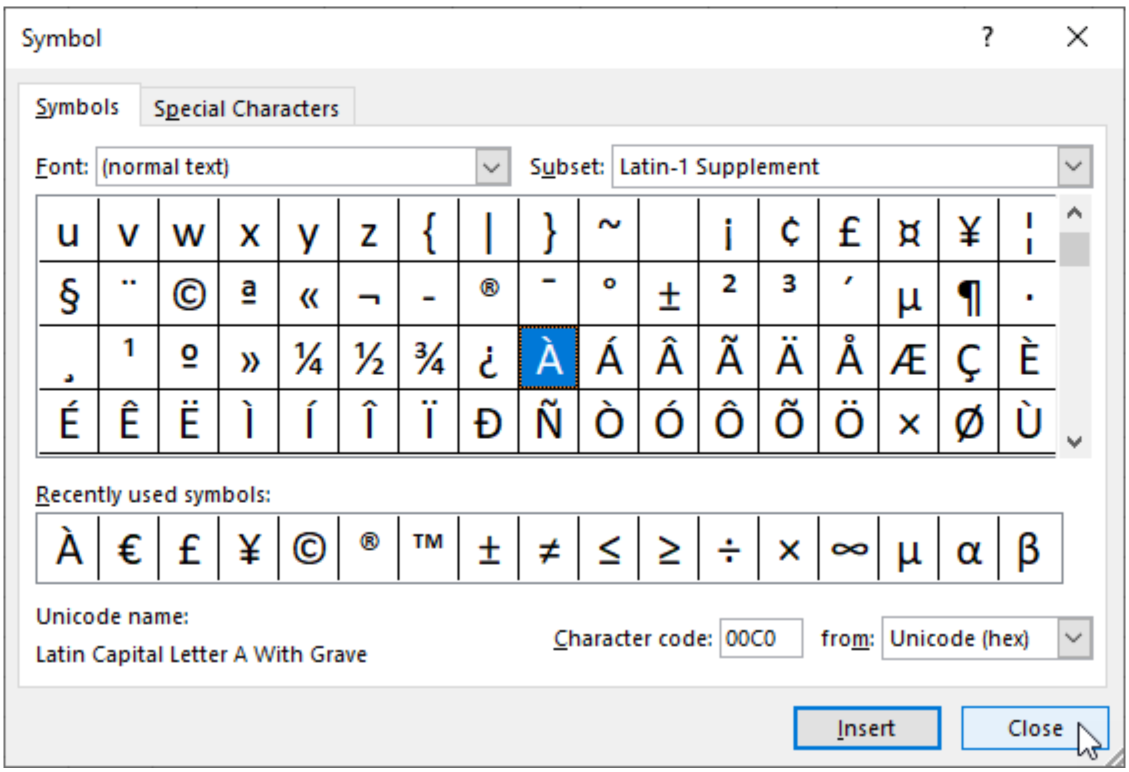


Utilize International Symbols

Many languages can be entered using a standard keyboard, but some do require special **international** characters. To find and insert one of the symbols, click **Insert → Symbol**:



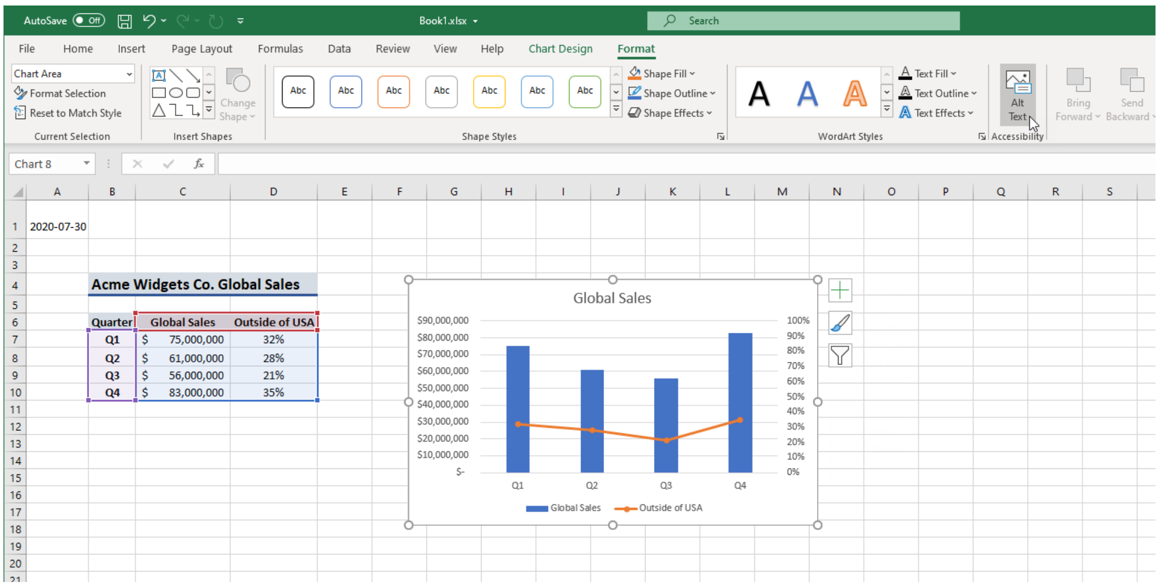
This action opens the **Symbol** dialog box to the **Symbols** tab. First, from the Font drop-down menu select the font that you would like to use. Next, double-click the symbol that you would like to insert into the last location that was selected on the current worksheet. The Symbol dialog box remains open, allowing you to enter more than one symbol in your selected cell. When you are finished adding symbols, click **Close**:



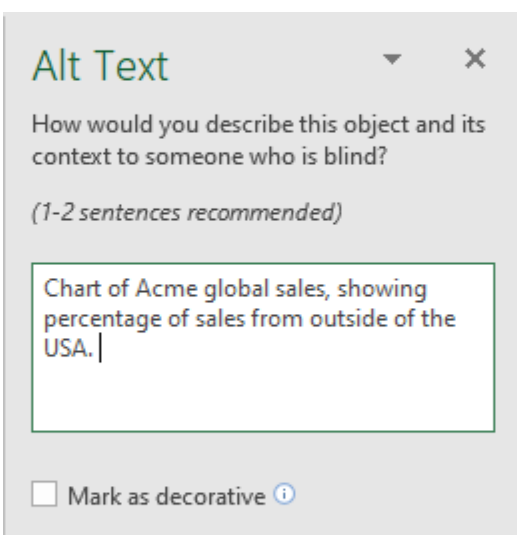
Adding Alternative Text to Objects

You can create alternative text (**Alt Text**) for shapes, pictures, charts, or other objects in your Excel workbooks. This helps people with visual impairments, who use screen readers, to better understand your graphical content. When you add Alt Text to an object, a screen reader reads out the Alt Text when it encounters the object. Without Alt Text, the screen reader user only knows they have reached an object without knowing what it shows.

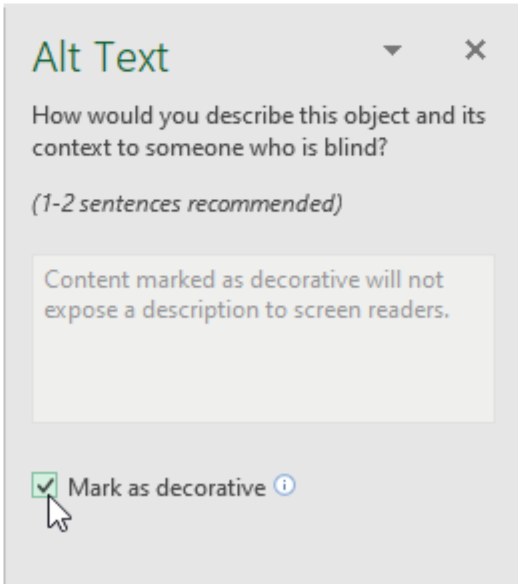
To add Alt Text to an object, first select the object, then click **Format → Alt Text**:



The **Alt Text** task pane opens, where you can type a description of the object (typically one or two sentences), to help communicate the information it presents:



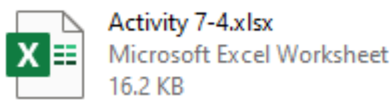
If you instead check the **Mark as decorative** checkbox, the object will not expose a description to screen readers. This allows you to identify to the user objects as decorative, rather than informational:



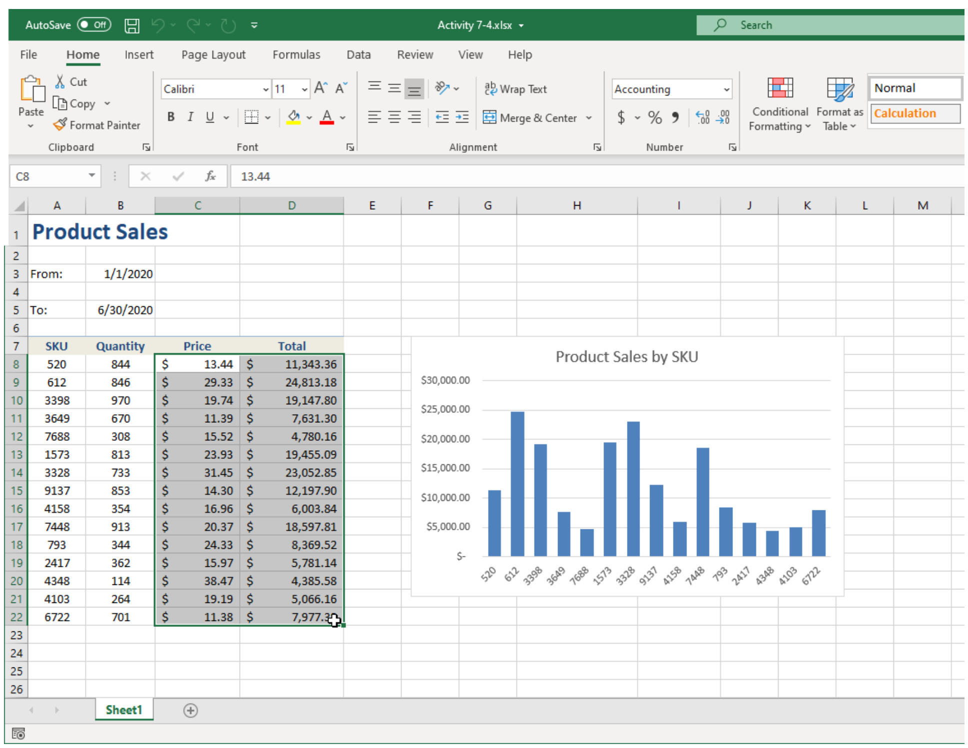
Activity 7-4: Preparing a Workbook for Multiple Audiences

The workbook that you have been working on needs to be sent to customers in Quebec, a French speaking Canadian province. You have been asked to prepare it for them.

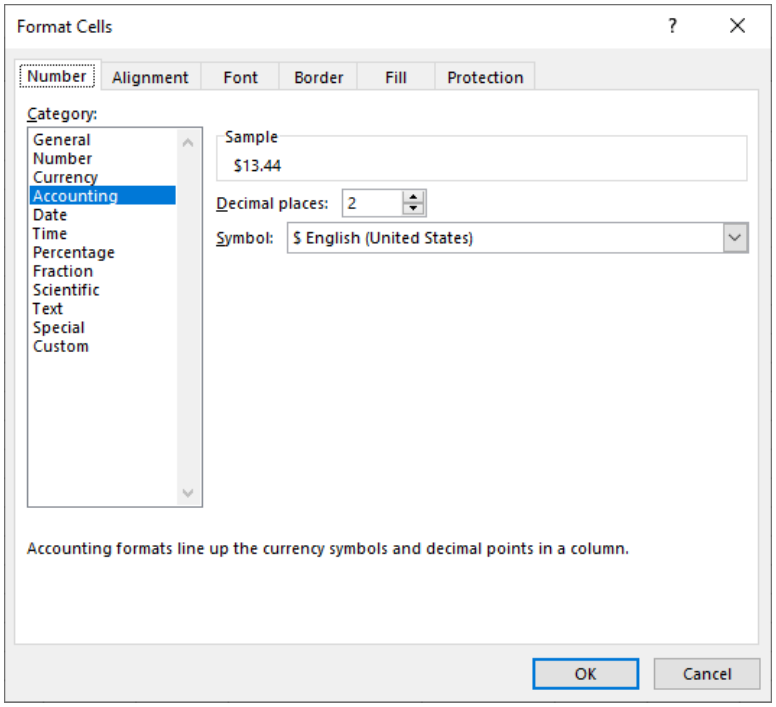
1. To begin, open Activity 7-4 from your Exercise Files folder:



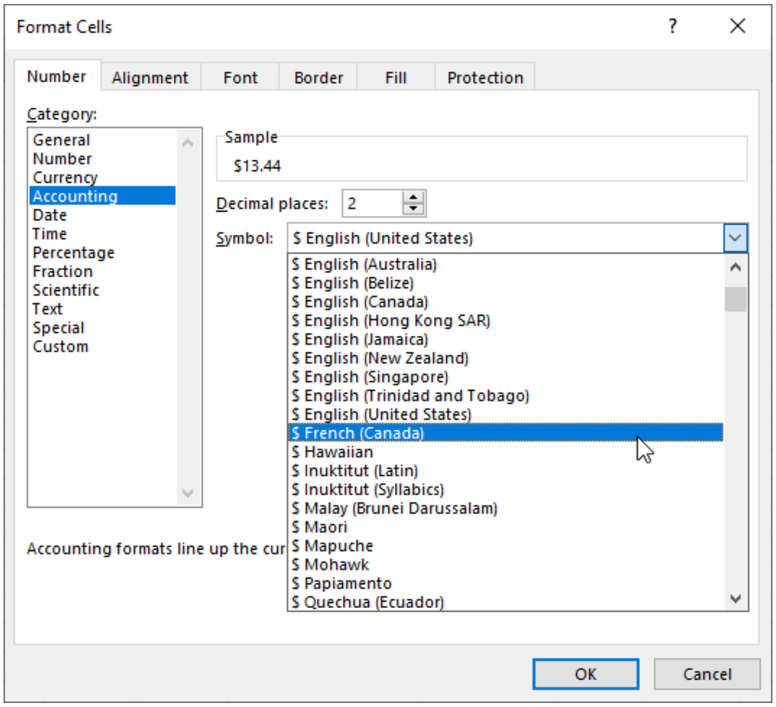
2. Use your cursor to select cells **C8 to D22**:



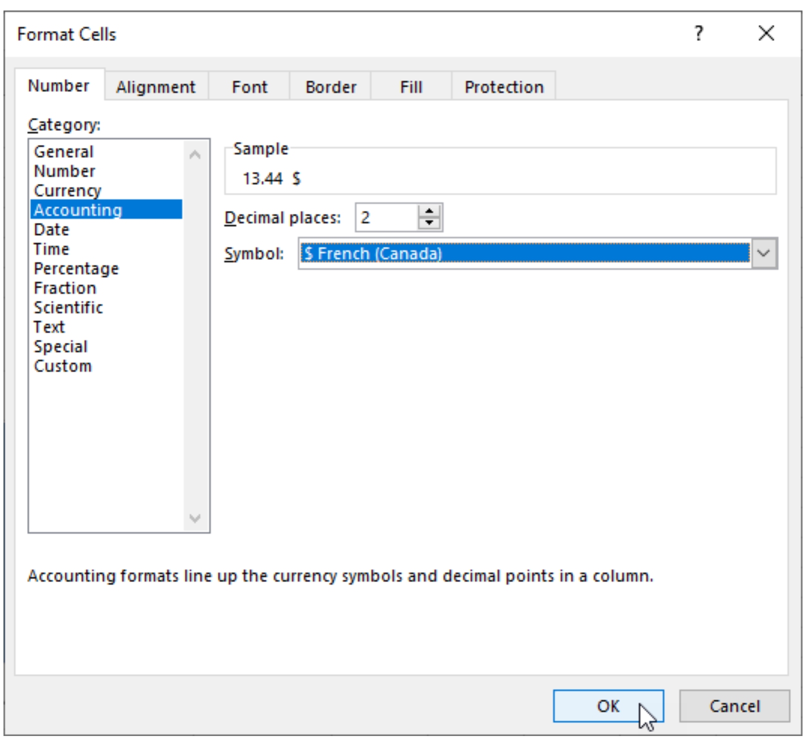
3. Next, press **Ctrl + 1.** The Format Cells dialog box opens. Click the **Number** tab if it is not already displayed:



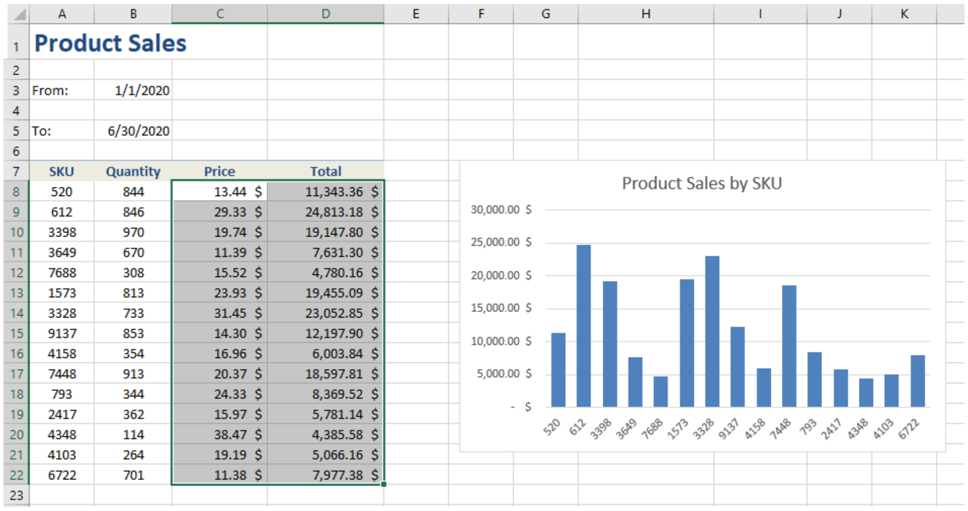
4. Ensure that the **Accounting** category is selected from the Category list on the left, then click the **Symbol** drop-down menu and click the **French (Canada)** option:



5. With the new currency symbol selected, click **OK** to apply your changes:



6. Back at the worksheet, you will see that the cells have been updated with the new currency format:



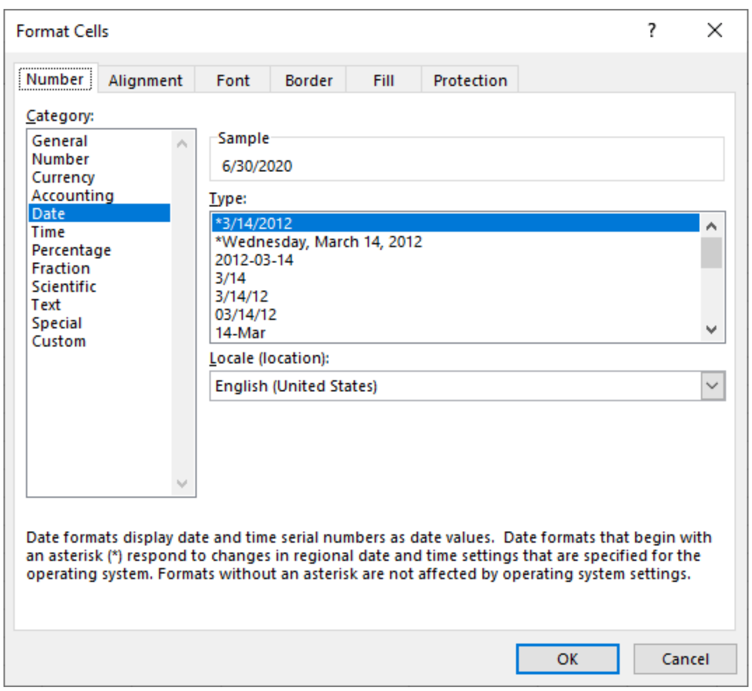
Product Sales

From: 1/1/2020

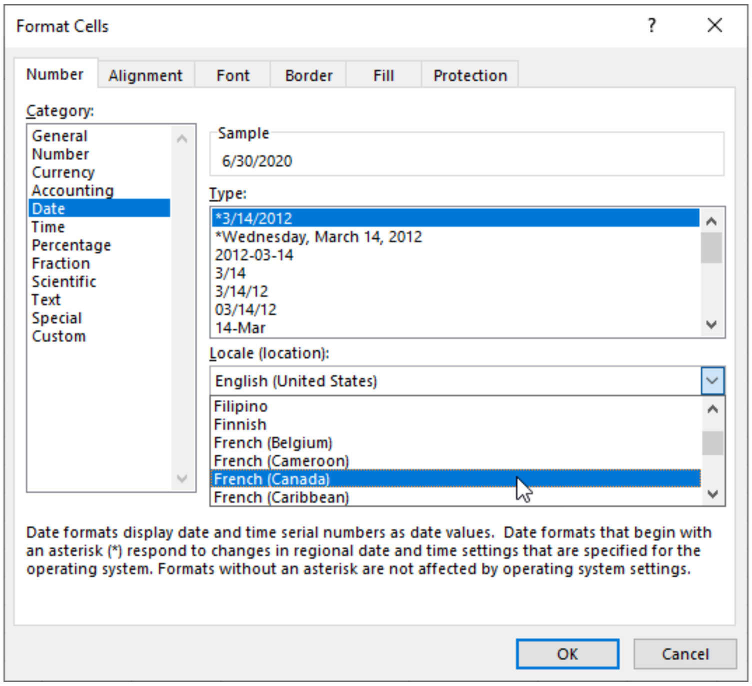
To: 6/30/2020

SKU	Quantity	Price	Total
520	844	13.44 $	11,343.36 $
612	846	29.33 $	24,813.18 $
3398	970	19.74 $	19,147.80 $
3649	670	11.39 $	7,631.30 $
7688	308	15.52 $	4,780.16 $
1573	813	23.93 $	19,455.09 $
3328	733	31.45 $	23,052.85 $
9137	853	14.30 $	12,197.90 $
4158	354	16.96 $	6,003.84 $
7448	913	20.37 $	18,597.81 $
793	344	24.33 $	8,369.52 $
2417	362	15.97 $	5,781.14 $
4348	114	38.47 $	4,385.58 $
4103	264	19.19 $	5,066.16 $
6722	701	11.38 $	7,977.38 $

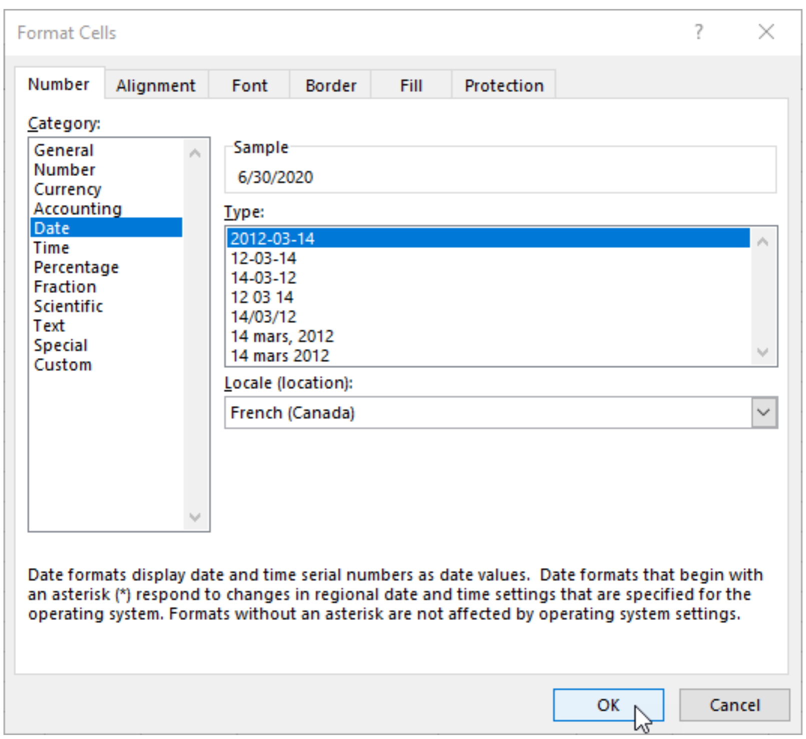
7. Now select cell **B3**, then hold **Ctrl** and also select cell **B5**. Once both cells are selected, press **Ctrl + 1**, to again open the Format Cells dialog box:



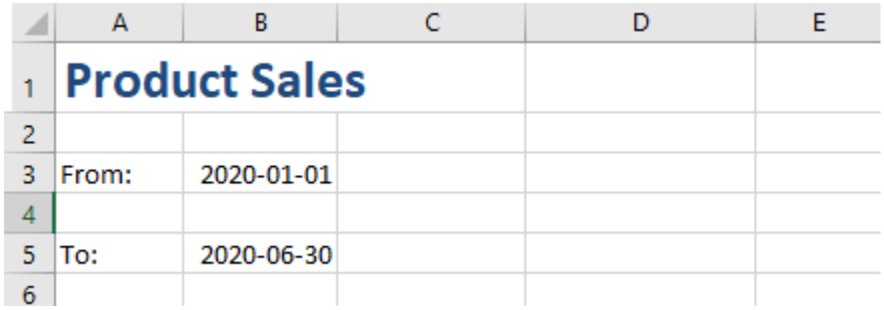
8. Ensure that the **Date** category is selected from the Category list on the left, then click the **Locale** (location) drop-down menu and select the **French (Canada)** option:



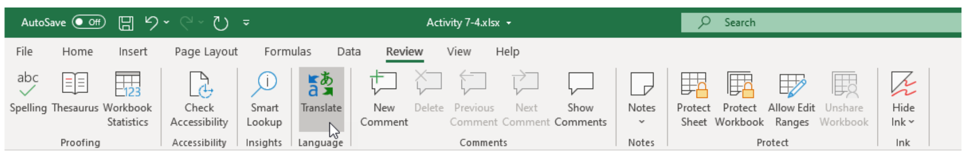
9. With the new date locale selected, click **OK** to apply your changes:



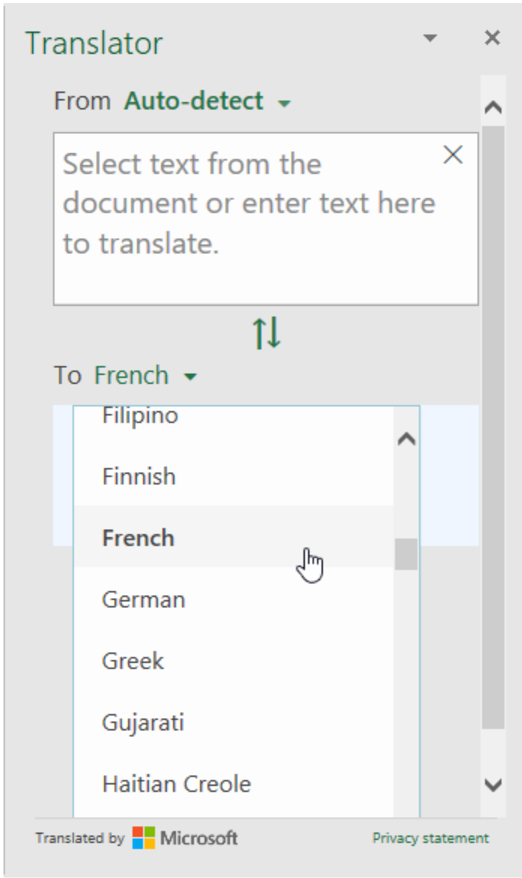
10. The date formats have now been updated:



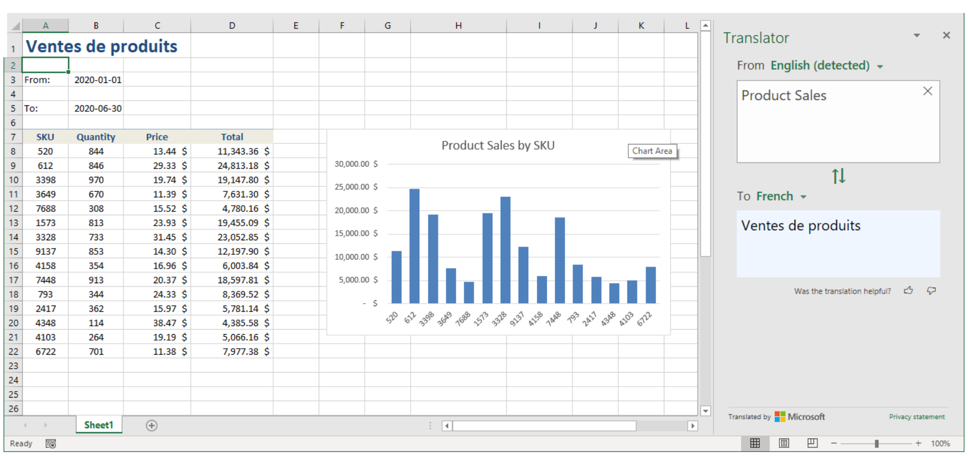
11. Now, to translate the title and the date labels, click **Review → Translate**:



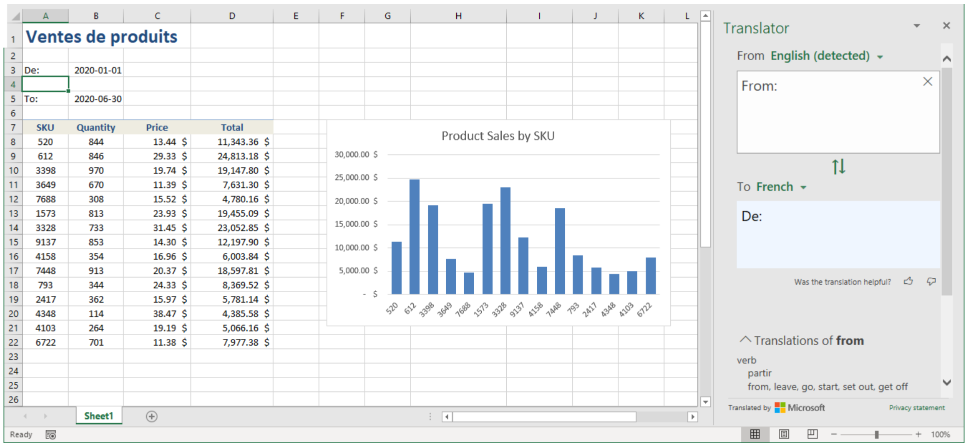
12. In the Translator task pane, leave the **From** language selector set to Auto-detect and click on the **To** drop-down menu and scroll to find, then select, **French**:



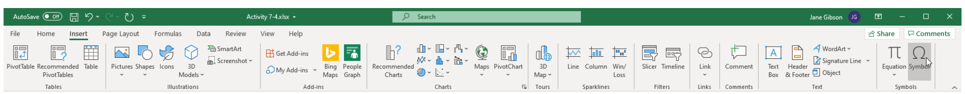
13. Now click on cell **A1**. You will see that the translation is, likely, "**Ventes de produits**." Type this into cell A1, then press **Enter**:



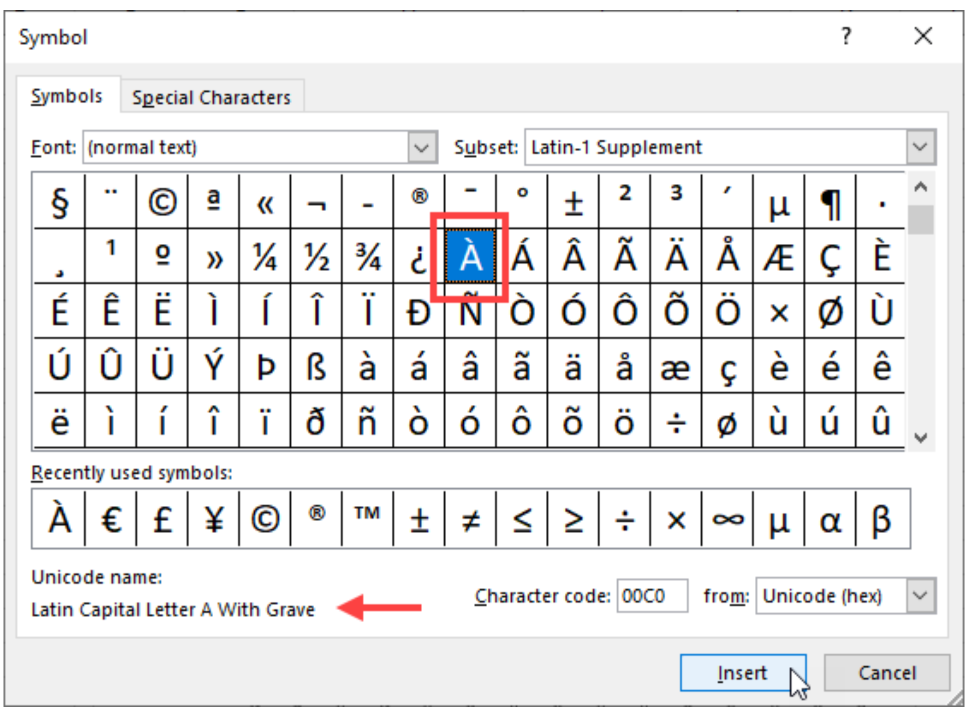
14. Now, click on cell **A3**. Type the translation, “**De:**”, in cell **A3**, and press **Enter**:



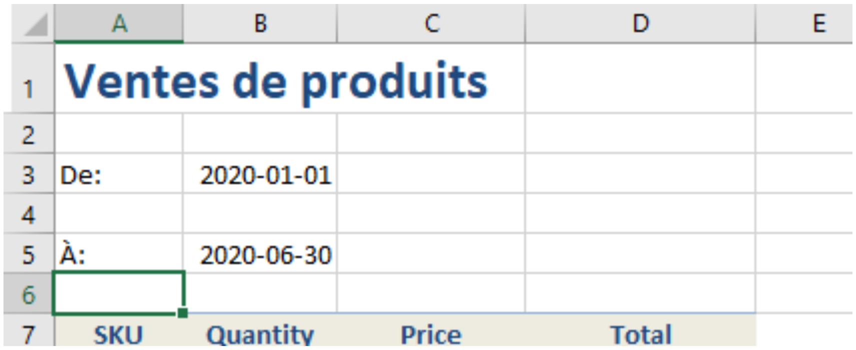
15. Now select cell **A5**. You will see that the translation for “To:” is “À:” (A with an accent grave). To enter this in the cell, first **delete** the contents of cell **A5**, then click **Insert → Symbol**:



16. The Symbol dialog box will open to the Symbols tab. Select the capital letter A with grave, then click **Insert,** then click **Close**:



17. Add the **colon** to complete the entry on cell A5, then press **Enter**:



18. Save the current workbook as Activity 7-4 Complete and then close Microsoft 365 Excel to complete this exercise.

Summary

During this lesson you learned about the various ways that you can enhance your workbooks in Excel 365. You should now be familiar with the customization options that are available, including notes and comments, as well as how to manage themes to control the appearance of your workbooks. At this point, you should also be comfortable with protecting your workbooks against data loss and unauthorized access. Finally, you now know how to prepare your workbooks when working with multiple audiences.

Review Questions

1. **What is the command sequence to insert a comment?**

2. **What are themes?**

3. **How do you add a background image to your worksheet?**

4. **In which group on the Review tab can you find the Protect Sheet command?**

5. **What is the command sequence to open the Alt Text task pane?**

LESSON LABS

Lesson 1

Lesson Lab 1-1

Objective

To understand how to apply and use range names, as well as apply and use specialized functions.

Briefing

You have a workbook that lists the total sales for every branch of your company. You need to calculate the average sales for each region, for stores with sales under $1,000,000.

Task

Apply the following range names to the indicated cells:

- A4:A27: Store
- B4:B9: Region_1
- B10:B14: Region_2
- B15:B17: Region_3
- B18:B22: Region_4
- B23:B27: Region_5

In the designated cells, use the AVERAGEIF function to calculate the average of the stores by region only where the stores earned under $1,000,000 in sales.

Hints

Remember that logical operators need to be enclosed in double quotations when constructing this function.

Sample Data

Lesson Lab 1-1.xlsx

Lesson 2

Lesson Lab 2-1

Objective	To understand how to analyze data using functions.
Briefing	You have been tasked with finishing a sales worksheet that lists the actual sales and sales goals for each store in your company.
Task	Use an IF function to determine if each store in every region has met their sales goal outlined in the worksheet.
Hints	Remember that the IF function syntax is as follows: IF(logical_test, value_if_true, value_if_false).
Sample Data	Lesson Lab 2-1.xlsx
Follow-Up Questions	Use the UPPER function to convert the text found in cell A1 entirely to uppercase.

Lesson Lab 2-2

Objective	To understand how to use lookup functions.
Briefing	You need to use a LOOKUP function to find specific information from the provided worksheet.
Task	Add a LOOKUP function to cell G2 to find out if store 358 met its sales goal.
Hints	Remember that the syntax for a LOOKUP function is as follows: =LOOKUP(lookup_value, lookup_area, results_area).
Sample Data	Lesson Lab 2-2.xlsx
Follow-Up Questions	Add the current date to cell E1 using the TODAY function.

Lesson 3

Lesson Lab 3-1

Objective	To understand how to create and customize tables, as well as sort table data.
Briefing	A worksheet that you have been working on requires a table. Additionally, you need to sort this data to better see which stores have not met their sales goal.
Task	Create a new table from the data in the A3:D27 range in the sample workbook. Apply any one of the table styles that are available. Sort the data in the table by the Sales Goal Met column from A to Z.
Hints	You can find the table styles in the Table Styles gallery on the Table Tools – Design tab.
Sample Data	Lesson Lab 3-1.xlsx
Follow-Up Questions	Add a Total Row to the table and calculate the sum of total sales, the sum of the sales goals, and a count of the stores that met their sales goals.

Lesson 4

Lesson Lab 4-1

Objective	To understand how to create and modify charts based on existing data.
Briefing	For an upcoming presentation, you would like to create a chart based upon sales data with which you have been working.
Task	Using the B3:C15 range in the provided Sample Data file, create a new chart that will best illustrate actual sales numbers against sales goals for the store. Once you have chosen and inserted a new chart, remove the title.
Hints	Remember that each chart type is best suited to a specific type of data, so if one chart does not look right, try another type. There might be a number of different solutions.
Sample Data	Lesson Lab 4-1.xlsx
Follow-Up Questions	Apply a new style to the chart that you just created.

Lesson Lab 4-2

Objective	To understand how to utilize trendlines while working with charts.
Briefing	To get a better picture of the order value by age group that has been collected over a period of time, you would like to add a trendline to a chart.
Task	Add a polynomial trendline to the chart that appears on the supplied worksheet, then format the trendline in red to stand out from the data plots.
Hints	Ensure that the polynomial trendline is set to an order of 2.
Sample Data	Lesson Lab 4-2.xlsx
Follow-Up Questions	Experiment with the other trendline types to see how they represent the data.

Lesson 5

Lesson Lab 5-1

Objective	To understand how to create and use PivotTables to analyze data.
Briefing	Using a PivotTable, you would like to see the total amount of sales made by stores that reached their sales goal and stores that did not.
Task	Using the provided data (A3:D27) in the Sample Data file, create a new PivotTable on the current worksheet (Sheet1) that starts in cell F3. Add data to the PivotTable by adding the Sales Goals Met field as a column. Next, add the Sales field to the Values area. Ensure that the Sales field uses the SUM function. Apply the appropriate data formats to the resulting table and adjust the column widths as necessary.
Hints	Remember that you can click and drag fields from the field list in the top half of the PivotTable Field task pane to the four areas on the bottom half.
Sample Data	Lesson Lab 5-1.xlsx

Lesson Lab 5-2

Objective	To understand how to present data using PivotCharts, as well as filter data using slicers.
Briefing	Using a PivotTable that you previously created, you would like to create a PivotChart that best illustrates the data that it presents.
Task	Create a PivotChart on the worksheet of the Sample Data file that uses the Column chart type. Insert a slicer that filters out data from store 122 as this location recently closed.
Hints	You can insert a slicer by clicking **PivotTable Analyze → Insert Slicer.** Additionally, by holding down the Ctrl key and clicking on a button in the slicer you can choose to filter out that option.
Sample Data	Lesson Lab 5-2.xlsx
Follow-Up Questions	On the PivotChart, add data labels to the outside end position.

Lesson 6

Lesson Lab 6-1

Objective	To understand how to work with graphical objects.
Briefing	You are going to be presenting the results of a customer survey. To improve the visual elements of this worksheet, you would like to add some graphical objects.
Task	Align, order, and group the happy and unhappy face shapes with the colored circles to create icons for satisfactory and unsatisfactory results, then size the grouped shapes to fit next to the average score and the scores for each CSR. Copy and paste as required to add an icon to each score. Scores above 6 get a happy face and scores below 6 get an unhappy face. Next, search stock art and online to find and add an image below the title that is related to customer satisfaction.
Hints	Remember that clicking **Shape Format → Selection Pane** will open the Selection task pane, where you can arrange the layers of the shapes.
Sample Data	Lesson Lab 6-1.xlsx
Follow-Up Questions	Add a SmartArt graphic to show the CSR results, from highest to lowest. Use colors in the individual shapes that match the icons.

Lesson 7

Lesson Lab 7-1

Objective	To understand how to manage themes, add backgrounds, and protect a workbook.
Briefing	You need to send a confidential workbook to an international branch to confirm the inventory value.
Task	Change the theme of the document to “Feathered,” then use the Lesson Lab 7.1.png image to add a background to the workbook. Unlock the cells in the range C5:C34, to allow for editing, then protect the worksheet, making sure you select “Edit objects” in the “Allow all users of this workbook to” field. (Allowing “Edit objects” lets users add notes to a worksheet even when it is protected.) Use the password “1234” (without the quotation marks). Finally, encrypt the document, again with the password “1234”.
Hints	When choosing a background, ensure that you choose the Browse button that appears in the **From a file** section. Also remember that you click **File → Info → Protect Workbook** to encrypt with a password.
Sample Data	Lesson Lab 7-1.xlsx
Follow-Up Questions	Try editing the values in column C, then column B.

Lesson Lab 7-2

Objective	To understand unprotecting workbooks, marking them as final, using comments and notes, and using translation.
Briefing	An international branch has returned a confidential workbook in response to your request. You must finalize it.
Task	Open the workbook using the password “1234” (without the quotation marks). Also unprotect the sheet with the same password. You can now remove the background and change the theme back to **Office**. Find any notes on the worksheet and translate them to English. Convert the note to a comment and add the translation in a new thread.
Hints	You can copy the text from the note and paste it into the translator. You can use the Auto-detect feature if you are not sure what the language is. Also, remember to clear the password from the document encryption.
Sample Data	Lesson Lab 7-2.xlsx

COURSE WRAP-UP

Post-Course Assessment

1. Where can you search for different types of functions?

a. In the Microsoft Search box

b. In the Insert Function dialog box

c. In the Formulas tab

d. All of the above

2. What is the LEN function used for?

a. It returns a set number of characters from a string

b. It counts the number of cells in a row

c. It returns the number of characters in a string

d. It counts the number of rows in a column

3. When does the AND function return a TRUE value?

a. When one of the arguments is true

b. When all the arguments are true

c. When all the arguments are false

d. When there is only one argument.

4. What is the last argument in all of the database functions?

a. criteria

b. database

c. lookup_value

d. row_num

5. What are the two contextual tabs available when you have a chart selected?

a. Chart Task Pane

b. Chart Design

c. Format

d. Add Chart

6. What do dual axis charts display?

a. A unique axis for both data series in a combination chart

b. Two different axis titles

c. Values above and below zero

d. Two charts beside each other

7. What does a slicer do, in relation to PivotTables?

a. Adds columns to the table

b. Filter fields by unique entries

c. Adds rows to the table

d. Separates column data

8. How can you see the layers of all shapes and pictures on a worksheet?

a. Click Shape Format → Group → Group

b. Click Picture Format → Selection Pane

c. Click Picture Format → Bring Forward → Bring to Front

d. Click Shape Format → Selection Pane

9. What is a digital signature?

a. A scan of your signature

b. A link to your company website

c. A fingerprint scanner

d. An electronic, encrypted, certificate of authenticity

10. What is Alt Text used for?

a. To add translations to objects in your workbook

b. As a programming language

c. To give context to objects in your workbook for users with screen readers

d. To add animations to your workbook objects

Course Summary

Congratulations on completing the second part of Microsoft 365 Excel training. During this course, you learned how to:

- Create advanced formulas
- Analyze data with logical and lookup functions
- Organize worksheet data with tables
- Visualize data with charts
- Analyze data with PivotTables, slicers, and PivotCharts
- Work with graphical objects
- Enhance workbooks

You should now know which formulas and functions are used to complete which tasks, as well as how to use those formulas and functions for data analysis. You should be comfortable with the variety of data visualization tools that are available in Excel, as well as the use of graphics and the many ways that you can enhance your workbooks.

ANSWER KEYS

Lesson 1 Review Questions

1. **For a selected range, where do you type in a new range name?**

   You type a new range name for a selected range into the Name Box.

2. **How many function categories are there in Microsoft 365 Excel?**

   In Excel 365, there are 12 function categories.

3. **What is the command sequence to show formulas rather than calculated values in cells?**

   The command sequence to show formulas rather than calculated values in cells is **Formulas → Show Formulas.**

4. **What is a nested function?**

   A nested function is a function within the arguments of another function.

5. **What is the command sequence to change workbook calculations to manual?**

   The command sequence to change workbook calculations to manual is **Formulas → Calculate Options → Manual.**

Lesson 2 Review Questions

1. **What is the TRIM function used for?**

   The TRIM function is used to remove empty spaces from a string, excluding those that appear between two words.

2. **What is the TEXTJOIN function used for?**

   The TEXTJOIN function is used to combine (concatenate) text strings together, with or without delimiters, from multiple cells into one single cell.

3. **What are the only two possible outputs from a logical function?**

   The output from a logical function is either TRUE or FALSE.

4. **What is the difference between the TODAY function and the NOW function?**

   The difference between the TODAY function and the NOW function is that the TODAY function will only print the current date, while the NOW function prints both the date and time.

5. **What is the FV function used for?**

   The FV function is used to calculate the future value of an investment that has a fixed interest rate, as well as a fixed or periodic payment schedule.

Lesson 3 Review Questions

1. **What is the command sequence to add a table?**

   To add a table, click **Insert → Table.**

2. **How do you add a Total Row to a table?**

   To add a Total Row, click **Table Design → Total Row.**

3. **What type of functions do Total Rows use by default?**

   Total Row formulas use the subtotal function to display the results of common operations. This means the formulas will display totals only for rows that are not hidden.

4. **How can you remove duplicate values from a table?**

   To remove duplicate values from a table, first select a cell within the table and click **Table Design → Remove Duplicates.**

5. **When you convert a table to a range, what happens to the structured references?**

   Structured references are replaced with cell references when you convert a table to a range.

Lesson 4 Review Questions

1. **What are charts?**

   Charts are graphical representations of data and its relationships.

2. **What is a line chart typically used for?**

   Line charts are typically used to display data changes over a period of time.

3. **What is the difference between modification and formatting?**

   When you choose to modify a chart, you are changing the various elements that are used to illustrate the data. Formatting, on the other hand, is the process of altering the overall appearance of the chart.

4. **When are the Chart contextual tabs displayed?**

   The Chart contextual tab set is displayed whenever a chart is selected.

5. **What is the command sequence to add a trendline using the ribbon?**

   The command sequence to add a trendline using the ribbon is **Chart Design → Add Chart Element → Trendline → [Trendline].**

Lesson 5 Review Questions

1. **What is pivoting in Excel?**

   Pivoting is the act of moving data around to change the table's structure.

2. **Where do the field names come from in the Choose fields to add to report section of the PivotTable Fields task pane?**

   The field names are derived from the column headers in the table or range used to create the PivotTable.

3. **What happens to fields that are dragged to the Values area on the PivotTable Field task pane?**

   Fields that are dragged to the Values area of the PivotTable Field task pane will have calculations performed on them or their values summarized.

4. **What is the command sequence to insert a PivotChart?**

   The sequence to insert a PivotChart is **PivotTable Analyze → PivotChart.**

5. **What do the buttons on a slicer represent?**

   The buttons on a slicer represent unique entries that exist within the field that is associated with the slicer.

Lesson 6 Review Questions

1. **What are the six types of graphical objects that can be inserted into Excel workbooks?**

   The six types of graphical objects that can be inserted into Excel workbooks are Pictures, Shapes, Icons, 3D Models, SmartArt, and screenshots.

2. **Are shapes considered pictures or drawings?**

   Shapes are considered drawings.

3. **How do you open the Selection pane?**

   To open the Selection pane, click **Picture Format (or Shape Format) → Selection Pane.**

4. **What are SmartArt graphics used for?**

   SmartArt graphics are used to visually represent text-based content in a chart or diagram.

5. **How do you open the Choose a SmartArt Graphic dialog box?**

   To open the Choose a SmartArt Graphic dialog box, click **Insert → SmartArt.**

Lesson 7 Review Questions

1. **What is the command sequence to insert a comment?**

   To insert a comment, click **Review → New Comment.**

2. **What are themes?**

   Themes are combinations of preset colors, fonts, and effects

3. **How do you add a background image to your worksheet?**

   To add a background image, click **Page Layout → Background**.

4. **In what group on the Review tab can you find the Protect Sheet command?**

   You can find this command in the Protect group on the Review tab.

5. **What is the command sequence to open the Alt Text task pane?**

   To open the Alt Text task pane, click **Format → Alt Text**.

Post-Course Assessment

1. Where can you search for different types of functions?

a. In the Microsoft Search box

b. In the Insert Function dialog box

c. In the Formulas tab

d. All of the above

All of these methods can help you find and use functions.

2. What is the LEN function used for?

a. It returns a set number of characters from a string

b. It counts the number of cells in a row

c. It returns the number of characters in a string

d. It counts the number of rows in a column

The LEN function returns the numbers of characters in a cell that contains text, or in a text string, and is often used to ensure text strings are the correct length.

3. When does the AND function return a TRUE value?

a. When one of the arguments is true

b. When all the arguments are true

c. When all the arguments are false

d. When there is only one argument.

The AND function only returns TRUE when all of the arguments are true.

4. What is the last argument in all of the database functions?

a. criteria

b. database

c. lookup_value

d. row_num

The last argument in a database function is criteria, where the criteria is defined withing the workbook, directly below a column name that exactly matches a column name in the database.

5. What are the two contextual tabs available when you have a chart selected?

a. Chart Task Pane

b. Chart Design

c. Format

d. Add Chart

When a chart is selected in a worksheet, the Chart Design and Format contextual tabs will become available on the Ribbon.

6. What do dual axis charts display?

a. A unique axis for both data series in a combination chart

b. Two different axis titles

c. Values above and below zero

d. Two charts beside each other

A dual axis chart allows you to display a unique axis for both data series in a combination chart. This makes it easier to compare different but related values.

7. What does a slicer do, in relation to Pivot Tables?

a. Adds columns to the table

b. Filter fields by unique entries

c. Adds rows to the table

d. Separates column data

A slicer allows you to quickly filter fields in your pivot table using unique values in that field.

8. How can you see the layers of all shapes and pictures on a worksheet?

a. Click Shape Format → Group → Group

b. Click Picture Format → Selection Pane

c. Click Picture Format → Bring Forward → Bring to Front

d. Click Shape Format → Selection Pane

You can see the layers of all the shapes and pictures on a worksheet by first selecting a picture or a shape, then clicking **Shape Format → Selection Pane**, or **Picture Format → Selection Pane.**

9. What is a digital signature?

a. A scan of your signature

b. A link to your company website

c. A fingerprint scanner

d. An electronic, encrypted, certificate of authenticity

A digital signature is an electronic, encrypted, certificate of authenticity. It provides assurance to the recipient of a file that it really came from you and has not been altered.

10. What is Alt Text used for?

a. To add translations to objects in your workbook

b. As a programming language

c. To give context to objects in your workbook for users with screen readers

d. To add animations to your workbook objects

Alt Text allows you to give context to shapes, pictures, charts, and other objects in your workbook to assist users with visual impairments, who use screen readers to view your files.

APPENDICES

Keyboard Shortcut Quick Reference Sheet

File Management	Open a new workbook	Ctrl + N
	Save a file	Ctrl + S
	Open a file	Ctrl + O
	Print worksheet	Ctrl + P
	Close Microsoft Excel	Alt + F4
Worksheet	Switch between worksheet tabs (left to right)	Ctrl + Page Up
	Switch between worksheet tabs (right to left)	Ctrl + Page Down
	Insert cells	Ctrl + Shift + +
	Delete cells	Ctrl + -
Text Editing	Select all items in current worksheet	Ctrl + A
	Copy text	Ctrl + C
	Cut text	Ctrl + X
	Paste text	Ctrl + V

Open Dialogs	**Open Find tab of Find and Replace dialog**	Ctrl + F
	Open Replace tab of Find and Replace dialog	Ctrl + H
	Open Go To dialog	Ctrl + G
	Open Font tab of Format Cells dialog	Ctrl + Shift + F
	Check spelling	F7
	Get Help	F1
Text Formatting Tools	**Apply bold formatting**	Ctrl + B
	Apply underlining	Ctrl + U
	Apply italic formatting	Ctrl + I
	Align text to center	Ctrl + E
	Align text to left	Ctrl + L
	Align text to right	Ctrl + R
	Justify text	Ctrl + J
	Increase font size	Ctrl + Shift + .
	Decrease font size	Ctrl + Shift + ,
	Undo last action	Ctrl + Z
	Redo last action	Ctrl + Y

Glossary

absolute reference

A type of reference that will not change even if it is moved or copied to another location.

add-in

Small components that can be added to Excel to add features and functionality.

array

Any grouping of two or more adjacent cells.

arguments

Data used by functions to complete calculations.

AutoFill

A feature that is used to automatically fill sequential data into a range of cells.

AutoFilters

Preconfigured filters that can be quickly applied or removed.

Anova

Short for Analysis of Variance. Used to examine if the averages of samples are different in a significant way.

cell

The intersection of a row and column on a worksheet.

charts

Visual representations of numeric data in a dataset.

conditional formatting

A formatting type that will highlight cells whose data satisfies certain criteria.

consolidation

The process of combining, condensing, and summarizing data from multiple sources into one destination.

correlation

Indicates if data sets trend or change with each other.

criteria range

Used in database functions or advanced filters, this refers to the range that contains criteria needed to perform an operation.

database functions

Functions that allow you to perform operations on multiple fields in an Excel database.

delimited text

Data that is entered with one row equaling one line of text.

dependent cells

Cells that are affected by the contents of another cell.

exporting

The process of sending data from one application to another.

external reference

A link to the contents of one or more cells within the worksheet of another workbook.

fields

Columns that appear in a dataset that is used for a PivotTable.

fill

Formatting that adds background color to cell(s).

fill handle

The small black box that appears in the bottom right-hand corner of a selected cell or cell range. Used to activate the AutoFill feature.

filtering

Removing data from view based upon set criteria.

Flash Fill

Feature that will automatically extract or combine data based on a pattern.

font

A design for a set of characters, combining typeface and other qualities such as size, pitch, and spacing.

form

An interface element of a workbook that is used to collect data or execute an action.

Format Painter

A tool that is used to copy formatting from one selection of text to another.

formula

A mathematical relationship expressed through symbols.

Formula Bar

A part of the Excel interface that displays the cell name, as well as values and formulas in the selected cell.

function

A preconfigured formula that is used for a specific purpose.

HTML

A programming language that describes how to display data.

importing

The process of opening data in one application that was saved in another application.

logical operators

A type of operator that is used to compare values and determine if those values meet specified criteria.

logical values

A type of value that expresses whether data is TRUE or FALSE based on specified criteria.

macros

Small programs that are created to complete a specific task or set of tasks.

mixed references

Cell references that include both relative and absolute references.

multi-cell array formula

A type of array formula that performs multiple calculations on one or more arrays and then displays the results.

outline

A feature in Excel that allows you to organize datasets in a worksheet into hierarchical groups.

PivotChart

Similar to regular Excel charts, a PivotChart is a visual representation of data that is being displayed in a PivotTable.

PivotTable

A data analysis tool that dynamically allows you to pivot columns and rows of raw data without altering it.

precedent cells

Cells within a worksheet that provide data for a formula.

range names

Meaningful names that can be added to cell ranges so that they can be easily referred to and understood later.

relative reference

A cell reference that will change relative to its positioning in a worksheet.

scenario

A set of cell values that are saved and substituted into your worksheet at your convenience.

single-cell array formula

A type of array formula that performs multiple calculations on arrays and then displays the results in a single cell.

slicers

A type of data analysis tool that works in conjunction with PivotTables to sort data based on unique data entries.

Sparklines

Small graphs contained within a single cell that are used to summarize data and display trends.

spreadsheet

Either a paper or electronic file that is used to store and work with data (mostly numbers) in a tabular fashion.

SUBTOTAL functions

A type of Excel function that is used to perform calculations on subsets of data.

subtotals feature

A feature that is used to quickly perform the SUBTOTAL function on a subset of data within a dataset.

summary functions

A feature that uses SUBTOTAL functions on subsets of data within a table.

table

A dataset that is comprised of rows and columns but is treated as one object (unlike regular data ranges).

Tell Me

Natural language help feature accessed directly on the ribbon interface.

Text pane

Part of the interface when SmartArt is added or selected in Excel. Typically used to add text to SmartArt.

tracer arrows

Colored arrows used to indicate the direction of the data flow to and from cells and formulas.

transactional data

Data that represents each transaction (or event) in a series. It is not summarized in any way and is considered raw data without row labels.

VBA

Visual Basics for Applications, a programming language that can be used to automate procedures in Microsoft Office

workbook

An Excel file that stores multiple worksheets.

worksheet

An electronic spreadsheet.

workspace

Saved set of Excel files.

XML

A commonly used programming language that is frequently used to describe data. Stands for Extensible Markup Language

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