

EXCEL
Center for Lifelong Learning
GEORGE SELF

March 2020 – Edition 1

George Self: *Excel*, Center for Lifelong Learning, March 2020

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FOREWORD

Microsoft Excel is a spreadsheet program developed by Microsoft for Windows, MacOS, Android and iOS and is part of the Office suite of software. It features calculation, graphing tools, pivot tables, and a macro programming language called *Visual Basic for Applications*. Excel is used widely for many financially-related activities from simple quarterly forecasts to full corporate annual reports. Excel is also used for common information organization like contact lists and inventory tracking. Finally, Excel helps researchers perform statistical analysis tasks like variance analysis, chi-square testing, and charting complex data.

I've used Excel for both business and personal use for more than 20 years. For the Cochise College Center for Lifelong Learning class, I started with an "open source" book since those are available free of charge and I could modify it to meet the objectives of this class. I found two books:

- *Beginning Excel* by Noreen Brown, Barbara Lave, Julie Romey, Mary Schatz, Diane Shingledecker. I found it at *Open Oregon Educational Resources*, <https://ecampusontario.pressbooks.pub/beginningexcel/>.
- *How to Use Microsoft Excel: The Careers in Practice Series*, adapted by *The Saylor Foundation* without attribution as requested by the work's original creator. It was downloaded from <https://resources.saylor.org/wwwresources/archived/site/textbooks/How%20to%20Use%20Microsoft%20Excel.pdf>

While the book is useful in its current form, I will continually update it based on emerging trends in research. It is my hope that students can use this book to learn about Excel and other instructors can adapt it for their own classes.

— George Self

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Part I

BASIC SKILLS

Part 1 is a basic introduction to Excel. Topics include creating and editing spreadsheets plus using formulas and functions to compute values in a spreadsheet.

Part II

INTERMEDIATE SKILLS

Part 2 covers using charts and tables in a spreadsheet. These tools add immense analytical capability to a spreadsheet so users can quickly spot trends and anomalies in large data sets.

Part III

ADVANCED SKILLS

Part 3 demonstrates how to use multiple sheets in formulas and functions to extend statistical analysis over a 3-D range.

WORKING WITH DATA

Excel is designed to work with data, and this chapter demonstrates how data is imported and then analyzed with tools like pivot tables. Also included in this chapter is information about safeguarding data and performing two different what-if analysis techniques.

1.1 IMPORTING DATA

Learning Objectives

- Data can be imported from many sources, including the web, databases, or local files.
- Tools on the **Data** tab of the ribbon make it easy to import data.

To use Excel's powerful tools for analysis, data must first be imported into a spreadsheet. Data can be imported from many sources but two common ones are from the web and from a datafile located on the local computer. Data is very often posted on the web for researchers to use in their projects. The United States federal government, for example, has more than 200,000 datasets freely available in fields like taxes, crime, trade, education, and dozens of other topics¹. Sometimes, that data can be imported directly into Excel but more often it must be downloaded to a local computer and then imported into Excel from that file. This section demonstrates both of those procedures.

1.1.1 *Import From the Web*

Data in a table on a website can be imported directly into an Excel workbook. Follow these steps to import data from a website.

1. Open a new file with a blank workbook.
2. Save the file as **WebData.xlsx**.
3. Click **Get External Data** in the **Data** tab of the ribbon.
4. Click **From Web** in the popup menu, as shown in Figure 1.

¹ See <https://www.data.gov/>

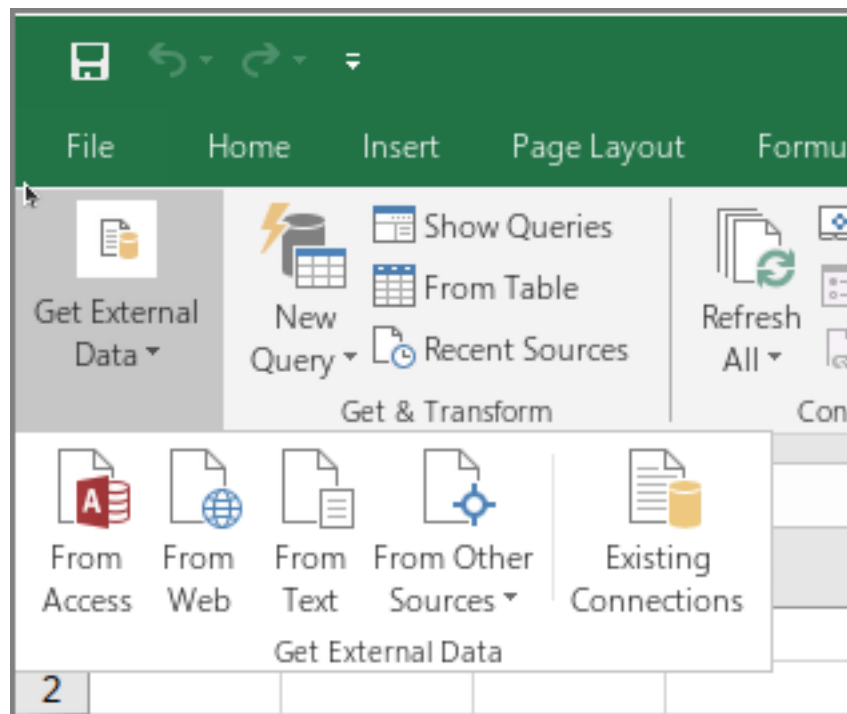


Figure 1: Import From Web Menu

For this exercise, a page on Wikipedia that has several data tables will be used. The URL is: https://en.wikipedia.org/wiki/Largest_airlines_in_the_world

5. Enter the URL in the **From Web** popup.
6. Press **GO**
7. Excel will access the website and open the **Navigator** window, as shown in Figure 2.



Figure 2: From Web URL Window

8. Scroll down the displayed page until the desired table is visible. Notice a small arrow icon to the left of the table. Click that icon to mark the table for downloading, then click the **Import** button. Figure 3 shows the data table loaded into Excel.

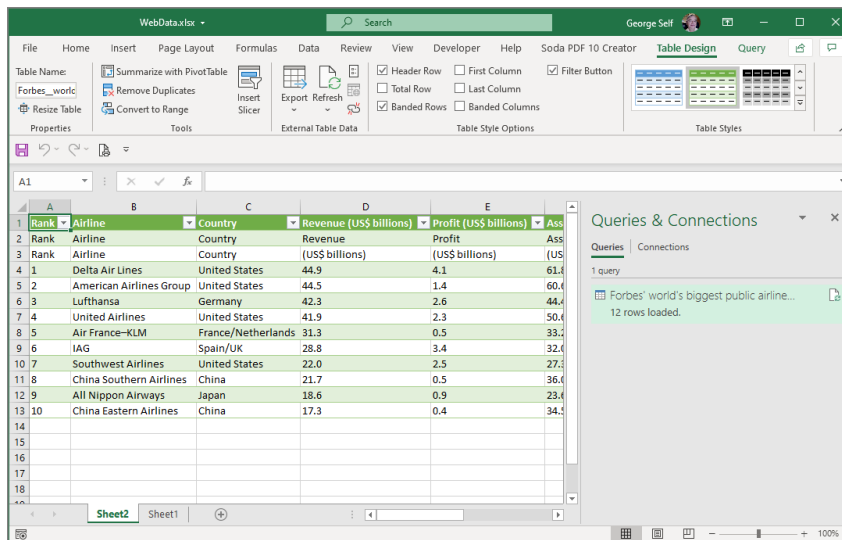


Figure 3: Imported Data Table

Notice that the data is imported into a new worksheet. Excel now displays a **Queries & Connections** box on the right side of the screen. That box lists the Web queries that were used to import data tables. Since there has only been one query then only one line appears in this box, but if more queries are run they will also be listed here.

9. Close the **Queries & Connections** box by clicking the **X** in the top right corner of the box.

A data table is imported into Excel as a table, so tools like filtering, sorting, and slicing the data are readily available. As with any Excel table, this data table can be recolored and formatted as desired. Those skills, though, are taught elsewhere in this class and are not further covered here.

1.1.2 Import From Data File

Data file: CH7-Data.csv

It is common for web data to be downloaded via a data file. Those data files are, typically, in a .CSV format. This is a simple text file and can be opened with a program no more complicated than Notepad; but they are typically opened with Excel or some other data analysis tool. Figure 4 shows the first few lines of the sales data file used in this lesson opened in Notepad.

	OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1	1/6/2019	East	Jones	Pencil	95	1.99	189.05
2	1/23/2019	Central	Kivell	Binder	50	19.99	999.5
3	2/9/2019	Central	Jardine	Pencil	36	4.99	179.64
4	2/26/2019	Central	Gill	Pen	27	19.99	539.73
5	3/15/2019	West	Sorvino	Pencil	56	2.99	167.44
6	4/1/2019	East	Jones	Binder	60	4.99	299.4
7	4/18/2019	Central	Andrews	Pencil	75	1.99	149.25
8	5/5/2019	Central	Jardine	Pencil	90	4.99	449.1
9	5/22/2019	West	Thompson	Pencil	32	1.99	63.68
10	6/8/2019	East	Jones	Binder	60	8.99	539.4
11	6/25/2019	Central	Morgan	Pencil	90	4.99	449.1
12	7/12/2019	East	Howard	Binder	29	1.99	57.71
13	7/29/2019	East	Parent	Binder	81	19.99	"1,619.19"
14	8/15/2019	East	Jones	Pencil	35	4.99	174.65
15	9/1/2019	Central	Smith	Desk	2	125	250
16	9/18/2019	East	Jones	Pen Set	16	15.99	255.84
17	10/5/2019	Central	Morgan	Binder	28	8.99	251.72
18	10/22/2019	East	Jones	Pen	64	8.99	575.36
19	11/8/2019	East	Parent	Pen	15	19.99	299.85
20	11/25/2019	Central	Kivell	Pen Set	96	4.99	479.04

Figure 4: CSV File

Complete the following steps to load a .CSV file into Excel.

1. Click **Get External Data** in the **Data** tab of the ribbon.
2. Click **From Text**. Figure 5 illustrates this button.

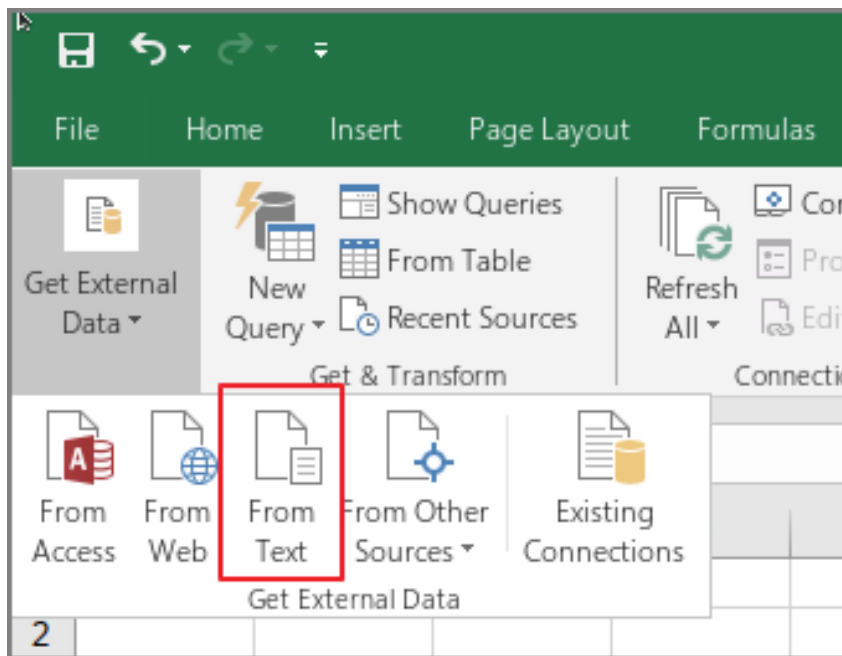


Figure 5: Import CSV File

1. Navigate to the data file.
2. Click the file name and then **Import**. Figure 6 shows the **Import Text File** dialog box.

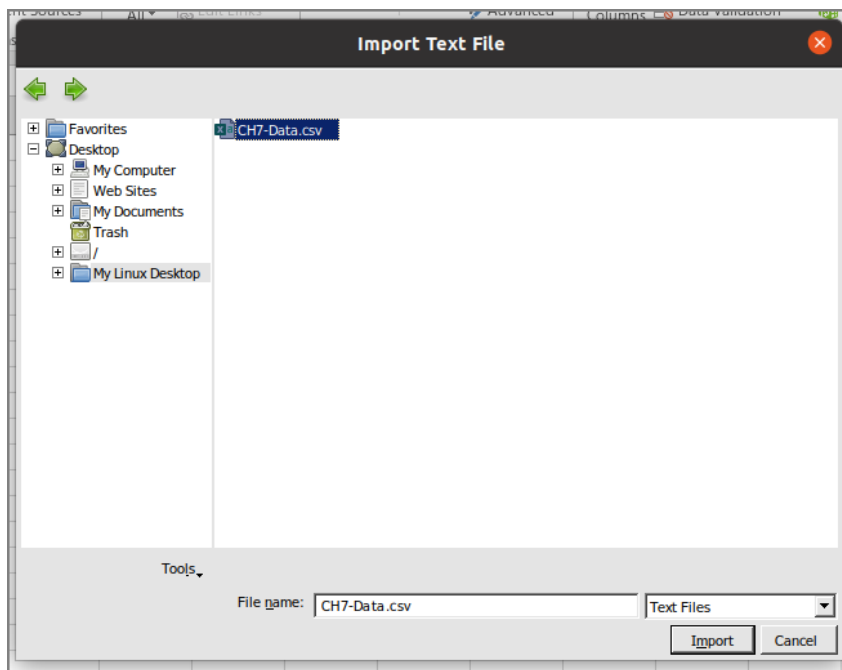


Figure 6: Selecting the CSV file

- Excel will begin to import the .CSV data. Excel starts a wizard that contains its “best guess” about the type of data in the file, as illustrated in Figure 7.

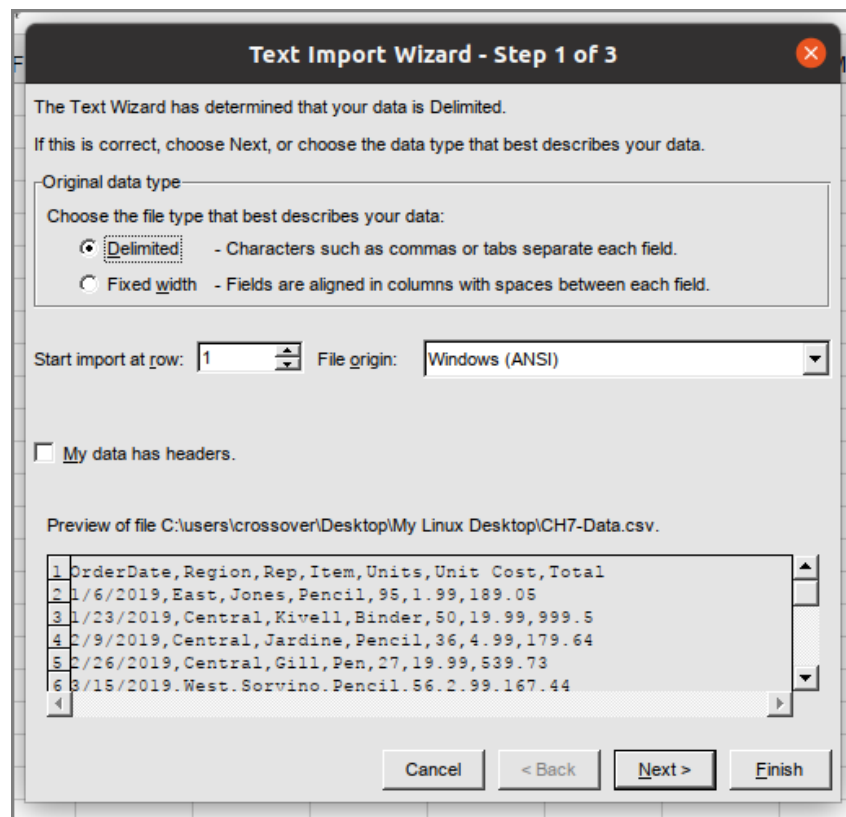


Figure 7: Step One of the Text Import Wizard

- The sample text contained in the box at the bottom of Figure 7 looks correct, so Excel has correctly determined that the CSV file contains delimited text using Windows format. Click **Next**.
- For this data, it is appropriate to begin the import at row 1, but that can be changed if there are several explanatory lines at the top of the file.
- Click the **My data has headers** checkbox since the first line of the data contains column headers.
- Click **Next**.
- Figure 8 shows that Excel is now guessing that a tab is being used to separate the data columns, but that is not correct. Click the checkbox for **Comma** and notice that the sample data in the box at the bottom of the screen separates into columns.

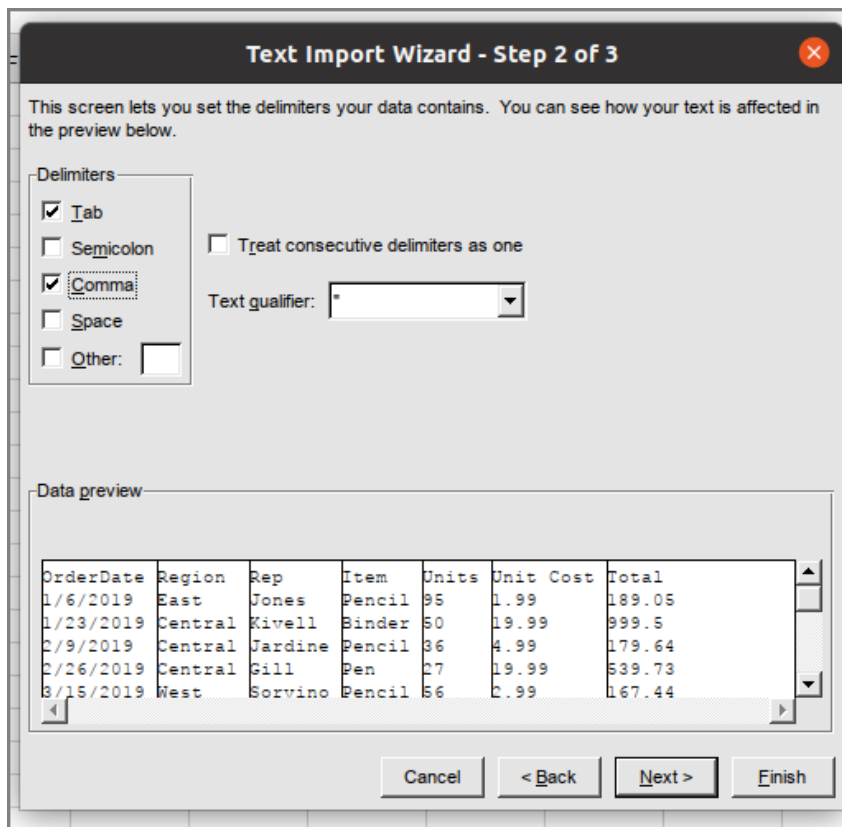


Figure 8: Defining Delimiters in the Data Import Wizard

1. Step three of the data import wizard permits users to identify the type of data contained in each column. For this import, click on column one to highlight it and then click on the **Date:** button to define this column as dates. The *MDY* date format option is correct.
2. Click **Finish** to complete the wizard.
3. Excel now asks if the data should be loaded into the existing worksheet or create a new worksheet, as illustrated in Figure 9.
4. For this exercise, load the data into cell **A1** in the existing worksheet.

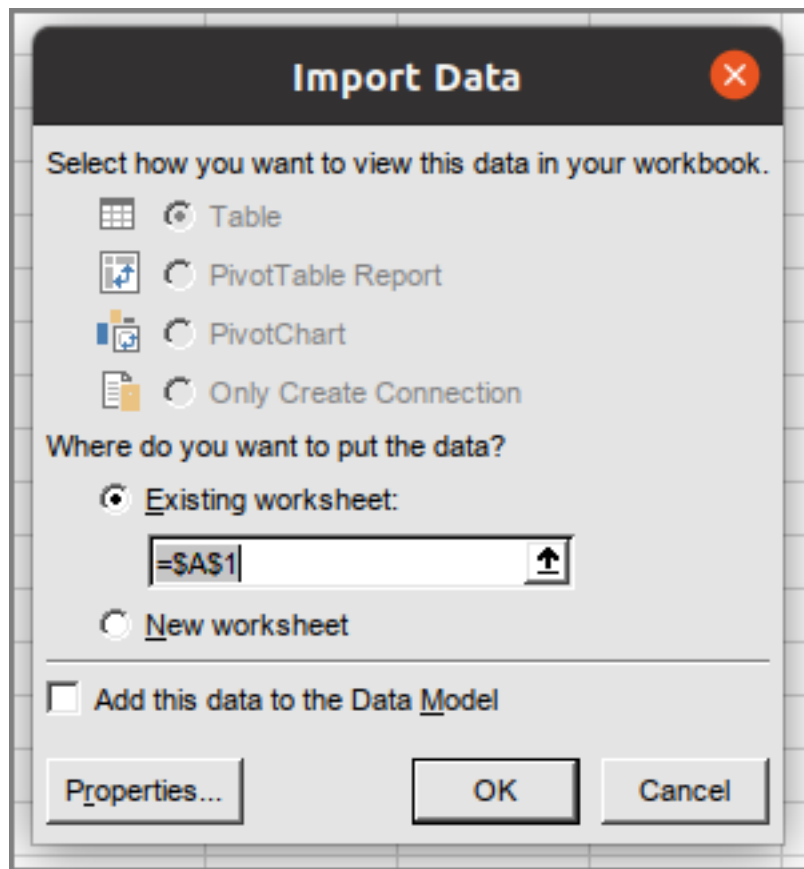


Figure 9: Loading the Data

Figure 10 shows the first few lines of the worksheet with the imported data.

	A	B	C	D	E	F	G	
1	OrderDate	Region	Rep	Item	Units	Unit Cost	Total	
2	1/6/2019	East	Jones	Pencil	95	1.99	189.05	
3	1/23/2019	Central	Kivell	Binder	50	19.99	999.5	
4	2/9/2019	Central	Jardine	Pencil	36	4.99	179.64	
5	2/26/2019	Central	Gill	Pen	27	19.99	539.73	
6	3/15/2019	West	Sorvino	Pencil	56	2.99	167.44	
7	4/1/2019	East	Jones	Binder	60	4.99	299.4	
8	4/18/2019	Central	Andrews	Pencil	75	1.99	149.25	
9	5/5/2019	Central	Jardine	Pencil	90	4.99	449.1	
10	5/22/2019	West	Thompson	Pencil	32	1.99	63.68	
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12	6/25/2019	Central	Morgan	Pencil	90	4.99	449.1	
13	7/12/2019	East	Howard	Binder	29	1.99	57.71	
14	7/29/2019	East	Parent	Binder	81	19.99	1,619.19	
15	8/15/2019	East	Jones	Pencil	35	4.99	174.65	
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19	10/22/2019	East	Jones	Pen	64	8.99	575.36	
20	11/8/2019	East	Parent	Pen	15	19.99	299.85	
21	11/25/2019	Central	Kivell	Pen Set	96	4.99	479.04	

Figure 10: The Worksheet With Imported Data

5. Rename the worksheet to **Sales Data**.
6. Save the workbook as **Sales Summary**.

Key Take-Aways

Importing Data

- Data can be imported from tables found on websites using **From Web** on the **Get External Data** group on the **Data** tab on the ribbon.
- Data can be imported from CSV files downloaded from websites using **From Text** on the **Get External Data** group on the **Data** tab on the ribbon.

1.2 PIVOT TABLES

Learning Objectives

- Create a pivot table.
- Manipulate a pivot table to change the information displayed.

Pivot tables dynamically summarize data and are a favorite tool for analysts since they are highly customizable and very powerful. These tools are called pivot tables because the data displayed can be easily pivoted from rows to columns and back. Pivot tables are sometimes called contingency tables or crosstabs and are frequently seen in reports where tabular data is presented. A common example of a pivot table is found in newspapers and magazines during elections where the editor creates a breakout of voters by party, gender, race, or other factors. For this exercise, sales data from a small supplier will be analyzed.

1. Open the **Sales Summary** workbook if it is not already opened.
2. Click in cell **A1** in the **Sales Data** worksheet.
3. Click **PivotTable** in the **Tables** group on the **Insert** tab of the ribbon. In Figure 11, the **PivotTable** button can be found at the left end of the ribbon.

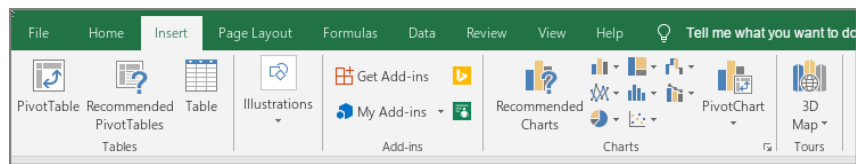


Figure 11: PivotTable Button On The Ribbon

1. In the **Create PivotTable** popup, as seen in Figure 12, ensure that Excel automatically selected **\$A\$1:\$G\$44**, which is all the data on the worksheet. Also, ensure **New Worksheet** is selected as the location of the new pivot table.
2. Click **OK**.

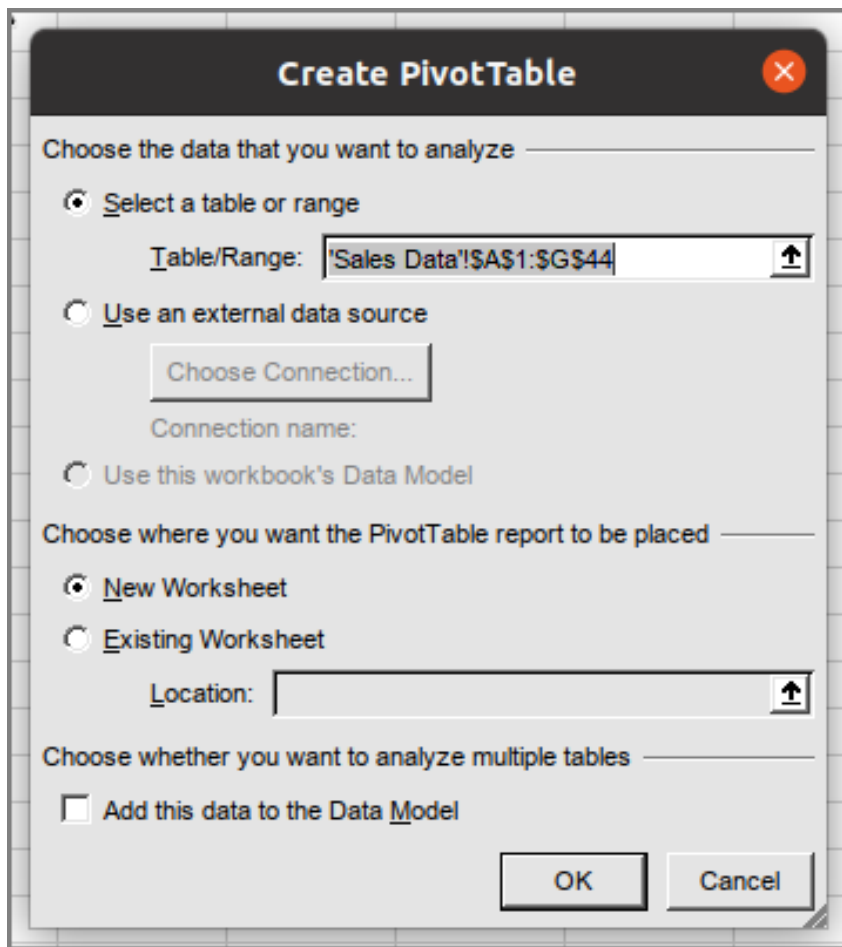


Figure 12: Create PivotTable Wizard

3. A pivot table is created on a new worksheet. Rename that sheet **Sales Pivot**.
4. Move the **Sales Pivot** worksheet to the right of **Sales Data**.
5. A blank pivot table has six areas of interest for this lesson, as shown in Figure 13.
 - **A.** The **Pivot Table** will appear in the large area on the left (it is blank in the illustration).
 - **B.** The **Field List** contains the names of all the fields available in the data set. These are the column headers in the data table.
 - **C.** **Filters** is where complex filters can be created to restrict the data displayed on the pivot table.
 - **D.** **Column Labels** define the columns on the pivot table.
 - **E.** **Row Labels** define the rows on the pivot table.
 - **F.** **Values** define the numeric data calculated and displayed in the pivot table.

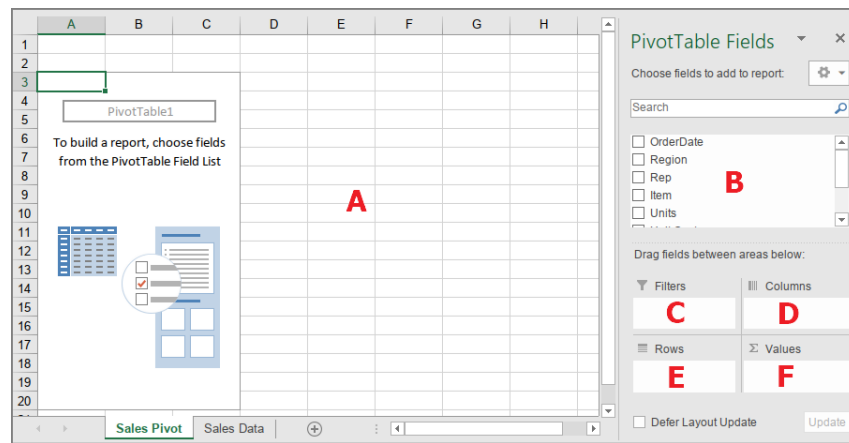


Figure 13: Pivot Table Areas

6. Check the *Region* box in the Field List. By default, Excel places that item in the Row Labels area since it contains text labels. (Note: *Region* can also be dragged to the Row Labels area.)
7. Check *Item* in the Field List. By default, Excel places Item in the Row Labels area since it contains text labels. (Note: *Item* can also be dragged to the Row Labels area.)
8. Check *Units* in the Field List. By default, Excel places that Units in the Values area since it contains numbers (notice that Excel automatically creates a sum of Units, but that can be changed to average, max, min, or other statistical values).
9. The pivot table now shows how many units of each type of product was sold in each area. There is also a Grand Total at the bottom of the pivot table. With just a few clicks of the mouse, Excel has created a useful decision-making chart for managers. Figure 14 illustrates the pivot table at this point.

Region	Sum of Units
Central	1199
Binder	424
Desk	7
Pen	27
Pen Set	243
Pencil	498
East	691
Binder	234
Pen	175
Pen Set	152
Pencil	130
West	231
Binder	64
Desk	3
Pen	76
Pencil	88
Grand Total	2121

Figure 14: Sales Units

10. Click and drag *Item* from the Row Labels area to the Column Labels area. (Note, this can also be done by clicking the down-arrow for *Item* and selecting **Move to Column Labels**.) The same data is still being displayed, but it has been rearranged to make it easier to compare regions. Also notice that Excel automatically created two Grand Totals, one for the rows and one for the columns. Figure 15 illustrates the pivot table at this point.

Region	Sum of Units	Column Labels
Central	1199	
Binder	424	
Desk	7	
Pen	27	
Pen Set	243	
Pencil	498	
East	691	
Binder	234	
Pen	175	
Pen Set	152	
Pencil	130	
West	231	
Binder	64	
Desk	3	
Pen	76	
Pencil	88	
Grand Total	2121	

Figure 15: Sales Units With Columns

11. Uncheck *Units* in the Field List. This removes it from the pivot table and leaves only labels with no numbers.
12. Check *Total* in the Field List. By default, Excel places that item in the Values area since it contains numbers (notice Excel auto-

matically creates a sum of Total). The table now reports the total value of all sales by region and item.

13. Change the value displayed to average rather than sum.
 - a) Click the down arrow in *Sum of Total* in the Values area, as illustrated in Figure 16

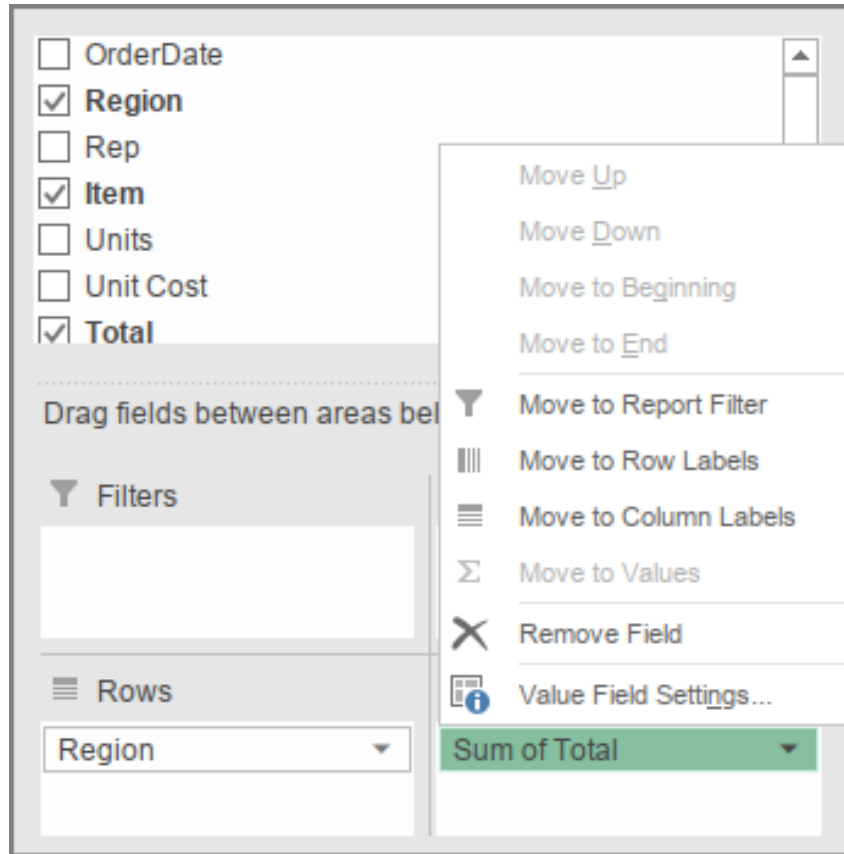


Figure 16: Values popup

- b) Select **Value Field Settings**.
- c) Select **Average** in the popup, as illustrated in Figure 17
- d) Click **OK**.

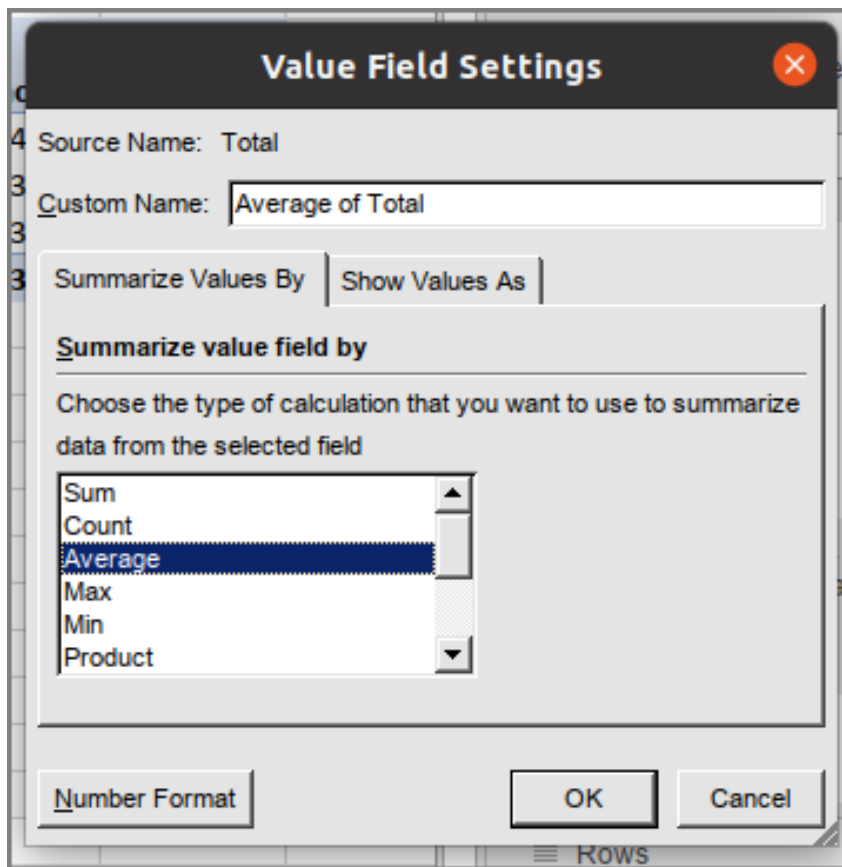


Figure 17: Selecting Average Values

- e) The PivotTable is instantly changed to display the average sales by region and item.
14. The average is displayed to seven decimal places. Since this is money, it would be best to round the averages to two decimal places.
 - f) Click the down arrow in *Average of Total* in the Values area.
 - g) Select **Value Field Settings**.
 - h) Click the **Number Format** button at the bottom left corner of the **Value Field Settings** popup, as illustrated in Figure 18.

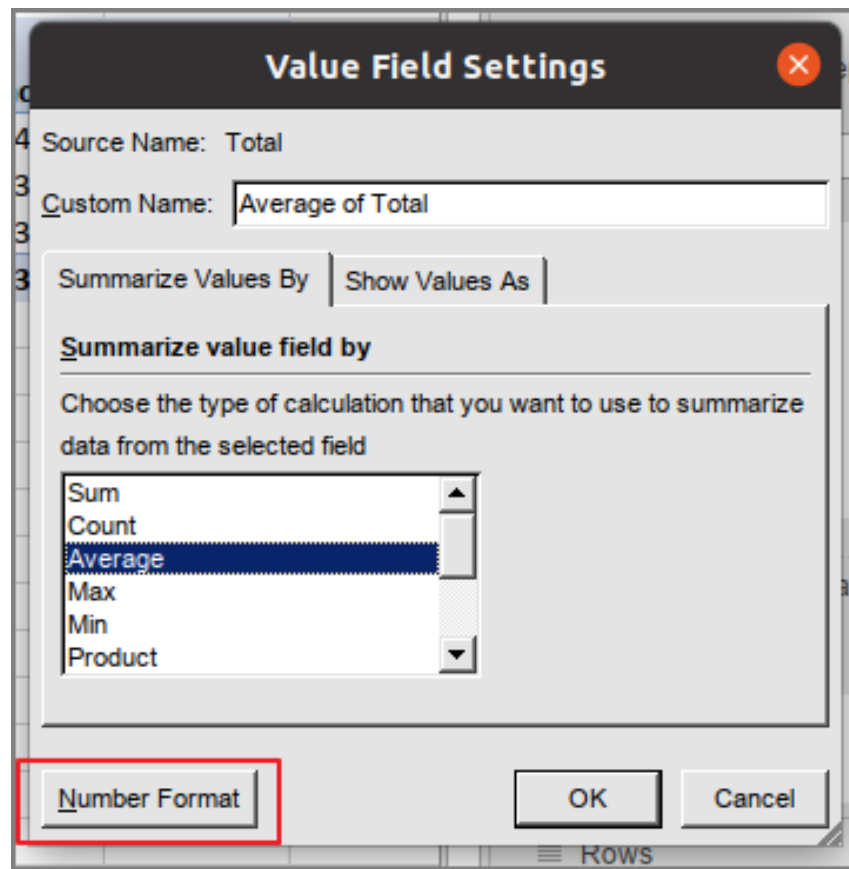


Figure 18: The Number Format Button

- i) Choose **Number** and set 2 decimal places (the default setting).

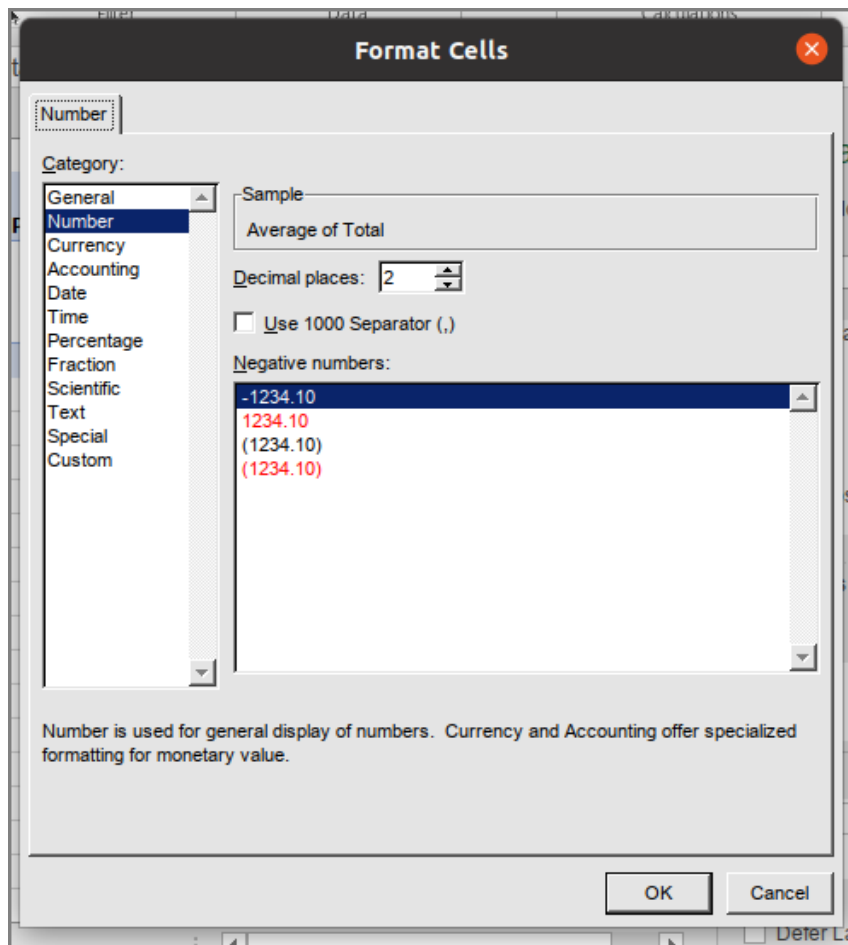


Figure 19: Setting Two Decimal Places

- j) Click **OK**.
 - k) Click **OK**.
 - l) The pivot table is instantly changed to display the averages rounded to two decimal places.
15. Rename the pivot table by clicking **PivotTable** in the **Analyze** tab of the ribbon. Enter *Sales* for the PivotTable Name, as illustrated in Figure 20.

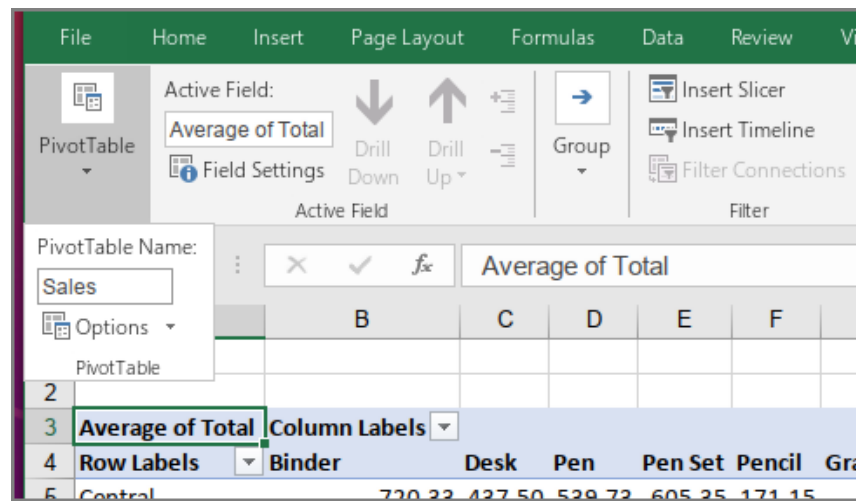
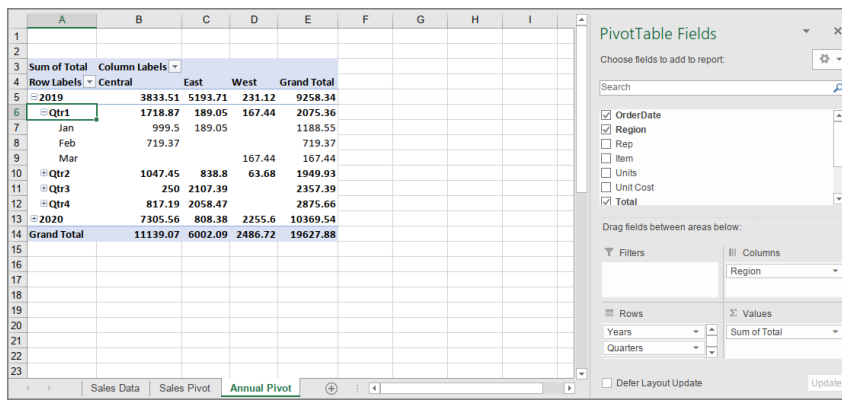


Figure 20: Renaming the Pivot Table

16. Create a new pivot table by clicking in cell **A1** in the **Sales Data** worksheet.
17. Click **PivotTable** in the **Tables** group on the **Insert** tab of the ribbon.
18. In the **Create PivotTable** popup, ensure that Excel automatically selected **\$A\$1:\$G\$44**, which is all the data on the worksheet. Also, ensure **New Worksheet** is selected as the location of the new pivot table.
19. Click **OK**.
20. A pivot table is created on a new worksheet. Rename that worksheet **Annual Pivot** and move it to the right of **Sales Pivot**.
21. Rename the pivot table by clicking **PivotTable** in the **Analyze** tab of the ribbon. Enter **Annual** for the pivot table Name.
22. Check **OrderDate** in the Field List. By default, Excel places that item in the pivot table Row Labels area since it contains dates. Notice that Excel automatically expands the dates into years, quarters, and months.
23. Drag **Total** from the Field List to Values. The pivot table now shows the total sales by date. Clicking the plus sign beside the years and quarters in the pivot table drills down to specific quarters and months of interest.
24. Drag **Region** from the Field List to Columns. This creates columns for each region in the pivot table so now management can find sales by month and region.



PivotTable Fields

Choose fields to add to report:

Search

☒ OrderDate
☒ Region
☐ Rep
☐ Item
☐ Units
☐ Unit Cost
☒ Total

Drag fields between areas below:

Filters **Columns**
 Region

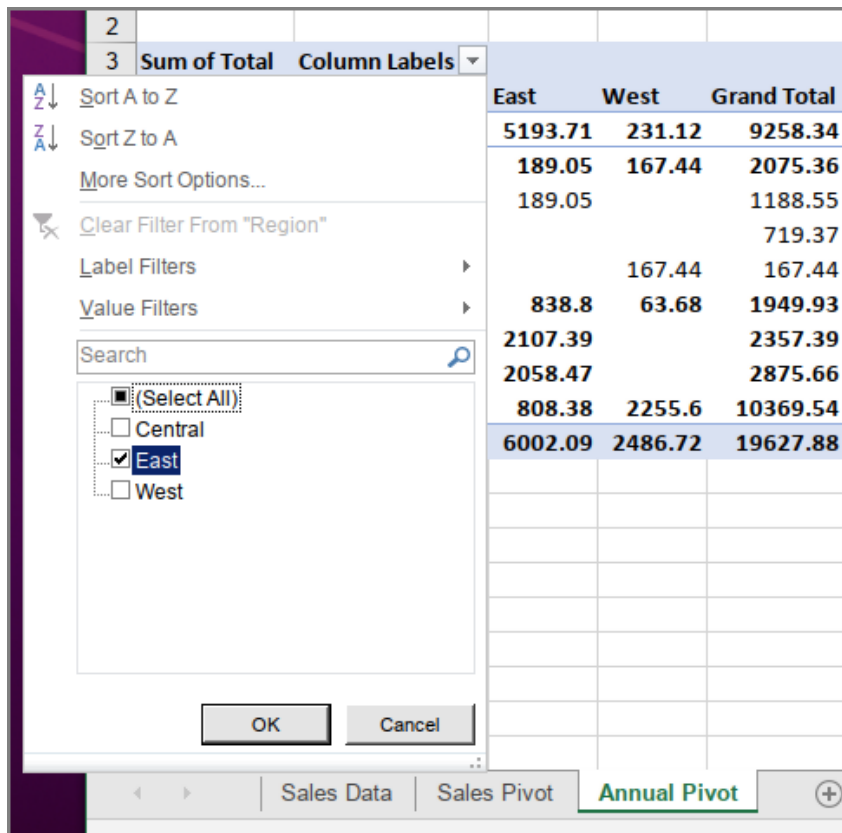
Rows **Values**
 Years
 Quarters
 Sum of Total

☐ Defer Layout Update **Update**

Sum of Total	Column Labels	East	West	Grand Total
2019		3833.51	5193.71	231.12
Qtr1		1718.87	189.05	167.44
Jan		999.5	189.05	1188.55
Feb		719.37		719.37
Mar			167.44	167.44
Qtr2		1047.45	838.8	63.68
Qtr3		250	2107.39	2357.39
Qtr4		817.19	2058.47	2875.66
2020		7305.56	808.38	2255.6
Grand Total		11139.07	6002.09	2486.72

Figure 21: Sales Units With Columns

25. To filter the data, click the down arrow to the right of the *Column Labels* or *Row Labels* headers. Check only those regions or dates that should be included in the pivot table. For example, click the down arrow to the right of the *Column Labels* and uncheck everything except *East* and notice how the pivot table is updated to include only the East region. Also notice that the dropdown includes options to sort the data in the pivot table.



Column Labels

Sort A to Z
 Sort Z to A
 More Sort Options...

Clear Filter From "Region"

Label Filters
 Value Filters

Search

☒ (Select All)
☐ Central
☒ East
☐ West

OK **Cancel**

Sum of Total	Column Labels	East	West	Grand Total
2019		5193.71	231.12	9258.34
Qtr1		189.05	167.44	2075.36
Jan		189.05		1188.55
Feb				719.37
Mar			167.44	167.44
Qtr2		838.8	63.68	1949.93
Qtr3		2107.39		2357.39
Qtr4		2058.47		2875.66
2020		808.38	2255.6	10369.54
Grand Total		6002.09	2486.72	19627.88

Figure 22: Filtering Regions

26. While managers normally like having dates grouped by month/quarter/year, that can be easily modified. Click cell **A5** in the pivot table so only that one cell is selected. Click the **Group Field** button in the **Group** group in the **Analyze** tab.

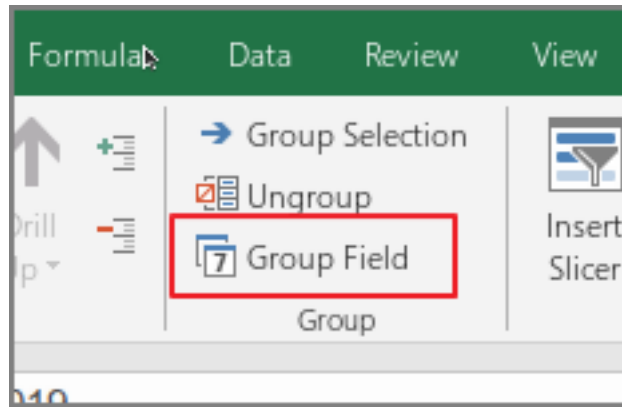


Figure 23: The Group Field Button

27. In the **Grouping** popup box the start/end dates for the data can be specified in order to limit the data shown in the pivot table. For this exercise, leave the dates at their default (two entire years), but click *months* so it is no longer highlighted then click **OK**. Figure 24 illustrates the **Grouping** popup box after the **Months** item is inactivated. This will remove the *Months* drill down capability and only show years and quarters in the pivot table. By using this option, details can be removed from the pivot table so trends may become more visible.

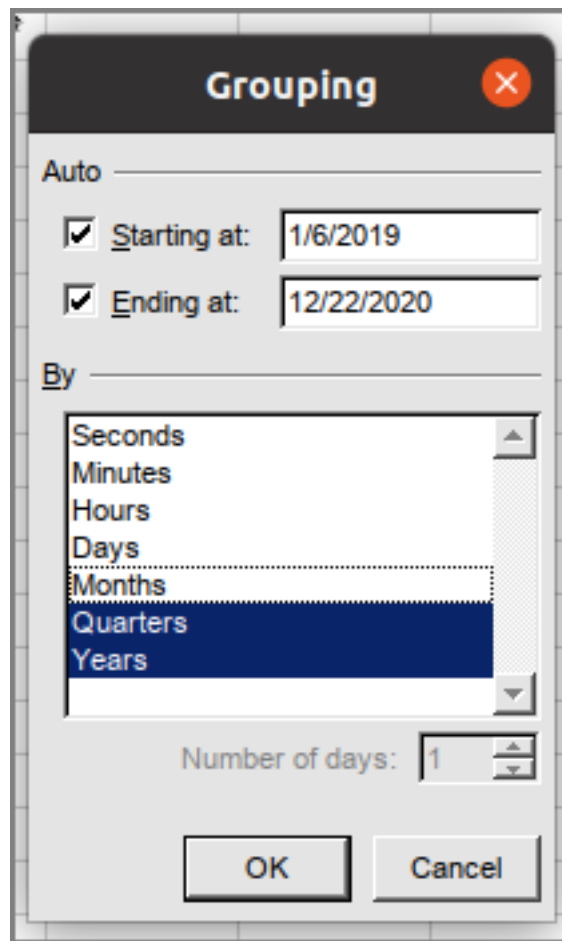


Figure 24: Removing Months From The Group

28. Drag *Rep* from the Field List to the Filters area. Notice that the pivot table now has a selector in cell **B1** so a specific representative (or group of representatives) can be used to filter data on the pivot table. Click the down arrow for the *Rep* filter, select **Andrews**, and click **OK**. Notice that the pivot table is instantly updated to include only Andrews' sales data.

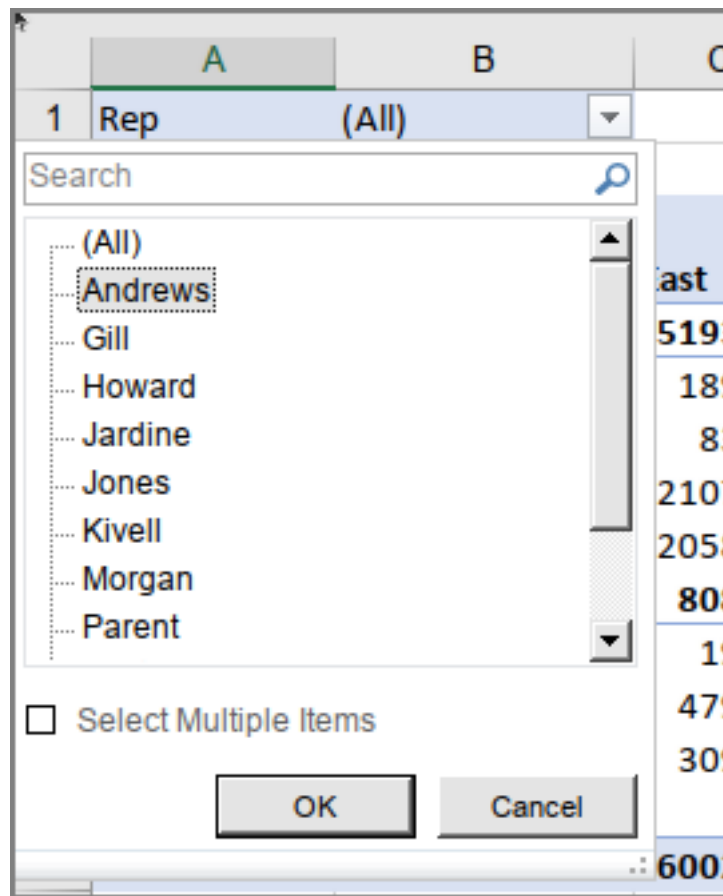


Figure 25: Filtering For One Representative

29. This pivot table will be used to create a pivot chart in the next section; however, the filter is not needed. Uncheck *Rep* in the Field List to remove that from the filter area.
30. Save the workbook.

Key Take-Aways

Pivot Tables

- Pivot tables are a very powerful analysis tool that are easy to create and use.

1.3 RECOMMENDED PIVOT TABLES

Learning Objectives

- one

1. Open the **Sales Summary** workbook.

- Click cell **A1** in the **Sales Data** worksheet.
- Click **Recommended PivotTables** in the **Tables** group of the **Insert** tab.
- Excel will analyze the data and create several recommended pivot tables. These can be clicked and previewed in the **Recommended PivotTables** popup. Figure 26 illustrates the **Recommended PivotTables** popup.

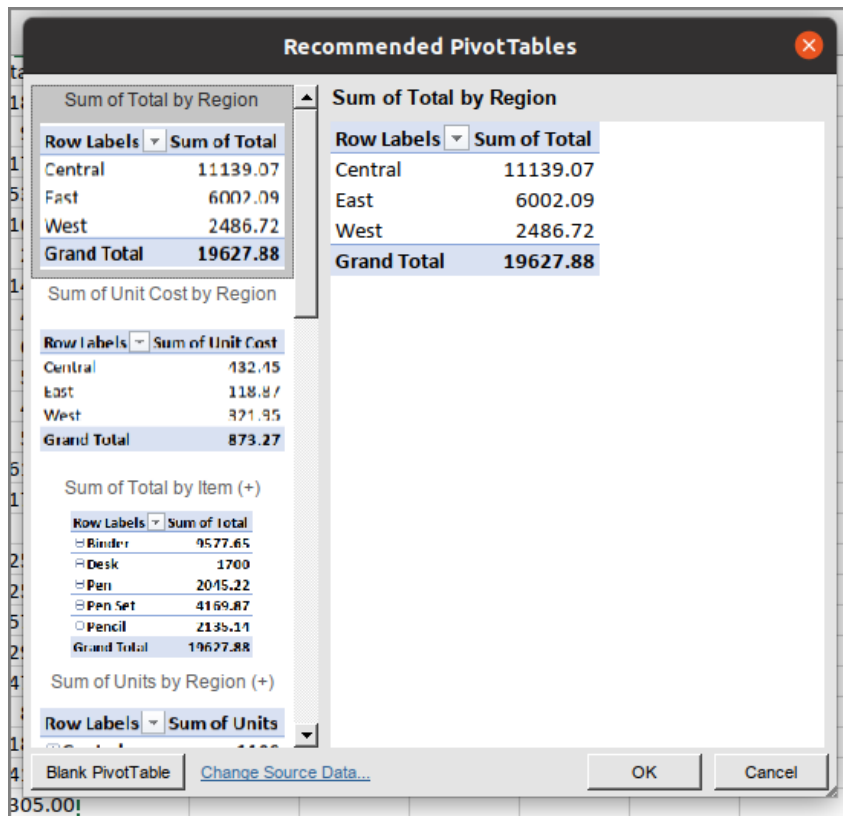


Figure 26: Recommended PivotTables

- Click on the first recommended pivot table, **Sum of Total by Region**, and click **OK**.
- Excel creates the pivot table in a new worksheet. Name that worksheet **Sales By Region**. Move **Sales By Region** to the right of **Annual Pivot**.
- Rename the pivot table by clicking **PivotTable** in the **Analyze** tab of the ribbon. Enter *By Region* for the PivotTable Name.
- The new pivot table includes all of the same features as those created manually so formatting and variable manipulation is available to modify this table.

Key Take-Aways

Recommended Pivot Tables

- Excel automatically analyzes data in a worksheet and recommends appropriate pivot tables for the data.
- If a recommended pivot table is selected, it can be easily manipulated to meet the goals of the research project.

1.4 PIVOT CHARTS

Learning Objectives

- one

One of the strengths of creating a pivot table is that the table can be used to create a chart and as the table is modified the chart is also automatically modified. Follow these directions to explore the power of pivot charts.

1. Open the **Sales Data** worksheet in the **Sales Summary** workbook.
2. Activate cell **A1** by clicking in it.
3. Click **Pivot Chart** in the **Charts** group of the **Insert** tab.

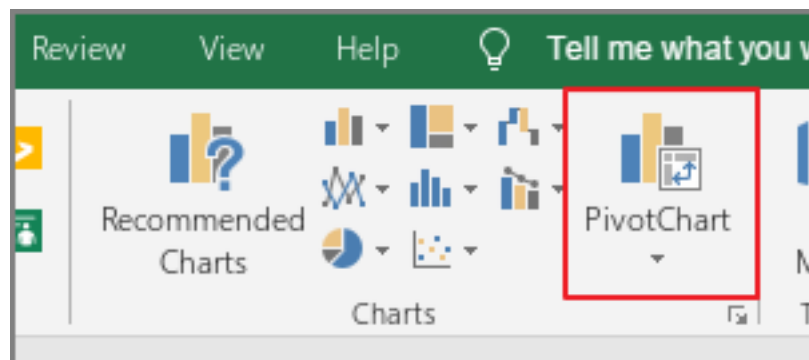


Figure 27: The Pivot Chart Button

4. In the **Create PivotChart** popup, ensure that Excel automatically selected **\$A\$1:\$G\$44**, which is all the data on the worksheet. Also, ensure **New Worksheet** is selected as the location of the new pivot chart.
5. Click **OK**.

6. Excel will open a new pivot chart worksheet. This worksheet is similar to a pivot table worksheet and creating a chart is like creating a table.
7. Rename the pivot chart worksheet to **Sales By Item**.
8. Move **Sales By Item** to the right of **Sales By Region**.
9. Select **Rep** and **Total**. Excel creates a bar chart that shows the total sales for each Representative, as illustrated in Figure 28.

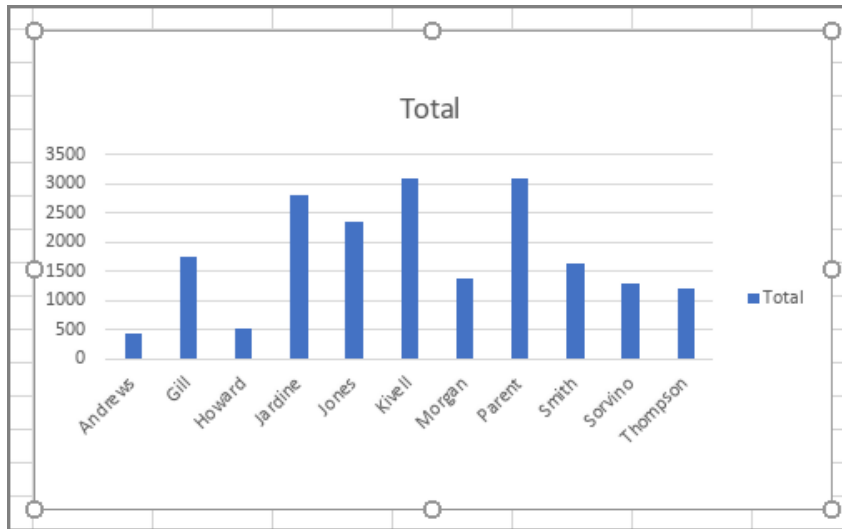


Figure 28: Sales By Representative

1. Uncheck **Rep** and check **Item**.
2. The bar chart automatically updates to display the total sales for each item in the inventory. This chart, though, would be better if it were a pie chart.
 - a) Click the down arrow for the **Sum of Total** item in the *Values* area of the pivot table.
 - b) Select **Value Field Settings** in the popup options menu.
 - c) Click the **Show Values As** tab in the **Value Field Settings** popup box.
 - d) Choose **% of Grand Total** in the drop-down menu near the middle of the **Value Field Settings** box.

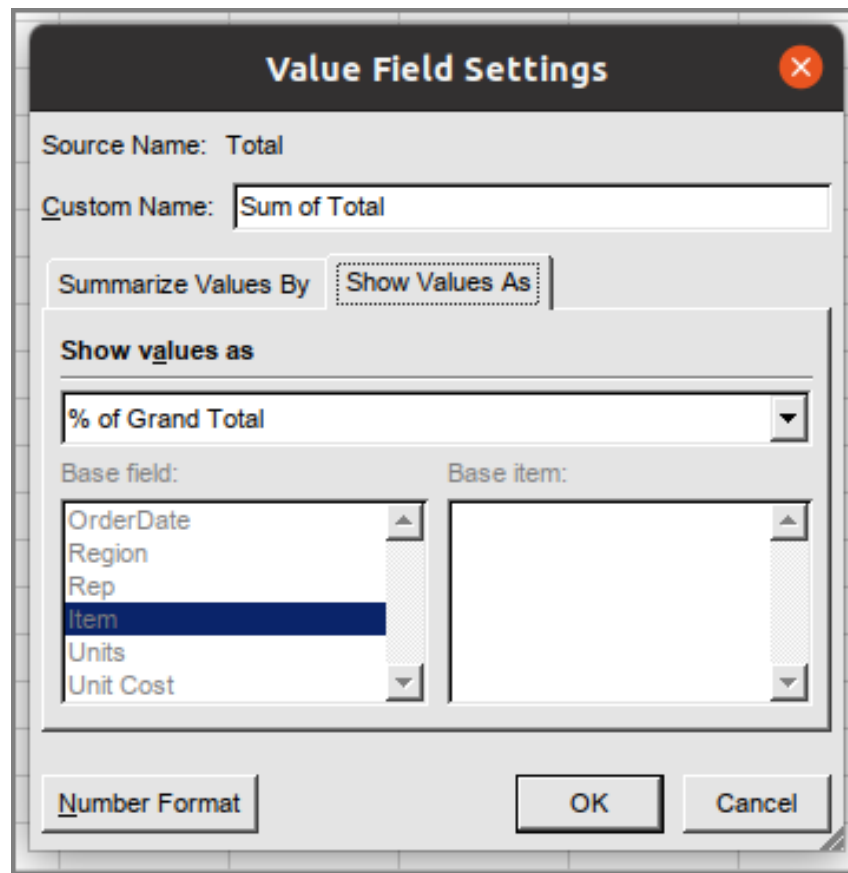


Figure 29: Values As a Percentage Of The Total

- e) Click **OK**.
 - f) The values in the pivot table change to percentages rather than numbers.
3. Click **Change Chart Type** in the **Type** group of the **Design** tab on the ribbon.
 4. Select **Pie Chart** and click **OK**.

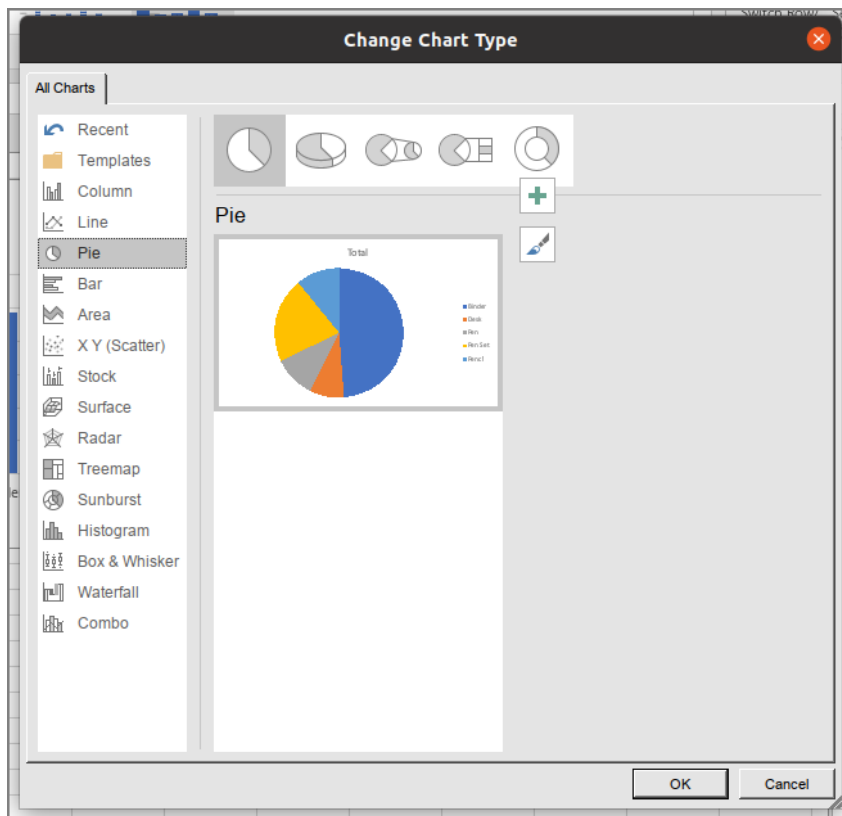


Figure 30: Selecting a Pie Chart

5. Click the + sign at the top right of the pie chart and then click **Data Labels** to display the percent of each slice.

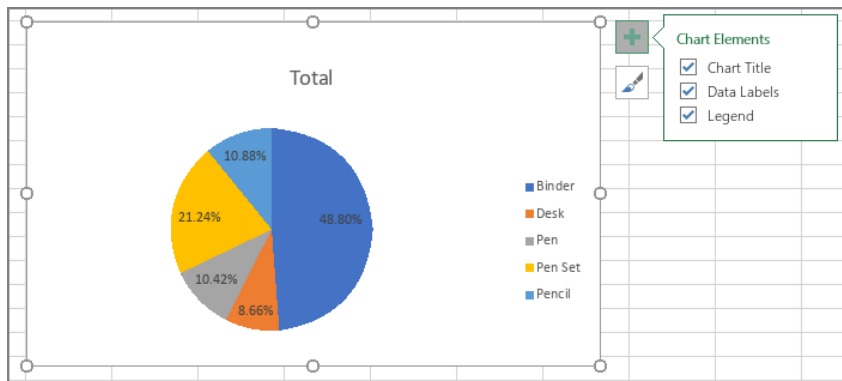


Figure 31: Adding Data Labels

6. Click off of the chart so it is no longer selected and then right-click on the chart title. Select **Edit Text** from the popup menu.

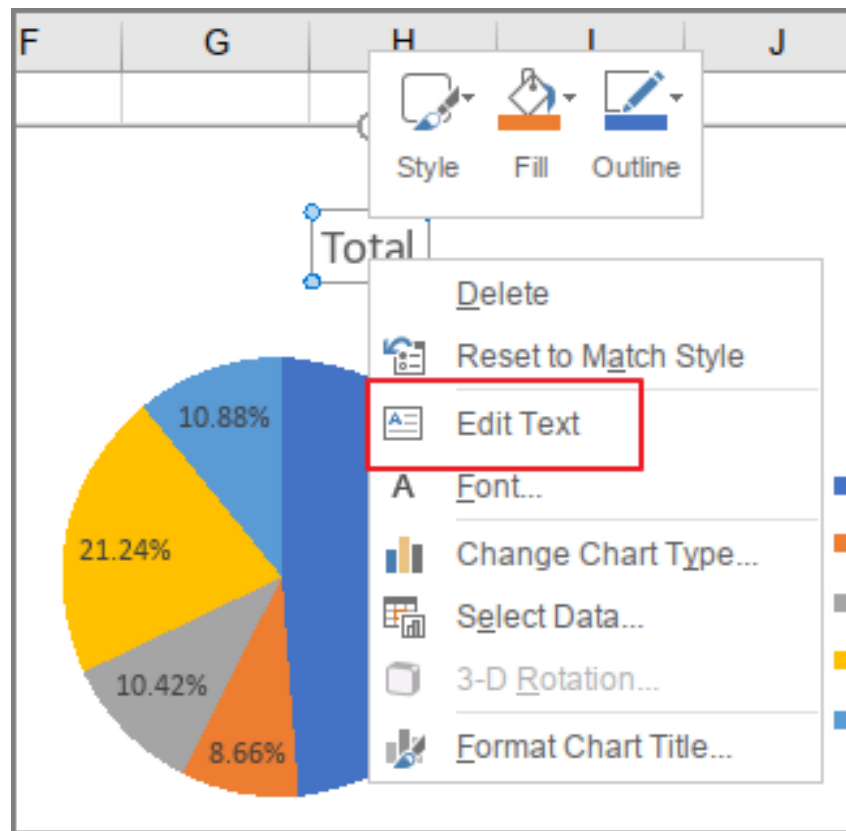


Figure 32: Editing The Title

7. Enter *Sales by Item* as the chart title and then click off of the chart so it is no longer selected.
8. The chart colors and other chart elements can be changed using options found on the **Design** tab.
9. Save the workbook.

Key Take-Aways

Pivot Charts

- Creating a pivot chart uses the same process as a pivot table.
- Once a pivot chart has been created, it can be modified using all of the chart tools.

1.5 SAFEGUARDING

Learning Objectives

- Data input can be restricted to prevent typing errors from creeping into a data table.
- It is often desirable to lock worksheet cells, or entire worksheets, so users do not accidentally change or delete formulas.

It is occasionally desirable to safeguard certain cells in a worksheet, or the entire worksheet, to keep a user from accidentally changing something important. For example, if several cells include complex formulas then those should be secured so users will not accidentally delete them. There are two methods generally used to safeguard worksheets: data validation and worksheet protection.

1.5.1 Data Validation

Excel's data validation rules can be used in a variety of ways.

- Restrict the data entered into a cell.
- Circle all cells that do not conform to specified validation rules.
- Limit the user to a list of possibilities.

One of the easiest ways to restrict data is to provide a drop-down list of choices for the user.

1. Open **CH7-Advanced.xlsx**.
2. Select the **Validation** worksheet.
3. Notice that this sheet includes a list of Zip codes in cells **K2:K10**. The goal is to permit the user to only select from this list of Zip codes to help reduce data entry errors.
4. The first step is to name the list of zip codes.
 - a) Select K2:K10.
 - b) Click **Define Name** in the **Defined Names** group on the **Formulas** tab.

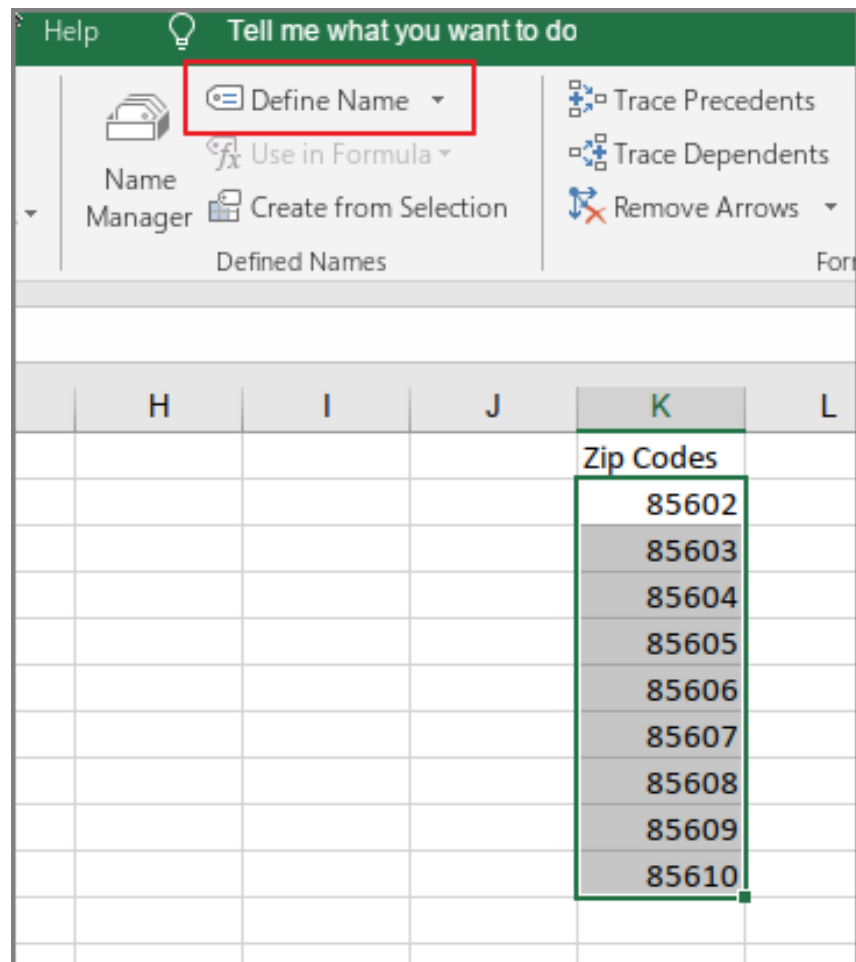


Figure 33: Selecting a Range of Cells to Name

- c) Name the selected cells *Zip*.
- d) Click **OK**.

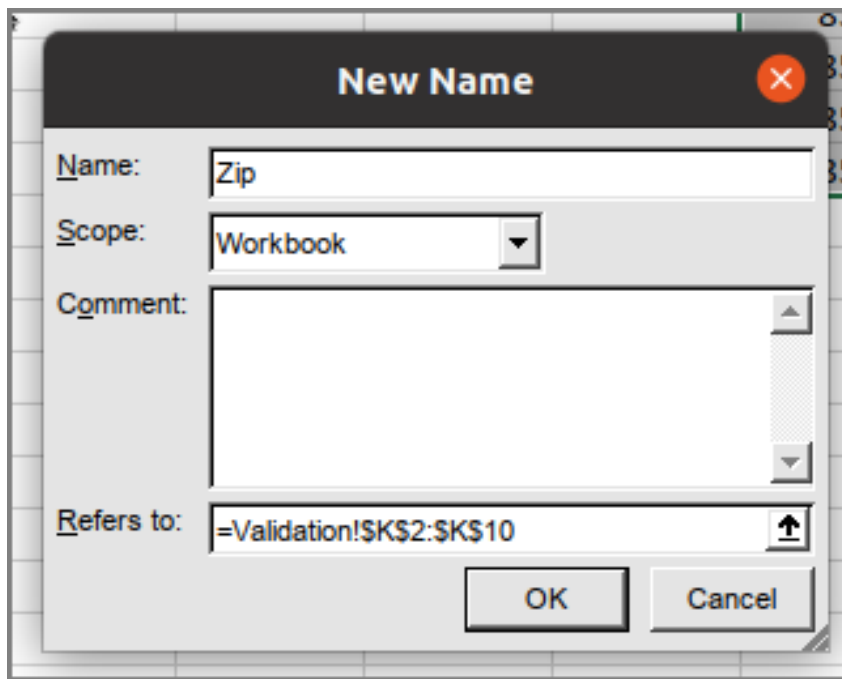


Figure 34: Naming a Range of Cells

5. Select **D2**, which is the first cell that needs data validation.
6. Click **Data Validation** on the **Data tools** group of the **Data** tab on the ribbon. (*Note*, click the button, not the down arrow on the right side of the button.)

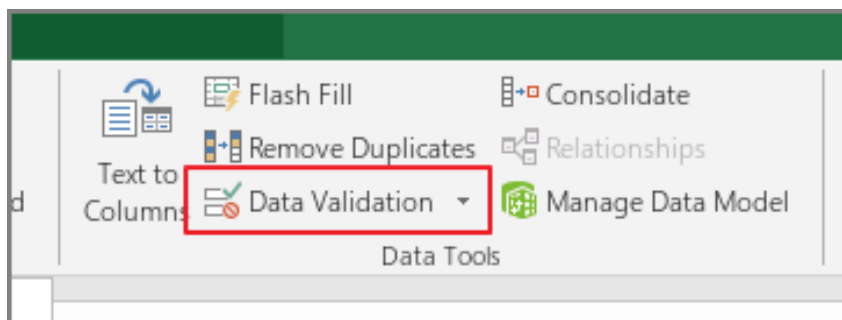


Figure 35: The Data Validation Button

7. Select **List** in the **Allow** field.

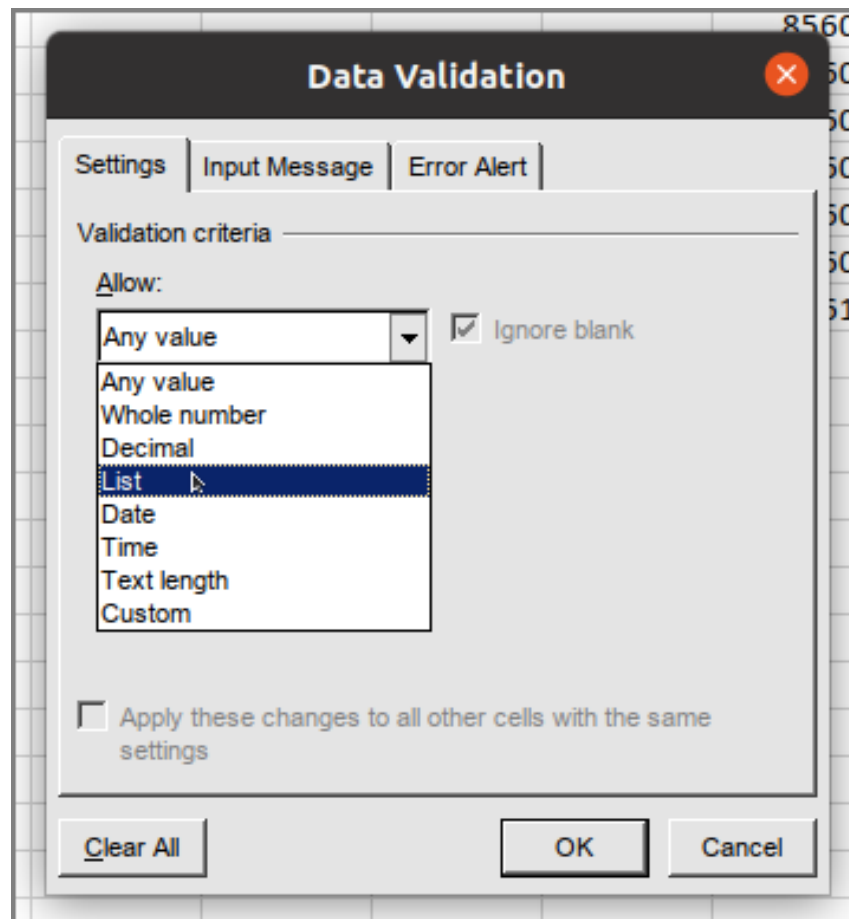


Figure 36: Selecting A Validation List

8. Check **Ignore blank**. If this is left unchecked then it would force the user to enter a zip code, but when this is checked the user can leave the zip code field blank.
9. Check **In-cell dropdown**. This creates a drop-down list so the user can select a zip code from a list rather than enter it manually.
10. Enter `=Zip` for the **Source**. This tells Excel that the acceptable list of zip codes for cell **D2** is found in the *Zip* list.
11. Click **OK**.

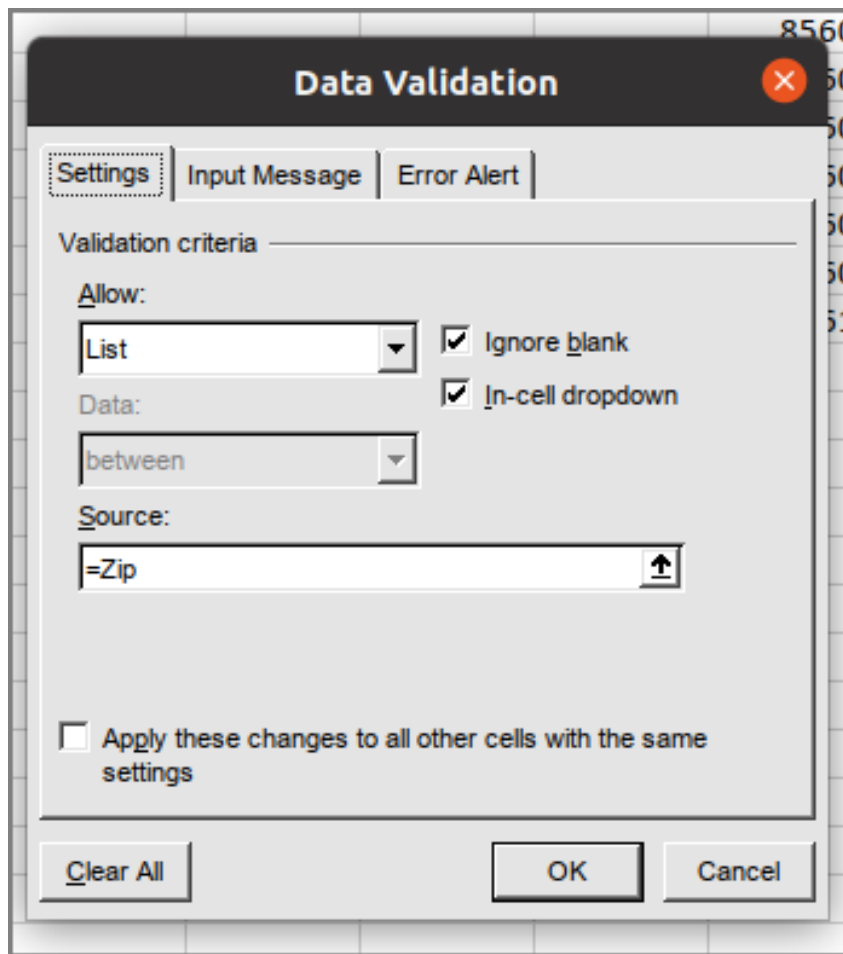


Figure 37: Setting the Data Validation List

After following the above steps, a drop-down selection box will appear whenever the user click into cell **D2**, as illustrated in Figure 38. That cell can then be copied to **D3:D6** so all of those cells will get the same drop-down selection.

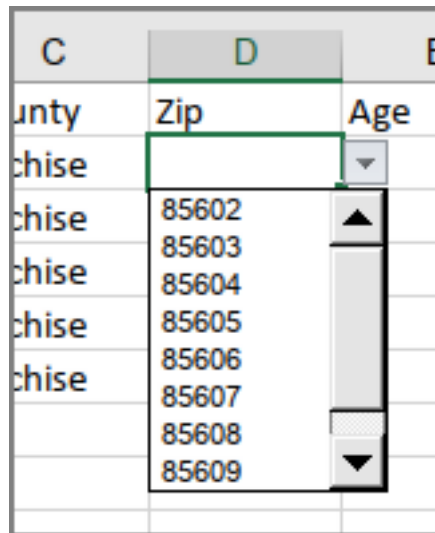


Figure 38: Valid Selections

Note**Validation List Location**

For this exercise the list of valid zip codes was contained on the same worksheet as the cells to be validated. However, the validation list is normally found on a different worksheet so it can be protected and, optionally, hidden from the user.

A second validation method is used when the user can enter data that cannot be selected from a list. For example, if users are required to enter their age then a drop-down list containing every possible age is not reasonable. In this case, Excel can be set up to ensure that the data entered is within certain specific bounds. For example, an “age” entry should be between 1 and 99 (or maybe some other range). Data validation can use a full set of Boolean comparisons (between, equal to, greater than, etc.). As part of the process, various messages can be displayed when the cell is selected to help guide the user. Finally, the action taken when invalid data is entered (*Stop*, *Warning*, or *Information*) can be specified.

1. Open **CH7-Advanced.xlsx**.
2. Select the **Validation** worksheet.
3. Notice that this sheet includes an entry for Age. The expectation is that users will enter their age but it is important to restrict this data to numbers between 1 and 99 so they do not accidentally enter a large number or even text.

4. Select **E2**, which is the first cell that needs data validation.
5. Click **Data Validation** on the **Data tools** group of the **Data** tab on the ribbon. (*Note*, click the button, not the down arrow on the right side of the button.)
6. Select **Whole number** in the **Allow** field.
7. Select **Between** in the **Data** field.
8. Enter **1** in the **Minimum** field.
9. Enter **99** in the **Maximum** field.

The screenshot shows the 'Data Validation' dialog box with the 'Settings' tab active. The 'Validation criteria' section is configured as follows:

- Allow:** A dropdown menu showing 'Whole number'.
- Data:** A dropdown menu showing 'between'.
- Minimum:** A text box containing the value '1'.
- Maximum:** A text box containing the value '99'.
- Ignore blank:** A checked checkbox.

At the bottom of the dialog, there are three buttons: 'Clear All', 'OK', and 'Cancel'. The 'Apply these changes to all other cells with the same settings' checkbox is unchecked.

Figure 39: Settings for Validating Numeric Data

10. Click the **Input Message** tab and enter *Age* for the *Title* and *Input an age between 1 and 99* for the *Input Message*.
11. Click the **Error Alert** tab and select the **Stop** style then enter *Age* for the *Title* and *Input an age between 1 and 99* for the *Input Message*.
12. Click **OK**.

13. Copy **E2** to **E3:E6**.
14. Click in **E2** to activate that cell. Notice that the help message pops up. Enter some number in **E2**. If that number is between 1 and 99 then the entry works without error, but if anything else is entered an error message pops up and forces a correct number to be entered.



Figure 40: Stopping on Data Entry Error

15. Click **E2** to activate that cell.
16. Click **Data Validation** on the **Data tools** group of the **Data** tab on the ribbon. (*Note*, click the button, not the down arrow on the right side of the button.)
17. Click the **Error Alert** tab on the **Data Validation** dialog box.
18. This cell was initially set to *Stop* on an error. Perhaps, though, it would be acceptable for the user to finish the data entry even if it contained an error. Change the Style drop-down to **Warning**.
19. Click **OK**.
20. Copy **E2** to **E3:E6**.
21. Click in **E2** to activate that cell. Notice that the help message pops up. Enter some number in **E2**. If that number is between 1 and 99 then the entry works without error, but if anything else is entered a warning message pops up and permits the user to continue with the bad number or retry.

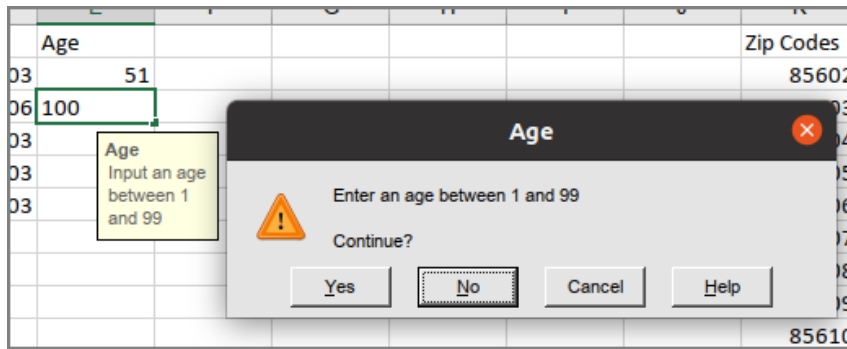


Figure 41: Warning on Data Entry Error

22. Enter these numbers into cells **E3:E6**: 51, 100, 40, 99, 0. A warning should pop up for **E4** and **E6** since those entries are out of the acceptable range, but click **Yes** on the warning popup box so the data is entered.
23. Click the down arrow on the right side of the **Data Validation** button in the **Data tools** group of the **Data** tab on the ribbon.
24. Select **Circle Invalid Data**.

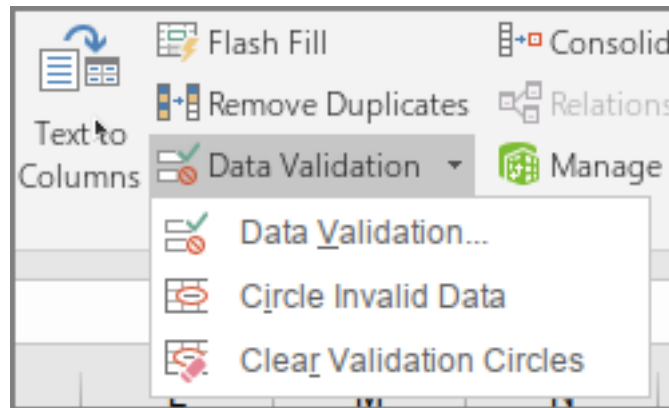


Figure 42: Data Validation Options

25. Notice that the cells containing bad data are now circled so they can be corrected.

	E
	Age
503	51
506	100
503	40
503	99
503	0

Figure 43: Circled Data Errors

26. Click the down arrow on the right side of the **Data Validation** button on the **Data tools** group of the **Data** tab on the ribbon.
27. Select **Clear Validation Circles** to clear the validation circles.

Note

Data Validation

Data validation will not automatically update the error circles as new data is entered. Therefore, after data is entered into a worksheet the **Circle Invalid Data** button must be clicked to check that data.

1.5.2 Worksheet Protection

After entering the data validation rules, it is desired to lock the **Validation** worksheet so users cannot accidentally delete the formulas. Before adding protection to a worksheet, cells that need to remain open for editing must be unlocked. That way, after the entire sheet is locked those selected cells can still be edited. Follow these steps to unlock cells that should remain editable.

1. Click on the **Validation** worksheet tab to activate it.
2. Select **D2:E6**.
3. Right-click on the selected cells.
4. Select **Format Cells** from the popup menu.
5. Click the **Protection** tab of the dialog box.

6. Uncheck **Locked**.
7. Click **OK**.

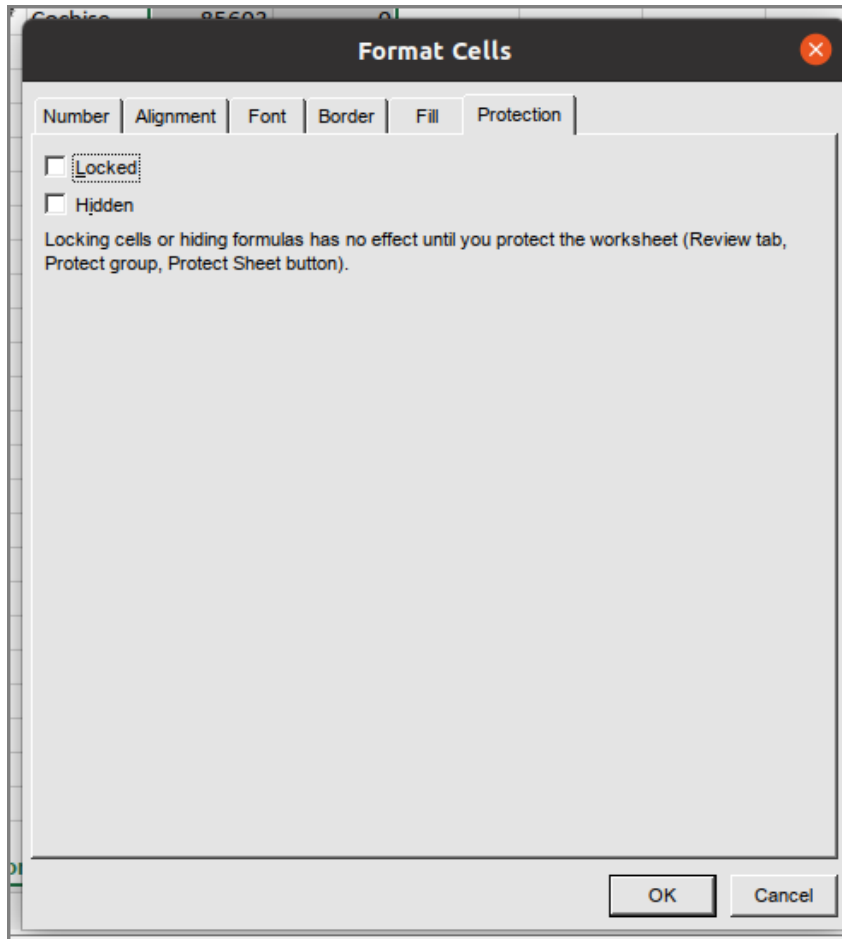


Figure 44: Unlocking Editable Cells

Next, do this to lock the sheet.

1. Click **Protect Sheet** in the **Protect** group on the **Review** tab.
2. Check **Protect worksheet and contents of locked cells**.
3. Uncheck all options except **Select Unlocked Cells**.
4. Click **OK**.
5. Notice that now the mouse cannot click in any cell except **D2:E6**

Important!**Password**

Worksheets can be password protected, but there is no way to recover the worksheet if the password is forgotten. Therefore, it is essential to use a password that is easy to remember but difficult to guess.

Important!**Security**

While it is easy to lock worksheets to keep users from accidentally changing a formula, this should not be considered any sort of security. Users can easily unlock the worksheet and make whatever changes they want. This is just a way to stop users from accidentally making changes.

Key Take-Aways**Safeguarding**

- Data entry can be validated to decrease the chance of bad data being entered due to simple typing errors.
- Worksheets can be protected so users cannot accidentally change formulas or data.

1.6 WHAT-IF ANALYSIS**Learning Objectives**

- Managers often want to use the power of Excel to predict the results of business decisions.
- Data tables can be used to predict the effect on a variable if a second variable changes.
- Goal seeking permits a manager to find an optimum value for a variable when given a specific goal.

One of the most important uses for a computerized spreadsheet like Excel over a paper-and-pencil system is the ability to quickly test various business parameters to forecast profits (or losses). Two forecasting techniques are commonly used.

1.6.1 Data Table

A data table is the simplest forecasting technique. Excel can fill the cells of a data table with values that are the result of repeatedly applying a formula to a range of data. As an example, imagine that Riley was buying a new car that cost \$35,000. The dealership offered financing at 6% but the term (length of the loan) was flexible. Riley wanted to know what term to choose to get the maximum payment possible that is under \$1000.

1. Open **Ch7-Advanced.xlsx**.
2. Select the **One Var Data Table** worksheet.
3. Notice that some information has already been started, including the loan amount (cell **B3**), interest rate (cell **B4**), and term (cell **B5**).
4. Enter this formula to calculate the size of a monthly payment in cell **B6**: **=PMT(B4/12,B5,B3)** (Note: *PMT* is an Excel function that is used to calculate payments.)
5. In cell **E3** enter: **=B6**.
6. In cell **D4:D11** enter *12, 18, 24, 30, 36, 42, 48, 54, 60* (Tip: using autofill may make this quicker).
7. Select cells **D3:E12**.

[illegible]

Figure 45: Preparing To Create a Data Table

- Click **Data Table** in the **What-If Analysis** button in the **Forecast** group on the **Data** tab.

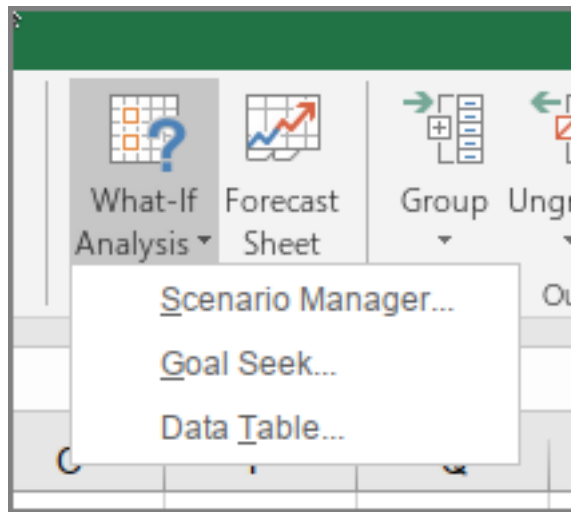


Figure 46: The What-If Analysis Menu

9. In the **Data Table** properties, enter `B5` for Column input cell (leave the Row input cell blank since this data table has only one column with no rows). Excel will substitute values from `D4:D12` into cell `B5` one at a time and find the result using the formula in `E3`.

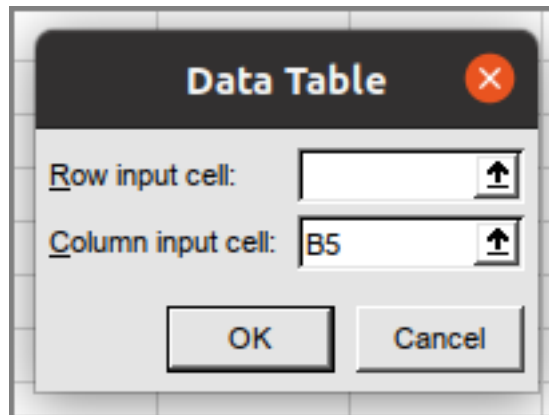


Figure 47: The Data Table Settings

10. Click **OK**.

		(\$676.65)
12	-3012.33	
18	-2038.11	
24	-1551.22	
30	-1259.26	
36	-1064.77	
42	-925.968	
48	-821.976	
54	-741.19	
60	-676.648	

Figure 48: Data Table Results

Riley should choose a term of 42 months since that creates the largest payment that is less than \$1000. Note: the payments are negative numbers because they represent money that is leaving Riley's bank account.

In the one-variable example above only one variable, *term*, was changed to determine its impact on the payment. Excel can also build a data table that reflects changing two variables. Imagine that Morgan is investing some savings in a fund that has an annual percentage rate of 5%. Morgan can invest anywhere from \$1000 to \$10000 for any number of years from 2 to 7 and is interested to see how that investment will grow.

1. Open **Advanced Exercises.xlsx**.
2. Select the **Two Var Data Table** worksheet.
3. Notice that some information has already been started, including the initial investment (cell **B3**), annual percentage rate (cell **B4**), number of compounding periods per year (**B5**), and the number of years (cell **B6**).
4. Enter this formula to calculate the future value of the investment in cell **B7**: `=FV(B4/B5,B6*B5,-B3)`. (Note, *FV* Excel function that is used to calculate the future value of an investment. Note that there are two commas in a row and a negative sign before the last term.)
5. In cell **D3** enter: `=B7`.
6. In cell **D4:D13** enter *1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000* (Tip: using autofill may make this quicker).

7. In cell **E3:J3** enter 2, 3, 4, 5, 6, 7.
8. Select **D3:J13**.

Savings Investment									
Initial Investment	\$1,000.00		2	3	4	5	6	7	
Interest Rate	5.00%	1000							
Periods per Year	12	2000							
Years	2	3000							
Balance	\$1,104.94	4000							
		5000							
		6000							
		7000							
		8000							
		9000							
		10000							

Figure 49: Two-Variable Data Table Setup

- Click **Data Table** in the **What-If Analysis** button in the **Forecast** group on the **Data** tab.
- In the **Data Table** properties, enter **\$B\$6** for Row input cell and **\$B\$3** for Column input cell.
- Click **OK**.

Savings Investment									
Initial Investment	\$1,000.00	\$1,104.94	2	3	4	5	6	7	
Interest Rate	5.00%	1000	1104.941	1161.472	1220.895	1283.359	1349.018	1418.036	
Periods per Year	12	2000	2209.883	2322.944	2441.791	2566.717	2698.035	2836.072	
Years	2	3000	3314.824	3484.417	3662.686	3850.076	4047.053	4254.108	
Balance	\$1,104.94	4000	4419.765	4645.889	4883.581	5133.435	5396.071	5672.144	
		5000	5524.707	5807.361	6104.477	6416.793	6745.089	7090.18	
		6000	6629.648	6968.833	7325.372	7700.152	8094.106	8508.216	
		7000	7734.589	8130.306	8546.267	8983.511	9443.124	9926.252	
		8000	8839.531	9291.778	9767.163	10266.87	10792.14	11344.29	
		9000	9944.472	10453.25	10988.06	11550.23	12141.16	12762.32	
		10000	11049.41	11614.72	12208.95	12833.59	13490.18	14180.36	

Figure 50: Two-Variable Data Table Results

When Excel has completed the data table, Morgan would be able to balance the amount of money he can come up with initially with the length of time he is willing to leave that money in the bank.

1.6.2 Goal Seek

Often, business owners know the goal they seek for their company and they want Excel to determine how to achieve that goal. Imagine that a restaurant owner wants to know how much money to take in (“receipts”) to generate \$100,000 in profit.

1. Open **Ch7-Advanced.xlsx**.
2. Select the **Goal Seek** worksheet.

- This worksheet already includes some data: the company receipts (B2), the cost of food as a percentage of receipts (B3), the overhead as a percentage of receipts (B4), and a place for the net profit calculation (B5).
- Enter this formula in B5: $=B2-((B2*B3)+(B2*B4))$.
- Click **Goal Seek** in the **What-If Analysis** button in the **Forecast** group on the **Data** tab.
- Enter $\$B\5 for the *Set cell* parameter, enter 100,000 for the *To value* parameter, and enter $\$B\2 for the *By changing cell* parameter.

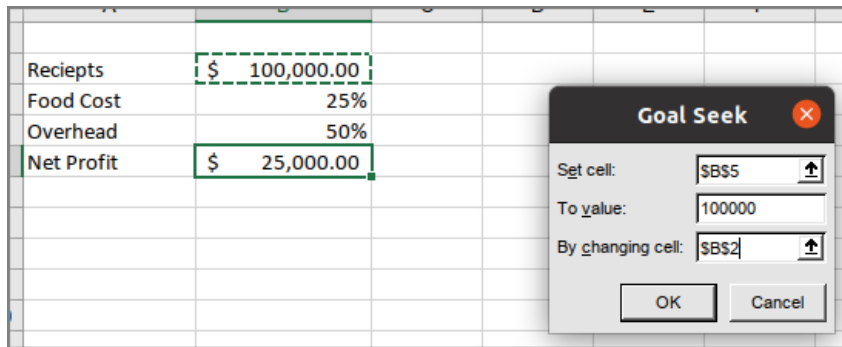


Figure 51: Goal Seek Setting

- Click **OK**.

The data on the worksheet will adjust to fit the requirement. Clicking **OK** on the **Goal Seek Status** dialog box will change the worksheet while clicking **Cancel** will revert the worksheet back to its original values.

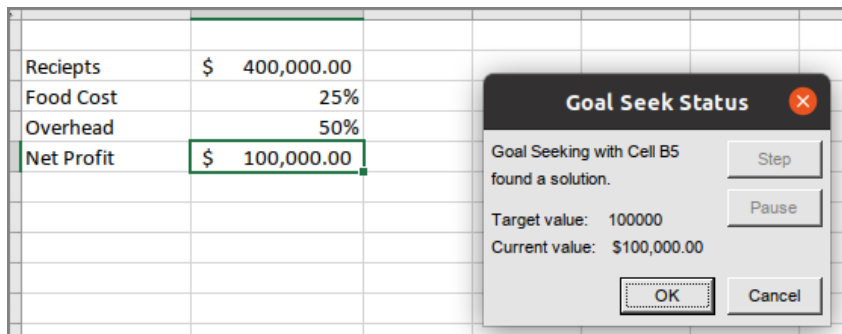


Figure 52: Goal Seek Results

As a challenge, try using Goal Seek to change the overhead percentage in order to yield a profit of \$35,000 with receipts of \$100,000.

Key Take-Aways

What-if Analysis

- Data tables are effective ways to predict the effect of changes in a variable.
- Goal seeking finds an optimum value for a variable to meet a specific goal.

1.7 USING EXCEL MACROS

Learning Objectives

- Macros automate simple tasks to save time in data entry.

The **Macros** button in the **Macros** group of the **View** tab allows users to automate repetitive tasks. The top part of the button will open the **View Macros** dialog box and the bottom half reveals options for macros.

1. Open a new blank workbook. (*Note: the macro is placed in a new workbook so it does not accidentally interfere with the exercises in any other workbook.*)
2. Click **A1** to select that cell.
3. Click **Macros** in the **Macros** group of the **View** tab (be sure to click the small arrow at the bottom of the **Macros** button).
4. Select **Use Relative References**.
5. Select **Record Macro**.
6. Name the macro *MyName*.
7. Click in the **Shortcut Key** box and type **Shift** + **Q**.
8. Store the macro in this workbook.
9. Enter this description: *Inserts my name*.

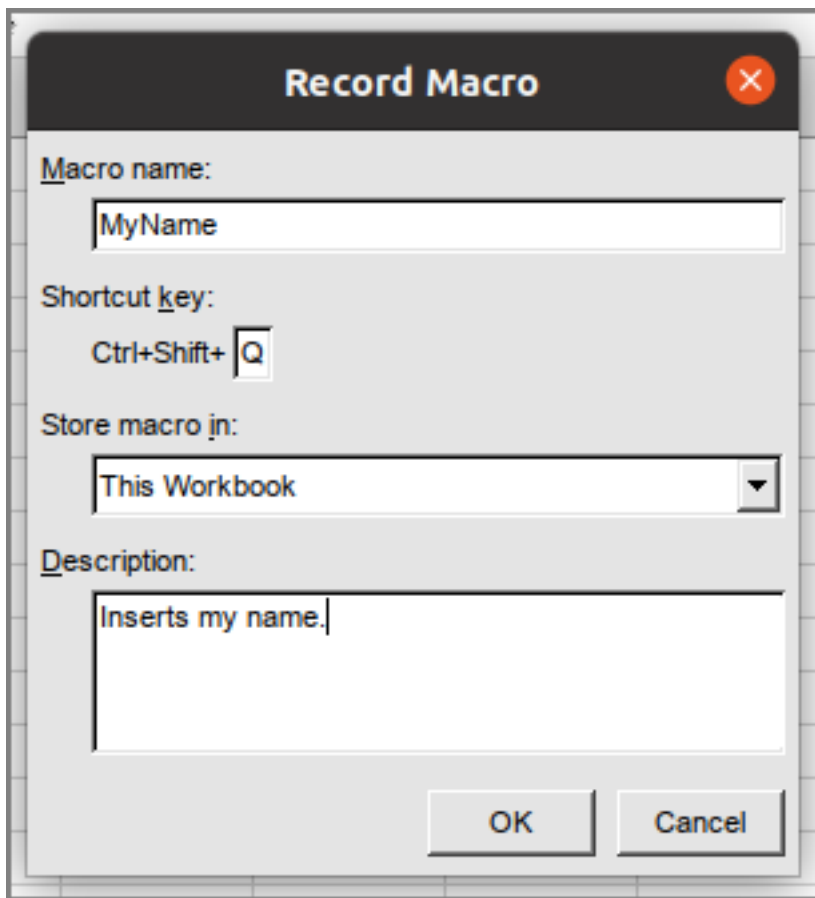


Figure 53: The Record Macro Settings Box

10. Click **OK**.
11. Type your first and last name and press **Enter**.
12. Click **Macros** in the **Macros** group of the **View** tab (be sure to click the small arrow at the bottom of the **Macros** button).
13. Select **Stop Recording**.

Select another cell on the worksheet and press **Ctrl** + **Shift** + **Q**. Remember that relative references were activated for the macro, otherwise the name would have always been created in cell **A1** (the original cell) instead of the current cell.

1. Click **Macros** in the **Macros** group of the **View** tab (be sure to click the top of the **Macros** button).
2. This opens the Macro manager dialog where macros can be edited, deleted, or have various options set.

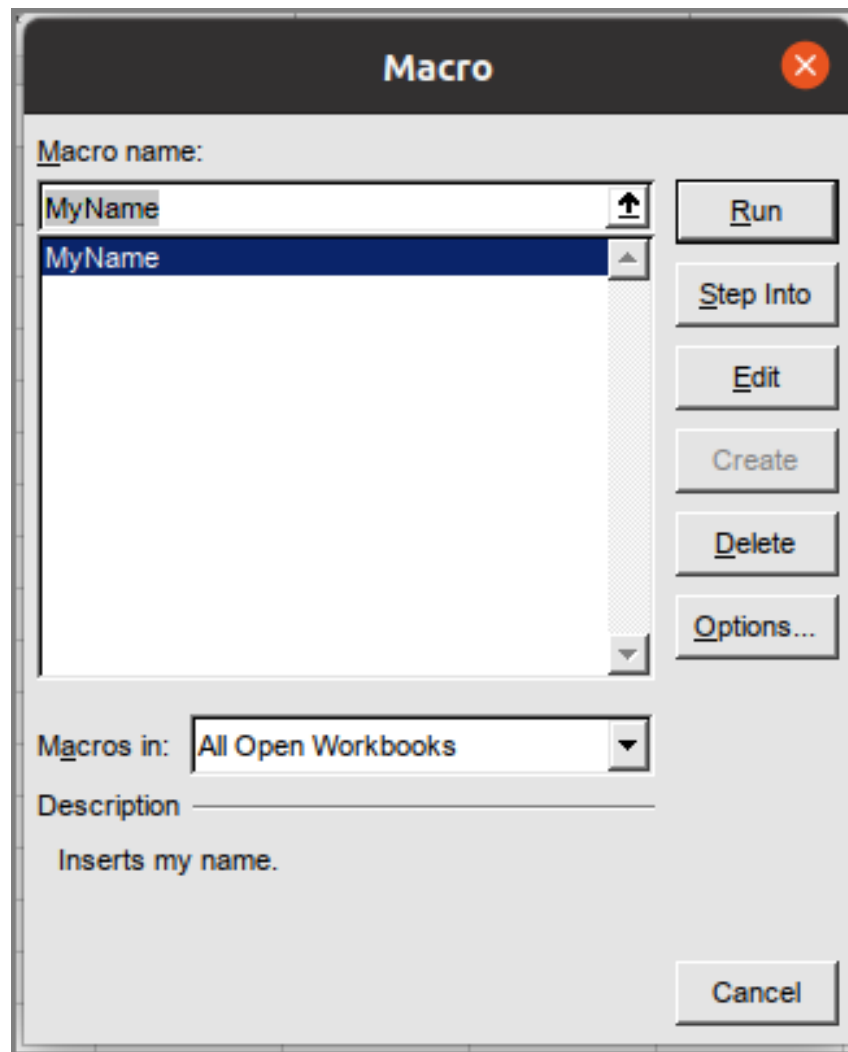


Figure 54: The Macro Manager Box

3. Click **Cancel** to close the Macro manager.

Remember that all workbooks containing macros must be saved using the “macro-enabled” option (that creates a file extension of *.xlsm*). Figure 55 shows a drop-down menu at the bottom right corner of the **Save-As** screen where **Excel Macro-Enabled Workbook** must be selected.

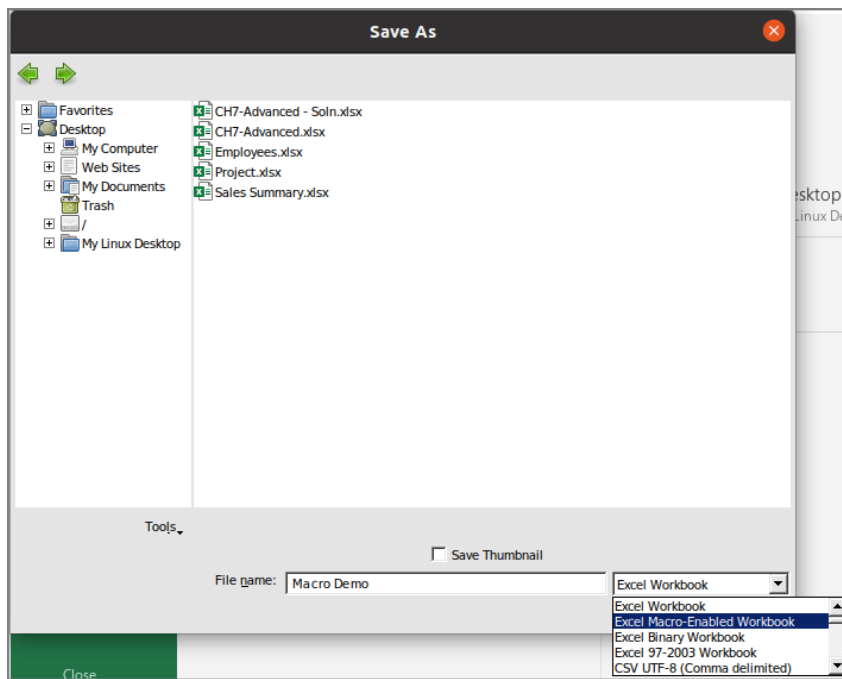


Figure 55: Saving a Workbook With a Macro

Since this macro will not be reused in the future, close the workbook without saving.

Key Take-Aways

Using Excel Macros

- Macros automate simple tasks to save time in data entry.

1.8 PREPARING TO PRINT

Learning Objectives

- Review each worksheet in a workbook in Print Preview.
- Modify worksheets as needed to professionally print data and charts.

Just like consistency in formatting is important when working with workbooks containing multiple worksheets with pivot tables and charts, so is consistency in page setup. Now that the **Sales Summary** workbook is complete, prepare it for printing by changing the adding a header and footer.

1. Open the **Sales Summary** workbook.
2. Click **Print** in the Backstage view to enter the print preview. To view all of the worksheets at one time, select **Print Entire Workbook** in the first box in the Settings section. There are 6 pages to scroll through in Print Preview. At this point, clicking the **Print** button would print all of the worksheets rather than just the active sheet.
 - All of the pages look good except pages one and six.
 - Page one is just the raw data. There is no point in printing that worksheet so it should be hidden.
 - Page six should have a chart, but there is something wrong with that page.
 - A header and footer should be added.
3. Exit Backstage View.
4. Right-click on the **Sales Data** worksheet tab and select **Hide**.
5. Activate the **Sales By Item** worksheet by clicking that tab. Notice that part of the chart is printing on a second page as indicated by a dotted line running down the edge of column J.
6. Move and resize the chart so the top “snaps” to the top of Row 9, the bottom “snaps” to the bottom of Row 22, and the left side “snaps” to the left side of Column B. Resize right side of the chart so it snaps to the line between column F and G.
7. Activate the **Sales Pivot** worksheet by clicking that tab. Hold down the **[Shift]** key and click on the **Sales By Item** tab to activate all four worksheets.
8. Click the **Page Setup** dialog box launcher arrow in the bottom right corner of the the **Page Setup** group on the **Page Layout** tab then click the **Header/Footer** tab.
9. Click the **Custom Footer** button. In the center section, insert the worksheet name using the **Insert Sheet Name** button. The Footer dialog box should look like Figure 56.

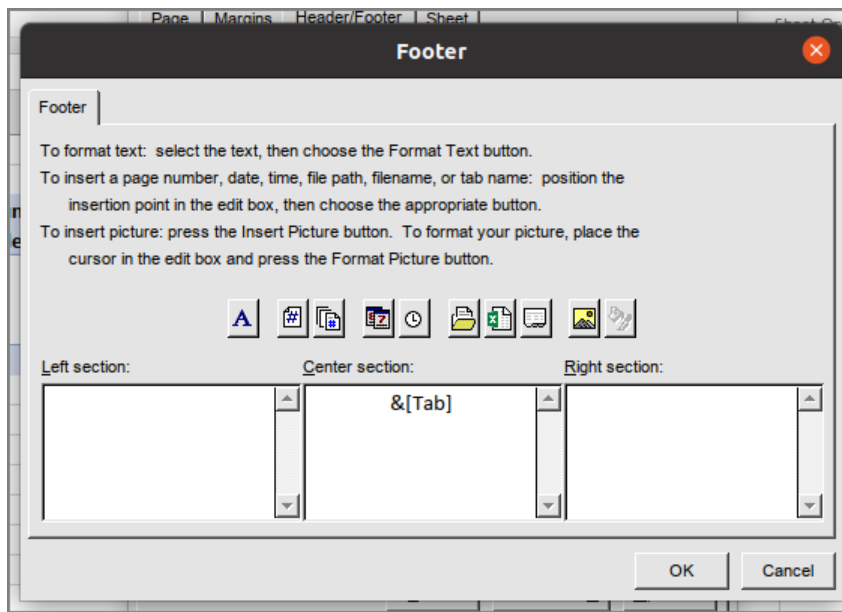


Figure 56: Page Footer

10. Click **OK** to close the **Footer** dialog box.
11. Click the **Custom Header** button. In the right section, insert the date using the **Insert Date** button. The Header dialog box should look like Figure 57.

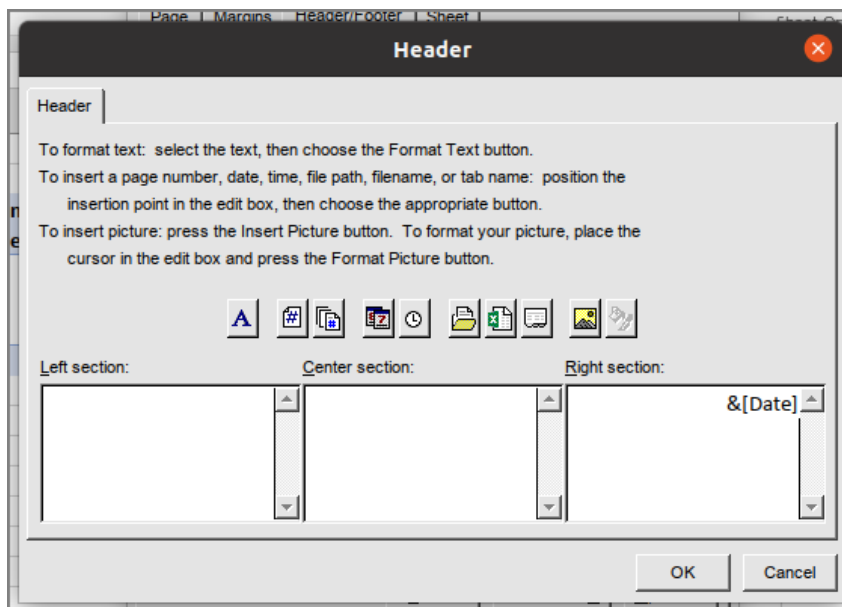


Figure 57: Page Header

12. Click **OK** to close the **Header** dialog box. Click **OK** again to close the **Page Setup** dialog box.

13. Return to Print Preview to confirm that each worksheet is printing on one page with the date appearing in the header and the correct worksheet name appearing in the footer.

Key Take-Aways

Preparing to Print

- Formatting for print is an essential part of creating a workbook.

1.9 CHAPTER PRACTICE

1.9.1 Project Team Analysis

Data file: PR7-Data.csv

1. Load the data.
 - a) Start Excel and open a new workbook.
 - b) Save the workbook as **Project**.
 - c) Click **Get External Data** in the **Data** tab of the ribbon.
 - d) Click **From Text**.
 - e) Navigate to **PR7-Data.csv**.
 - f) Click the file name and then **Import**.
 - g) Import the data file into a new worksheet.
 - i. The data in the CSV file has headers.
 - ii. The data uses a comma delimiter.
 - iii. The *Date Completed* column should be formatted as **Date MDY**.
 - iv. Import the data into cell **A1** on the current worksheet.
 - h) Name the worksheet **Project Data**.
2. **Question 1:** What type of project is the most fiscally productive?
 - a) Activate cell **A1** by clicking in the cell.
 - b) Click **Recommended PivotTables** in the **Tables** group of the **Insert** tab on the ribbon.
 - c) Select the first pivot table, **Sum of Amount Billed by Project Type** and click **OK**.
 - d) Rename the pivot table to *Billed* and then rename the worksheet to *Billed*.

- e) Move the **Billed** worksheet to the right of the **Project Data** worksheet.
 - f) Click the down arrow to the right of *Sum of Amount Billed* in the Values area and select **Value Field Settings**.
 - g) Change the name of this field to *Total Billed*.
 - h) Right-click in cell **B4** to activate the first cell with totals.
 - i) In the popup menu, select **Sort** then **Sort Largest to Smallest**. This sorts the total billed from the largest to smallest amount.
 - j) Save the workbook.
3. **Question 2:** Which client spends the most?
- a) Click in cell **A1** in the **Project Data** worksheet to activate it.
 - b) Click **PivotTable** in the **Tables** group of the **Insert** tab.
 - c) Create a pivot table on a new worksheet.
 - d) Name the pivot table and worksheet *Clients*.
 - e) Move the **Clients** worksheet to the right of the **Billed** worksheet.
 - f) Drag *Client* from the Field List to the Rows area and *Amount Billed* from the Field List to the Values area.
 - g) Change the name of the values header from *Sum of Amount Billed* to *Total Billed*.
 - h) Sort the *Total Billed* column so the largest number is at the top.
 - i) Save the workbook.
4. **Question 3:** Which quarter was the most profitable?
- a) Click in cell **A1** in the **Project Data** worksheet to activate it.
 - b) Click **PivotTable** in the **Tables** group of the **Insert** tab.
 - c) Create a pivot table on a new worksheet.
 - d) Name the pivot table and worksheet *Quarterly*.
 - e) Move the **Quarterly** worksheet to the right of the **Clients** worksheet.
 - f) Drag *Data Completed* from the Field List to the Rows area and *Amount Billed* from the Field List to the Values area.
 - g) Change the name of the values header from *Sum of Amount Billed* to *Total Billed*.
 - h) Save the workbook.

5. **Question 4:** Which team completed the largest proportion of the projects?
 - a) Click in cell **A1** in the **Project Data** worksheet to activate it.
 - b) Click **PivotChart** in the **Charts** group of the **Insert** tab.
 - c) Create a pivot chart on a new worksheet.
 - d) Name the pivot chart and worksheet *Teams*.
 - e) Move the **Teams** worksheet to the right of the **Quarterly** worksheet.
 - f) Drag *Team Leader* from the Field List to the *Axis (Categories)* area and *Hours Spent* from the Field List to the Values area.
 - g) Change the name of the values header from *Sum of Hours Spent* to *Total Hours*.
 - h) Sort the *Total Hours* column so the largest number is at the top.
 - i) Change the title of the chart to *Total Hours Spent*.
 - j) Since there is only one data point, the legend is not needed, so remove it. Click the + sign near the top right corner of the chart and uncheck the **Legend** item.
 - k) Save the workbook.
6. Submit the **Project** workbook to the instructor.

1.10 SCORED ASSESSMENT

1.10.1 Employee Analysis

Data file: SC7-Data.csv

1. Load the data.
 - a) Start Excel and open a new workbook.
 - b) Save the workbook as **Employees**.
 - c) Click **Get External Data** in the **Data** tab of the ribbon.
 - d) Click **From Text**.
 - e) Navigate to **SC7-Data.csv**.
 - f) Click the file name and then **Import**.
 - g) Import the data file into a new worksheet.
 - i. The data in the CSV file has headers.
 - ii. The data uses a comma delimiter.

- iii. The *hired* column (scroll to the right edge of the data list) should be formatted as **Date MDY**.
 - iv. Import the data into cell **A1** on the current worksheet.
 - h) Name the worksheet **Employee Data**.
2. **Question 1:** What is the average salary for each role?
- a) Create a pivot table that lists the roles in the business (Accounting, Associate, etc.), the number of people in each role, and the average salary for that role.
 - b) The pivot table should be on a worksheet named **Avr Salary** and that worksheet should be to the right of the **Employee Data** worksheet.
 - c) The average salary should be formatted as currency.
 - d) Sort the list so the highest salary is first.
 - e) Save the workbook.
 - f) Figure 58 illustrates how the pivot table should look.

Row Labels	Count	Avr Salary
CEO	1	\$125,000.00
CFO	1	\$120,000.00
Section Supervisor	2	\$67,216.00
Accounting	2	\$65,898.00
Human Resources	3	\$64,306.67
Team Leader	5	\$61,577.60
Purchasing	2	\$51,447.50
Associate	13	\$31,914.31
Intern	1	\$27,000.00
Grand Total	30	\$51,893.90

Figure 58: Avr Salary By Role

3. **Question 2:** What is the average age of the employees when broken down by sex and marital status?
- a) Create a pivot table that lists the average age by marital status and sex for all employees.
 - b) The pivot table should be on a worksheet named **Avr Age** and that worksheet should be to the right of the **Avr Salary** worksheet.

- c) The average age should be formatted as a number with two decimal places.
- d) Save the workbook.
- e) Figure 59 illustrates how the pivot table should look.

Row Labels ▼	Average of age
<input type="checkbox"/> Divorced	46.25
Female	50.00
Male	42.50
<input type="checkbox"/> Married	45.92
Female	43.63
Male	50.50
<input type="checkbox"/> Separated	46.75
Female	44.33
Male	54.00
<input type="checkbox"/> Single	31.40
Female	31.75
Male	30.00
<input type="checkbox"/> Widowed	62.80
Female	65.67
Male	58.50
Grand Total	46.47

Figure 59: Avr Age

4. **Question 3:** How many employees have been hired each year from 2007?
- a) Create a pivot table that lists the count by year. (*Hint:* count the username field since each employee has a unique username.)
 - b) The pivot table should be on a worksheet named **Year Hired** and that worksheet should be to the right of the **Avr Age** worksheet.
 - c) The username field should be labeled *count*.
 - d) The *hired* field should display only years, not quarters or months.
 - e) The list should be sorted by year (which is the default).

- f) Save the workbook.
- g) Figure 60 illustrates how the pivot table should look.

Row Labels ▼	Count
2007	4
2008	2
2010	4
2011	6
2012	3
2013	3
2014	1
2015	3
2016	2
2017	1
2018	1
Grand Total	30

Figure 60: Number Hired By Year

5. **Question 4:** How many employees work in each role?
- a) Create a pivot chart that shows the count by role. (*Hint:* count the username field since each employee has a unique username.)
 - b) The pivot chart should be on a worksheet named **Count By Role** and that worksheet should be to the right of the **Year Hired** worksheet.
 - c) The username field should be labeled *Number*.
 - d) The data should be sorted such that the role with the most employees ("Associate") should be first.
 - e) The chart's title should be *Count By Role*
 - f) The chart should not have a legend.
 - g) Save the workbook.
 - h) Figure 61 illustrates how the pivot chart should look.

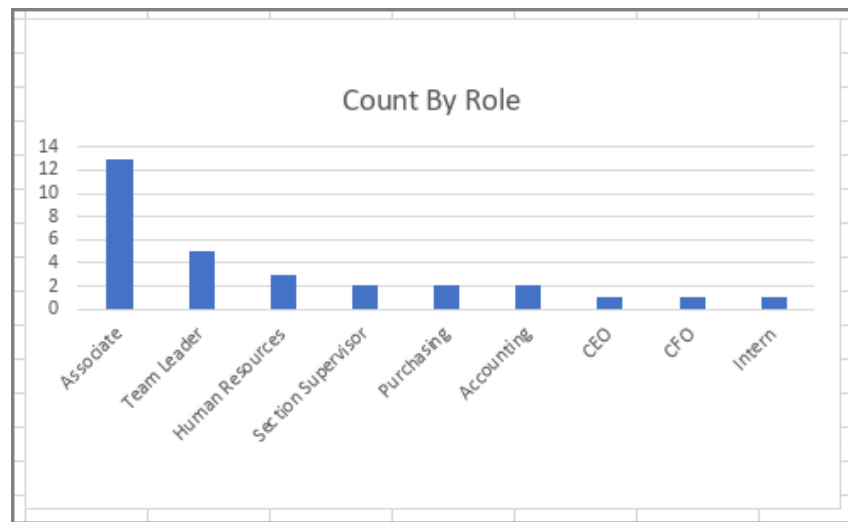


Figure 61: Count By Role

6. Submit the **Employees** workbook to the instructor.

COLOPHON

This document was typeset using the typographical look-and-feel classicthesis developed by André Miede. The style was inspired by Robert Bringhurst's seminal book on typography "*The Elements of Typographic Style*". classicthesis is available for both L^AT_EX and L^yX:

<https://bitbucket.org/amiede/classicthesis/>

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