MASTERY SERIES

Microsoft® Excel 2019 & 365

LEVEL 2 OF 3

ALEX SCOTT
Conestoga College

LABYRINTH LEARNING™

Microsoft Excel 2019 & 365: Level 2

LABYRINTH LEARNING™

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Lookup Functions and Outlines

Preface

This textbook is part of our new approach to learning for introductory computer courses. We've kept the best elements of our proven, easy-to-use instructional design and added interactive elements and assessments that offer enormous potential to engage learners in a new way.

Why Did We Write This Content?

In today's digital world, knowing how to use the most common software applications is critical, and those who don't are left behind. Our goal is to simplify the entire learning experience and help every student develop the practical, real-world skills needed to be successful at work and in school. Using a combination of text, videos, interactive elements, and assessments, we begin with fundamental concepts and take learners through a systematic progression of exercises to achieve mastery.

What Key Themes Did We Follow?

We had conversations with dozens of educators at community colleges, vocational schools, and other learning environments in preparation for this textbook. We listened and adapted our learning solution to match the needs of a rapidly changing world, keeping the following common themes in mind:

Keep it about skills. Our content focus is on critical, job-ready topics and tasks, with a relentless focus on practical, real-world skills and common sense. We use step-by-step instructional design to ensure that learners stay engaged from the first chapter forward. We've retained our proven method of progressively moving learners through increasingly independent exercises to ensure mastery—an approach that has successfully developed skills for more than 25 years.

Keep it simple. Our integrated solutions create a seamless experience built on a dynamic instructional design that brings clarity to even the most challenging topics. We focus our content on the things that matter most and present it in the easiest way possible. Concise chunks of text are combined with visually engaging and interactive elements to increase understanding for all types of learners.

Keep it relevant. Fresh, original, and constantly evolving content helps educators keep pace with today's student and work environments. We reviewed every topic for relevancy and updated it where needed to offer realistic examples and projects for learners.

How Do I Use This Book?

Our comprehensive learning solution consists of a print textbook, a groundbreaking interactive ebook, and our easy-to-use eLab course management tool featuring additional learning content, such as overviews and video tutorials, and assessment content. Our interactive ebook contains learning content delivered in ways that will engage learners.

The eLab assessment solution includes Project Grader exercises for most chapters that are automatically graded by the system, in addition to clear feedback and analytics on student actions.

Included with Your Textbook Purchase

Depending on your purchase option, some or all of the following are included with your textbook:

Interactive ebook: A dynamic, engaging, and truly interactive textbook that includes elements such as videos, self-assessments, slide shows, GIFs, and other interactive features. Highlighting, taking notes, and searching for content is easy.

eLab Course Management System: A robust tool for accurate assessment, tracking of learner activity, and automated grading that includes a comprehensive set of instructor resources. eLab can be fully integrated with your LMS, making course management even easier.

Instructor resources: This course is also supported on the Labyrinth website with a comprehensive instructor support package that includes detailed lesson plans, lecture notes, PowerPoint presentations, a course syllabus, test banks, additional exercises, and more.

Student Resource Center: The exercise files that accompany this textbook can be found within eLab and in the Student Resource Center, which may be accessed from the ebook or online at: **labyrinthelab.com/office19**

We're excited to share this innovative, new approach with you, and we'd love you to share your experience with us at: lablearning.com/share

Visual Conventions

This book uses visual and typographic cues to guide students through the lessons. Some of these cues are described below:

Cue Name	What It Does
`Type this text`	Text you type at the keyboard is printed in this typeface.
Action words	The important action words in exercise steps are presented in boldface.
Ribbon	Glossary terms are highlighted with a yellow background.
Note! Tip! Warning!	Tips, notes, and warnings are called out with special icons.
	Videos, WebSims, and other ebook or online content are indicated by this icon.
Command→Command→ Command→Command	Commands to execute from the Ribbon are presented like this: Ribbon Tab→Command Group→Command→Subcommand.
Design→Themes→Themes	These notes present shortcut steps for executing certain tasks.

Display Settings

Multiple factors, including screen resolution, monitor size, and window size, can affect the appearance of the Microsoft Ribbon and its buttons. In this textbook, screen captures were taken at the native (recommended) screen resolutions in Office 2019 running Windows 10, with ClearType enabled.

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EXCEL

6 Advanced Workbook Formatting

In this chapter, you will work with various tools useful for customizing your workbooks to suit your own, specific needs. For example, an invoice workbook you send to your customers at work might look quite different from a rough workbook you are using for your personal budget at home. You will learn ways to set up and adjust your worksheet to look consistent, professional, and presentable, as well as how to track information about the document.

LEARNING OBJECTIVES

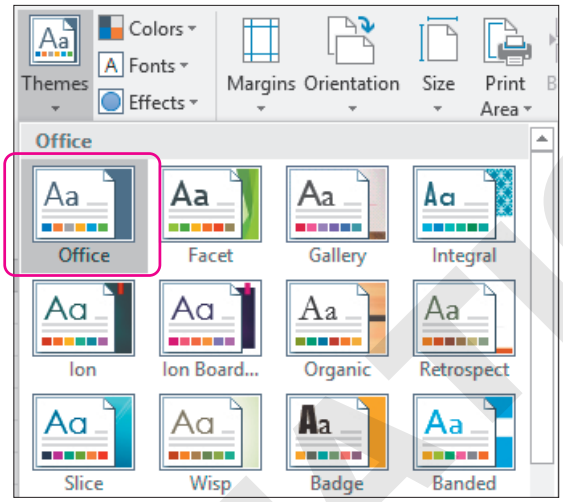
- Apply and customize themes
- Create and use cell styles
- Apply cell borders and fill
- Create custom number formats
- Customize the page setup
- Edit document properties

Project: Preparing Company Documents

In addition to being an instructor at LearnFast College, you serve on different committees and work with various teams on special projects. LearnFast is currently preparing its annual performance review in which it reports to employees, management, and investors on how well the college did last year. You have volunteered to review the Excel file and use your skills to add appropriate formatting before the report is distributed and presented at the annual meeting.

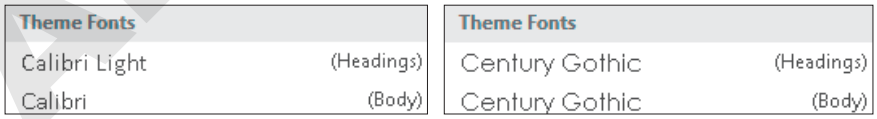
Formatting with Themes

Themes are an easy way to personalize a workbook with a unique set of colors, fonts, and effects. You can apply a different theme to an existing workbook or choose the desired theme when you first begin working on a new workbook. The theme is applied to the whole workbook, so all worksheets will have a consistent look.



All Office applications have a standard set of themes, and you can scroll through, preview, and select a theme from the gallery; the current theme is highlighted in gray.

The theme controls the default font used in the workbook. This may affect the default column width and row height in the workbook as well, depending on the chosen theme.



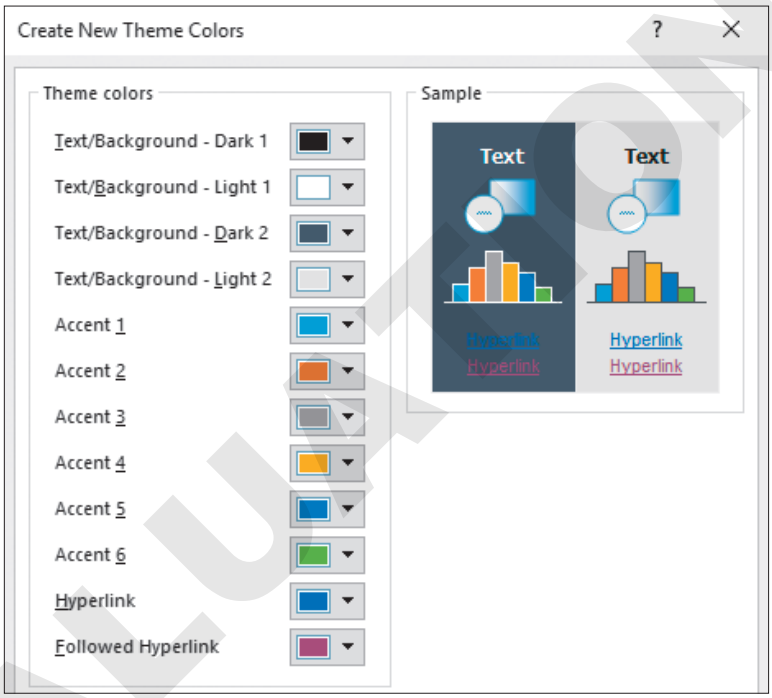
The default/theme fonts for the Office theme (left) and the Slice theme (right)

The theme also changes the color palette for formatting options such as fill color, font color, and border color. If your existing workbook uses theme colors for formatting and you change the theme, the formatting in the workbook will change to match the new theme colors. However, if your existing workbook uses standard colors for fill, font, and/or border formatting, those colors will always stay the same regardless of the theme.

The color palettes for the Office theme (left) and the Slice theme (right)

Customizing Themes

You can modify an existing theme by changing each of the three elements individually: the colors, fonts, or effects. For example, to modify the colors, you can choose from the list of color combinations available or customize even further by choosing each individual color to be used in the theme.



The Create New Theme Colors window allows you to choose ten theme colors for text/background and six accent colors, in addition to the colors used for hyperlinks and followed hyperlinks.

To modify the theme fonts, you can also choose from the gallery of options or choose your own custom heading font and body font.

Tip! *After you have modified any part of a theme, you can save your theme to use again in other documents.*

Page Layout→Themes

Page Layout→Themes→Themes→Save Current Theme

DEVELOP YOUR SKILLS: E6-D1

In this exercise, you will modify the workbook's theme and theme colors to match the LearnFast College school colors.

Before You Begin: *Download the student exercise files from your eLab course or the Student Resource Center (labyrinthelab.com/office19) and determine your file storage location before beginning this exercise.*

1. Start Excel, open **E6-D1-PerformanceData** from your **Excel Chapter 6** folder, and save it as: **`E6-D1-PerformanceReport`**

   To begin, you will choose a different theme for the document, which will change the font, font color, and fill color in both worksheets.

2. Choose **Page Layout→Themes→Themes**.

   As you place the mouse over the different themes, you can see a preview of the changes on the worksheet. Modifying the theme means any existing content that is formatted using a theme font or a theme color will change to match the new theme.

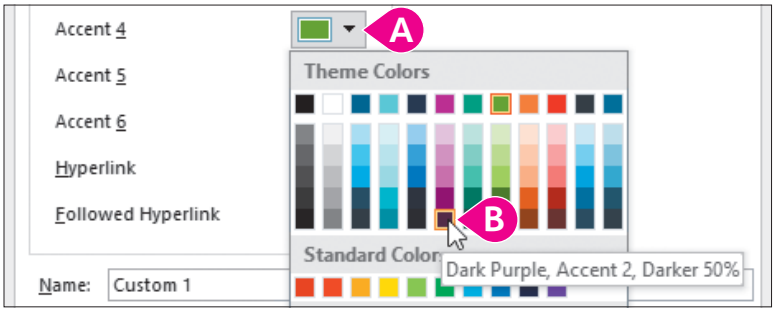
3. Choose the **Slice** theme.

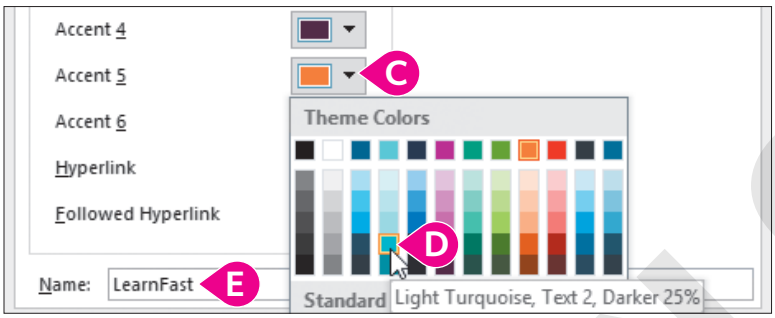
4. Choose **Home→Font→Fill Color menu button**.

   The theme colors showing in the Fill Color menu have changed, but do NOT select any of the colors at this time. You will adjust two of the colors in the next steps.

5. Choose **Page Layout→Themes→Colors→Customize Colors…**.

6. Follow these steps to set the colors for Accent 4 and Accent 5:





A. Click the **color menu** button ▾ beside Accent 4.

B. Choose **Dark Purple, Accent 2, Darker 50%**.

C. Click the **color menu** button ▾ beside Accent 5.

D. Choose **Light Turquoise, Text 2, Darker 25%**.

E. Type **`LearnFast`** in the Name box for the new theme colors and click **Save**.

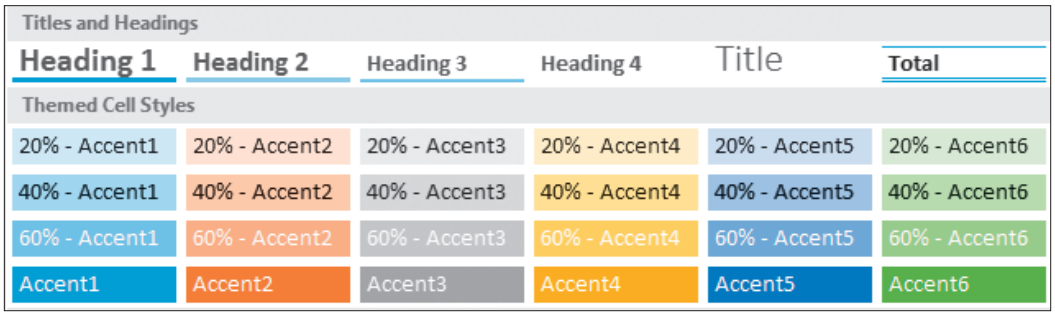
The new colors for Accent 4 and 5 are seen in the headings at the top of the worksheet. These colors are now saved for use in other workbooks.

7. Save the file.

Note! *Always leave your file open at the end of an exercise unless instructed to close it.*

Cell Styles

You can use Excel's built-in cell styles to give your worksheet a quick, uniform design. The Cell Styles option combines formatting such as font, color, fill, and alignment. There are numerous options, including cell styles for data such as input and output styles, cell styles for formatting your titles and headings, and themed styles that change depending on the theme.



You can also create new cell styles or modify existing cell styles; however, these changes apply only to the current workbook (unless you merge the cell styles from one workbook to another). The simplest way to create a new style is to format one cell the way you wish the style to appear, and then create a new style based on the selected cell. Excel refers to this as creating a new style "by example."

To modify a cell style, you can right-click any style in the gallery and choose the Modify option. This opens the Style dialog box, from where you can make your modifications.

Home→Styles→Cell Styles

DEVELOP YOUR SKILLS: E6-D2

In this exercise, you will create and apply cell styles to the worksheet to ensure consistent formatting.

1. Save your file as: **`E6-D2-PerformanceReport`**

   First you will apply the Total cell style to the totals for each of the four data categories.

2. Go to the **2020** sheet, if necessary, and select the totals for the student enrollments in the **range A11:C11**.
3. Choose **Home→Styles→Cell Styles** to open the cell style gallery, if necessary.

   Depending on your monitor size, you may already see the gallery; if so, click the More button to expand it.

4. In the Titles and Headings group, select the **Total** style.

5. Apply the **Total** style to the totals for the three other data categories in the **ranges E11:G11**, **I11:K11**, and **M11:O11**.

Tip! *Use the Format Painter for quick work.*

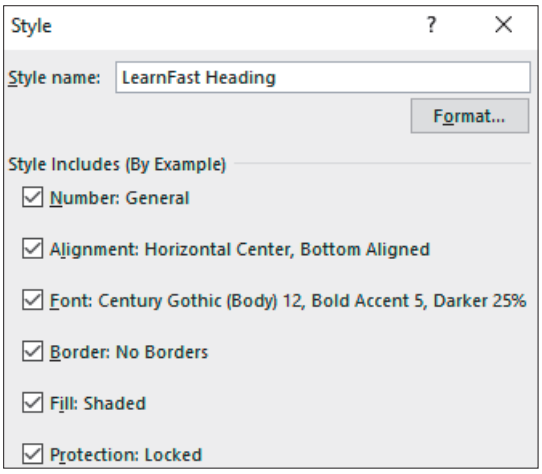
6. Locate the headings below *Student Enrollments* and select the **range A6:C6**, taking care to include the blank cell, **cell A6**.
7. Apply the **Heading 3** style to the selected range.
8. Apply the same style, **Heading 3**, to the **ranges E6:G6**, **I6:K6**, and **M6:O6**.

   Next you will create a new cell style based on the title near the top of the worksheet and apply it to the headings.

9. Select **cell A2**, which contains the text *Annual Performance Review*.

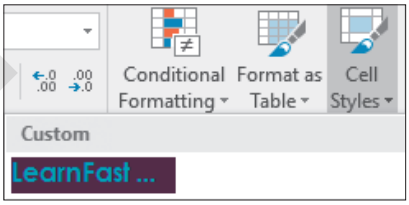
10. Choose **Home→Styles→Cell Styles →New Cell Style…**.

    In the Style dialog box, the Style Includes area shows formatting already added, based on the selected cell; if desired, you could modify the formatting by clicking the Format button. For this exercise, you will keep the settings as they are.



11. Enter **`LearnFast Heading`** for the new style's name and click **OK** to accept all other settings.

    Your new cell style is now available in the Cell Styles gallery in the Custom group.

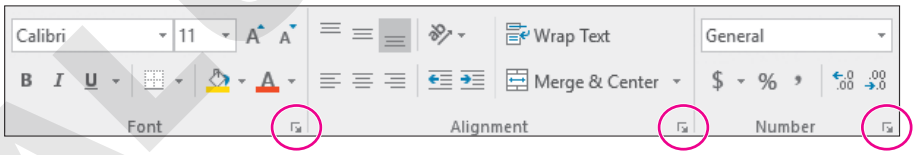


12. Apply the **LearnFast Heading** style to **cells A5**, **E5**, **I5**, and **M5**.

13. Save the file.

Using the Format Cells Dialog Box

Excel has many formatting and other features available right from the Ribbon, and there are even more cell formatting options in the Format Cells dialog box. The Format Cells dialog box is useful when you have a cell or range that requires specific formatting adjustments.



The dialog box launchers on the Home tab offer quick, alternative ways to open the Format Cells dialog box.

The Format Cells dialog box has six tabs with additional options for formatting; the active tab depends on which method you use to open the dialog box.

Home→Cells→Format →Format Cells

Cell Borders and Fill

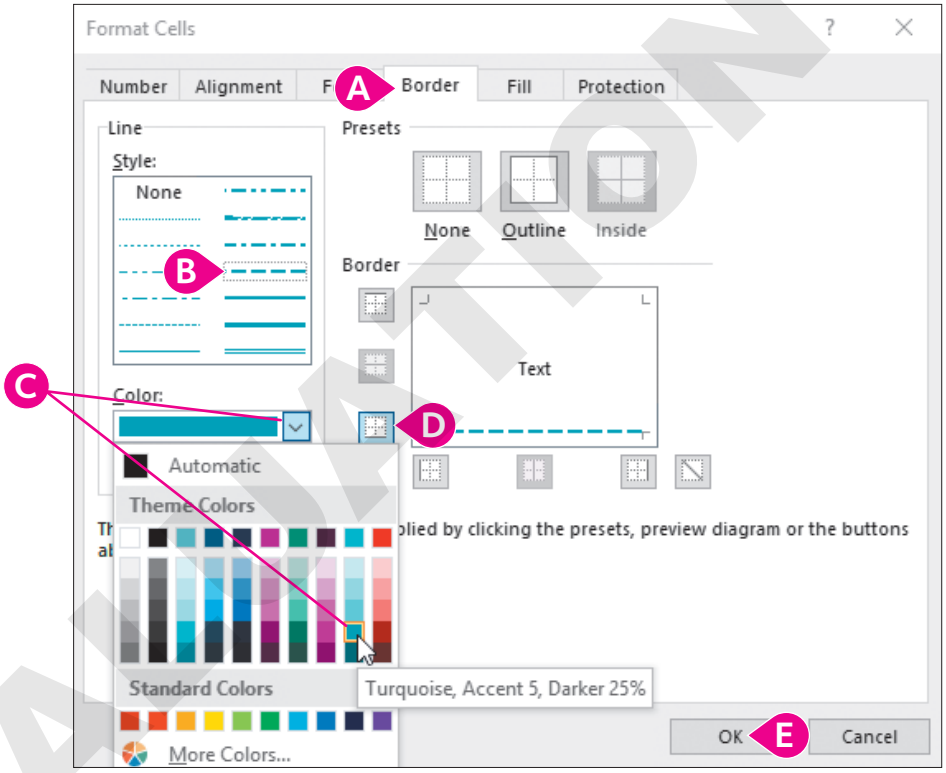
The borders options available on the Ribbon are very plain, unless you use the Draw Borders features. Another option is to select the desired cells and open the Format Cells dialog box. From there you can choose from a gallery of line styles, choose a color, and apply the border to the desired area of the selected cell or range. You can also see a preview of all these options before applying them to the worksheet.

Likewise, if you want a cell formatted with a fill other than a solid color, you can open the Format Cells dialog box to access fill options, such as gradients and patterns.

DEVELOP YOUR SKILLS: E6-D3

In this exercise, you will use the Format Cells dialog box to create customized border and fill formatting.

1. Save your file as: **`E6-D3-PerformanceReport`**
2. Select **cell A1**, which contains the title *LearnFast College*.
3. Choose **Home→Cells→Format→Format Cells**.
4. Follow these steps to create a unique border:



A. Click the **Border** tab.

B. Select the thick dashed line style, the fourth option in the second column.

C. Click the **Color menu** button ▾ and select **Turquoise, Accent 5, Darker 25%**.

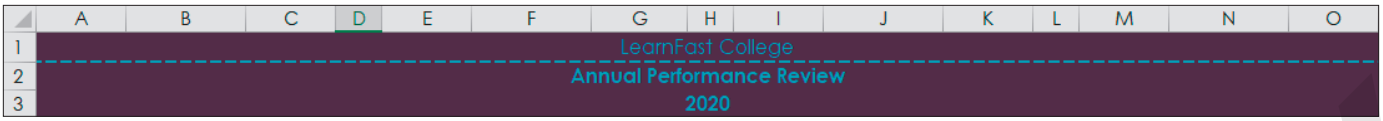
D. Click the **Bottom Border** button to add a border at the bottom of the selected cell.

Hint: You can also click near the bottom of the preview below the word Text to apply a border to the bottom.

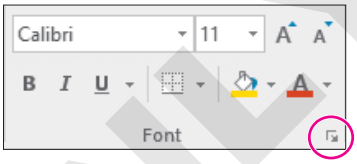
E. Click **OK**.

Remember, you can't see the border while the cell is still selected.

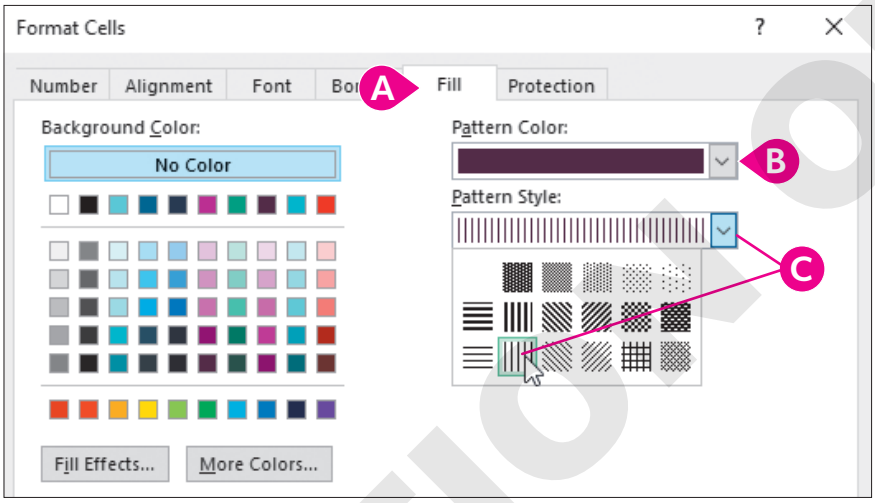
5. Click **cell A5** to select that cell and deselect **cell A1**, which allows you to see the border you just created.



6. Select the **range A4:O4**, the blank row between the titles and headings.
7. Reopen the Format Cells dialog box by clicking the **Font Settings** dialog box launcher.



8. Follow these steps to create a pattern fill:



   A. Click the **Fill** tab.
   B. Click the **Pattern Color menu** button ▾ and select **Dark Purple, Accent 4**.
   C. Click the **Pattern Style menu** button ▾ and select **Thin Vertical Stripe**.

9. Click **OK**.

   The purple pattern is inserted into the range, creating an interesting visual effect.

10. Save the file.

Creating Custom Number Formats

Although Excel has many number formats to choose from, there may be times you need to modify the number formatting for your own purposes. For example, you may want to add text or symbols to the number formatting, such as *99USD*, or you may want to display a number with preceding zeroes, such as *000395*.

You create custom formatting in the Format Cells dialog box. The Number tab includes the Custom category, which allows you to create the desired format by using a combination of character codes.

CUSTOM NUMBER FORMATTING

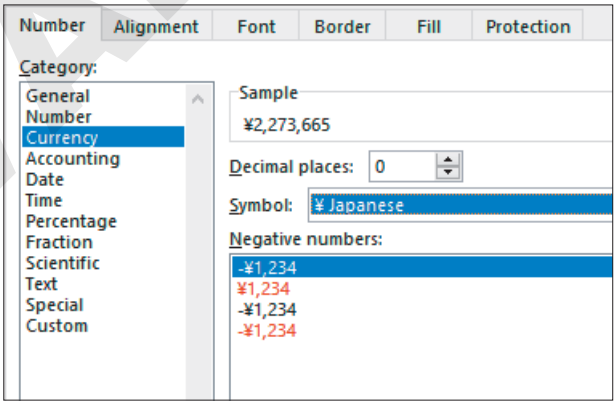
Code	Description	Example	Display
#	Digit placeholder, if required	###	123
0	Digit placeholder, always displayed	0000	0123
.	Decimal point	#.000	1.230
,	Thousands separator	#,###	1,230
%	Percentage	#.##%	1.23%
$ - + / ( )	Characters that can be added to the displayed number	+$###	+$123
"abc"	Displays the text inside the double quotes	###"USD"	123USD
[Red]	Displays values in the color specified	[Red]#,###	1,230

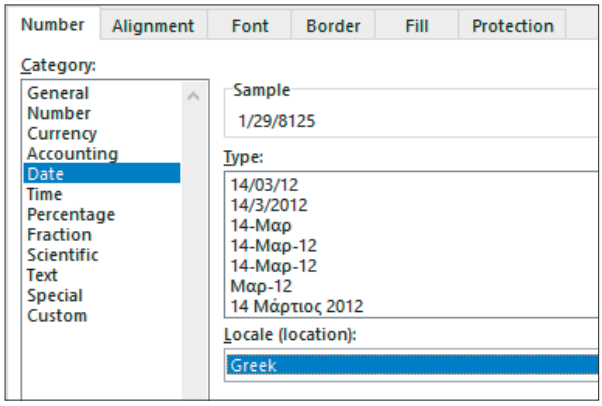
You can also specify a different format for each of the different types of values: positive values, negative values, zero values, and text. Each format must be created in that specific order and separated by semicolons. For example, you could format positive numbers in blue, negative values in red, zero values in black, and all text values in green using this code: [Blue]General;[Red]General;[Black]General;[Green]General

View the video "Custom Number Formatting."

International Formatting

Excel includes formatting options for creating dates and currency according to international standards. For example, if you are sending a worksheet to users in Ireland or Japan, you may want to include the Euro or Yen currency format, respectively. Similarly, if you're sending a worksheet to users in Greece, you may want to adjust the date format according to that country's standard. These additional options are available from the Currency and Date categories on the Number tab in the Format Cells dialog box.



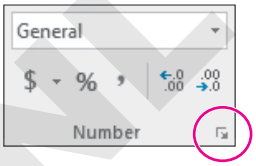


DEVELOP YOUR SKILLS: E6-D4

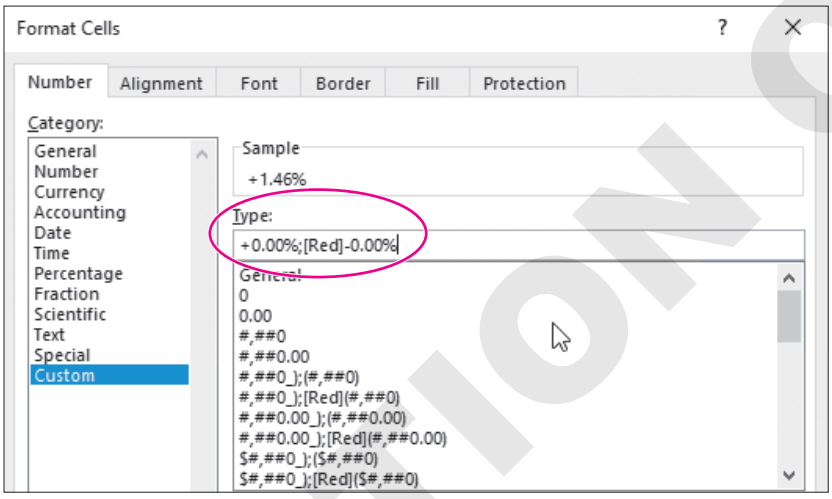
In this exercise, you will create custom number formatting to enhance the data display.

1. Save your file as: **`E6-D4-PerformanceReport`**
2. Select the **range C7:C11**, which shows the change from the previous year to the current year.

   Right now, it's difficult to read the values in this column, so you will add custom number formatting to make the data easier to understand.
3. Open the Format Cells dialog box by clicking the **Number Format** dialog box launcher.



4. Choose **Custom** from the bottom of the Category list.
5. Click in the **Type** box, delete **General**, and enter: **`+0.00%;[Red]-0.00%`**



   The first group of characters represents positive numbers, the second represents negative numbers, and the semicolon separates the two. Positive numbers will display the plus sign and percent sign with two decimal places; negative numbers will have the percent sign and two decimals, but they will show a negative sign and display in red.
6. Click **OK** to apply the new number formatting.

Student Enrollments		
	Current Year	Change
Q1	1248	+1.46%
Q2	1213	+5.48%
Q3	1377	-1.64%
Q4	1385	+0.87%
Total	5223	+1.36%

7. Use the **Format Painter** to apply the same number format to the other columns below the *Change* heading in the **ranges G7:G11**, **K7:K11**, and **O7:O11**.
8. Select the current year revenue data in the **range J7:J11** and then reopen the Format Cells dialog box.

9. On the Number tab, select the **Custom** category, type **`$#,###,"K"`** in the Type box, and click **OK**.

   This code inserts the dollar sign and abbreviates the digits by rounding to the nearest thousand (because there is no digit placeholder following the second thousand separator) and adds the letter K *at the end to represent the word* thousand.

Revenue		
	Current Year	Change
Q1	$2,274K	-1.05%
Q2	$2,173K	+10.14%
Q3	$2,221K	+13.75%
Q4	$2,457K	-8.38%
Total	$9,125K	+2.47%

10. Use the **Format Painter** to copy the current year revenue format to the current year expenses in the **range N7:N11**.
11. Save the file.

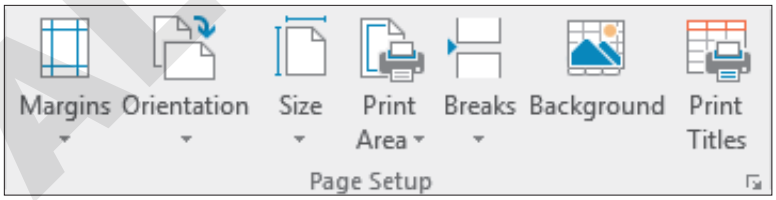
Customizing the Page Setup

The default workbook settings are Normal margins (0.7" left and right, 0.75" top and bottom) on ordinary letter-size (8.5" x 11") paper with portrait orientation. The margin is the white space around the edge of your printed file.

You can customize these settings as necessary. For example, you can create narrower margins to fit more data on one sheet. These page settings are not fully visible from the Normal view; to see how your document will look when printed (for example, to see the margins or orientation), go to Page Layout view or the Print Preview.

Adding a Worksheet Background Image

If your worksheet is meant for display on the screen only, a worksheet background can add some visual interest and personality. The background will not print, so if you plan to print the worksheet, keep this in mind. The background picture can be inserted from your computer files, from an online image search using Bing, or from your OneDrive account.



Page Layout→Page Setup

DEVELOP YOUR SKILLS: E6-D5

In this exercise, you will modify the page setup to fit the data on one page and insert a background picture.

1. Save your file as: **`E6-D5-PerformanceReport`**
2. Choose **View→Workbook Views→Page Layout**.

   When modifying page layout settings, *it's a good idea to switch to* Page Layout view *so you can see the changes being made. Currently the data is split on two pages, and the margins are visible at the top and sides of the worksheet.*
3. Choose **Page Layout→Page Setup→Margins→Narrow**.

   Now more of the data fits on the first page but some data is still on page 2.
4. Choose **Page Layout→Page Setup→Orientation→Landscape**.

   Again, more data is visible on page 1, but there are still two pages, so one more change is needed.
5. Choose **Page Layout→Page Setup→Size→Legal**.

   Now all the data will fit on one sheet of paper.
6. Change the view back to **Normal**.
7. Insert a background by choosing **Page Layout→Page Setup→Background**.
8. In the From a File section, click **Browse** to insert a file saved on your computer.
9. Navigate to your **Excel Chapter 6** folder, select the **Graduate.jpg** picture, and click **Insert**.

   The picture of the graduation cap and diploma is now displayed in the background, behind the data. You may notice the picture is tiled—that is, it repeats over and over again horizontally and vertically. There is no way to change this setting in Excel for background images.
10. Save the file.

Editing Document Properties

The Excel file's document properties can tell you, or anyone else who accesses the file, important information about it. The document properties already include information such as the date the file was created, the date it was last modified, the author (creator), and file size. Other information can also be added to the document properties, such as a title, subject, tags (keywords), or comments.

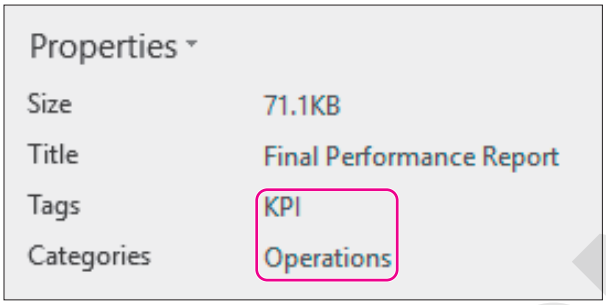
File→Info

DEVELOP YOUR SKILLS: E6-D6

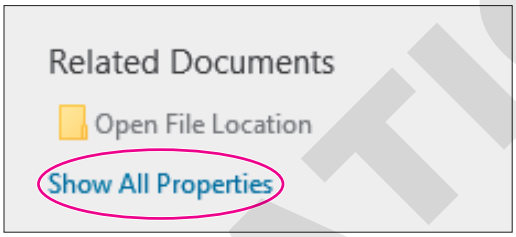
In this exercise, you will modify the document properties to include a title, tags, category, and subject.

1. Save your file as: **`E6-D6-PerformanceReport`**
2. Choose **File** to go to Backstage view, where the Info screen is displayed by default.

   Notice the Protect Workbook, Inspect Workbook, and other options on the left side and the Properties section on the right side of the screen.
3. Click in the **Add a Title** box and enter this text, tapping Tab when finished: **`Final Performance Report`**
4. Enter the remaining document properties as shown:



5. Click **Show All Properties** at the bottom of the Properties list to expand the list.



6. Click the **Specify the Subject** box and type: **`2019 and 2020 Performance`**
7. Use the **Back** button to return to your worksheet.
8. Save your workbook and close Excel.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).

Reinforce Your Skills

REINFORCE YOUR SKILLS: E6-R1

Apply Themes, Cell Styles, and Formatting

Kids for Change is preparing for its upcoming fundraiser, and you have volunteered to help. In this exercise, you will enhance the formatting in the Purchases workbook to make it look more presentable.

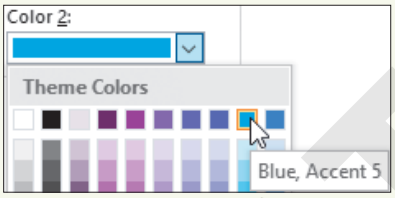
1. Open **E6-R1-Purchases** from your **Excel Chapter 6** folder and save it as: **`E6-R1-PurchasesNew`**

   First you will adjust the theme and then the theme colors.

2. Choose **Page Layout→Themes→Themes →Ion**.
3. Choose **Page Layout→Themes→Colors →Violet II**.
4. Autofit the width of **column B** to display all dates correctly.

   Now you will adjust the formatting for the column headings.

5. Select the **Item Name** heading in **cell A3**.
6. Launch the **Format Cells** dialog box.
7. Click the **Fill** tab and then choose **Fill Effects**.
8. Modify Color 2 of the gradient to **Blue, Accent 5** and then click **OK**.



9. Click the **Font** tab and select **Plum, Accent 1, Darker 25%** for the color.
10. Click the **Border** tab and choose the thickest solid line style.
11. Change the border color to **Plum, Accent 1, Darker 25%** and apply the border to the bottom of the cell.
12. Click **OK** to apply the new formatting.

    Now you will create a cell style using your new formats and then apply the cell style to the other headings.

13. With cell A3 still selected, choose **Home→Styles→Cell Styles →New Cell Style...**.
14. Enter **`Custom Heading`** for the new style name and click **OK**.
15. Select the **range B3:H3** and apply the **Custom Heading** style.
16. Merge and center the title in **cell A1** across **columns A:H** and then adjust the font color to **Blue, Accent 5, Darker 25%**.
17. Use the **Format Painter** to apply the new formatting to the title in **cell A2**.
18. Save the file.

REINFORCE YOUR SKILLS: E6-R2

Modify Number Formatting, Page Setup, and Document Properties

In this exercise, you will continue to work with the Kids for Change Purchases worksheet as you apply custom number formatting and edit the document properties.

1. Save your file as: **`E6-R2-PurchasesNew`**
2. Select the **range C4:C5**.
3. Open the Format Cells dialog box and, on the **Number** tab, choose **Custom**.
4. Clear the existing text in the Type box; then enter the code **`#" each"`** and click **OK**.

   Be sure to enter the space between the first quotation mark and the letter e so a space will separate the digits and the text.
5. Select the **range C6:C7** and then open the Format Cells dialog box and, on the **Number** tab, choose **Custom**.
6. Clear the text in the Type box; then enter **`#" pkg"`** and click **OK**.
7. Select **cell C8** and create a custom number format using the code: **`#" case"`**

   The cells in column C display numbers and text; only the numbers are used in the formulas that calculate the subtotals in column E.

   To add some space around the edges of the page, you will increase the margins.
8. Choose **Page Layout→Page Setup→Margins →Wide**.

   To finalize the worksheet, you will modify the document properties.
9. Choose **File** to go to Backstage view.
10. Enter these document properties:

Property	Value
Title	**`Purchase List`**
Tags	**`fundraiser purchase order`**

11. Use the **Back** button to return to your worksheet.
12. Save and close the workbook.

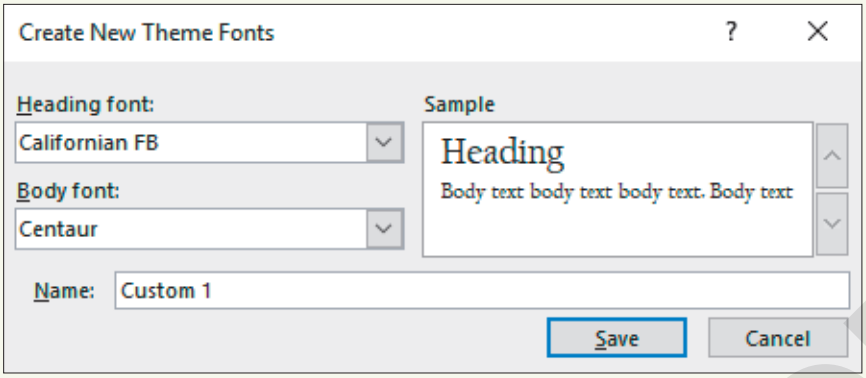
REINFORCE YOUR SKILLS: E6-R3

Update the Employee Database

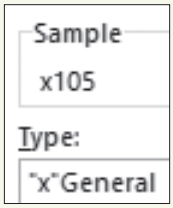
In this exercise, you will overhaul the Employee worksheet to format it according to new company procedures.

1. Open **E6-R3-Employees-v1** from your **Excel Chapter 6** folder and save it as: **`E6-R3-Employees-v2`**
2. Change the theme to **Vapor Trail**.

3. To adjust the theme fonts, choose **Page Layout**→**Themes**→**Fonts** A→**Customize Fonts**.
4. In the dialog box, choose **Californian FB** in the Heading Font menu and **Centaur** in the Body Font menu; keep the name as *Custom 1* and click **Save**.

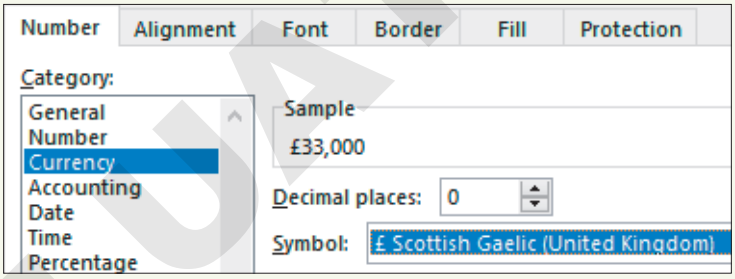


5. Select the headings in the **range A4:F4** and apply the **Custom Heading** cell style.
6. Select the titles in the **range A1:A2** and change the fill color to **Red, Accent 1, Darker 25%**.
7. Select the employee ID numbers in the **range B5:B11**.
8. Create a custom number format with five digits always showing and preceded by the pound sign, using the code: **"#"00000**
9. Select the employees' extensions in the **range F5:F11**.
10. Create another custom number format, this time by inserting **x** in front of the General format, so the letter *x* will be inserted in front of each entry.



Now you will adjust the Salary number format to an international currency.

11. Select the **range D5:D11** and change the number format to **Scottish Gaelic** currency format, with no decimals.



Now you will add some finishing touches by setting document properties and adjusting the page orientation.

12. Choose **File** to go to Backstage view and then enter these document properties:

Property	Value
Tags	**Employee extension salary**
Categories	**HR**

13. Use the **Back** button to return to your worksheet.
14. Change the page orientation to **Landscape**.
15. Save and close the workbook and then close Excel.

Apply Your Skills

APPLY YOUR SKILLS: E6-A1

Create Custom Number Formatting and Cell Styles

In this exercise, you will modify the Universal Corporate Events list of outstanding invoices.

1. Open **E6-A1-Invoices** from your **Excel Chapter 6** folder and save it as: **`E6-A1-InvoicesDue`**
2. Select the client contact numbers in the **range F4:F9**.
3. Open the Format Cells dialog box; on the **Number** tab, select the **Special** category.
4. In the Type section, choose **Phone Number** and click **OK**.
5. Select the extension numbers in **column G** and create a custom number format that inserts the letter **`x`** in front of each extension number.
6. Select the days-until-due numbers in the **range I4:I9**.
7. Create a custom number format that displays all negatives in brackets and red.

   Hint: Separate the positive and negative number formats with a semicolon (;).

Contact Number	Extension	Date Due	Days Until Due
(426) 555-0199	x205	13-Jul	(7)
(426) 555-0103	x129	18-Jul	(2)
(426) 555-0126	x103	14-Jul	(6)
(426) 555-0117	x211	23-Jul	3
(426) 555-0184	x106	17-Jul	(3)
(426) 555-0125	x150	21-Jul	1

8. Select **cell A3** then increase the font size to 12 points and change the font to **Eras Demi ITC**.
9. With cell A3 still selected, create a new cell style named: **`UCE Head`**
10. Apply the new **UCE Head** style to the other headings in **row 3**.
11. Adjust the column widths for **columns D–G** to: **`13`**
12. Save your file.

APPLY YOUR SKILLS: E6-A2

Modify Theme, Page Setup, and Document Properties

In this exercise, you will continue to modify the Universal Corporate Events list of outstanding invoices.

1. Save your file as: **`E6-A2-InvoicesDue`**
2. Change the workbook theme to **Crop**.
3. In **cell D10**, insert the SUM function to calculate the total amount owed from all clients.
4. In **cell C10**, enter **`Total Owing`** and right-align the text.
5. Select the **range C10:D10** and apply the **UCE Head** style.
6. Reapply the **Accounting** number format to **cell D10**.
7. Select the **range C10:D10** and then use the Format Cells dialog box to add a double-line outline border around the cells.

   Hint: Use the Border tab. Do not change the border color and do not place a border between the two cells.

8. Switch to **Page Layout** view and then change the page orientation to **Landscape** and the margins to **Narrow**.
9. Use the mouse to manually adjust the width of **column A** so the text *Winchester Web Design* fits in column A and column I fits on page 1.
10. Switch back to **Normal** view.
11. Edit the document properties by adding the subject: **`Invoices Due`**

    Hint: To see the Subject line, you need to show all properties.
12. Save and close the workbook.

APPLY YOUR SKILLS: E6-A3

Revise the Guest List

Universal Corporate Events is organizing a fundraising event for the Kids for Change organization. In this exercise, you will modify the guest list's theme, styles, formatting, and page layout prior to distribution to the team.

1. Open **E6-A3-GuestList** from your **Excel Chapter 6** folder and save it as: **`E6-A3-GuestList-KfC`**
2. Change the workbook theme to **Crop**.
3. Merge and center the **ranges A1:G1** and **A2:G2**.
4. Apply the **Heading 1** style to **cell A1** and the **Heading 2** style to **cell A2**.
5. Select the **range A1:G3** and then use the Format Cells dialog box to apply the **Green, Accent 4** pattern color and the **6.25% Gray** pattern style.

   Hint: Use the Fill tab.
6. Select the donor ID numbers in the **range B5:B15** and create a custom number format to display each ID number with five digits, preceded by the letters **`KFCD`** and a hyphen (-).

   Hint: The ID 602 should display as KFCD-00602.
7. Select the total donations information in the **range F5:F15**.
8. Create a custom number format that stores the numerical value in each cell but displays only the text **`Thank You`** on the worksheet.

   Hint: In the Type box, enter the text only, with no digit placeholders.

   Check to see that the values in column F are displayed in the Formula Bar, but the text displays on the worksheet.
9. Adjust the page orientation to **Landscape**.
10. Set these document properties:

Property	Value
Title	**`Donor Appreciation Event`**
Tags	**`KfC`**
Categories	**`Guest List`**

11. Save your work and close Excel.

Project Grader

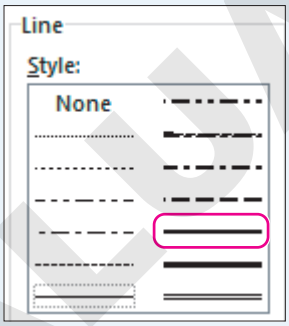
If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.

PROJECT GRADER: E6-P1

Applying Advanced Formatting to Distributor Data

Taylor Games would like you to improve the visual appeal of their distribution workbook. In this exercise, you will use advanced formatting that includes themes, cell styles, backgrounds, and properties.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E6_P1_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E6_P1_Start** from your **Excel Chapter 6** folder.
2. Apply these cell styles:
   - **Title** style to **cell B1** of the **Distributor Sales** worksheet
   - **Title** style to **cell C1** of the **Top Distributors** worksheet
   - **Heading 4** style to **cell C4** of the **Top Distributors** worksheet
3. Format **cell D4** in the **Top Distributors** worksheet with these fill settings:
   - Fill Pattern Color: **Standard Colors, Yellow**
   - Fill Pattern Style: **25% Gray** (the fourth option on the Pattern Style list)
4. Format **cell D4** in the Top Distributors worksheet with these border settings:
   - Line Style: **Solid Medium Thickness**



   - Border Preset: **Outline**
5. In **cell C7** of the Top Distributors worksheet, create a custom number format that always displays six digits in blue.
6. Create a new cell style named **`TGBlue`** that is based on the custom number format in **cell C7**.
7. Apply the new **TGBlue** cell style to the **range C8:C36**.
8. In the Top Distributors worksheet, insert a background using the **TG-Background.jpg** picture located in your **Excel Chapter 6** folder.
9. Set these document properties:
   - Title: **`Taylor Games`**
   - Categories: **`Distribution`**

10. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 6** folder as **`E6_P1_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 6** folder as: **`E6_P1_Submission`**

PROJECT GRADER: E6-P2

Branding the Classic Cars Workbook Using Advanced Formatting

Classic Cars Club would like to continue branding their workbook. In this exercise, you will improve the workbook's visual appeal using customized themes and cell styles.

1. Download and open your Project Grader starting file.
    - *Using eLab:* Download **E6_P2_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
    - *Not using eLab:* Open **E6_P2_Start** from your **Excel Chapter 6** folder.
2. In the **Car Values** worksheet, apply the **Engravers MT** font to **cell A1**.
3. Create a new cell style based on cell A1 named: **`CCTitle`**
4. Apply the **CCTitle** cell style to **cell A1** in the **Membership List** worksheet and to **cell A1** in the **Brands & Ages** worksheet.
5. Apply the **Facet** theme to the workbook.
6. In **cell C8** of the Car Values worksheet, create a custom number format that always displays the characters **`CC-`** followed by five digits (for example: *CC-32467*).
7. Create a new cell style named **`CCMember#`** that is based on the custom number format in **cell C8**.
8. Apply the new **CCMember#** cell style to these ranges:
    - **C9:C37** in the **Car Values** worksheet
    - **C7:C36** in the **Membership List** worksheet
9. Customize the page setup for the **Brands & Ages** worksheet using these settings:

Setting	Value
Margins	**Narrow**
Orientation	**Landscape**

10. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 6** folder as **`E6_P2_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 6** folder as: **`E6_P2_Submission`**

Extend Your Skills

These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.

E6-E1 That's the Way I See It

You are committed to taking control of your personal finances, and with your newly learned Excel skills, you are setting up a monthly budget for yourself. Open **E6-E1-Budget** and save it as: **E6-E1-MyBudget**

Customize the theme and theme fonts to suit your preference, including creating your own custom color palette and saving it with your name. Apply a cell style of your choice to the titles. Next, create your own custom format in cell A5 using the fill, font color, and borders of your choice. Save the format as a cell style and then apply that style to cell A9, cell A15, and to the range C4:E4.

Enter category names and sample data (you can decide to use real data or fictitious data) into the Income and Expenses categories. List at least five expenses, including categories such as Rent, Groceries, and Transportation.

E6-E2 Be Your Own Boss

As owner of Blue Jean Landscaping, you maintain a workbook that holds customer feedback data on the freelance landscape architects the company uses from time to time. You want to show the data at the next staff meeting, but it needs some formatting work first. Open **E6-E2-Ratings** and save it as: **E6-E2-ArchitectRatings**

Start by applying appropriate formatting to the titles and headings. Then create custom number formatting for the Supplier ID# column data to always show four digits, preceded by the number sign (#). In the Above/Below 9.0 column, create custom number formatting that shows negative numbers in red. Add a worksheet background that is suitable for this information and, finally, add a title and subject to the document properties.

E6-E3 Demonstrate Proficiency

At Stormy BBQ, you pride yourself on top-notch customer service. Every three months the customer service staff goes through testing to ensure their skills are up to par, and you need to present the results of the recent tests to your boss. Open **E6-E3-Tests** and save it as: **E6-E3-CSTestResults**

Create and apply appropriate cell styles and formatting. Create a custom number format for the Employee # column that adds the letters *CS* after the digits. In cell D4, create a custom number format to add *Score Out Of* in front of the digits. Create a formula in column E that divides each employee's score by cell D4 (hint: use an absolute reference) and apply the Percent number format to the results. Lower-scoring employees will need more training, so create a conditional formatting rule to highlight scores of 65% or less. Finally, adjust the page setup so the data fits on one page if it needs to be printed.

EXCEL

7 Date Functions and Conditional Formatting

In this chapter, you will use a variety of methods to work with an important type of data in Excel: date and time information. Dates provide useful information for all kinds of data, such as when customer invoices are due and when payments were made, or recording company expenses, schedules, and reports. You will also explore creating and customizing conditional formatting rules to gain valuable insight into the data in your worksheet.

LEARNING OBJECTIVES

- Identify date serial numbers
- Apply custom date formatting
- Enter times
- Create functions using dates
- Perform date and time calculations
- Create customized conditional formatting rules
- Edit rules using the Conditional Formatting Rules Manager

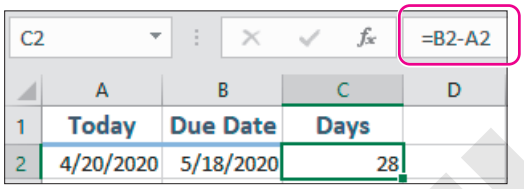
Project: Updating Company Documents

Airspace Travel, which provides travel packages to tropical destinations, prides itself on providing top-notch customer service. As part of its service plan, the company carefully tracks its customers' travel dates and flight times, as well as the frequency of their trips. You have been lending your Excel expertise to the company, and now Airspace has given you the task of reviewing and updating their travel information.

Date Serial Numbers

In Excel, dates are stored as sequential serial numbers. To understand dates in Excel, you must also know that Excel dates start with January 1, 1900. The serial number for January 1, 1900, is *1*, and the serial numbers increase by one for each day after that date. For example, the serial number *501* represents *May 15, 1901*, which is exactly 500 days after January 1, 1900.

Using serial numbers for dates is helpful because it means that they can be used in calculations and functions. For example, you can use a formula to find the days until a payment is due by starting with the due date and subtracting today's date.

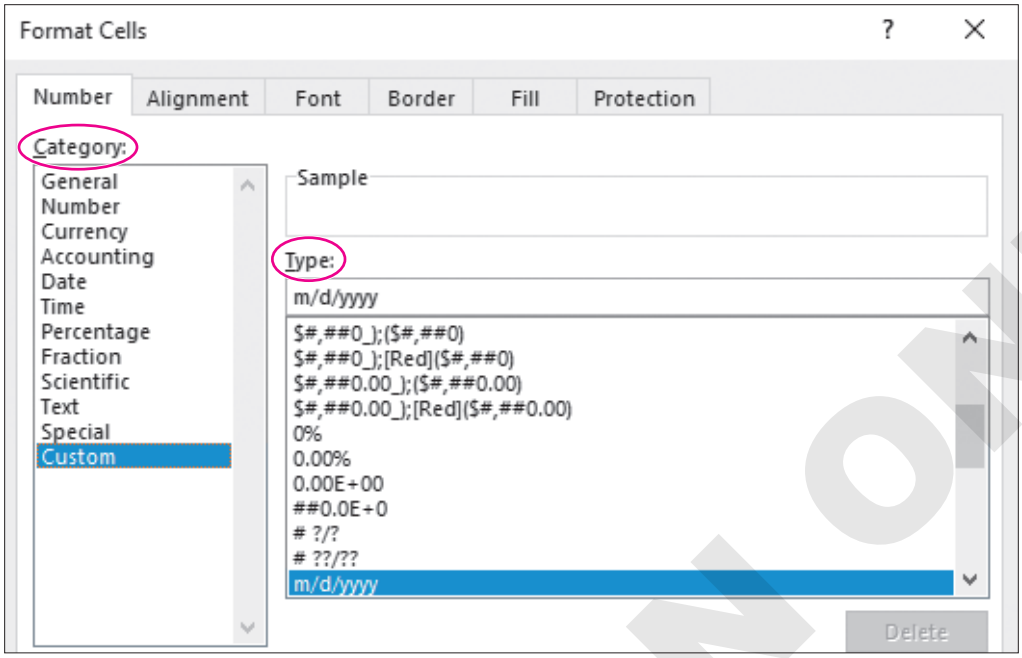


The formula in cell C2, *=B2-A2*, subtracts today's date in cell A2 from the due date in cell B2.

Applying Custom Date Formatting

There are many ways to enter a date into a cell, and depending on how you do so, Excel will apply one of the default date formats—usually either *4/17/2020* or *17-Apr*. After entering a date, you have the option of adjusting the date formatting using the Number Format drop-down menu or applying custom date formatting. The Number Format menu gives you two options, Short Date and Long Date; for example, *4/17/2020* and *Friday, April 17, 2020*, respectively.

Additional date formatting options are available from the Format Cells dialog box, either in the Date or the Custom category. Both categories have many options to choose from under Type.



In Custom format, *d* represents the day, *m* represents the month, and *y* represents the year. You can also create your own date formats by using the codes *d, m,* and *y* in different combinations, similar to creating other custom number formats.

CUSTOM DATE FORMATTING

Category	Format Type	Description	Display for April 17, 2020
Date	3/14	Month/Day	4/17
	3/14/12	Month/Day/Year	4/17/20
	March-12	Month-Year	April-20
	March 14, 2012	Month Day, Year	April 17, 2020
Custom	d-mmm	Day-Month	17-Apr
	d-mmmm	Day-Month	17-April
	d-mmm-yy	Day-Month-Year	17-Apr-20
	dddd mmmm "the" d	Day of the Week Month "the" Day	Friday April the 17

View the video "Custom Date Formatting."

DEVELOP YOUR SKILLS: E7-D1

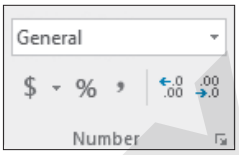
In this exercise, you will enter dates and then use those dates in a simple calculation. You will also apply different formatting to the dates.

1. Start Excel; open a new, blank workbook and save it to your **Excel Chapter 7** folder as: **E7-D1-DaysOld**
2. In **cell A1**, enter today's date in the format *mm/dd* and tap Enter.

   When only the month and day are entered, Excel automatically assigns the current year to the date (even though the year does not display in the worksheet, it is stored in the Formula Bar).

3. In **cell A2**, enter your birth date, including the year, and tap Enter.
4. In **cell A3**, enter the formula: **=A1-A2**

   To find the difference between two dates, always subtract the lower date from the higher date (remember each day counts up by one), and the result is the number of days between the two. The result in cell A3 shows how old you are, calculated in the number of days! Notice that the number format in cell A3 is General.



5. Select the two dates in the **range A1:A2** and choose **Home→Number→Number Format menu button →General**.

   The format for the two dates is converted to General, which means the serial number for those dates is now displayed.

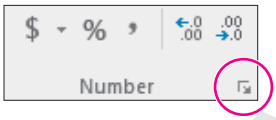
6. With the same range selected, choose **Home→Number→Number Format menu button → Long Date**.

   The Long Date format displays the day of the week, so you can see the day of the week on which you were born (in case you don't remember!).

7. In **cell B3**, type **days old** and tap Enter.
8. Save the file and close it.

   Now you will apply various formatting to the dates in the Airspace customer invoices file.

9. Open **E7-D1-Invoices** from your **Excel Chapter 7** folder and save it as: **E7-D1-Clients**
10. Select the invoice dates in the **range G4:G13**.
11. Open the Format Cells dialog box by clicking the **Number Format** dialog box launcher.



   Because you opened the dialog box from the Number group on the Ribbon, the active tab is Number.

12. If necessary, choose **Custom** from the Category list.
13. Clear the existing text in the Type box and then enter the code **mmm-d** and click **OK**.

   The date display is now reversed, showing the short-form text for the month and then the day.

Invoice Date
Sep-8
Sep-7
Sep-1

14. Select the travel dates in the **range J4:J13**.
15. Open the Format Cells dialog box from the Number group again and ensure the **Custom** category is selected.

   The day of the week is important to know for travel information, so you will add the day of the week using a custom date format.

16. In the Type box, enter the code **ddd mmm-d** and click **OK**.

   The day of the week now precedes the month for the dates in the Travel Date column.

Travel Date
Sat Oct-12
Mon Sep-30
Fri Oct-4

17. Save the workbook.

Entering Time Information

6:00
20-Jun
500

Much like you do with dates, you can enter times exactly as you want them to appear in the workbook. For example, if you type *6:00* into a cell, Excel will recognize this as a time entry and display it in the cell as *6:00*. Just like dates and numbers, times are right-aligned by default.

Also similar to dates, each time has a serial number attached to it. Because each day is 1, each hour is 1/24 (or 0.041667 if written as a decimal). Therefore, if you enter *6:00*, Excel displays the time as *6:00* but stores the information as 0.25 (six hours is one-quarter of the day). Combining the date and time would mean that 12:00 noon on July 1, 2010, is stored with the serial number 40360.5; the date serial number is 40360 and the time is 0.5, halfway through the day.

Most of the time, you won't have to worry about the serial number. As long as the time is entered correctly, Excel will apply the correct custom number formatting.

You can also add an AM/PM designation, if you prefer, rather than using a 24-hour clock, but you must enter a space between the time and either AM/PM. You can enter *6:00 AM* for the morning or *6:00 PM* for the evening (note the space before *AM* and *PM*). If no designation is entered, Excel assumes you are using the 24-hour system, so 6:00 is stored as 6:00 AM. You can also use number formatting to customize the way the time displays on the worksheet.

TIME ENTRIES

Entry	Display	Time Stored As
6:00	6:00	6:00:00 AM or 0.25
9:00 AM	9:00 AM	9:00:00 AM or 0.375
12:00	12:00	12:00:00 PM or 0.5
13:30	13:30	1:30:00 PM or 0.5625
6:00 PM	6:00 PM	6:00:00 PM or 0.75

DEVELOP YOUR SKILLS: E7-D2

In this exercise, you will enter the flight times for Airspace's clients into the worksheet.

1. Save your file as: **`E7-D2-Clients`**

   The first time in cell M4 displays the AM designation, while the rest of the times are displayed in the 24-hour system (for example, 20:00).

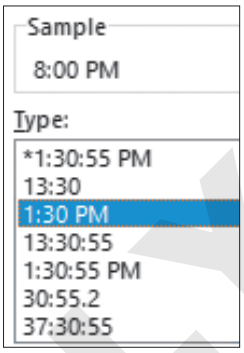
2. Select the flight times in the **range M5:M10** and choose **Home→Number→Number Format menu button ▾→General**.

   The serial numbers for the flight times are displayed.

   Now you will adjust the number formatting to display the correct time format.

3. With the flight times in the range M5:M10 still selected, click the **Number Format** launcher in the Number group on the Ribbon.

4. Choose **Time** from the Category list, and then choose the third option, which will display hours:minutes AM/PM, from the Type list and click **OK**.



5. Enter the remaining clients' flight times into the **range M11:M13** as shown.

   Be sure to type hour:minutes AM/PM and include the space to display the correct designation for AM or PM.

	A	B	M
11	**Karynn**	**Alida**	5:30 PM
12	**David**	**Monton**	7:20 AM
13	**Amanda**	**Campbell**	9:00 AM

6. Save the file.

Using Date Functions

Excel has many date functions available in the Function Library. Dates are commonly found in Excel worksheets because they provide useful information about when an event or a transaction took place. Date information becomes even more useful when you can use it in formulas and functions. For example, you can use date functions to insert the current date or to extract information from a date, such as the month or year.

You enter date functions just like you do other functions, such as SUM. For example, you can use the TODAY function to enter today's date like this: *=TODAY()*. For this function, no arguments are entered inside the parentheses.

DATE FUNCTIONS

Function	Description	Example
TODAY()	Displays the current date based on today's serial number; the date automatically updates when the worksheet is recalculated or reopened; no arguments are included in the parentheses	Formula: =TODAY() Result: 2/21/2020
NOW()	Like TODAY but also displays the time (based on the computer's clock); no arguments are included in the parentheses	Formula: =NOW() Result: 2/21/2020 11:09
DATE(year,month,day)	Returns a specific date based on the arguments entered	Formula: =DATE(2020,12,20) Result: 12/20/2020
YEAR(date)	Returns the year of the specified date as either a serial number or a cell reference to a cell containing a date	Cell B23: 12/20/2020 Formula: =YEAR(B23) Result: 2020
WEEKDAY()	Returns the number of the corresponding day for the date provided, entered either as a serial number or a cell reference, from 1 to 7; Sunday is 1	Formula: =WEEKDAY(B23) Result: 1
WORKDAY()	Used for adding workdays (Monday to Friday) to a start date, such as adding 10 business days to the date of an invoice; holidays can be skipped if listed somewhere in the workbook	Cell G1: 12/25/2020 Formula: =WORKDAY(B23,5,G1) Result: 12/28/2020

DEVELOP YOUR SKILLS: E7-D3

In this exercise, you will use date functions to enter date-related information into your worksheets.

1. Save your file as: **E7-D3-Clients**
2. Insert a new row above the column headings in **row 3** of the worksheet.
3. In **cell D3**, type **Month:** and tap Tab.
4. In **cell E3**, enter the formula **=G5** and complete the entry.

   You wish to display the month of the listed invoices, so you will edit the number format to display only the month of the first invoice listed.
5. With cell E3 selected, open the Format Cells dialog box from the Number group on the Ribbon.
6. Ensure the Custom category is chosen; in the Type box, edit the code to display **mmmm** only and click **OK**.

   The code mmmm *displays the full month name, whereas the code* mmm *displays the three-letter abbreviation, and no day or year information. Cell E3 now displays* September.
7. Merge and center the **range E3:F3**.
8. In **cell H3**, enter **Year:** and tap Tab.
9. In **cell I3**, enter the formula **=YEAR(G5)** and complete the entry.

   The formula argument is simply looking for a serial number, which is provided by entering a cell reference to a cell that contains a date. The result of the formula is the year from the date of the first listed invoice in cell G5, which is 2019.
10. Merge and center the **range I3:J3**.
11. Go to the **Client History** worksheet and insert a new row above the column headings in **row 3**.
12. In **cell A3**, enter **As Of:** and then merge and center the **range A3:B3**.
13. In **cell C3**, enter the formula **=TODAY()** and then merge and center the **range C3:F3**.
14. Apply the **Long Date** number format to **cell C3**.
15. Save the file.

Calculations Using Date and Time

When you understand the basic principles of dates and time in Excel, there are many valuable ways to use this information. You can perform mathematical operations such as addition and subtraction to find the difference between two dates or add a number of days to a particular date. Likewise, you can take two times and find the time difference or add and subtract hours and even minutes.

You can combine these mathematical operations with the date functions for even more applications. For example, you can use the TODAY function to insert today's date in one cell and enter a future date such as next Christmas in another cell, and then use a formula to subtract today from Christmas to determine the number of days remaining until the holiday. Any time you open the file, the TODAY function updates to the current date, so the formula calculation updates the number of days until Christmas. Of course, in business, there are much more practical applications.

DEVELOP YOUR SKILLS: E7-D4

In this exercise, you will use date functions to enter date-related information in your worksheets.

1. Save your file as: **`E7-D4-Clients`**
2. Go to the **Sept** worksheet.

   Airspace Travel allows customers to take up to three months after their travel date to pay for their trip, so you will enter a formula to calculate the due date.
3. In **cell L5** of the Balance Due Date column, enter this formula: **`=EDATE(J5,3)`**

   The EDATE function takes two arguments: the start date, which is the travel date in cell J5, and the number of months to add to the date, which is three. The result of the formula for the first client is January 12, *three months after October 12.*
4. Copy the formula down the column for the remaining clients.

   You instruct your clients to arrive at the airport three hours before their flight time, so now you will enter a formula to calculate their planned arrival times.
5. In **cell N5**, enter the formula: **`=M5-(1/24*3)`**

   This formula takes the time saved in cell M5 and subtracts three hours (one hour is 1/24). The result of the formula for the first client is 8:00 AM.
6. Copy the formula down the column for all clients.
7. Go to the **Client History** sheet and insert a column to the left of **column F**.
8. In **cell F4**, enter the heading: **`Days Since Travelled`**
9. In **cell F5**, enter the formula: **`=$C$3-E5`**

   Because cell C3 contains the TODAY function and cell E5 contains the last travel date, the formula result will update to show the new number of days since that customer has travelled each time you open the file. However, you must first change the number format so it does not show a date.
10. Apply the **General** number format to **cell F5**.

    Now you can see how many days since the first customer, Eric, took his last trip. This information could be used to reach out to customers who haven't travelled in a long time. Of course, this number will depend on the day on which you complete this exercise.
11. Copy the formula down the column for the remaining clients.

    Because the formula uses an absolute reference to cell C3, that cell reference stays the same for each customer.
12. Insert a column to the left of **column E**.
13. In **cell E4**, enter the heading: **`Years of Loyalty`**

    Now you want to enter a formula to find the number of years since each customer first became a client. The YEARFRAC function will find the difference between the dates and will return a whole number for complete years and then convert excess days into a fraction of a year. For example, 1 year and six months would display as 1.5.

14. In **cell E5**, insert the formula: **=YEARFRAC(D5,$C$3)**

    Again, you must convert the number format for the result to make sense.

15. Choose **Home→Number→Comma Style** , to apply that number format to **cell E5**.

16. Choose **Home→Number→Decrease Decimal** to reduce the number of decimal places showing to one.

17. Copy the formula in **cell E5** down the rest of the column.

    The results of the formula will again depend on the day the exercise is completed and will update each day the file is opened.

18. Save the file.

Conditional Formatting Using Graphics and Custom Rules

Conditional formatting applies formatting to cells that meet your desired criteria. For example, there are preset conditional formatting options for the top or bottom numbers in the selected range, or cells that are greater than, less than, or equal to a number of your choice. You can create multiple rules for the same set of data, and the rules are applied in the order that you choose. Conditional formatting is always updated whenever the data changes.

If none of the options in the Conditional Formatting menu has your desired criteria, you can create a new conditional formatting rule. New rules can be created using the same basic principles as the preset rules; however, you can customize the specific way the rules are applied. You can also create conditional formatting rules based on the outcome of a formula.

Conditional Formatting with Graphics

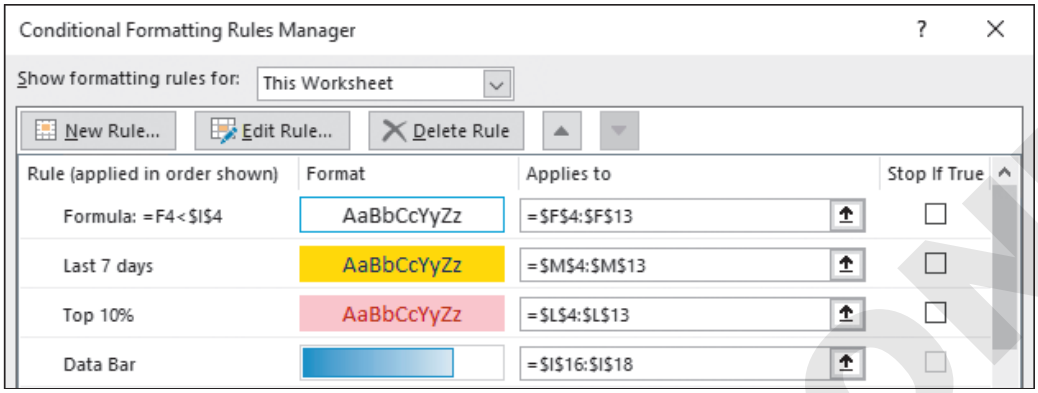
Another option for conditional formatting is to use data bars, color scales, and icon sets to visualize your data by breaking it into three equal parts: values that are above average, average, and below average in the selected range. There are many quick options to choose from in the Conditional Formatting menu, or you can create a custom rule. Another option is to modify the graphics so the three ranges are not three equal parts; for example, the top 10%, middle 80%, and bottom 10% instead.

Expenses	Actual	Budget	Difference
Bank Fees	7,200	7,300	100
Insurance	18,230	17,000	-1,230
Rent	25000	25000	0

This data uses conditional formatting with data bars, a color scale, and an icon set to highlight trends and important information.

The Conditional Formatting Rules Manager

Use the Conditional Formatting Rules Manager to create, edit, and delete rules or to rearrange the order in which they are applied. To see which rules have been created, you can choose to show the formatting rules for the current selection or the full worksheet.

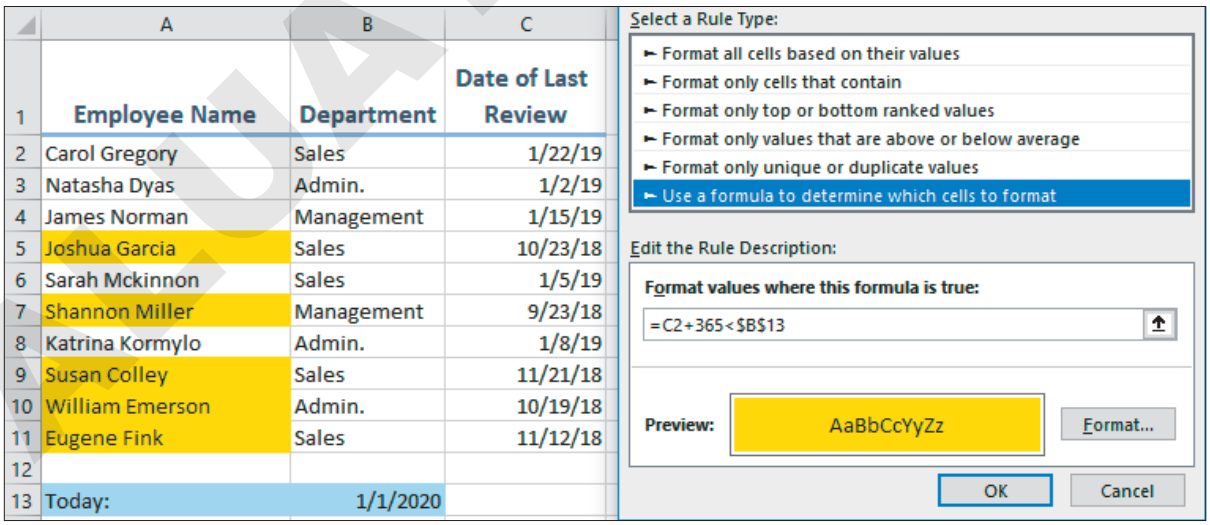


In this example, you see the four rules on the current worksheet and the ranges to which the rules apply.

Conditional Formatting Using Formulas

Creating a custom rule that uses a formula is another way of expanding the possibilities of conditional formatting. Instead of comparing the cells in the selected range to the other cells within that range, a rule allows any cell to be compared to a number or any other cell; if the formula is true, the formatting is applied.

To determine which employees are due for their annual wage review, you could highlight their names if one year has passed since their last review. The conditional formatting rule will compare their last review date in column C plus 365 (one year) to see if it's less than today's date, entered in cell B13. The formula for the conditional formatting applied to the names in column A would be: *=C2+365<$B$13*



	A	B	C
1	Employee Name	Department	Date of Last Review
2	Carol Gregory	Sales	1/22/19
3	Natasha Dyas	Admin.	1/2/19
4	James Norman	Management	1/15/19
5	Joshua Garcia	Sales	10/23/18
6	Sarah Mckinnon	Sales	1/5/19
7	Shannon Miller	Management	9/23/18
8	Katrina Kormylo	Admin.	1/8/19
9	Susan Colley	Sales	11/21/18
10	William Emerson	Admin.	10/19/18
11	Eugene Fink	Sales	11/12/18
12			
13	Today:	1/1/2020	

Tip! *C2 is a relative reference and $B$13 is an absolute reference. In conditional formatting, the rule is written for the first cell in the range (cell A2 here) and automatically adjusts cell references for each row/column (A3:A11). Today's date is a constant, so an absolute cell reference is required.*

Home→Styles→Conditional Formatting→New Rule

Home→Styles→Conditional Formatting→Manage Rules

DEVELOP YOUR SKILLS: E7-D5

In this exercise, you will create and modify conditional formatting rules to highlight important information about your clients.

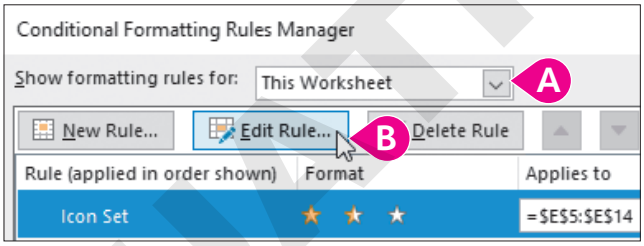
1. Save your file as: **`E7-D5-Clients`**
2. If necessary, select the data under *Years of Loyalty* in the **range E5:E14** (Client History sheet).
3. Choose **Home→Styles→Conditional Formatting** →**Icon Sets→3 Stars** (in the Ratings group).

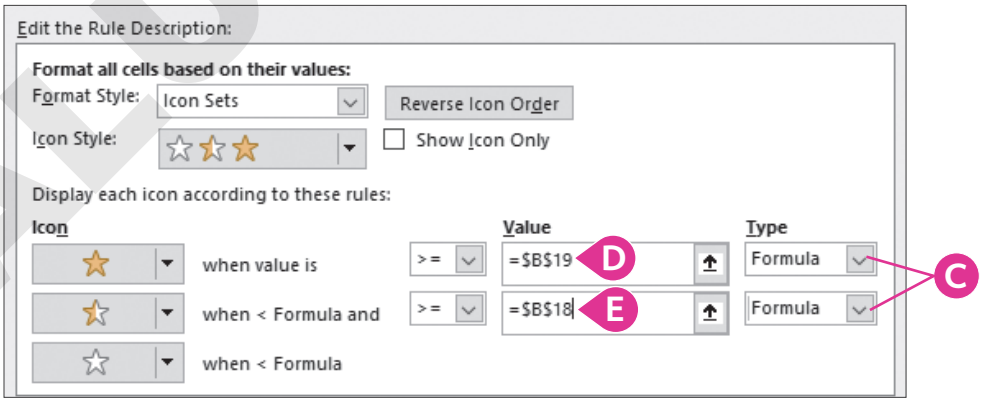
   The icons give an indication of the newest and oldest customers, but you have a loyalty program that you want to use instead.
4. In **cell A17**, enter **`Loyalty Program`** and then merge and center the **range A17:B17** and apply a thick bottom border.
5. Enter the qualifications for Silver and Gold status in the **range A18:B19**:

	A	B
17	**Loyalty Program**	
18	Silver	3
19	Gold	5

Edit an Existing Rule

6. Choose **Home→Styles→Conditional Formatting** →**Manage Rules**.
7. Follow these steps to edit the rule:





A. Select **This Worksheet** to show all rules on the worksheet.

B. Click **Edit Rule...**.

C. In the Edit Formatting Rule dialog box, change the type for each value to **Formula**.

D. Click the box for the first value and then click **cell B19** on the worksheet.

E. Click the box for the second value and then click **cell B18** on the worksheet.

8. Click **OK** to finish editing the rule; click **OK** again to close the Rules Manager.

   The full star icon is applied to Gold and Platinum clients, a half star is applied to Silver clients, and Bronze clients have an empty star; both Gold and Platinum are greater than or equal to five, and Bronze is less than three.

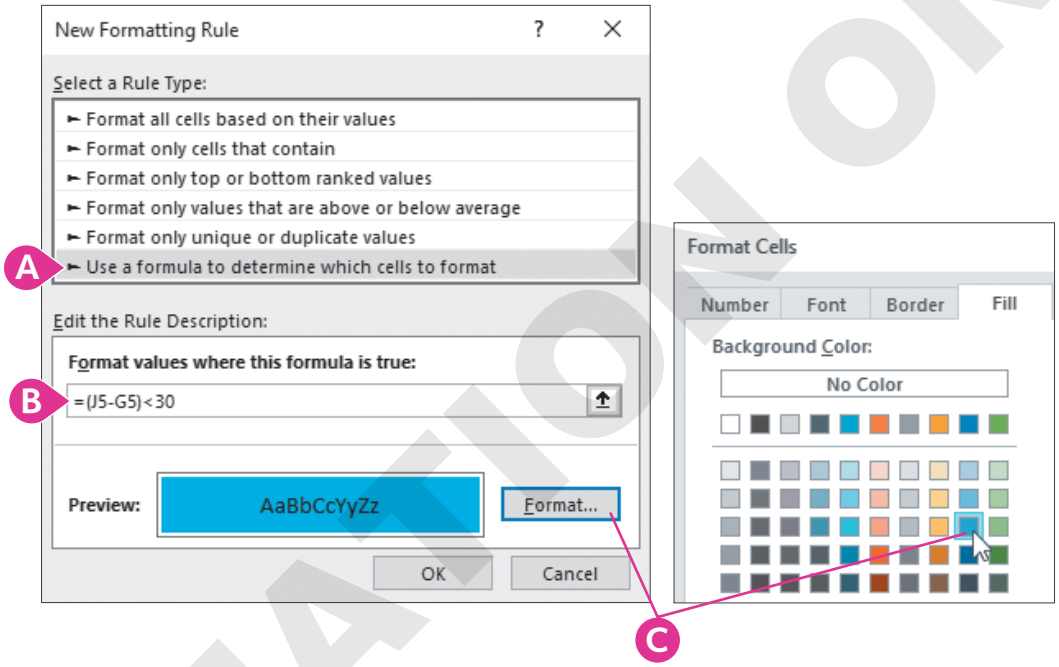
Create a New Rule Using a Formula

9. Go to the **Sept** worksheet and select the invoice dates in the **range G5:G14**.

   You want to know which customers booked their trips less than 30 days in advance, so you will create a rule to highlight these customers.

10. Choose **Home→Styles→Conditional Formatting →New Rule**.

11. Follow these steps to create the new rule:



A. Select **Use a formula to determine which cells to format**.

B. Enter the formula **=(J5-G5)<30** to format values where this formula is true.

C. Click **Format...**; in the Format Cells dialog box, click the **Fill** tab and choose any light blue color.

12. Click **OK** twice, once to close the Format Cells dialog box and again to create and apply the new rule.

The rule takes the difference between the travel date in column J and the invoice date in column G, and then applies the blue fill if the difference is less than 30 days. The rule applies to four out of the ten customers.

First Name	Last Name	Provider	Destination	# of Guests	Price Per Person	Invoice Date
Eric	Snow	Sunwind	Jamaica	2	$ 899	Sep-8
Alison	Lobosco	Sunwind	Mexico	2	$ 770	Sep-7
Lacy	Henrich	TrueBlue	Dominican Republic	4	$ 1,200	Sep-1
Will	Johns	Eastjet	Cuba	3	$ 950	Sep-9
Nicki	Hollinger	Sunwind	Mexico	1	$ 875	Sep-8
Lennard	Williams	TrueBlue	Brazil	6	$ 800	Sep-8
Kerri	Knechtel	TrueBlue	Columbia	4	$ 560	Sep-5
Karynn	Alida	Sunwind	Bahamas	2	$ 870	Sep-8
David	Monton	Eastjet	Dominican Republic	2	$ 650	Sep-6
Amanda	Campbell	Sunwind	Jamaica	7	$ 900	Sep-9

13. Save and close the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).

Reinforce Your Skills

REINFORCE YOUR SKILLS: E7-R1

Work with Date Formatting and Time Entries

In this exercise, you will create custom date formatting for the Kids for Change Fun Run sign-up information and finish entering the runners' finish times.

1. Open **E7-R1-FunRun** from your **Excel Chapter 7** folder and save it as: **`E7-R1-FunRunTimes`**
2. Select the dates under *Sign-up Date* in the **range B4:B21**.
3. Open the Format Cells dialog box from the Number group on the Ribbon and make these adjustments:
   - Choose **Custom** from the Category list.
   - In the Type box, enter the code **`mmmm dd`** and click **OK**.
4. The finish times for the last four runners need to be entered, so complete the **range F18:F21** as shown:

	A	F
18	Latoya Lynch	2:28 PM
19	Timothy Graham	3:11 PM
20	Earl Ramirez	3:48 PM
21	William Schiavone	3:20 PM

5. Insert a row above the column headings in **row 3**, select **cell A3**, and enter the date: **`6/7/2020`**
6. With **cell A3** selected, open the Format Cells dialog box again and make these adjustments on the Number tab:
   - Choose **Custom** from the Category list.
   - In the Type box, enter the code **`"Race Date: "dddd, mmmm d`** and click **OK**.
7. Merge and center the **range A3:G3** and apply bold formatting.
8. Save the file.

REINFORCE YOUR SKILLS: E7-R2

Use Date Functions and Calculations and Apply Conditional Formatting

In this exercise, you will calculate race times and apply conditional formatting to indicate the top performers for the charity race.

1. Save your file as: **`E7-R2-FunRunTimes`**
2. Near the bottom of the worksheet, in **cell A24**, enter the text **`Updated On:`** and tap Tab.
3. In **cell B24**, enter the formula: **`=TODAY()`**
4. In the **range A24:B24**, decrease the font size to 10 points and apply italic formatting.

   Now you will calculate the time it took each participant to run the race.

5. In **cell G5**, enter the formula: **`=F5-E5`**

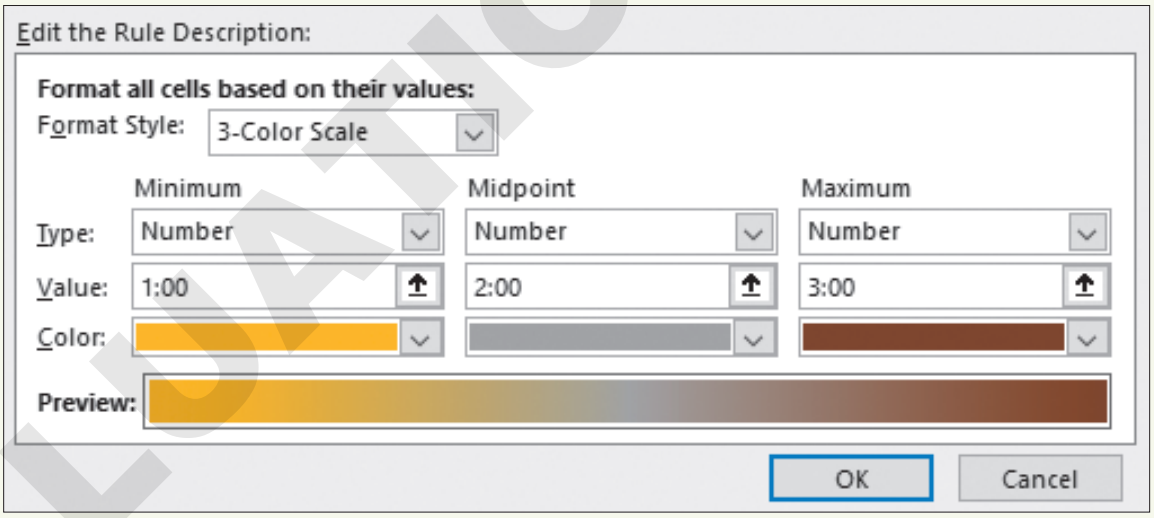
   You need to adjust the time format to display hours and minutes, not the time of day.

6. With **cell G5** selected, open the Format Cells dialog box and on the Number tab, if necessary, choose the **Custom** category.
7. In the Type box, remove the AM/PM code so only *h:mm* remains and then click **OK**.
8. Copy the formula in **cell G5** down the column for the other participants.
9. Select the data in the Total Raised column, **range D5:D22**.
10. Apply the conditional formatting data bars of your choice from the Gradient Fill section.
11. Select the times in the **range G5:G22**.
12. Start a new conditional formatting rule.

    Hint: Choose Home→Styles→Conditional Formatting→New Rule.

13. In the top section of the New Formatting Rule dialog box, choose to format cells based on their values.
14. In the bottom section of the dialog box, adjust the format style, type, and value settings as shown and use these colors:

Minimum	**Gold, Accent 4**
Midpoint	**Gray, Accent 3**
Maximum	**Orange, Accent 2, Darker 50%**



15. Click **OK** to apply the conditional formatting.

    Notice the gold color applied to those who finished close to the 1:00 hour mark, the silver color to those close to the 2:00 hour mark, and the bronze color applied to anyone who finished close to or over the 3:00 hour mark.

16. You have been notified that Glenn Edwards' finish time was entered incorrectly, so enter the correct time of **`11:04 AM`** in **cell F10**.

    Glenn's time is now 1:04, which now has the gold fill applied.

17. Save and close the workbook.

REINFORCE YOUR SKILLS: E7-R3

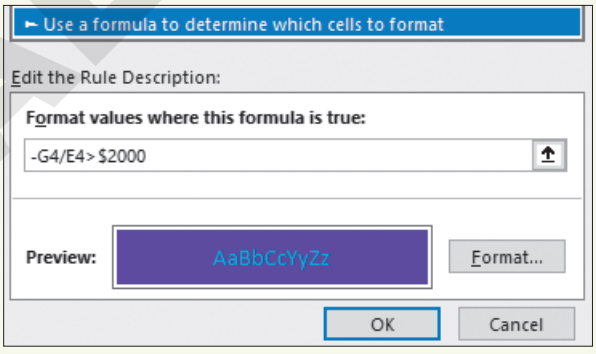
Rank the Donor List

In this exercise, you will use date functions and apply conditional formatting to identify your best financial supporters at Kids for Change.

1. Open **E7-R3-Donors** from your **Excel Chapter 7** folder and save it as: **`E7-R3-DonorsRanked`**

   The formatting has been removed from the data, so the dates need to be reformatted appropriately.
2. Select the First Donation column data in the **range D4:D18**.
3. Open the Format Cells dialog box from the Number group on the Ribbon and make these changes:
   - Choose **Custom** from the Category list.
   - In the Type box, enter the code **`mmm d, yyyy`** and click **OK**.
4. In **cell A2**, enter **`Updated:`** and in **cell B2**, enter the formula: **`=TODAY()`**
5. Use the **Format Painter** to copy the format from **cell A1** to the **range A2:F2**.
6. Select the **range B2:E2** and then merge and center the cells and apply the **Long Date** format.
7. Select the **range E5:F18** and apply the **Comma Style** number format with no decimals.
8. Select the **range E4:F4** and apply the **Accounting** number format with no decimals.
9. Insert a column to the left of **column E** and then enter the heading **`Years of Support`** in **cell E3**.
10. Adjust the width of **column E** to **8**.
11. In **cell E4**, enter the formula **`=YEARFRAC(D4,$B$2)`** and then fill the formula down the column.
12. With the **range E4:E18** still selected, adjust the number format to **Number**.

    Now you want to determine which donors have consistently donated more than $2,000 per year on average by applying a conditional formatting rule.
13. Select the **range A4:A18** and start a new conditional formatting rule.
14. At the top of the dialog box, select **Use a formula to determine which cells to format** and enter the formula: **`=G4/E4>2000`**
15. Adjust the formatting to apply a dark fill color and a light font color of your choice.



16. Click **OK** to apply the rule.

    You should have Elizabeth Betts, Nicki Hollinger, *and* Dave Martin *formatted with color.*
17. Save and close the workbook.

Apply Your Skills

APPLY YOUR SKILLS: E7-A1

Use Date Formatting and Date Functions

In this exercise, you will take the Expense Report for the Universal Corporate Events employees and use date functions and formatting to improve the report.

1. Open **E7-A1-Expenses** from your **Excel Chapter 7** folder and save it as: **E7-A1-ExpenseReport**
2. In **cell H2**, enter the formula **=NOW()** to insert the date and time of the report.
3. Edit the number format for **cell H2** to display the date and time using this code: **mmmm dd, yyyy h:mm am/pm**

   You will notice the time information will continue updating as you work on the rest of the exercise.
4. Insert a new row below the headings, above **row 4**.
5. In **cell D4**, display the first day of the month from cell D3 by entering the formula: **=D3**
6. In **cell F4**, enter the formula **=F3** and in **cell H4**, enter the formula: **=H3**
7. In **cell E4**, display the last day of the month from cell D3 using this formula: **=EOMONTH(D3,0)**

   The EOMONTH function takes a date, adds any number of months, and then returns the last day of that month. In this case, the formula takes the date of July 1 *in cell D3, adds zero months, and returns the last day of that month,* July 31.

   Now you will repeat this step for August and September.
8. Copy the formula from **cell E4** and paste it into **cell G4** and **cell I4**.

   If you notice a formula error flag appear, which is a small green triangle in the top-left corner of the cell, ignore it.
9. Adjust the display of the date in **cell D3** to show only the month name using the code: **mmmm**
10. Increase the font size of the July heading in **cell D3** to 14 points and change the vertical alignment to **Middle Align**.
11. Use the **Format Painter** to copy the format from **cell D3** to the **range F3:J3**.
12. Save the file.

APPLY YOUR SKILLS: E7-A2

Apply Conditional Formatting Rules

In this exercise, you will apply conditional formatting rules to indicate a warning for expenses that are over budget for the Universal Corporate Events employee expense reports.

1. Save your file as: **E7-A2-ExpenseReport**
2. Select the expenses for July to September in the **range D5:H10**.

   You will begin by creating conditional formatting to see which months went over budget.
3. Create a new conditional formatting rule.

4. Choose to use a formula to determine which cells to format and enter: **=D5>$C5**

   The mixed reference in this formula allows the conditional formatting rule to be applied to all the rows and columns in the selected data using the data from column C.

5. Modify the format to apply the fill **Gold, Accent 4, Lighter 40%** (8th column, 4th row).

   Now you will create a second rule, which will show which expense totals went over the total three-month budget.

6. Select the total expenses in the **range J5:J10**.
7. Create a new conditional formatting rule using the formula **=J5>(C5*3)** and the fill **Gold, Accent 4, Darker 25%** (8th column, 5th row).

   You should now see that the Entertainment total has gone over the three-month budget.

8. Open the Conditional Formatting Rules Manager and edit both rules on the worksheet (one at a time) by applying the bold font style to the conditional formatting.
9. Save and close the file.

APPLY YOUR SKILLS: E7-A3

Work with the Client Marketing List

In this exercise, you will use the information from the Client Events worksheet to create a marketing schedule to contact your clients and encourage them to book another event with Universal Corporate Events.

1. Open **E7-A3-ClientEvents** from your **Excel Chapter 7** folder and save it as: **E7-A3-ClientMktg**
2. In **cell A2**, edit the subtitle to: **Marketing Schedule - Client Communications**
3. Insert a column to the left of **column D**.

   When talking to clients, you want to remember the weekday of their events, so you will add a column to show this information.

4. Insert the heading **Day of Week** in **cell D4** and the formula **=C5** in **cell D5**.
5. Adjust the number format to show the full name of the day only.
6. Copy the formula down the column to **row 16** and then adjust the width of **column D** to **12**.
7. Insert two new columns to the left of **column E**.

   You want to schedule a thank-you letter and a follow-up phone call one month and two months after the events, respectively, so you will use the EDATE function.

8. Enter the heading **Letter** in **cell E4** and the heading **Phone Call** in **cell F4**.
9. In **cell E5**, enter a formula using the EDATE function to enter the date for one month after the Winchester Web Design event.
10. In **cell F5**, enter a formula using the EDATE function to enter the date for two months after the event.
11. Use the **Format Painter** to copy the date format from **cell C5** to the **range E5:F5**.
12. Copy the formulas in the **range E5:F5** down the columns for all the clients.

    Now you want to quickly see the highest and lowest Survey Ratings for reference when calling clients.

13. Apply conditional formatting to the Survey Rating column using the **3 Flags Icon Set** (in the Indicators group).
14. Save and close the file.

Project Grader

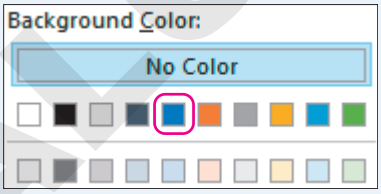
If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.

PROJECT GRADER: E7-P1

Formatting Sales Goals

Taylor Games would like to easily identify items that failed to meet sales goals in the first quarter. They would like this report within 30 days. In this exercise, you will create a report that displays the months in the first quarter with start and end days for each. Then, you will apply conditional formatting to easily identify which items failed to reach sales goals in each month.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E7_P1_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E7_P1_Start** from your **Excel Chapter 7** folder.
2. Use the **NOW** function to enter the current date and time in **cell D2**.
3. Apply this custom date formatting to **cell D2**: **`mmmm dd, yyyy h:mm am/pm`**
4. Enter a formula in **cell D3** that adds 30 days to the date in **cell D2**.
5. Apply the custom date format **`mmmm`** to the **range D6:H6** so that only the months are displayed.
6. Use this end-of-month function in **cell E7** to display the last day of the month: **`EOMONTH(D6,0)`**
7. Copy the **range D7:E7** and paste it to the **range F7:I7**.
8. Use these guidelines to create a new conditional formatting rule:
   - Create it for the **range D8:I22**.
   - Use this formula to determine which cells to format: **`=D8<$C8`**
   - Format the cells with a fill color using the fifth color in the Background Color palette.



9. Change the data in **cell F12** to: **`240`**
10. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 7** folder as **`E7_P1_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 7** folder as: **`E7_P1_Submission`**

PROJECT GRADER: E7-P2

Calculating Membership Renewal

Classic Cars Club would like to identify the date individual memberships will expire and calculate a date six months earlier so a renewal letter can be sent to the member. In this exercise, you will calculate the month each membership will expire and apply a conditional formatting rule to easily identify expiring memberships by color. Also, you will calculate a renewal letter date by subtracting six months from the membership expiration date for each member.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E7_P2_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E7_P2_Start** from your **Excel Chapter 7** folder.
2. Enter today's date (the current date) in **cell E1** of the **Membership List** worksheet.
3. Create a custom format in **cell E1** that displays the text **`Memberships Start:`** followed by a blank space and then followed by the date in **`dd mmm, YYYY`** format (for example: *Memberships Start: 22 Apr, 2021*).
4. Enter the following formula in **cell L7**: **`=$E$1+(H7*365)`**
5. Apply this custom format to **cell L7**: **`mmmm, yyyy`**
6. Copy the formula in **cell L7** down the column to the **range L8:L36**.
7. In **cell M7**, determine the renewal letter date using the **`EDATE`** function with the arguments **`L7`** and **`-6`**. Renewal letters will be sent out six months before the membership expiration.
8. Apply the cell formatting used in **cell L7** to **cell M7**.
9. Copy the formula in **cell M7** down the column to the **range M8:M36**.
10. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 7** folder as **`E7_P2_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 7** folder as: **`E7_P2_Submission`**

Extend Your Skills

These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.

E7-E1 That's the Way I See It

As a person who likes purchasing the latest electronic gadgets, you take advantage of retailers that offer interest-free deferred payments whenever possible. You need a way to track when all these payments become due, or you risk paying the full amount of interest. Open **E7-E1-Purchases** and save it as: **E7-E1-PmtDue**

Enter the purchase dates and interest-free months in columns B–C for five purchases. (This can be fictional data; use dates within the past three months and enter somewhere between three and twenty-four months in the *Interest Free Months* column.) Use the EDATE function in column D to determine the payment due date, enter today's date with the TODAY function in cell D1, and use a formula to determine how many days until the payment comes due in cell E5. Apply a conditional formatting rule that uses a color scale to show which payments are coming up the soonest, and then finish off by applying appropriate formatting to the dates, data, headings, and titles throughout.

E7-E2 Be Your Own Boss

Using the information recorded for your clients at Blue Jean Landscaping, you will calculate the amount of time to bill each client for and when that client is due for their next service appointment. Open **E7-E2-TimeRecords** and save it as: **E7-E2-TimeRecordsRevised**

Start by formatting the date of service as a Long Date but then customize the format to remove the day of the week. Calculate the billed time for each client. Each client needs service every two weeks, so calculate the next service date for each by adding 14 days to the last date of service. Format the times and dates appropriately and apply data bars to the billed time data.

E7-E3 Demonstrate Proficiency

The Stormy BBQ customer service employees receive their performance reviews at least once every six months. You need to schedule their next review dates and review their scores with them. Open **E7-E3-Performance** and save it as: **E7-E3-PerformanceReview**

Calculate the years of employment for each employee in column D and then calculate the date for each employee's next performance review. For employees with fewer than three years of employment, their review is three months after their last review; for all other employees, it's every six months. Apply a conditional formatting rule using icons of your choice to show employees who scored above 90, above 80, and everyone else. Ensure all numbers and dates are formatted appropriately.

EXCEL

8 Financial Functions and What-If Analysis

In this chapter, you will learn about some of the financial functions frequently used in Excel. You will use these functions to analyze potentially changing circumstances with the What-If Analysis tools. What-if analyses allow you to see how the results of formulas change by altering the input values, such as the interest rate used in financial functions.

LEARNING OBJECTIVES

- Create financial functions
- Create one-variable and two-variable data tables
- Use the What-If Analysis tools to create scenarios
- Adjust input values using Goal Seek

Project: Making Financial Decisions

Airspace Travel has a number of big financial decisions to make. The company is currently seeing rapid growth in its business, but it is running out of office space and needs to expand. The owners have asked you to help them prepare for and analyze the potential impact of several decisions, including the purchase of a new office building, an investment opportunity, and an equipment purchase. You will use the tools in Excel, including various financial functions and What-If Analysis tools, to help them make the best choices.

Creating Financial Functions

Completing financial calculations is an important part of using Excel, and there is a whole category of financial functions to use. These types of calculations might include calculating your monthly payment on a loan or mortgage, finding out how much an investment will be worth in the future, or determining how long it will take to pay off a debt. Financial functions can be useful because they provide valuable information for decision-making, analysis, and forecasting. These functions can also provide the basis for more in-depth analysis tools in Excel.

Input Values for Financial Functions

When creating financial functions, it's good practice to avoid inserting constant values in your function arguments. A better way is to store the constant values, or inputs, on the worksheet so they are always visible and can be quickly changed and updated in all formulas.

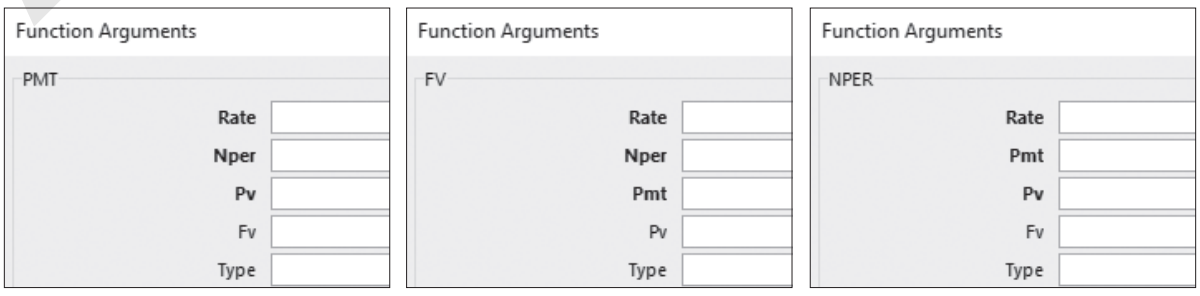
For example, to calculate a payment, you could insert the interest rate directly into the PMT function arguments. If you need to change the interest rate, you would have to go into the formula and manually change it. But if the interest rate is stored in a cell and properly labeled, changing the interest rate in that cell will automatically update any formula that refers to that interest rate.

This might not make a big difference if you have only one formula, but for large, complex worksheets you might have many different formulas all using the same input, such as the interest rate!

Formulas→Function Library→Financial

Financial Function Arguments

The arguments for many financial functions are similar, and Excel will help you build the correct formula to achieve the desired result. As with other functions, you can enter the arguments in the Insert Function dialog box or type them directly into the cell. With more complex functions, it can be easier to visualize your arguments using the dialog box.

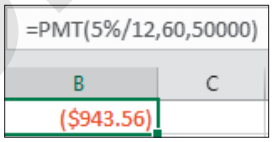


The field names for required arguments are shown in bold in the dialog box; the others are optional arguments.

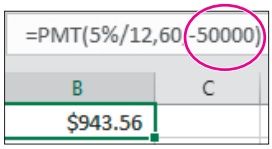
FINANCIAL FUNCTION ARGUMENTS

Argument	Description
Rate	Interest rate per payment period; so if the annual interest rate is 5%, the interest rate per period for a monthly payment would be 5% / 12
Nper	Number of payment periods over the life of the loan or investment, often monthly; so a five-year loan with monthly payments would have 5 x 12 = 60 payment periods
Pmt	Payment made on the loan or amount invested each period, which is a constant value (cannot change) over the life of the loan or investment
Pv	Loan amount or initial amount invested (Present Value)
Fv	Ending balance; for loans it's usually zero (or omitted) to pay off the loan, and for investments it's the desired amount at the end of the term (Future Value)
Type	Indicates whether payments are due at the beginning or end of each period

When financial functions are used in Excel, payments are considered negative values. For example, a $50,000 loan with 5% annual interest over 60 months would be paid back in installments payments of –$943.56.



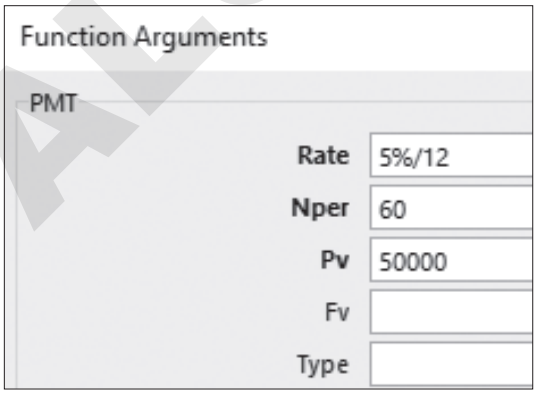
If you want the payment to appear as a positive number, you can reverse this by entering a negative number for the Pv argument (the loan amount) and think of that as a negative number, which represents a "debt."

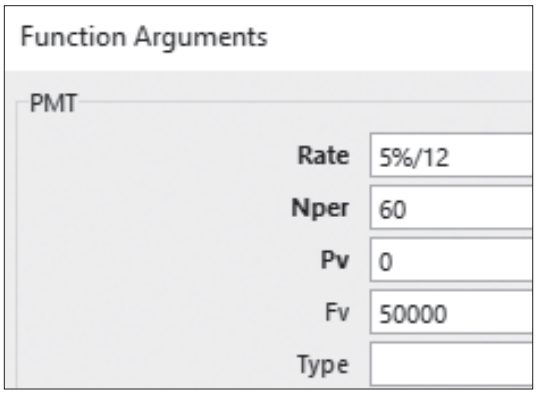


PMT Function

The PMT, or Payment, function is used to calculate the amount of each payment required to pay off a loan, where the payments and interest remain constant over the life of the loan. This is also called a *term loan* because there is a predetermined time period, or number of payments, to pay off the loan. The PMT function can also be used to determine how much you must save (the payment) each month to reach some future value amount. Again, this assumes the interest and payments are consistent and the length of time is known.

For example, you may want to know the payments required to pay off a $50,000 loan in five years at 5% annual interest or how much you have to save each month to have $50,000 saved after five years at the same interest rate. The Pv in the figure on the left below is the $50,000 loan, and the Fv on the right is the future value of $50,000 saved.





DEVELOP YOUR SKILLS: E8-D1

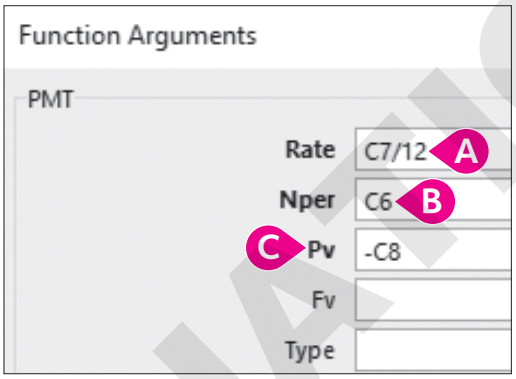
The Airspace owners are currently looking at buying a property for $650,000 with a $100,000 down payment for a thirty-year mortgage at 2.75% APR. In this exercise, you will find the amount of the monthly mortgage payment for the new office space and total interest over the life of the loan.

1. Start Excel, open **E8-D1-ATC** from your **Excel Chapter 8** folder, and save it as: **`E8-D1-ATCFinancials`**
2. Ensure the **Mortgage** sheet is active and **cell C8** is selected.

   The first step is to calculate the amount of the loan by starting with the purchase price and subtracting the down payment.
3. In **cell C8**, enter the formula: **`=C4-C5`**

   The loan amount will be $550,000. Now you can calculate the monthly payment based on the loan amount, interest rate, and term.
4. Select **cell C9** and choose **Formulas→Function Library→Financial →PMT** to insert the PMT function (you will need to scroll down through the list).

   As with other functions, you can either type or point and click to insert cell references. The point-and-click method can improve reliability and help ensure you select the correct cell.
5. Follow these steps to insert the PMT function arguments:



   A. Click **cell C7** and type **`/12`** to divide the annual percentage rate (APR) by 12, which returns the interest rate per month.

      If necessary, move the dialog box out of the way so you can click the cell in the worksheet.

   B. Tap Tab to move to the Nper box and then click **cell C6** for the number of payments (length of the term in months).

   C. Tap Tab to move to the Pv box and then type **–** and click **cell C8**, which is the amount borrowed.
6. Click **OK** to enter the formula and then adjust the number format to show two decimal places.

   The monthly mortgage payment will be $2,245.33.

   To calculate total interest, first you need to calculate total payments, which is the monthly payment multiplied by the term.
7. In **cell C10**, enter the formula: **`=C9*C6`**

   Next, take the total payments minus the loan amount to find the total interest paid over the life of the loan.

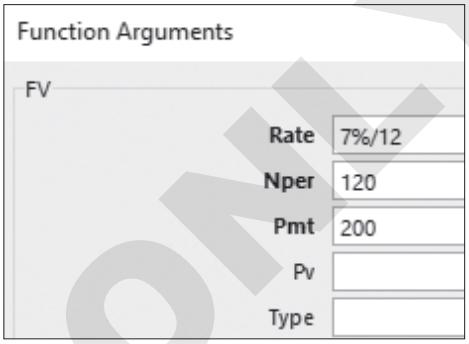
8. In **cell C11**, enter the formula: **=C10-C8**

   The total interest cost of the mortgage will be $258,318.

9. Save the file.

FV Function

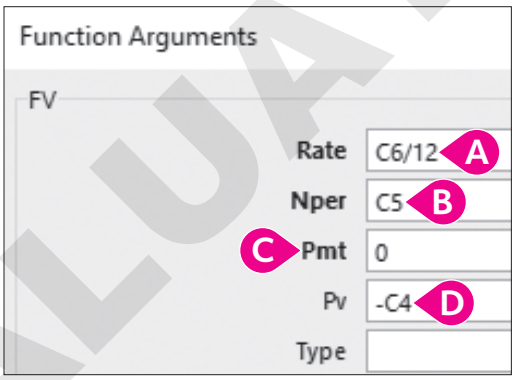
The FV, or Future Value, function calculates the future value of an investment when you specify the interest rate, length of the investment, and amount of each payment. Like the PMT function, the interest rate and payments must be constant throughout the term. For example, if you know you can invest $200 each month for 10 years into an account that earns 7% interest per year, the FV function will tell you how much you will have saved up at the end. You can include the Pv argument if the starting investment in the account is more than zero.



DEVELOP YOUR SKILLS: E8-D2

In this exercise, you will use the FV function to find out how much you would have after 10 years if Airspace were to invest $100,000 instead of purchasing the new office space.

1. Save your file as: **E8-D2-ATCFinancials**
2. Go to the **Investment** sheet and ensure **cell C7** is active.
3. Choose **Formulas→Function Library→Financial →FV** to insert the FV function.
4. Follow these steps to insert the FV function arguments:

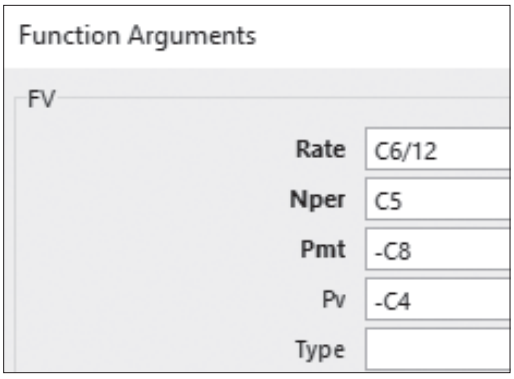


   A. Click **cell C6** and then type **/12** to get the interest rate per month.
   B. Tap Tab and click **cell C5** (length of the term in months).
   C. Tap Tab and enter **0** for the payment amount.
   D. Tap Tab then type **–** and click **cell C4** (amount you are investing up front).
   E. Click **OK**.

   With the compounding monthly interest, you would have $191,218 in 10 years. Now you will find out how much you would have if you were to invest an additional $200 each month.

5. Enter **200** in **cell C8**.

6. In **cell C9**, enter an FV function with the same arguments as step 4, except this time for the **Pmt** argument, type **–** and select **cell C8**.

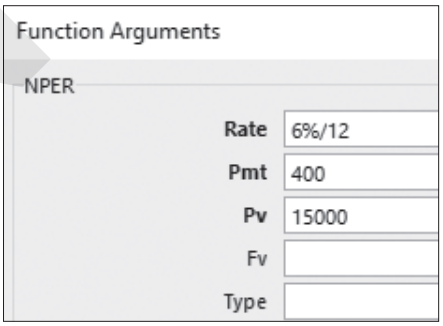


With an additional investment of $200 per month, you would have $224,899 after 10 years.

7. Save the file.

NPER Function

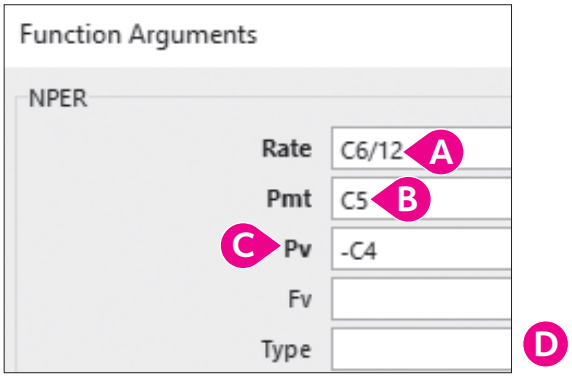
The NPER function is similar to the PMT and FV functions, but for this function the missing information is the number of periods, or the length of the term, required to reach the financial goal. Again, this could be reaching some investment amount or paying off some amount of debt where the interest rate remains constant. For example, if you want to pay off a $15,000 loan at 6% interest per year, you can find out how long it will take if you pay $400 per month.



DEVELOP YOUR SKILLS: E8-D3

In this exercise, you will use the NPER function to determine how long it will take to pay for a new printer that costs $12,000 if Airspace opens a line of credit and pays $250 consistently each month.

1. Save your file as: **`E8-D3-ATCFinancials`**
2. Go to the **Printer** worksheet and ensure **cell C7** is selected.
3. Choose **Formulas→Function Library→Financial →NPER**.
4. Follow these steps to insert the NPER function arguments:
   - A Click **cell C6** and then type **`/12`** to determine the interest rate per month.
   - B Tap Tab and click **cell C5** for the payment amount for each month.
   - C Tap Tab and then type **–** and click **cell C4** (amount being borrowed up front to cover the purchase).
   - D Click **OK**.



The loan would take just over 51 months to be paid off.

5. Remove all of the decimals from the number format of **cell C7**.
6. Save the file.

Using What-If Analysis Tools

To understand the basics of using the What-If Analysis tools, you should recognize that it is just that: asking the question, what if? *What if the interest rate increases on my loan? What if I invest $200 per month instead of $150?*

To answer these questions, you could create your formula and then go through and systematically change the values of the arguments to see the different results. However, the What-If Analysis tools provide better ways to examine different possibilities and try out alternate values in your formulas via the Scenario Manager, Goal Seek, and data tables. What-if analyses work best with complex formulas, such as the financial functions PMT, FV, and NPER, because there are several input values that can potentially change.

Data Tables

A data table is *not* a table and it *does not* allow you to sort or filter or insert a total row. Data tables are quite different! A data table allows you to insert multiple input values to replace an argument in your formula and see the results for all of them at the same time.

One-Variable Data Tables

To create a one-variable data table, you must first set up the table. The table requires *either* a row or column of input cells to replace one of the formula arguments, as well as the cell that contains the formula itself. To use a column input cell, the formula must be at the top of the column; to use a row input cell, the formula must be the first cell at the left of the row.

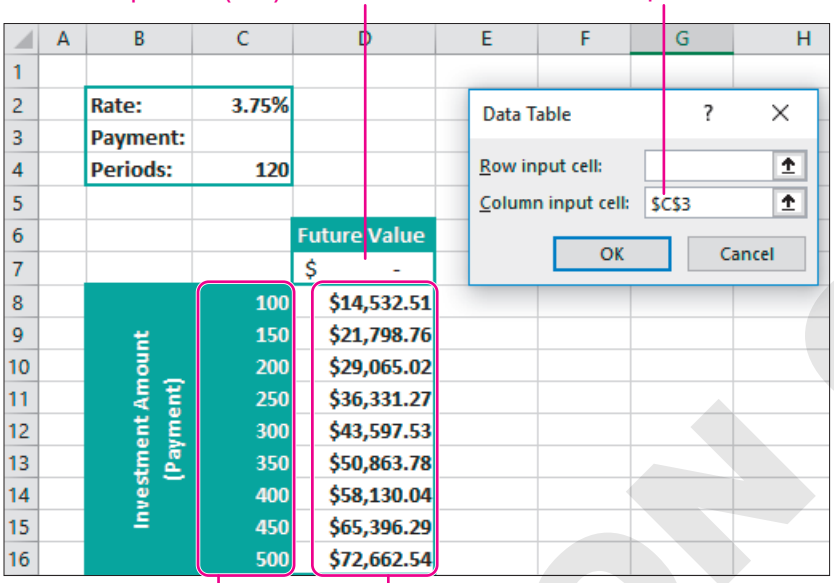
Note! *For a one-variable table, you enter only one input cell to change, hence either a row or a column (not both).*

For example, you might want to use the Future Value function to determine how much you would have after 10 years (120 months) based on different monthly investment amounts. If you know you can invest at a constant rate of 3.75% interest per year, you could use the following table. As your monthly investment amount grows, so does the amount you have at the end (the future value).

Tip! *To replace a variable in the formula, the formula argument* must *be a cell reference, not an actual value.*

Cell D7 contains the formula *=FV(C2/12,C4,-C3)*. The result is zero because cell C3 is blank, meaning the payment is zero. The formula also refers to the 3.75% rate in cell C2 and the number of periods (*120*) in cell C4.

Cell C3 is the payment amount, the argument that replaces zero with the new input values.



This column contains input values to be used in the formula instead of the existing payment value.

The results of the data table display below the formula.

You can also create a larger table that has multiple what-if formulas but still only one *variable* input for each of the formulas.

Two-Variable Data Tables

A two-variable data table is similar to a one-variable table, except that there is both a row and a column of input values to replace *two* different arguments in the formula. The formula for a two-variable table *must be in the upper-left cell* of the table.

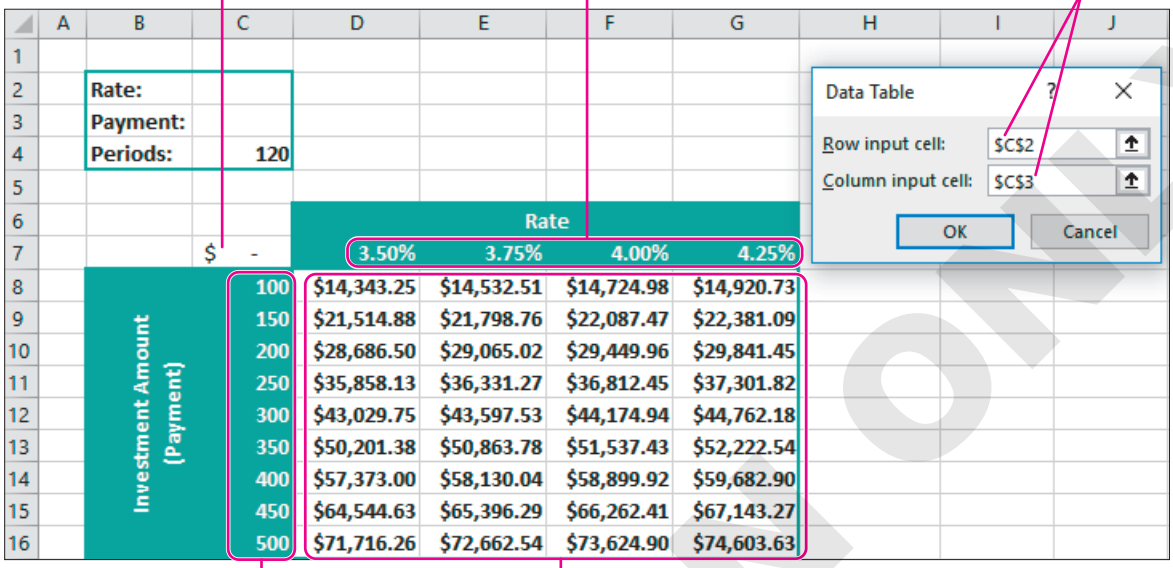
In the following example, the period is still 10 years and the investment varies from 100 to 500, but now the interest rate also varies from 3.5% to 4.25%.

Note! *The FV function assumes a constant interest rate for the investment lifespan, but you could use this data table to determine when to invest if you want to lock in at a higher interest rate or to make assumptions about the* average *interest rate over the investment lifespan.*

Cell C7 contains the formula *=FV(C2/12,C4,-C3)*. The result is zero because cells C2 and C3 are blank. The formula also refers to the periods (*120*) in cell C4.

This row contains input values to use in the formula instead of the existing rate value.

Cell C2 is the rate and cell C3 is the payment amount. These are the two arguments to be replaced by the payment (column) and rate (row) input values.



This column contains the input values to enter in the formula instead of the existing payment value.

The results of the data table display here.

View the video "Creating One- and Two-Variable Data Tables."

Data→Forecast→What-If Analysis→Data Table...

DEVELOP YOUR SKILLS: E8-D4

In this exercise, you will create one- and two-variable data tables to analyze what happens to the payments when the loan amount changes and when both the loan amount and interest rate change. Airspace may want to negotiate a lower purchase price or look for a larger building, depending on the results of your analyses.

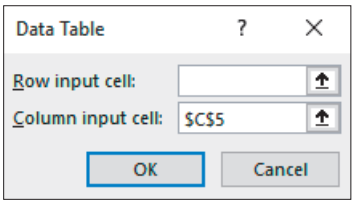
1. Save your file as: **`E8-D4-ATCFinancials`**
2. Go to the **Mortgage Variables** worksheet.

   The first step in creating a data table is to ensure the arguments are set up correctly. For your one-variable table, the constants are the rate and term in cells C3 and C4. You will enter the formula to use in cell D5.
3. In **cell D5**, enter the formula: **`=PMT(C3/12,C4,-C5)`**

   Cell C5 is a blank cell; it's the variable that will be replaced with the loan amount values in the table.
4. Apply the **White, Background 1** font color to **cell D5**.

5. Select the **range C5:D11** and choose **Data→Forecast→What-If Analysis** → **Data Table…**.

6. In the Data Table dialog box, click in the **Column Input Cell** box and then click **cell C5** in the worksheet.



Cell C5 is the cell that will be replaced by the new values in the Loan Amount column.

7. Click **OK** to insert the data table.

Rate:	2.75%	
Term:	360	Payments
Loan:		
Loan Amount	$500,000	$2,041.21
	$550,000	$2,245.33
	$600,000	$2,449.45
	$650,000	$2,653.57
	$700,000	$2,857.69
	$750,000	$3,061.81

The payment is the same as the original calculation on the Mortgage worksheet if the loan amount is $550,000. But if the loan amount goes up or down, you can see the change in the payment that would be required.

Now you will enter the PMT function again, using the same arguments, but in the upper-left corner of the two-variable table. The constant will be the term in cell C4, and this time the variables are both the Loan Amount (column) and the Rate (row).

8. In **cell G5**, enter the formula: **`=PMT(C3/12,C4,-C5)`**

Cells C3 and C5 will be replaced values in the table; C3 represents the variable interest rate and C5 represents the variable loan amount.

9. Apply the **White, Background 1** font color to **cell G5**.

10. Select the **range G5:K11** and choose **Data→Forecast→What-If Analysis** → **Data Table…**.

11. In the Data Table dialog box, enter **`C3`** in the Row Input Cell box and **`C5`** in the Column Input Cell box and then click **OK**.

		Rate			
		2.25%	2.50%	2.75%	3.00%
Loan Amount	$500,000	$1,911.23	$1,975.60	$2,041.21	$2,108.02
	$550,000	$2,102.35	$2,173.16	$2,245.33	$2,318.82
	$600,000	$2,293.48	$2,370.73	$2,449.45	$2,529.62
	$650,000	$2,484.60	$2,568.29	$2,653.57	$2,740.43
	$700,000	$2,675.72	$2,765.85	$2,857.69	$2,951.23
	$750,000	$2,866.85	$2,963.41	$3,061.81	$3,162.03

12. Save the file.

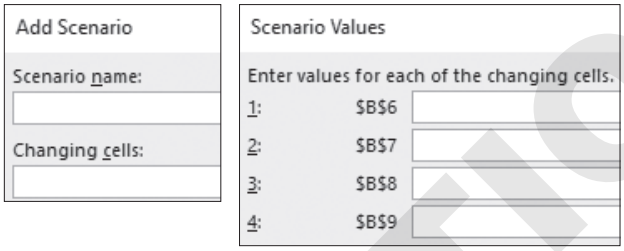
Scenario Manager

Data tables give you a lot of information about the potential outcome of variables in your calculations. However, you might not always want all of that data; you may want to compare results for only two or three possibilities. The Scenario Manager uses variable inputs similar to data tables but with several additional benefits:

- The Scenario Manager can handle more than just one or two variables. In fact, you can have as many as 32 variables.
- You can show the effects of these variables on multiple formulas at the same time.

For each set of variables, called changing cells, you can either choose to show the results of each scenario directly in the worksheet or create a scenario summary report that shows the results of each scenario side by side. This can be useful when comparing potential outcomes for manufacturing decisions or financial investments.

The Scenario Manager allows you to add, edit, delete, and display your scenarios. Each scenario requires creating a name, identifying the changing cells, and entering the values for each of the changing cells. The changing cells are the input cells that contain the values being used in your formulas.



It's best to avoid using a formula cell as a changing cell, because the scenario will replace the formula with a constant value, which could cause errors or mistakes in your calculations.

Tip!

It's good practice to create names for your input cells so users can easily see which values are being replaced.

Data→Forecast→What-If Analysis→Scenario Manager...

DEVELOP YOUR SKILLS: E8-D5

In this exercise, you will create scenarios using the mortgage calculation to see what the result will be for a few specific situations that could arise.

1. Save your file as: **E8-D5-ATCFinancials**

   You will create three scenarios based on possible changes to the price, interest rate, down payment, and term. To begin, you will define names for the cells.

2. Switch to the **Mortgage** worksheet and select the **range B4:C11**.
3. Choose **Formulas→Defined Names→Create from Selection**.

4. Ensure **Left Column** is checked and click **OK**.

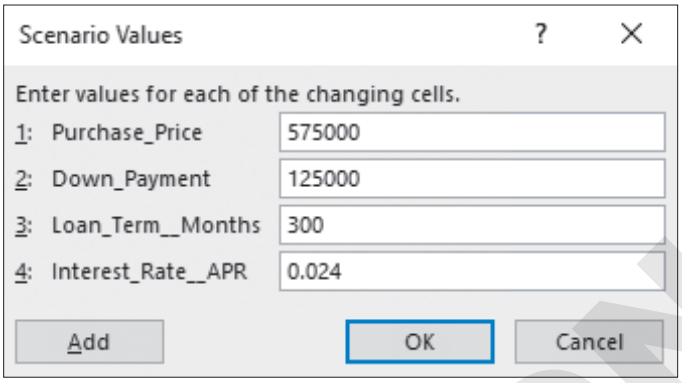
   This will name your input cells as well as the result cells in column C, using the labels in column B.

5. Select the **range C4:C7** (which will be the changing cells) and choose **Data→Forecast→What-If Analysis→Scenario Manager…**.

6. In the Scenario Manager dialog box, which shows there are currently no scenarios created, click **Add**.

7. Enter **`Best`** for the scenario name, confirm the changing cells are C4:C7 based on your previous selection, and click **OK**.

8. For the Best scenario, enter these new values for the changing cells:



   You believe the best possible situation allows you to negotiate a price of $575,000 for the property, pay $125,000 down, pay the mortgage off in 25 years (300 months), and obtain an interest rate of 2.4% (0.024).

9. Click **OK** to create the new scenario, which brings you back to the Scenario Manager.

10. Add another scenario named **`Worst`** that uses the same changing cells as step 5.

11. Enter the new values as indicated:

Purchase_Price	**690000**
Down_Payment	**75000**
Loan_Term__Months	**420**
Interest_Rate__APR	**0.0299**

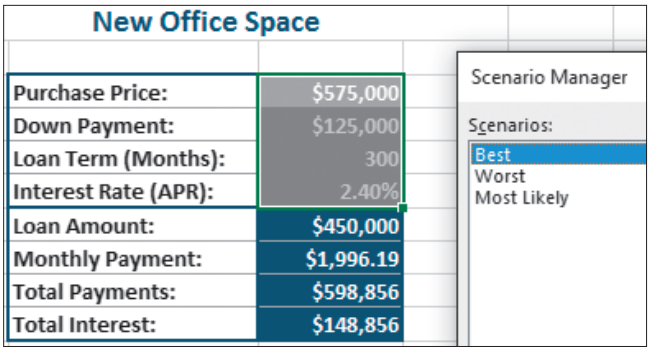
    The worst scenario is that the property costs $690,000, you can only pay a $75,000 down payment, the mortgage is for 35 years, and the interest rate goes up to 2.99%.

12. Add a third scenario named **`Most Likely`** using these values:

Purchase_Price	**640000**
Down_Payment	**90000**
Loan_Term__Months	**360**
Interest_Rate__APR	**0.0269**

    The most likely situation is that the property costs $640,000, the down payment is $90,000, the mortgage term is 30 years, and the interest rate is 2.69%.

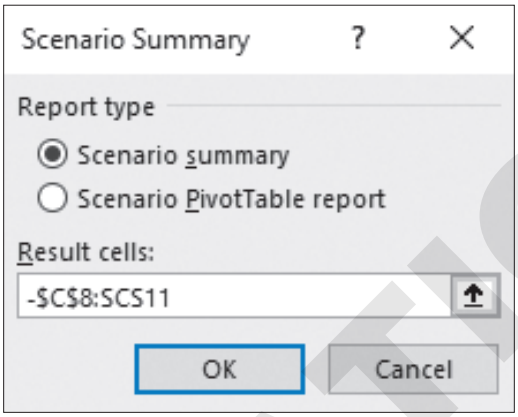
13. In the dialog box, choose the **Best** scenario and click **Show** to display the new values in the gray input cells, which automatically update the results in the blue formula cells.



Note the changes to the loan amount, payments, and interest.

14. In the dialog box, click **Summary**.

15. Choose the **Scenario Summary** report type and the **range C8:C11** as the result cells and then click **OK**.



The Scenario Manager inserts a new sheet that shows the values of the changing cells and result cells listed for the three scenarios as well as the current values that match the best scenario.

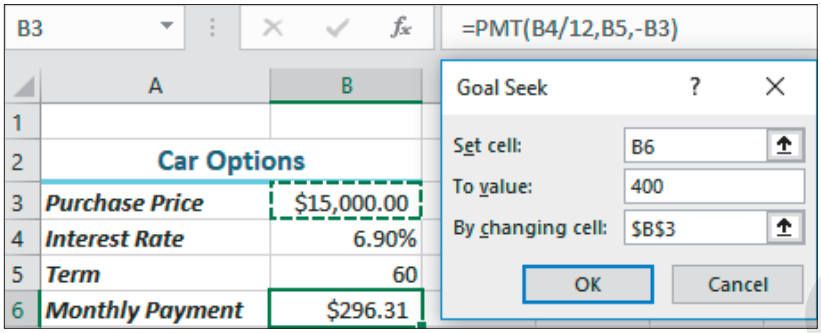
Scenario Summary	Current Values:	Best	Worst	Most Likely
Changing Cells:				
Purchase_Price	$575,000	$575,000	$690,000	$640,000
Down_Payment	$125,000	$125,000	$75,000	$90,000
Loan_Term__Months	300	300	420	360
Interest_Rate__APR	2.40%	2.40%	2.99%	2.69%
Result Cells:				
Loan_Amount	$450,000	$450,000	$615,000	$550,000
Monthly_Payment	$1,996.19	$1,996.19	$2,363.40	$2,227.89
Total_Payments	$598,856	$598,856	$992,627	$802,039
Total_Interest	$148,856	$148,856	$377,627	$252,039

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

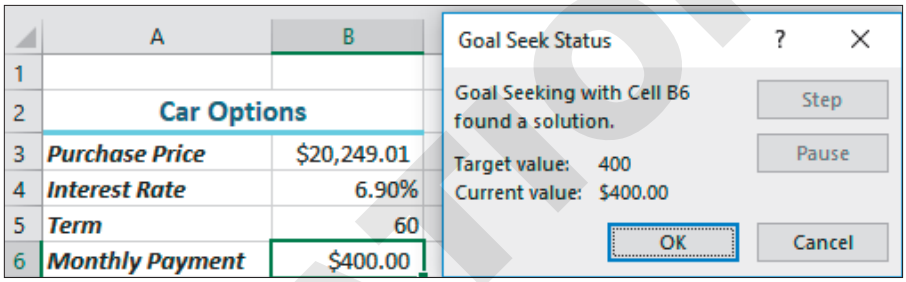
16. Save your work.

Goal Seek

Another What-If Analysis tool is Goal Seek, which is useful when you know the desired result and you want Excel to find the input required to achieve that result. For example, you might want your monthly car payment to be $400, and you know the interest rate and term. You could use Goal Seek to work backward to figure out how much you can afford to spend on the car (the loan amount).



The set cell *must* contain a formula. In this example, cell B6 contains the formula *=PMT(B4/12,B5,-B3)*. The changing cell must be a cell reference that directly or indirectly impacts the result of the formula—in this case, cell B3. Goal Seek can take a few seconds, as Excel has to work through the hundreds or thousands of possible variables until a solution is found.



The new result displays in cell B3, showing you can afford to spend $20,249.01.

Data→Forecast→What-If Analysis→Goal Seek...

DEVELOP YOUR SKILLS: E8-D6

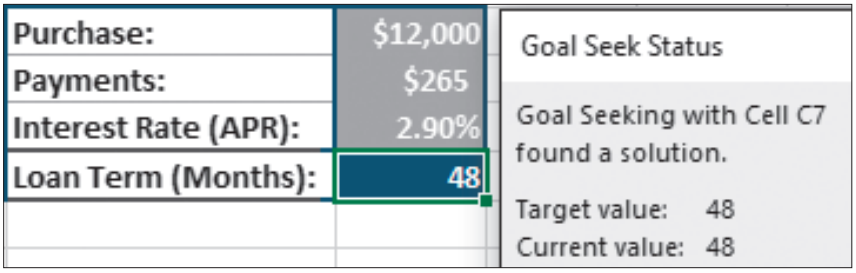
Airspace is purchasing a new printer. In this exercise, you will use Goal Seek to determine the monthly payment required to pay for the new printer in four years (48 months).

1. Save your file as: **`E8-D6-ATCFinancials`**
2. Switch to the **Printer** sheet, select **cell C7** if necessary, and choose **Data→Forecast→What-If Analysis→Goal Seek...**.

   Because you selected cell C7 in the worksheet, C7 appears in the Set Cell box by default.
3. Enter **48** in the To Value box.

4. In the By Changing Cell box, select **cell C5** and click **OK**.

   Goal Seek works through the possibilities and finds the solution. In the worksheet, the payment has been adjusted to $265 (rounded) and the loan term is now 48 months.



5. Click **OK** to close the Goal Seek window and keep the new values.
6. Select **cell C5** and increase the decimal to show two decimal places and the exact payment of $265.08.
7. Save the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).

Reinforce Your Skills

REINFORCE YOUR SKILLS: E8-R1

Use Financial Functions and Data Tables

In this exercise, you will use financial functions and data tables to calculate the Kids for Change budget for the upcoming year, which includes paying down a loan and purchasing a new van and also takes into consideration the anticipated funding obtained from their summer charity race.

1. Open **E8-R1-Forecast** from your **Excel Chapter 8** folder and save it as: **`E8-R1-Forecast2023`**

   There are two vans you are looking at purchasing. One is a bit more expensive, but the seller is offering better loan terms. You will insert the calculations for the first option and then copy the formulas for the second option.

2. Calculate the loan amount in **cell C11** by entering the formula: **`=C7-C8`**
3. In **cell C12**, choose **Formulas→Function Library→Financial →PMT**.
4. Enter these arguments for the PMT function (note the **–** sign in the Pv argument):

Rate	**`C10/12`**
Nper	**`C9`**
Pv	**`-C11`**

5. Click **OK**.

   The monthly payment is $331.11 for option 1.

6. Calculate the total payments by entering the formula **`=C12*C9`** in **cell C13**.
7. Calculate the total interest by inserting the formula **`=C13-C11`** in **cell C14**.
8. Select all four formulas in the **range C11:C14** and use the **fill handle** to copy them across to **column D**.

   The monthly payment for option 2 is $194.14, which is much lower, but the total interest is higher.

Future Purchase Planning			
Transportation		Option #1	Option #2
	Purchase Price:	$11,900	$13,500
	Down Payment:	$1,000	$1,000
	Loan Term (Months):	36	72
	Interest Rate (APR):	5.90%	3.75%
	Loan Amount:	$10,900	$12,500
	Monthly Payment:	$331.11	$194.14
	Total Payments:	$11,920	$13,978
	Total Interest:	$1,020	$1,478

The charity holds a $12,000 loan at a low interest rate that is renewed each year, so you would like to calculate the remaining debt after making payments of $100 each month.

9. In **cell C21**, insert the FV function with these arguments (note the – sign):

Rate	`C20/12`
Nper	`C18`
Pmt	`C19`
Pv	`-C17`

The debt at the end of the year will be $11,019.

Now you will create forecasts for the funds you expect to raise at the summer charity race. The formula calculates the funds raised based on an estimated $2.50 in costs for each participant, an average of $25.00 raised by each participant, and fixed costs of $300 to rent tents and tables for the event and supply food for volunteers.

10. Select **cell G25**.

In the Formula Bar, see that the formula is a reference to the formula in cell C29 (the result of the formula doesn't show on the worksheet because it is formatted in white font color).

11. Select the **range F25:G36** and choose **Data→Forecast→What-If Analysis** → **Data Table…**.

12. Click the **Column Input Cell** box and then click **cell C27** (the expected number of participants) in the worksheet.

This replaces the value of 150 with the values 100–200 in column F to calculate the amount of funds raised if there are anywhere from 100 to 200 participants.

13. Click **OK** to insert the data table.

14. Select the **range G26:G36** and change the number format to **Currency** with no decimals.

The average amount raised per participant is an estimate based on last year's results. If the participants are not as successful at raising funds this year, or if you encourage them to try harder by offering an incentive, this number could fluctuate.

15. Select the **range J25:O36** and choose **Data→Forecast→What-If Analysis** → **Data Table…**.

Notice the formula in cell J25 is again a reference to cell C29.

16. In the Data Table dialog box, indicate **cell C26** as the row input cell and **cell C27** as the column input cell and then click **OK**.

17. Select the **range K26:O36** and change the number format to **Currency** with no decimals.

18. Save your work.

REINFORCE YOUR SKILLS: E8-R2

Work with Scenario Manager and Goal Seek

After doing some more shopping, you found two more appealing vehicles. In this exercise, you will add more options for vehicles to purchase and adjust the payments made to the loan to pay off more of the debt.

1. Save your file as: `E8-R2-Forecast2023`

2. Select the **range D6:D10** and choose **Data→Forecast→What-If Analysis** → **Scenario Manager…**.

3. Choose **Add**, type `Option #2` for the scenario name, and click **OK**.

4. Confirm these values for the new scenario:

Option	**#2**
Purchase_Price	**13500**
Down_Payment	**1000**
Loan_Term_Months	**72**
Interest_Rate__APR	**0.0375**

5. Click **Add** to save the scenario values for Option #2 and add a new scenario for Option #3.
6. Enter **Option #3** for the name and click **OK**.
7. Enter these values for the new scenario:

Option	**#3**
Purchase_Price	**14999**
Down_Payment	**1000**
Loan_Term__Months	**60**
Interest_Rate__APR	**0.0299**

8. Click **Add** to save the scenario values for Option #3 and add another new scenario.
9. Use **Option #4** as the scenario name, enter these values, and click **OK**:

Option	**#4**
Purchase_Price	**12575**
Down_Payment	**1000**
Loan_Term__Months	**60**
Interest_Rate__APR	**0.048**

10. Select **Option #3** and click **Show** to display the scenario on your worksheet, then select **Option #4** and click **Show** again.

    Options #1 and #4 are displayed on the worksheet; options #2 and #3 are saved as scenarios that you can view again later.

11. Close the Scenario Manager.

    Now you want to determine the payments needed to bring the loan down to $10,000 at the end of the year.

12. Use Goal Seek to set **cell C21** to the value of **10000** by changing **cell C19**.
13. Format **cell C19** with two decimal places.

    The payments will now be $184.22 to reduce the debt to $10,000.

14. Save and close the file.

REINFORCE YOUR SKILLS: E8-R3

Determine Relocation Costs

Kids for Change is moving! In this exercise, you will calculate the cost of relocating the headquarters to a downtown location versus an office in the suburbs. You'll also create a data table to forecast funds that can be raised from holding a charity dinner to help pay for the move.

1. Open **E8-R3-HQ** from your **Excel Chapter 8** folder and save it as: **`E8-R3-HQOptions`**
2. In **cell C10** on the **HQ** sheet, enter **`=C6-(C7*C6)`** to calculate the loan amount.

   The down payment is 5%, so the loan amount is the purchase price less 5% of the purchase price. Note: If you use the mouse to select the cells, the formula will show cell names instead of C6 and C7.
3. In **cell C11**, enter the formula **`=PMT(C9/12,C8,-C10)`** to calculate the monthly payment amount.
4. In **cell C12**, enter **`=C11*C8`** to calculate total payments.
5. In **cell C13**, enter **`=C12-C10`** to calculate total interest.

   Total payments are $395,823 and total interest is $125,073.
6. Select the **range C5:C9** and create a new scenario named **`Downtown`** that uses the current worksheet values.
7. Add a second scenario named **`Suburbs`** using these values:

Option	**`Suburbs`**
Purchase_Price	**`239500`**
Down_Payment	**`0.05`**
Loan_Term__Months	**`300`**
Interest_Rate__APR	**`0.0319`**

   The purchase price is lower at $239,500; the interest rate (3.19%) is lower, too.
8. Show the Suburbs option in the worksheet and then close the Scenario Manager.
9. Switch to the **Dinner** worksheet and in **cell B9**, enter **`=(B6-B5)*B7-B8`** to calculate expected funds raised at the charity dinner if the maximum capacity is reached.

   The formula takes each ticket price less the cost per guest, multiplies by capacity if the event sells out and 300 guests attend, and then subtracts the cost of the hall rental.
10. Select the **range E5:J10**.

    Cell E5 contains a reference to the formula you created in cell B9, which you can use to create a data table to see the results if anywhere from 200 to 300 tickets are sold and the ticket price is increased or decreased between $42 and $52.
11. Create a data table in which the row input cell is the ticket price in **cell B6** and the column input cell is the max capacity in **cell B7**.

    You will now use Goal Seek to determine how many tickets need to be sold to break even.
12. Select **cell B9** and use Goal Seek to set that cell to **0** (which represents only covering the costs) by changing **cell B7**.

    You need to sell at least 18 tickets to cover your costs.
13. Save your work and close the file.

Apply Your Skills

APPLY YOUR SKILLS: E8-A1

Forecast Return on Investment (ROI)

In this exercise, you will use data from the marketing team at Universal Corporate Events to forecast the return on investment from a proposed advertising campaign.

1. Open **E8-A1-Advert** from your **Excel Chapter 8** folder and save it as: **`E8-A1-AdvertROI`**

   The information presented here shows a calculation based on how many hours the ad runs, the reach of the audience, and the average sales rate for converting the audience into sales.

2. In **cell B15** on the **ROI** sheet, enter a formula to calculate the net profit by subtracting total costs from total sales.
3. Select the **range E7:K12**.
4. Insert a data table based on the formula in **cell B15** using the appropriate cells for the two variables, sales rate, and ad hours.
5. Adjust the number format for the **range F8:K12** to Currency with no decimals.
6. Select the **range A6:B15** and use the **Create from Selection** command to create defined names for the cells from the values in the left column.
7. Select the **range B8:B10** plus **cell B12**.

   Hint: Use the Ctrl key.

   You will create another scenario, and these will be the changing cells.

8. Use the Scenario Manager to add an **`Estimate`** scenario that uses the current worksheet values.

   You have to decide whether to invest in better production (by paying a higher production cost and paying more for prime-time ad spots), if the results increase the sales rate and amount enough to increase your overall profit.

9. Add a second scenario named **`High Quality`** using these values:

Sales_Rate	**`0.0192`**
Costs_Per_Hour_Airtime	**`14500`**
Total_Production_Cost	**`120000`**
Avg_Sale_Amount	**`625`**

10. Show the results for the High Quality scenario in the worksheet and then close the Scenario Manager.

    Your net profit based on this scenario would be $830,000.

11. Save your work.

APPLY YOUR SKILLS: E8-A2

Determine Interest Costs

In this exercise, you will use the NPER function to determine the interest cost if Universal Corporate Events borrows $1M to pay for the ad campaign.

1. Save your file as: **`E8-A2-AdvertROI`**

   UCE has budgeted $25,000 per month, and the interest rate is fixed at 5.89%.

2. Switch to the **Financing** sheet and in **cell B9**, use a function to calculate the term of the loan based on the finance amount, interest rate, and payments.

   Hint: Remember to divide the interest rate by 12 to get the monthly rate, since you want to determine the number of monthly periods; use a negative value for Pv to represent a loan.

   The actual term is more than 44 months.

3. Use Goal Seek to change the payments so the term is exactly 48 months.

4. The result displays eight decimal places, but you can round this off, so decrease the decimal places to zero.

   The monthly payments would be $23,435 to pay off the $1M loan in four years.

5. In **cell B10**, enter a formula that multiplies the payments by the term and then subtracts the initial finance amount to return the total interest.

   The total interest cost for the loan is $124,862.03, which you will add to the total costs of the campaign on the ROI sheet.

6. Go to the **ROI** sheet and edit the formula in **cell B14** so the total cost includes the total interest from the Financing sheet.

   The total costs are now $1,694,862, which reduces the overall profit to $705,138.

7. Save your work and close the file.

APPLY YOUR SKILLS: E8-A3

Perform a Cost Analysis

In this exercise, you will use financial functions and what-if analyses to help Universal Corporate Events analyze its office renovation project and decide how to finance it.

1. Open **E8-A3-Reno** from your **Excel Chapter 8** folder and save it as: **`E8-A3-RenoCosts`**
2. In **cell B10**, insert the PMT function based on the renovation costs, term, and interest rate.

   Hint: Multiply years by 12 to get the number of payments for the Nper argument.

3. In **cell B11**, insert a formula to calculate the total interest by multiplying the payments by the years, multiplying by 12, and then subtracting the renovation costs.
4. Select **cell F6** and insert a formula with a cell reference to the interest cost formula in **cell B11**.
5. Select the **range E6:F11** and insert a one-variable data table, substituting the values in **column E** for the length of the loan term in years.
6. Hide **row 6** in the worksheet.

7. Select the **range A7:B11** and create defined names for the cells from the selection based on the left column.

   Now you will create three scenarios and generate a summary report that compares the options.

8. Using **cells B7**, **B8**, and **B9** as the changing cells, create a scenario called **`Average`** based on the current worksheet data.

9. Create a new scenario called **`Best`** that uses these values:

Renovation costs	**`21,000`**
Term (years)	**`10`**
Interest rate	**`4.25%`**

10. Create another scenario called **`Worst`** that uses these values:

Renovation costs	**`30,000`**
Term (years)	**`20`**
Interest rate	**`5.5%`**

11. Generate a scenario summary report with the monthly payments and total interest cost for the result cells.

    The monthly payments for the Best scenario are slightly higher, but the total interest cost is much lower.

12. Save your work and close the file.

Project Grader

If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.

PROJECT GRADER: E8-P1

Calculating Costs Using Financial Functions and Scenarios

Taylor Games is considering the purchase of a new mill for making dice. The purchase involves variable terms. In this exercise, you will create a report that displays the possible costs of purchasing the mill at different rates and payments. Then, you will use this data in a data table to show what production rates and profits would be required to break even.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E8_P1_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E8_P1_Start** from your **Excel Chapter 8** folder.
2. In **cell C9** of the **Dice Maker Finance** worksheet, use the NPER financial function to calculate the term in months.
3. In **cell C10**, calculate the total interest using the formula: **`=(C8*C9)-C6`**
4. Create a new scenario using these settings:
   - Scenario name: **`Best`**
   - Base it on the range: **C6:C8**
   - Change the annual interest rate to: **`0.0425`**
   - Change the monthly payment to: **`750`**
5. Create another scenario using these settings:
   - Scenario name: **`Worst`**
   - Base it on the range: **C6:C8**
   - Change the annual interest rate to: **`0.075`**
   - Change the monthly payment to: **`500`**
6. Create a scenario summary that uses **`A6:C13`** for the Result cells.
7. Move the **Scenario Summary** worksheet to the end of the workbook (to the right of the *Dice Maker ROI* worksheet).
8. In **cell C10** of the **Dice Maker Finance** worksheet, use the Goal Seek tool and these settings to adjust the total interest:
   - Adjust the total interest to: **`5000`**
   - By changing the Monthly Payment amount
9. In **cell D8** of the **Dice Maker ROI** worksheet, create a reference to **cell C13** of the **Dice Maker Finance** worksheet.
10. In the Dice Maker ROI worksheet, create a two-variable data table using these guidelines:
    - Base the data table on the **range G7:J10**.
    - Use **cell D7** (*Profit Per Dice*) as the row input cell.
    - Use **cell D6** (*Monthly Production Rate*) as the column input cell.

11. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 8** folder as **`E8_P1_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 8** folder as: **`E8_P1_Submission`**

PROJECT GRADER: E8-P2

Creating Finance Tools

Classic Cars Club would like to offer finance tools for club members to calculate the costs of purchasing a classic car as well as possible investment value. In this exercise, you will create tables with formulas that will assist in calculating loan payments and future value. Then, you will display these formulas based on the value of a member's vehicle.

1. Download and open your Project Grader starting file.
    - *Using eLab:* Download **E8_P2_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
    - *Not using eLab:* Open **E8_P2_Start** from your **Excel Chapter 8** folder.
2. In **cell C9** of the **Finance Tools** worksheet, use the PMT financial function to determine the monthly payment based on the data provided in the **Payment Calculator** table.
3. In **cell C11**, calculate the total interest using the formula: **`=(C9*C10)-C7`**
4. Create a new scenario using these guidelines:
    - Scenario name: **`Best`**
    - Base it on the annual interest rate and term: (**cells C8** and **C10**)
    - Change the annual interest rate to: **`0.035`**
    - Change the term to: **`84`**
5. Create a new scenario using these guidelines:
    - Scenario name: **`Worst`**
    - Base it on the annual interest rate and term: (**cells C8** and **C10**)
    - Change the annual interest rate to: **`0.06`**
    - Change the term to: **`60`**
6. Show the Worst scenario.
7. In **cell G8**, calculate the future value using these settings:
    - Rate: **Cell F7**
    - Nper: **Cell F8**
    - Pmt: **`0`**
    - Pv: Use the negative value of **cell C7**.
8. Create a one-variable data table using these guidelines:
    - Base the data table on the **range F8:G16**.
    - Set the column input cell to **cell F8**.
9. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 8** folder as **`E8_P2_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 8** folder as: **`E8_P2_Submission`**

Extend Your Skills

These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.

E8-E1 That's the Way I See It

You are in the market for a new car and want to compare prices and payment options for your favorite cars. Open **E8-E1-Cars** and save it as: **E8-E1-CarOptions**

Research local car dealerships online and find at least three cars you might want to buy. Enter the details for your favorite option into the range B4:B8 in the worksheet. Enter the PMT function in cell B9 and save this option as a scenario, using the car's make and model for the scenario name. Add two more scenarios for the other cars and then create a summary report. Finally, create a one-variable data table in the range D4:E8 to calculate the different payments you would have to make if the interest rate for the loan fluctuates up or down slightly (you will have to enter the various interest rates first, in the range D5:D8).

E8-E2 Be Your Own Boss

Blue Jean Landscaping needs to purchase new equipment to expand its operations, including lawn tractors, trailers, and a new vehicle—all of which add up to a total loan of $65,000. The bank has several financing options that you are comparing. Open **E8-E2-Expansion** and save it as: **E8-E2-ExpansionFinancing**

Insert the appropriate formulas into the range C7:C9 and then create a two-variable data table next to the calculations to compare the total interest paid based on changing the years and interest rates, using the options shown. Determine which option has the lowest total interest and highlight that option with an appropriate format. Then, use Goal Seek to determine what interest rate you would have to negotiate to reduce total interest to $5,750.

Loan Options
5 years at 3.5%
7 years at 3.25%
10 years at 3.0%

E8-E3 Demonstrate Proficiency

With your recent success selling BBQ sauce by the bottle in local retail shops, you expect to see sales grow even more next year. To forecast growth in profit, you will use a data table. Open **E8-E3-SauceSales** and save it as: **E8-E3-SauceSalesGrowth**

The formulas for last year's sales and profits have been created, as has the total for all three BBQ sauce flavors and the expected growth in sales and profit for next year. Using references to the formulas in the range B12:D12 and cell B13, create a data table in the range A16:E24 that shows forecasts for next year if the expected growth of 5% is replaced with values from 3% to 10%. Then create two scenarios, one using current data and another in which the price is $8.00 and the cost is reduced to $3.00 for all three flavors.

EXCEL

9 Text Functions, Conditional Functions, and Formula Auditing

In this chapter, you will learn various functions that give you greater ability for analysis and decision making. You will create functions that sum or count values that meet your desired criteria. You will also explore functions used to clean up and rearrange text on your worksheet, as well as learn what you can do to find and prevent formula errors in your calculations.

LEARNING OBJECTIVES

- Use functions to format text
- Create conditional functions using IF and IFS criteria
- Create formulas using nested functions
- Find and correct errors in formulas
- Use 3-D cell references in formulas

Project: Analyzing Sales Information

The Airspace Travel monthly sales results are in, and the data has been compiled for all company agents and managers in a worksheet for your review. Because the data was imported from different sources, you need to clean up the text entries. You'll also use various conditional functions to pull out important information about specific performance.

Using Functions to Modify Text

Workbook data that comes from sources other than Excel may be formatted incorrectly. Data may also have been entered by multiple users, each using a different method of data entry. For example, one person might enter names into a worksheet using all capital letters, and another person might capitalize the first letter of the name only. Then when the two worksheets are combined, name entries will not be consistent. Another problem can occur when data is either entered in too few or too many columns, such as entering the first and last names together in one column when it is better to enter this data in separate columns.

Tip! *When storing data, it's best practice to use the smallest individual units for each field of information. In Excel, this means each column.*

Although many people primarily think of Excel as a way to work with numbers, there are quite a few functions that allow you to work with text as well. You can use text functions to fix the issues mentioned or to manipulate text data to be used for a different purpose. There are functions that let you change case, combine or separate text, remove spaces, and extract or even replace text.

Changing Case

PROPER, UPPER, and LOWER are three functions that allow you to change the case of the input text. PROPER converts the first letter of each word to uppercase (capital) and all other letters to lowercase. As you can probably guess, UPPER converts all letters to uppercase and LOWER converts all letters to lowercase.

When using these functions, the function argument is simply the text to convert; you can use a cell reference or the text itself. For example, cell A2 shows text where some words are in all lowercase letters and another word is in all uppercase letters. The formula displayed in cell B2, =PROPER(A2), tells Excel to capitalize the first letter of each word from cell A2, and the result is *Use Your Imagination* (displayed in cell C2).

	A	B	C
1	**Text**	**Formula**	**Result**
2	use your IMAGINATION	=PROPER(A2)	Use Your Imagination
3		=LOWER("AND")	and
4	make some magic!	=UPPER(A4)	MAKE SOME MAGIC!

Extracting Text

In some cases, only a part of the cell's contents is needed, or there may be extra characters or spaces you don't want. The LEFT, MID, and RIGHT functions extract a certain number of characters from the text string. The TRIM function removes all spaces except for a single space between words.

The LEFT and RIGHT functions take two arguments: the text (which can be actual text or a cell reference) and the number of characters to extract.

	A	B	C
1	Text	Formula	Result
2	BASKabcdefg	=LEFT(A2,4)	BASK
3	abcdefgETB	=RIGHT(A3,3)	ETB
4	abcALLdefg	=MID(A4,4,3)	ALL
5	Who likes basketball?	=TRIM(A5)	Who likes basketball?

The TRIM function's only argument is the text from which to remove the spaces.

The MID function requires three arguments: the text, the position of the first character to extract, and then the number of characters to extract.

Merge and Modify Text with Functions and Flash Fill

There are several ways to merge, or concatenate, text in Excel. The CONCAT function, which replaces the CONCATENATE function from earlier versions of Excel (though it's still available for compatibility), allows you to combine two or more separate text entries or a range of text entries into one cell. TEXTJOIN is another function that combines text; it also inserts a character between each entry, called a delimiter.

Flash Fill can also be used to combine text, and it has other advantages too. Flash Fill can combine multiple entries into one cell or extract text from one text string into multiple entries, and it can perform many other tasks. After you have entered one or two examples, Flash Fill looks for patterns in your data entries and automatically fills in the remaining values.

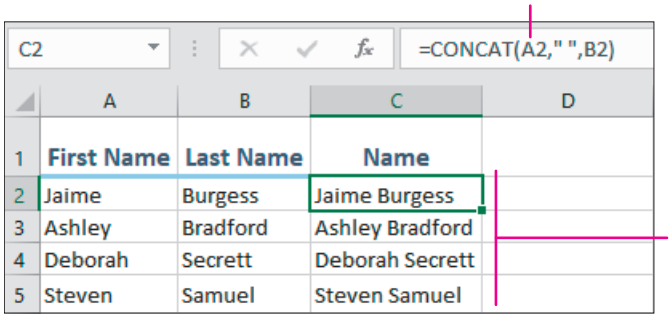
Tip! *The CONCAT and TEXTJOIN functions are used as part of a formula, whereas Flash Fill is just a tool that enters text values into cells.*

For example, if you have a column with First Name and another column with Last Name, CONCAT or TEXTJOIN can be used to combine the two names into one cell. Flash Fill can do this but can also do the opposite task; take one name and separate it into First and Last columns. You could use Flash Fill to extract one part of the cell only, such as the first three letters of the last name, or to extract the area code from a phone number. Flash Fill can even append or insert text, such as automatically creating email addresses from a list of employee names.

One big difference is that Flash Fill uses adjacent data only, whereas CONCAT and TEXTJOIN use a cell or range reference so the text could be anywhere on the worksheet or even on another

worksheet. Another difference is that a function will update automatically if changes are made to the source of the text, but after Flash Fill is used the text becomes static.

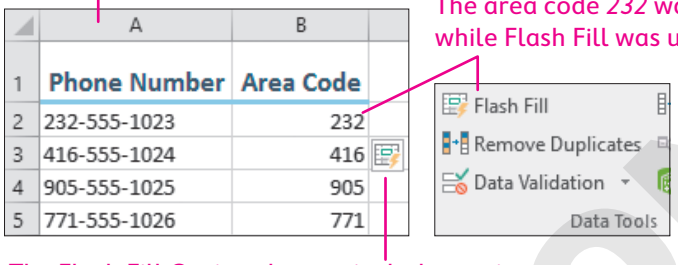
Column C uses CONCAT to combine the text from columns A–B into one cell.



The function arguments are cell references or text. The second argument (" ") inserts the text within the quotation marks, in this case a space, between the first and last names from column A and B.

The original data is in column A.

The area code *232* was manually entered in cell B2 while Flash Fill was used to fill in the others.



The Flash Fill Options button includes options to Accept and Undo the suggested entries.

Data→Data Tools→Flash Fill | Home→Editing→Fill→Flash Fill

Other Text Functions

Be sure to take some time to explore the other text functions available in Excel. There are text functions that allow you to replace or substitute text within a text string, functions for finding the text's position, and functions to calculate text length. You can even insert a function that will repeat a text character a specified number of times. These are just some examples; there is a long list of functions in the Text category of Excel's function library.

TEXT FUNCTIONS

Function	Description	Example
REPLACE	Replaces part of a text string with another text string, such as replacing digits in a credit card number to display 8181-xxxx-xxxx-1188	Cell B1: 8181-3011-1103-1188 Formula: =REPLACE(B1,6,9,"xxxx-xxxx") Result: 8181-xxxx-xxxx-1188
SUBSTITUTE	Looks for an exact match (case-sensitive) and replaces old text with new text if found, such as replacing Mgr with Manager	Cell B4: Mgr Formula: =SUBSTITUTE(B4,"Mgr","Manager") Result: Manager

TEXT FUNCTIONS

Function	Description	Example
LEN	Determines the number of characters in a cell entry	Cell B7: 2223334444 Formula: =LEN(B7) Result: 10
REPT	Repeats text, such as the letter A five times	Formula: =REPT("A",5) Result: AAAAA

Formulas→Function Library→Text

DEVELOP YOUR SKILLS: E9-D1

In this exercise, you will use text functions to clean up the text entries in the Airspace Sales Results worksheet.

1. Start Excel, open **E9-D1-Sales** from your **Excel Chapter 9** folder, and save it as: **`E9-D1-SalesAnalysis`**

Change Case

The workbook opens to the Jul Sales sheet. Notice that the names in column A are not consistent in terms of the capitalization used. You want to correct that and, to begin, you will create a blank column in which the names can be converted to proper capitalization.

2. Insert a new column to the left of **column A**.
3. In **cell A5**, enter the formula **`=PROPER(B5)`** and then fill the formula down the column to **cell A33** and **AutoFit** the column width.

   The cells now display the text with the first letter of each name capitalized. To keep just the text and not the function, you will copy and paste the values only to the same range.
4. With the **range A5:A33** selected, choose **Home→Clipboard→Copy**.
5. Without changing the selection, choose **Home→Clipboard→Paste menu button →Values** to paste the values only (not the formulas) into the selected range.

   Instead of the PROPER function in the Formula Bar for cell A5, you should now see the text Amir Johnson, *with both names capitalized.*
6. Delete the names from the **range B5:B33**.

Extract Text

7. Insert a column to the left of **column E**.

   You will extract the first six characters of the employee ID numbers, removing the extra characters.
8. In **cell E5**, enter the function **`=LEFT(D5,6)`** and then fill the formula down the column.
9. With the **range E5:E33** still selected, copy the formulas and then paste the values only into **column D**.
10. Delete the formulas from the **range E5:E33**.

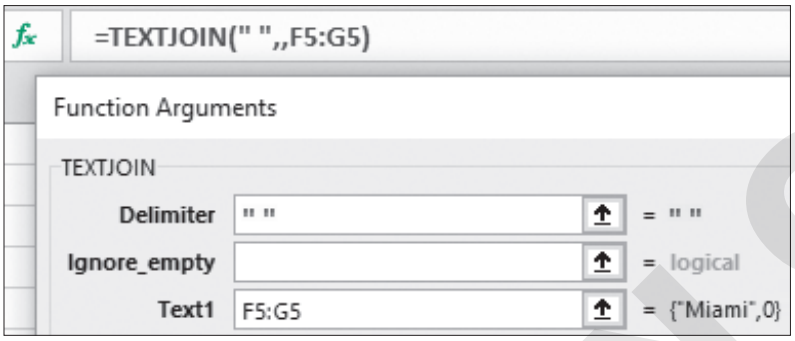
Combine Text

The location names that contain two words were mistakenly split into two columns, so you need to correct this by combining the two columns into one.

11. In **cell E5**, enter the function **`=CONCAT(F5:G5)`** and then fill the formula down the column.

The cities with two names are missing a space between the two words. To fix this, the CONCAT function could be modified, but then a space would be added to each entry even if it isn't necessary. TEXTJOIN will work better because a space will only be added when needed.

12. Replace the formula in **cell E5** with the TEXTJOIN function:



13. Fill the formula down **column E**; with the **range E5:E33** still selected, copy the formulas and paste the values only into **column F**.

14. Delete the formulas from **column E** (but keep the column) and delete **column G** (remove the entire column).

Use Flash Fill

Now you will fill in the blank columns and create a list of email addresses for the employees.

15. In **cell B5**, enter the name **`Amir`** and complete the entry.

16. Choose **Data→Data Tools→Flash Fill** to fill the first names down column B.

Based on the first example you typed, Amir, Excel uses the text before the space in column A.

17. In **cell C5**, enter the name: **`Johnson`**

18. Use the **fill handle** in **cell C5** to copy the last name down **column C**, then click the **Auto Fill Options** button and choose **Flash Fill** to replace *Johnson* with each person's actual last name.

Tip!

Whether you use Flash Fill from the Ribbon or Auto Fill Options, the results will be the same.

The advantage of Flash Fill is that if the result you want is text (not a formula) in each cell, Flash Fill skips the step of inserting a formula before copying and pasting values. The names are now in the appropriate column, so column A can be removed.

19. Delete **column A** entirely.

20. In **cell D4**, enter the heading: **`Email`**

21. In **cell D5**, enter this email address for Amir: **A.Johnson@airspace.com**

    Note that the email address automatically converts to a hyperlink. Although the email address is not fully visible, do not widen the column.

22. In **cell D6**, begin entering Robert's email address by typing **R** and stop when the suggested text appears in column D.

23. Tap Enter to accept the suggestions and insert the proper email addresses for all other employees in the column.

24. Save the file.

Creating Conditional Functions Using IF Criteria

Conditional functions allow you to sum, count, and find the average of a range of cells—if the cells meet your desired criteria.

IF CRITERIA FUNCTIONS

Function	Arguments [Optional]
SUMIF	=SUMIF(range,criteria,[sum range])
AVERAGEIF	=AVERAGEIF(range,criteria,[average range])
COUNTIF	=COUNTIF(range,criteria)
SUMIFS	=SUMIFS(sum range,range1,criteria1,range2,criteria2...)
AVERAGEIFS	=AVERAGEIFS(average range,range1,criteria1,range2,criteria2...)
COUNTIFS	=COUNTIFS(range1,criteria1,range2,criteria2...)

In the preceding table, you may have noticed that a single criterion is entered for the IF functions, and multiple criteria are entered for the IFS functions. Think of IFS as the plural of IF!

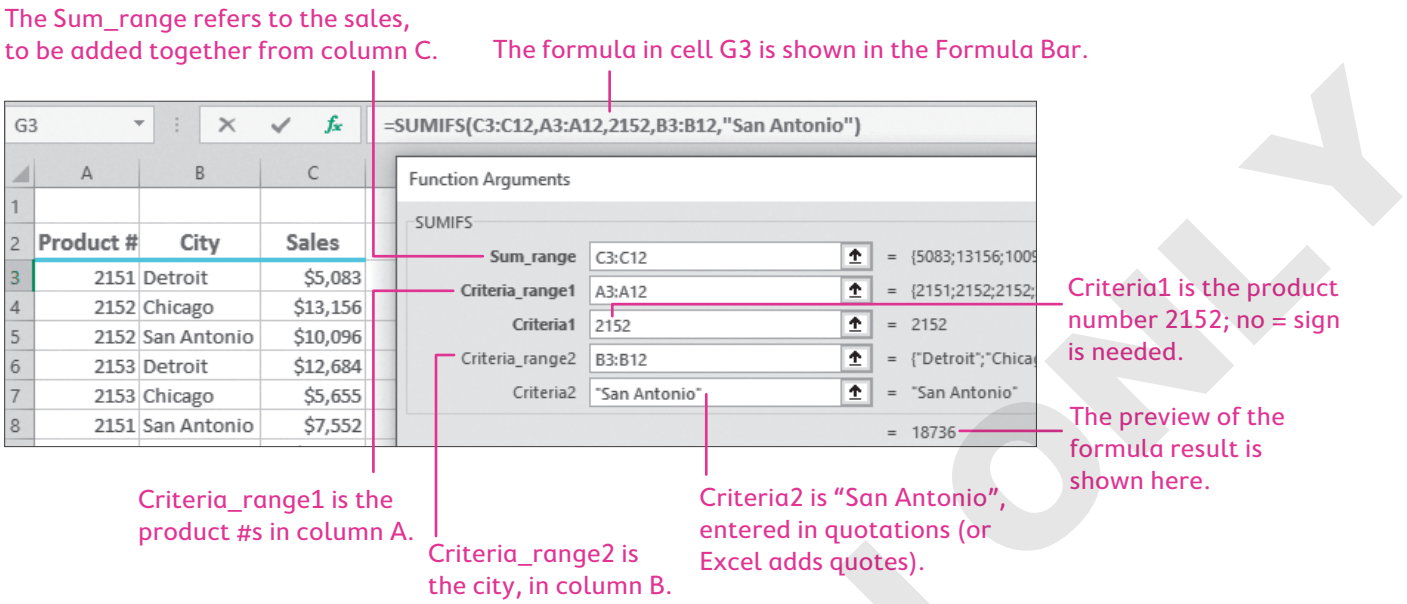
IF CRITERIA FUNCTION ARGUMENTS

Arguments	Description
Range	These are the cells to be compared with the criteria.
Criteria	They can be a comparison value or text, or an expression using a comparison operator such as =, >, <, >=, <=, <> (not equal to).
Sum range/Average range	This is the range to be summed or averaged, which can be different from the range being compared with the criteria. For IF functions, the sum/average range is optional; if omitted, the range from the first argument is used. For IFS functions, the sum/average range comes first and is required.

Using the conditional functions allows you to create formulas to find information such as:

- How many customers live in Florida?
- How many employees in the Human Resources division have salaries greater than $50,000?
- What are the total sales of product #2152?

For example, if you want to discover the total sales of product #2152 for employees in San Antonio, you would use the SUMIFS function because there are two criteria—the product and the city.



	A	B	C
1			
2	Product #	City	Sales
3	2151	Detroit	$5,083
4	2152	Chicago	$13,156
5	2152	San Antonio	$10,096
6	2153	Detroit	$12,684
7	2153	Chicago	$5,655
8	2151	San Antonio	$7,552

The Function Arguments dialog box makes it easier to enter the arguments because it can be difficult to keep track of the arguments when entering them directly in a cell. The dialog box also shows a preview of the formula result as you add more conditions. The result of the formula above is shown in the worksheet here:

=SUMIFS(C3:C12,A3:A12,2152,B3:B12,"San Antonio")

D	E	F	G	H
	Summary			
	Product	City	Total	
	2152	San Antonio	18736	

DEVELOP YOUR SKILLS: E9-D2

In this exercise, you will use conditional functions to obtain information about the Miami sales team's performance.

1. Save your file as: **`E9-D2-SalesAnalysis`**

   The description for each calculation is located in column K. You will enter the appropriate formula for each in column L.

Use Single Criterion Functions

2. In **cell L5**, enter this formula: **`=COUNTIF(E5:E33,"Miami")`**

   The formula looks for the criteria Miami *and counts each cell that matches this text in the range E5:E33. The formula result shows nine sales employees listed in the Miami location. Next you will find the sum of the Miami sales employees' commissions.*

3. In **cell L6**, insert the SUMIF function from the Math & Trig category in the Function Library.
4. In the Function Arguments dialog box, use these arguments:

Range	**E5:E33**
Criteria	**Miami**
Sum Range	**I5:I33**

Once complete, the formula in the Formula Bar shows: =SUMIF(E5:E33,"Miami",I5:I33)

The range and the criteria are the same as the COUNTIF function in step 2, but the SUMIF function also uses the sum range, which are the commissions in the range I5:I33. The result shows $6,876 *in total commissions earned by employees in Miami.*

5. Format **cell L6** as **Currency** with no decimals.

Now you will find Miami's average sales.

6. In **cell L7**, enter: **=AVERAGEIF(E5:E33,"Miami",H5:H33)**

Note! *Remember, you can use the Function Arguments dialog box to enter formulas with several arguments.*

This time the range to average is the sales data in column H. The result of the formula is 10643.22222, *which you will reformat now.*

7. Format **cell L7** as **Currency** with no decimals.

Work with Multiple Criteria Functions

The next thing you want to find is the number of Miami employees who achieved more than $10,000 *in sales.*

8. In **cell L8**, insert the COUNTIFS function and open the **Function Arguments** dialog box.
9. Enter **E5:E33** for the first criteria range and **Miami** for the criteria text.

As you insert the arguments, more boxes for additional criteria appear. You can select the ranges from the sheet with the mouse or type them, whatever you prefer.

10. Enter **H5:H33** for the second criteria range and **>10000** for the criteria.

You will leave the third criteria range blank.

11. Click **OK** to enter the function and compare your formula in the Formula Bar to this one: *=COUNTIFS(E5:E33,"Miami",H5:H33,">10000")*

The formula searches for Miami *in the Location column and numbers higher than 10,000 in the Sales column, and then counts the employees that meet both criteria; the result is* 4.

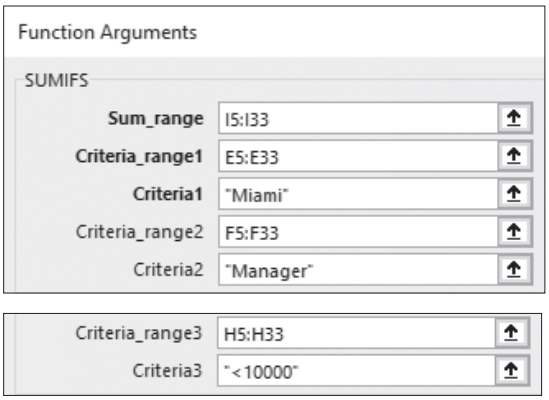
For comparison's sake, you also want to find out how many employees in Toronto had more than $10,000 *in sales.*

12. In **cell L8**, enter this formula: **=COUNTIFS(E5:E33,"Toronto",H5:H33,">10000")**

Use the Function Arguments dialog box, if desired.

The result is only three employees for Toronto. Now you want to find the total commissions paid out to Miami managers who had less than $10,000 *in sales. There will be three conditions this time: Location (Miami), Position (Manager), and Sales (less than* $10,000*); the sum range will be Commissions.*

13. In **cell L10**, insert the SUMIFS function and use these function arguments:



The complete formula in the Formula Bar should be:
=SUMIFS(I5:I33,E5:E33,"Miami",F5:F33,"Manager",H5:H33,"<10000")

This formula finds the sum for commissions if the criteria are met for Location, Position, and Sales. The result shows that $2,012 *in commissions was paid out to managers in Miami who did not achieve $10,000 in sales.*

14. Format **cell L10** as **Currency** with no decimals.
15. Save the file.

Nested Functions

There are times when you want to perform more than one function, without using two separate cells to do so. In those situations, it is possible to use functions inside of other functions. This is called *nesting* functions, or a *nested* function. Although this can be quite challenging with some functions, it can be fairly simple with others.

For example, when you use the AVERAGE function, you often get a long set of decimal places in the result. While you can adjust the number format, which will change the display of the number, the formula will store those decimal places for future calculations. In some cases, you might want to remove the decimal places altogether from the stored value, and this can be done by using a second function: the ROUND function. Thus, in the same cell, you could nest the AVERAGE function inside of the ROUND function to achieve the desired result.

This formula finds the average of the range F5:F52 and then rounds that result to zero decimal places.

Another example is, if you need more than one criterion to determine the result for an IF function, and there are more than two possible outcomes, you can nest an IF function in another IF function. For example, you could use the IF function to determine whether an employee achieved a sales goal and then inside that function place another IF function to determine if the employee also achieved a minimum number of sales.

The IFS Function

The IFS function also allows you to work with multiple conditions. With the IFS function, you are able to specify multiple criteria, and the function returns the value for the first one that is true. Depending on the situation, IFS can be used instead of nesting IF functions by rearranging the arguments slightly.

Rather than a value-if-false argument, like the IF function, one of the arguments in the IFS function *must* be true. This means you must carefully write your arguments to include at least one true possibility. Alternatively, the criteria for the last logical test can be entered as TRUE, which will return the corresponding value-if-true no matter what (as long as none of the previous logical tests are true).

The SWITCH Function

New!

The SWITCH function is another logical function that can simplify nested functions in some situations. SWITCH performs an action similar to a lookup and similar to nested IF functions. Essentially the function compares "an expression" to a list and returns the desired result for the matching value. This means it can be used to replace (or "switch") one thing with another. Like other functions, SWITCH can be combined (nested) with different functions to become even more useful.

For example, the SWITCH function can be used to evaluate the WEEKDAY of a specific date and return the desired results, perhaps the number of employees needed on that day of the week or a short text entry.

	A	B	C	D	E	F	G	H	I
1	Del's Restaurant								
2	Weekly Server Schedule								
3									
4		Date	Feb 18	Feb 19	Feb 20	Feb 21	Feb 22	Feb 23	Feb 24
5		Weekday	M	T	W	Th	F	Sa	Su
6	Name	Staff Needed	3	4	4	6	9	10	CLOSED

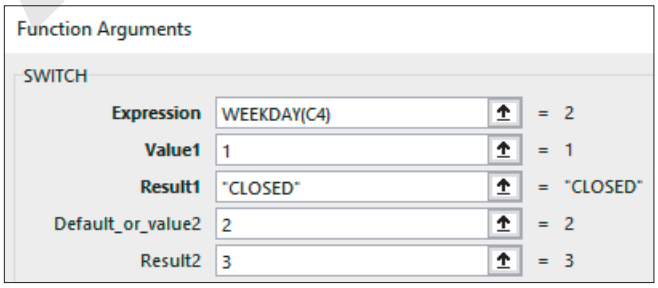
In this example, the SWITCH function evaluates the date in row 4 to return a short text entry in row 5 and the number of staff needed in row 6. The functions in cell C5 and C6 are:

- =SWITCH(WEEKDAY(C4),1,"Su",2,"M",3,"T",4,"W",5,"Th",6,"F",7,"Sa")
- =SWITCH(WEEKDAY(C4),1,"CLOSED",2,3,3,4,4,4,5,6,6,9,7,10)

Tip!

Remember, the WEEKDAY function examines the date and returns a 1 for Sunday, 2 for Monday, and so on.

Function arguments can be entered in any order, and up to 126 matching values can be entered. At least one value and one result are required, in addition to the expression to evaluate, and a default value can be entered if no matching values are found.



DEVELOP YOUR SKILLS: E9-D3

In this exercise, you will use a nested function to adjust the result of one formula and the IFS function to calculate an employee bonus in another formula.

1. Save your file as: **E9-D3-SalesAnalysis**
2. Select the Miami Average Sales amount in **cell L7**.
3. Increase the decimal to show three decimal places.

   The AVERAGEIF function results in a repeating decimal of .222.
4. Follow these steps to edit the formula:

   A. In the Formula Bar, click to place the insertion point between the = sign and AVERAGEIF and then type: **ROUND(**

   B. Click the right side of the Formula Bar and type **,0)** at the end of the formula.

   C. Click **Enter** on the Formula Bar to complete the changes.

   The result displayed now shows $10,643.000, *which is the average sales rounded to the nearest dollar.*
5. In **cell L7**, decrease the decimal to remove the decimals from the display.

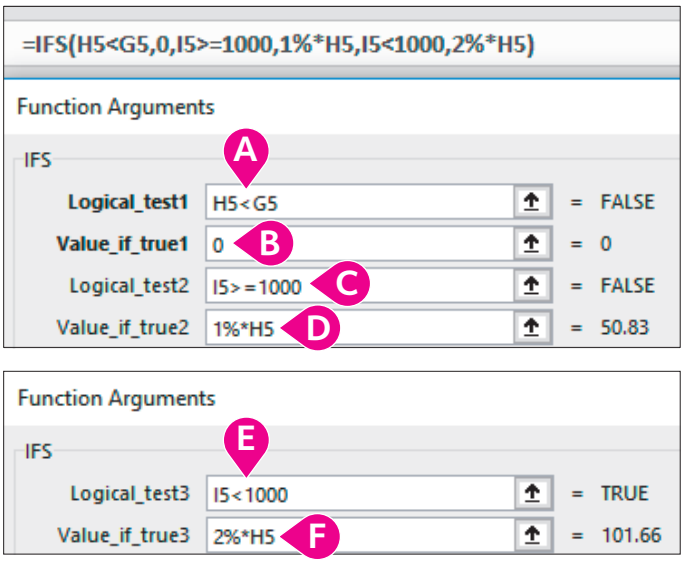
Using the IFS Function

6. Select **cell J4** and insert a new worksheet column.
7. In **cell J4**, apply a thick outside border and enter the heading: **Bonus**

   Because the commissions earned on sales can vary, you offer a 1% bonus to employees who met their sales target and a 2% bonus to employees whose commissions were also less than $1,000.
8. In **cell J5**, insert the **IFS** function from the Logical category of the Function Library.

Note! *The order of the logical tests is* very *important, since the function returns the value for the* first *test that is true!*

9. Follow these steps to create the IFS function:



- A In the first logical test, enter **H5<G5** to determine which employees did not meet their target.
- B The Value_If_True for employees who did not meet their target is no bonus, so enter: **0**
- C If the first test is false, the employee did meet their target, so enter **I5>=1000** in the second logical test to determine if their commissions were greater than or equal to $1,000.
- D If the second test is true, the employee did meet their goal but had commissions greater than $1,000, so call for a 1% bonus by typing: **1%*H5**
- E In the third logical test type: **I5<1000**
- F Type **2%*H5** as the Value_If_True formula so employees who did meet their goal and had commissions less than $1,000 will receive a 2% bonus.

10. Click **OK** to enter the formula, modify the number format to show two decimals, and then fill the formula down the column for all other employees.

    The result for the first employee is a bonus of $101.66.

11. Apply all borders to the **range J5:J33** to match the rest of the data and then reapply a thick outside border to **cell J4**.

Using the SWITCH Function

The company decided to modify the job titles, so you will use SWITCH to replace the existing names with new ones.

12. Select **cell G5** and insert a new column.

13. In **cell G5**, insert the **SWITCH** function with these arguments:

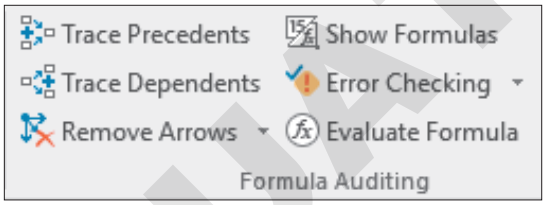
If cell F5 contains Agent *it will be replaced with* Sales Rep, *and if it contains* Manager *it will be replaced with* Sales Director.

14. Fill the formula down for all employees, then copy the new positions from **column G** and paste the values only into **column F**; delete **column G**.

15. Save your work.

Troubleshooting Formulas

As you might have noticed, working with formulas can sometimes be complicated. Excel's auditing tools can help you make sense of your worksheet when it contains a complex set of formulas. The auditing tools can help you identify which cells were used to create a formula or where a particular cell is being used in other formulas, as well as locate and correct errors in formulas.



Trace Precedents and Dependents

The Trace Precedents command displays arrows pointing to the current active cell from any cells that were used to produce the result. Trace Precedents works backward from the selected cell to show which cells affect the current result. Because the precedent cells could also use input from other cells to produce their results, there can be several layers of precedents. Repeating the Trace

Precedents command will display the next level of precedents until a warning sound indicates there are no more levels.

Name	Goal	Sales	# Sales
Bert	$ 1,000	$ 900	18
Ernie	1,200	1,300	12
Jen	800	950	21
Sarah	1,000	1,200	17
Total	**$ 4,000**	**$ 4,350**	**68**
Sales Above Goal		$ 350	
Average Sale		$ 63.97	

With the current cell displaying the Sales Above Goal amount, Trace Precedents shows that the total Goal and Sales cells are used to calculate the above-goal amount of $350.

Name	Goal	Sales	# Sales
Bert	$ 1,000	$ 900	18
Ernie	1,200	1,300	12
Jen	800	950	21
Sarah	1,000	1,200	17
Total	**$ 4,000**	**$ 4,350**	**68**
Sales Above Goal		$ 350	
Average Sale		$ 63.97	

Adding another level to Trace Precedents shows that the totals use the information in the Goal and Sales columns.

Although you can see which cells are used in a formula by looking at the formula in the Formula Bar, tracing precedents is much quicker and gives you a better way to visualize the flow of data through the worksheet.

The Trace Dependents command shows the opposite of the precedents; it shows you any cells that use the current cell in a formula. Like precedents, there can be layers of dependent cells, which are displayed by repeating the Trace Dependents command. Changing the value in the current cell will therefore have an effect on all of the dependent cells.

Name	Goal	Sales	# Sales
Bert	$ 1,000	$ 900	18
Ernie	1,200	1,300	12
Jen	800	950	21
Sarah	1,000	1,200	17
Total	**$ 4,000**	**$ 4,350**	**68**
Sales Above Goal		$ 350	
Average Sale		$ 63.97	

The current cell shows Bert's number of sales, and by using Trace Dependents you see that Bert's sales amount is used to calculate total sales.

Name	Goal	Sales	# Sales
Bert	$ 1,000	$ 900	18
Ernie	1,200	1,300	12
Jen	800	950	21
Sarah	1,000	1,200	17
Total	**$ 4,000**	**$ 4,350**	**68**
Sales Above Goal		$ 350	
Average Sale		$ 63.97	

By adding another level, you see that total sales is then used to calculate the average sale.

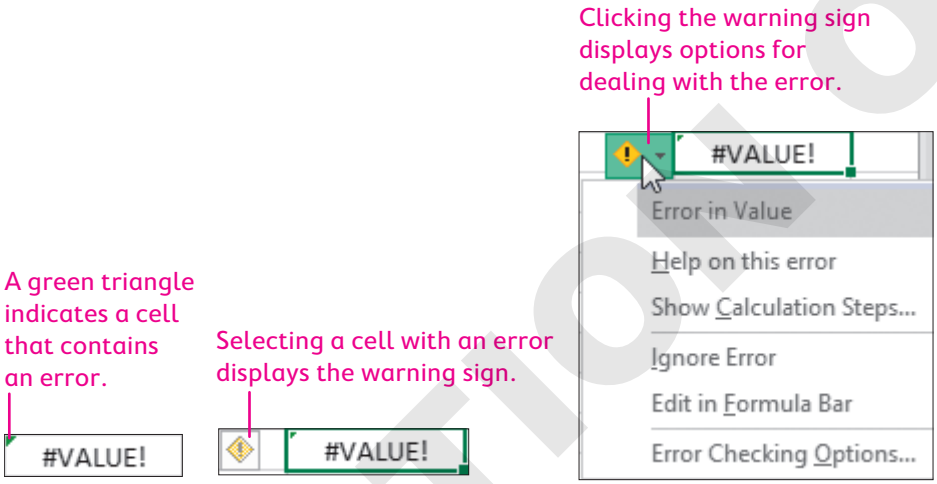
Another way to think of it is to think of tracing precedents as looking backward, to see where the information comes from, and tracing dependents as looking forward, to see where the information is being used. When you no longer need the arrows, you can simply use the Remove Arrows command to remove them.

View the video "Tracing Your Formulas."

Checking for Errors

The Error Checking tool can help you spot and correct errors in formulas. This can be particularly useful if you are reviewing someone else's work and aren't sure where the errors are located. If it is your own work, you would usually fix errors as you go along.

Errors in cells are flagged with a green triangle, and sometimes with an error message in the cell instead of the formula result.



Note! *Even if the formula displays a result, it might still contain an error, usually if the formula omits adjacent data. If this is done intentionally, you can click the warning sign and select Ignore Error to dismiss it.*

COMMON EXCEL FORMULA ERRORS

Error	Description
#DIV/0!	Dividing by zero is not possible, so this error displays if a formula attempts to divide by a cell that contains zero or by an empty cell.
#REF!	You will see this error if a formula contains an invalid cell reference; for example, if a formula refers to cell A1 and row 1 or column A is deleted.
#VALUE!	This error usually occurs because the formula is attempting to perform a mathematical operation using a cell that contains text.
#NAME?	This error occurs when a formula contains an incorrect function name or an undefined name for a cell or range.
Formula Omits Adjacent Cells	This error does not display in the result cell. It appears as a suggested error when a formula refers to a column or row of data but does not include all adjacent numerical values.

Evaluate a Formula

Not all mistakes result in Excel displaying an error; sometimes a valid formula is simply showing an incorrect result because it was not created with the correct cell references, functions, or operations. When reviewing a complex formula, it can be useful to break the formula down into steps and watch how Excel solves it. This can help you discover the source of an error or explain why the result does not look the way you expected. Evaluating a formula can also help you see how a formula with multiple operations is solved (by following the correct order of operations one step at a time).

The Watch Window

The Watch Window allows you to keep track of a particular formula, even when working on a different sheet or workbook. This is useful when you have multiple sheets with formulas that use data across many sheets, and you want to observe the effects of changes made on one sheet to the results of formulas on other sheets.

Formulas→Formula Auditing

DEVELOP YOUR SKILLS: E9-D4

In this exercise, you will use the Formula Auditing tools to analyze formulas and correct formula errors on the Aug Sales sheet.

1. Save your file as: **`E9-D4-SalesAnalysis`**
2. Go to the **Aug Sales** sheet and select **cell M10**.
3. Choose **Formulas→Formula Auditing→Trace Precedents**.

   You will now see lines drawn from the Location, Position, Sales, and Commissions columns, all pointing to cell M10. Because the formula refers to the range within the column, there is also a blue box around the entire range.

Location	Position	Target	Sales	Commissions	Bonus		Description	Amount
Miami	Sales Rep	$ 5,000	$ 5,286	$ 589	$105.72		Miami Employees	9
Miami	Sales Rep	10,000	13,419	1,351	$134.19		Miami Employee Commissions	$8,390
New York	Sales Rep	10,000	10,298	883	$205.96		Miami Average Sales	$10,890
New York	Sales Director	12,000	14,713	535	$294.26		Miami Employees - Sales >$10,000	4
Toronto	Sales Rep	5,000	5,485	437	$109.70		Toronto Employees - Sales >$10,000	4
Vancouver	Sales Director	10,000	5,815	614	$ -		Miami Mgr Comm's - Sales <$10,000	$0

   Tracing precedents also shows you that the position name has changed and needs to be updated in the formula.

4. In the Formula Bar, modify the formula for **cell M10** by replacing *Manager* with *Sales Director*:
   `=SUMIFS(I5:I33,E5:E33,"Miami",F5:F33,"Sales Director",H5:H33,"<10000")`

   The result in cell M10 displays $2,427. Modifying the formula also removes the arrows.

5. With **cell M10** still selected, choose **Formulas→Formula Auditing→Trace Precedents** two times.

   The first click shows the precedents again. On the second click, no arrows are added because the Location, Position, Sales, and Commissions columns all contain values—not formulas. If your volume is turned on, you may hear the warning sound indicating the command can't be completed.

6. With **cell M10** still selected, choose **Formulas→Formula Auditing→Trace Dependents**.

   You will see a warning box indicating there are no formulas that refer to the active cell.

7. Click **OK** to close the warning box.
8. Choose **Formulas→Formula Auditing→Remove Arrows**.
9. Select **cell M18** and choose **Formulas→Formula Auditing→Trace Precedents**.

   The Trace Precedents arrows indicate that cells M15, M16, and M17 are used in the formula to calculate the total paid out. Because the Sales amount is not paid to employees, this should not be included, and the formula will have to be corrected.

10. Edit the formula in **cell M18** to be: **`=M16+M17`**
11. With **cell M18** still selected, click the **Trace Precedents** button twice.

    The next level of precedents appears, showing that the formulas to calculate total commissions and bonuses use references to the data in the Sales and Commissions columns. This should be a warning that the formulas might be incorrect because Total Bonus does not refer to the Bonus column of data, and the ranges also do not include the entire column as they should.

12. Click the **Trace Dependents** button.

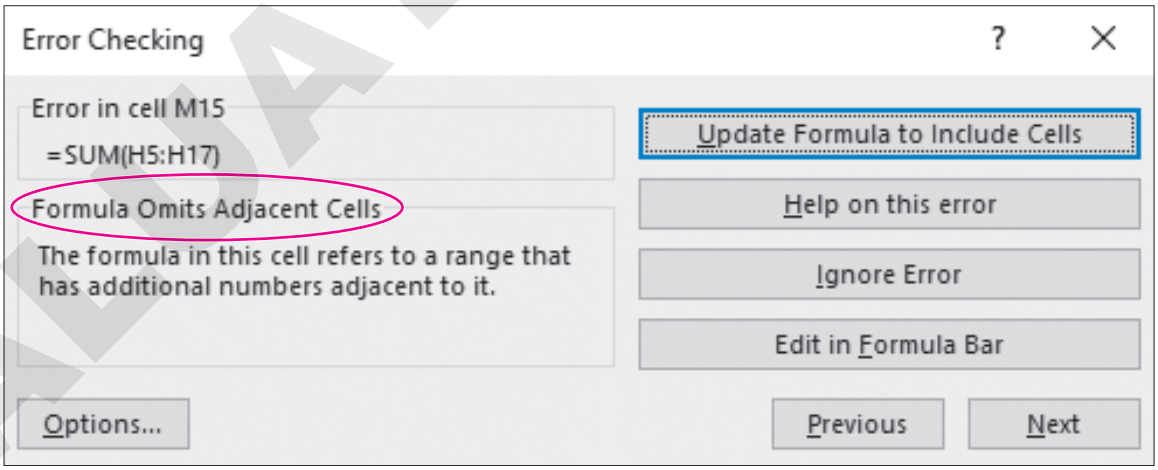
    The dependent arrow points to cell M19.

Check for Errors

Now you will find the errors on the sheet and correct them.

13. Remove the arrows from the worksheet.
14. Select **cell A1** and choose **Formulas→Formula Auditing→Error Checking**.

    The Error Checking dialog box opens and displays the first error in cell M15. The formula is =SUM(H5:H17)*, and the error is that the formula omits the adjacent cells.*



    Because Excel anticipates that formulas will normally refer to an entire column or row and not just part, the error asks whether you want to update the formula to include cells. Of course, if the formula is meant to use only part of the column, you can ignore the error; in this case, you will correct it.

15. Click **Update Formula to Include Cells**.

    The error checker moves to the next error in cell M16. The error in cell M16 is the same error; the formula does not include all cells in the column.

16. Click **Update Formula to Include Cells** again.

    The error checker moves to the next error in cell M17. The error in cell M17 also omits adjacent cells; however, the formula also refers to the wrong column, so you can fix this by directly editing the formula.

17. Click **Edit in Formula Bar**.

18. In the Formula Bar, replace the existing range reference with **`J5:J33`** so the formula reads *=SUM(J5:J33)* and then click **Resume** in the Error Checking dialog box.

    This time the error in cell M19 is an error in value, meaning a value used in the formula is of the wrong data type, usually text instead of a number. The formula is =M18/M14*, but cell M14 contains text. You can edit this formula in the Formula Bar so the formula is dividing Total Paid Out/Total Sales.*

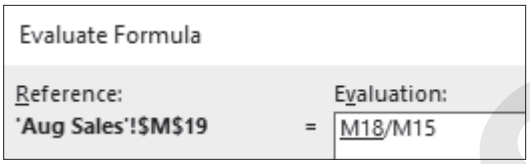
19. Click **Edit in Formula Bar**, then correct the formula to **`=M18/M15`** and click **Resume**.

    The rest of the worksheet is now error free.

20. Click **OK** in the dialog box and apply the **Percent Style** number format to **cell M19**.

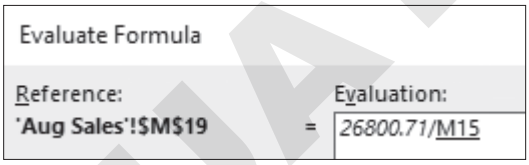
Evaluate a Formula

21. With **cell M19** still selected, choose **Formulas→Formula Auditing→Evaluate Formula**.



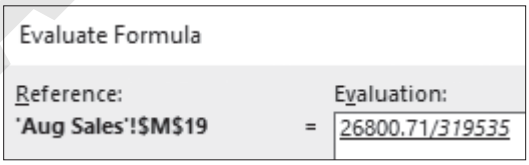
    The Evaluate Formula dialog box shows the reference to the cell being evaluated, cell M19 on the Aug Sales sheet, and the formula being evaluated, =M18/M15. The underline indicates the next part of the formula to evaluate.

22. Click **Evaluate**.



    Cell M18 is evaluated, and the value of cell M18 is displayed: 26800.71*. Note that the cell's true value is shown, not the value displayed on the worksheet, which is affected by the number format (in this case no decimals). The second cell reference, M15, is underlined, indicating it is the next part of the formula that will be evaluated.*

23. Click **Evaluate**.



    Now the value of cell M15 is displayed: 319535.

24. Click **Evaluate** once more.

    The result of the formula 26800.71/319535 *is now shown, which is* 8%.

25. Click **Close** in the Evaluate Formula dialog box.

26. Save the file.

3-D Cell References

Excel formulas can refer to data on other worksheets or in other workbooks; however, sometimes a formula is required to refer to multiple sheets at the same time. For example, if cell A5 contains sales information for Product #1, and there is a different sales worksheet for each month, you might want to summarize the sales data by finding the total in cell A5 across multiple sheets. This can be done by adding each cell individually or by using a 3-D reference in your formula.

Compare these two formulas.

- =SUM(January!A5+February!A5+March!A5+April!A5+May!A5)
- =SUM(January:May!A5)

Similar to using a range instead of referring to each cell individually, a 3-D reference is quicker because you can refer to the range of sheets January to May and all sheets between, and then use the same cell (or range) from all sheets.

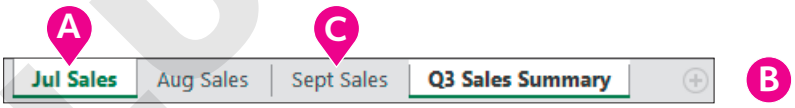
If you think of columns and rows as arranged left to right and up and down on a 2-D page, then stacking multiple worksheets on top of each other would be a third dimension, hence the 3-D reference. This is also useful because if a new sheet is inserted into the worksheet range, the data on the new sheet will automatically be included.

DEVELOP YOUR SKILLS: E9-D5

In this exercise, you will use 3-D cell references to create formulas that sum values from three worksheets.

1. Save your file as: **E9-D5-SalesSummary**
2. Go to the **Q3 Sales Summary** worksheet.

   For each employee you will summarize the total target, sales, and commission amounts for July, August, and September.
3. In **cell G5**, begin entering your formula by typing: **=SUM(**
4. Follow these steps to finish the formula using a 3-D reference:



   A. While editing the formula, click the **Jul Sales** worksheet tab.

   B. Click **cell G5** and see that the Formula Bar displays *=SUM('Jul Sales'!G5*.

   C. Hold down Shift +click the **Sept Sales** sheet tab to select the range of sheets Jul Sales:Sept Sales, which includes the Aug Sales sheet.
5. Complete the entry by clicking ✓ on the Formula Bar, which automatically returns you to the Q3 Sales Summary worksheet.

Warning! *Be careful when completing the entry. Do NOT click the Q3 Sales Summary tab or any other cells, as this will change the formula!*

The completed formula is =SUM('Jul Sales:Sept Sales'!G5), *which finds the sum of cell G5 on all three sheets. The result of the formula is* $15,000.

6. Select **cell H5** and complete steps 3–5 again to create a formula that adds cell H5 on the Jul Sales, Aug Sales, and Sept Sales sheets.

   Your completed formula should be =SUM('Jul Sales:Sept Sales'!H5).

7. In **cell I5**, create a formula that adds cell I5 on the Jul Sales, Aug Sales, and Sept Sales sheets.

   Your completed formula should be =SUM('Jul Sales:Sept Sales'!I5). *The sum in cell H5 is* $16,113, *and the sum in cell I5 is* $1,322.

8. Select the **range G5:I5** and use the **fill handle** to copy the formulas down all three columns.
9. Save your work and close the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).

Reinforce Your Skills

REINFORCE YOUR SKILLS: E9-R1

Work with Text Functions and Conditional Functions

In this exercise, you will take the information that was recorded from the Kids for Change Charity Race and fix the participants' names and bib numbers. You will then analyze the race results.

1. Open **E9-R1-FunRun** from your **Excel Chapter 9** folder and save it as: **`E9-R1-RaceResults`**
2. Select **column B** and insert a new column.
3. In **cell B5**, enter the formula: **`=PROPER(A5)`**

   The formula takes the text in cell A5 and capitalizes the first letters of the first and last names.
4. Copy the formula down the column using the **fill handle**.
5. With the **range B5:B22** selected, copy and paste the names into **column A** and be sure to paste the values only.
6. Delete **column B**.

   Now you will alter the bib numbers by removing the text to display the digits only.
7. Select **column E** and insert a new column.
8. In **cell E5**, enter: **`410`**
9. Use the **fill handle** to copy **cell E5** down the column and then use the Auto Fill Options to choose **Flash Fill**.

   Flash Fill enters the three numbers from the Bib # for all runners.
10. In **cell E4**, type **`Bib #`** and then delete **column D**.

Conditional Functions

11. In **cell J5**, enter: **`Runners 40 & Over`**
12. In **cell K5**, enter the formula: **`=COUNTIF(B5:B22,">=40")`**

    Use the Function Arguments dialog box, if desired, to enter the arguments one at a time. The result shows there were four runners aged 40 or older.
13. In **cell J6**, enter: **`~Average Time`**
14. In **cell K6**, enter the AVERAGEIF function with these arguments:

Range	**`B5:B22`**
Criteria	**`>=40`**
Average_Range	**`H5:H22`**

    The completed formula should look like this: =AVERAGEIF(B5:B22,">=40",H5:H22)

    The formula finds the average time in the range H5:H22 for runners who are 40 or older in the range B5:B22. Now the result needs to be formatted as time.
15. With cell K6 still selected, modify the number format to show hours and minutes only.

    Now you can see that the average time for the four runners who are 40 or older is one hour and forty minutes.

16. In **cell J7**, enter: **`~Total Raised`**
17. In **cell K7**, enter the formula: **`=SUMIF(B5:B22,">=40",E5:E22)`**
18. With **cell K7** still selected, format the result as Currency with no decimals.

    The total raised by the 40 and over group was $770.
19. In **cell J8**, enter: **`Runners Under 25`**
20. Copy and paste the contents of the **range J6:J7** into the **range J9:J10**.
21. Enter appropriate formulas into the **range K8:K10** to count the runners under 25, calculate their average time, and determine the total amount they raised.

    Use the previous steps to guide you, if necessary, as the arguments will be similar, except the criteria will be <25 this time. Hint: Take a look at the functions here for more guidance:

	J	K
8	Runners Under 25	=COUNTIF(B5:B22,"<25")
9	~Average Time	=AVERAGEIF(B5:B22,"<25",H5:H22)
10	~Total Raised	=SUMIF(B5:B22,"<25",E5:E22)

22. Use the **Format Painter** to copy the format from the **range K6:K7** to the **range K9:K10**.

Race Results	
Description	Result
Runners 40 & Over	4
~Average Time	1:40
~Total Raised	$770
Runners Under 25	5
~Average Time	3:06
~Total Raised	$1,012

23. Save your work and close the file.

REINFORCE YOUR SKILLS: E9-R2

Use Nested Functions and 3-D Cell References

In this exercise, you will use functions to summarize data from five cities where Kids for Change held their charity races.

1. Open **E9-R2-FunRun** from your **Excel Chapter 9** folder and save it as: **`E9-R2-RaceSummary`**
2. Select **cell C6** on the **Summary** sheet and create a formula to add all of the participants from **cell C5** on the five city sheets using a 3-D reference.

   Be sure to select the cell and worksheets with the mouse and do not simply type the formula. The finished formula will be =SUM('New York:Washington'!C5).
3. Using the **fill handle**, copy the formula into the **range C7:C9**, which will find the sum from all five cities for volunteers, expenses, and funds raised.

   The formula for net contributions is already inserted in cell C10, so the formula is updated with the data in cells C8 and C9.
4. Apply the Currency number format and remove the decimals from the **range C8:C9**.
5. Select **cell C10**, which contains the net contributions raised from all five cities.

6. Choose **Formulas→Formula Auditing→ Trace Precedents**.

   The arrows indicate that cell C10 uses the information in cells C8 and C9.

7. Click **Trace Precedents** a second time.

   This shows the next level of precedents, indicating that cells C8 and C9 use data from other worksheets.

8. Click the **Remove Arrows** button.

   In cell C11 you will create a formula to determine whether all cities achieved the minimum goal of raising $35,000, using a nested function with a 3-D cell reference.

9. Select **cell C11** and use the **Insert Function** button to insert the IF function.

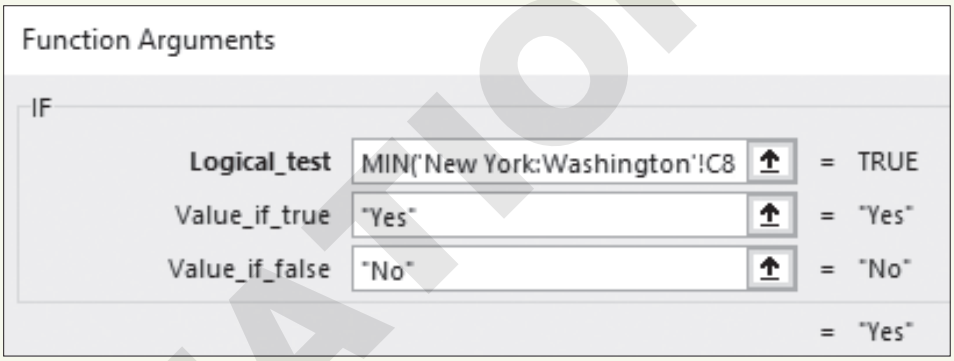
   The logical test for the IF function arguments will use the MIN function.

10. In the Logical_Test box, type **`MIN(`** and then select the **New York** sheet. Select **cell C8**, and then hold down Shift and select the **Washington** sheet.

11. Type **`)`** to close the MIN function parentheses and then complete the logical test by typing: **`>=35000`**

    The logical test will find the lowest number for the funds raised across all five cities and then test whether that number is greater than or equal to $35,000.

12. Enter **`Yes`** in the Value_If_True field and **`No`** in the the Value_If_False field.



    The Logical_Test field does not display the entire argument; only the first part is visible due to the limited size. The complete formula is =IF(MIN('New York:Washington'!C8)>=35000,"Yes","No").

13. Click **OK**.

    The result of the formula is Yes, *which means all five cities either met or surpassed the goal.*

14. Right-align **cell C11**.

15. In **cell C12**, enter the formula: **`=C6/C5`**

    The error appears because cell C5 has not been calculated yet; it is empty, so dividing by an empty cell returns the #DIV/0! *error.*

16. Select **cell C5**; begin to enter the formula **`=COUNT(`** and then use a 3-D reference to count **cell C5** on all the city sheets to count the number of cities involved.

    You can see there are five cities; however, if another city is added and a new sheet is inserted into the range, the formula results in cell C5 and cell C12 will automatically update, rather than require manual editing.

    The error is now removed from cell C12, and the result shows each city had an average of 189.6 *participants.*

17. Save your work and close the file.

REINFORCE YOUR SKILLS: E9-R3

Analyze Volunteer Data

In this exercise, you will look at the number of hours Kids for Change volunteers have donated over the past three years and use formulas to analyze and summarize the data.

1. Open **E9-R3-Vhours** from your **Excel Chapter 9** folder and save it as: **`E9-R3-VhoursSummary`**
2. In **cell B5**, type **`Dave Lozano`** to put the volunteer's surname after his given name and tap Enter.
3. Type **`S`** (the first letter of Sharon's first name) in **cell B6**, and tap Enter to accept the Flash Fill suggestions, entering the full names for all volunteers in the same order.
4. Cut and paste the contents of the **range B5:B11** into the **range A5:A11**.
5. In **cell B5**, enter a formula that will add all hours for Dave from 2018 to 2020.

   Hint: Use the SUM function and use the mouse to insert a 3-D reference to the range B5:M5 on all three worksheets.

   Across three years, Dave has volunteered 596 total hours.
6. In **cell C5**, enter a formula that will count all months in 2020 in which Dave volunteered more than 25 hours.

   Hint: Use the COUNTIF function, insert a reference to the range B5:M5 on the 2020 sheet, and use ">25" as the criteria.

   The result shows there were five months in 2020 in which Dave volunteered more than 25 hours.
7. In **cell D5**, enter a formula similar to the one created in **cell C5**, but modify the criteria to count the number of months in which Dave had zero hours.

   The result shows there were two months in 2020 in which Dave did no volunteer work.

   Now you want to find which volunteers averaged more than 15 hours per month in 2020, so you will use the AVERAGE function nested inside an IF function.
8. In **cell E5**, begin by inserting an IF function and open the Function Arguments dialog box.
9. In the Logical_Test field, use: **`AVERAGE('2020'!B5:M5)>15`**

   Hint: Use the mouse to select the range for the average function.
10. Enter **`Yes`** in the Value_If_True field and **`No`** in the Value_If_False field and then click **OK**.
11. Right-align **cell E5**.
12. Select the **range B5:E5** and copy the formulas in **row 5** down to **row 11** for the other volunteers.

    The results show that only one volunteer did not average more than 15 hours per month in 2020.
13. Save your work and close the file.

Apply Your Skills

APPLY YOUR SKILLS: E9-A1

Create a Data Summary

In this exercise, you will summarize expense data for two of Universal Corporate Event's sales employees, so that other employees can be inserted later on and their information will instantly be added to the total.

1. Open **E9-A1-Expenses** from your **Excel Chapter 9** folder and save it as: **`E9-A1-ExpenseReport`**

   First you need to capitalize the expense names on all sheets.
2. In **cell A10**, enter a formula to convert the text in **cell A5** to PROPER text format.
3. Copy the formula down to **cell A13** to convert all four expenses.
4. Copy and paste the **range A10:A13** into the **range A5:A8** on all three sheets.

   Hint: Paste the values only; copy once and then paste three times.
5. Delete the contents of the **range A10:A13** on the **Summary** sheet.

   Now you will combine the account type code with the expense account number.
6. Enter a formula in **cell C10** that uses the CONCAT function to combine **cell C5** and **cell B5**, in that order.

   The expense type code now precedes the expense account number.
7. Copy the formula in **cell C10** down to **cell C13**.
8. Copy and paste (values only) from the **range C10:C13** into the **range B5:B8**.
9. Delete **column C**.
10. Copy the **range B5:B8** from the Summary sheet into the same range on the two expense sheets for **David** and **Maria**, and then delete **column C** on both sheets.
11. In **cell C5** on the **Summary** sheet, create a formula with the SUM function that uses a 3-D reference to add both employees' January travel expenses.
12. Copy the formula down the column for all expenses and then copy the same four formulas across the rows for all months plus the total.
13. Format the total in **column O** of all three sheets with the Accounting number format, bold formatting, and no decimals. (Tip: If desired, select all three sheets and then edit them simultaneously.)
14. AutoFit **columns A–O** on all three sheets.
15. Save your work.

APPLY YOUR SKILLS: E9-A2

Evaluate Expenses

In this exercise, you will analyze the meal expenses for employees to see how much you would save if you were to cap monthly meal expenses that could be claimed.

1. Save your file as: **`E9-A2-ExpenseReport`**
2. In **cell A11** on the **Summary** sheet, enter: **`Meals Exp >500`**

3. Enter **Count** in **cell A12** and **Sum** in **cell A13**.
4. In **cell B12**, enter a formula using the COUNTIF function that will find the number of months in which employees' meals exceeded $500.
5. In **cell B13**, enter a formula using the SUMIF function to find the sum of the meals for the months in which employees' meals exceeded $500.
6. Enter **$ Above $500** into **cell A14**, apply a thick outside border, center-align the contents, and then copy and apply the same formatting to **cell A11**.
7. In **cell B14**, enter the formula: **=B13-(B12*500)**

   This formula takes the sum from the months over $500 and subtracts the number of months multiplied by $500 to find the difference that would be saved if there were a $500 cap on meal expenses.
8. Apply bold formatting and the Accounting number format to **cell B14**.
9. With **cell B14** still selected, use the **Trace Precedents** command as necessary until there are no more precedents to show.
10. Save your work.

    Notice the trace precedent arrows are removed.
11. In **cell D9**, enter the formula **=IF(SUM(D5:D8)>SUM(C5:C8),"+","-")** and then copy the formula across the row into the **range E9:N9**.

    This formula compares the sum of each month's expenses with the sum of the previous month's expenses. If they are greater, the result will be a plus sign and if they are less than or equal, the formula will return the minus sign; this will show upward or downward trends for overall expenses.
12. With the formula results in the **range D9:N9** still selected, apply bold formatting, center-align the cells, and increase the font size to 12 points.
13. Increase the row height of **row 11** to **32**.
14. Save your work and close the file.

APPLY YOUR SKILLS: E9-A3

Analyze Sales

In this exercise, you will modify the client codes for the Universal Corporate Events client list and then compare sales results for training events sold by each employee.

1. Open **E9-A3-Q3** from your **Excel Chapter 9** folder and save it as: **E9-A3-Q3Analysis**

   To begin, you have been asked to add the first three letters of each client's name to the client code in all capital letters. To do this, you can use the LEFT function, nested inside the UPPER function.
2. In **cell G5**, create a formula using the LEFT function to extract the first three letters of the client name in **cell A5**.
3. Modify the formula to put all three letters in caps by placing the LEFT function inside the UPPER function.

   The formula should be =UPPER(LEFT(A5,3)).
4. In **cell H5**, enter a formula using the CONCAT function to combine **cell G5** with **cell B5** (in that order).
5. Copy **cells G5** and **H5** down the columns to **row 16** using the **fill handle**.
6. Copy and paste (values only) from the **range H5:H16** into the **range B5:B16**.

7. Delete the contents in **columns G** and **H**.
8. In **cell B19**, enter a formula that counts the number of training events sold by David.

   Hint: The ranges C5:C16 and E5:E16 will be your criteria ranges.
9. In **cell C19**, enter a formula that adds the fees for training events sold by David.

   Hint: The criteria ranges will be the same as those used in the COUNTIFS function in step 8 and the sum range will be F5:F16.
10. In **cells B20** and **C20**, enter formulas to count and sum again, but this time use criteria to find data for the training events sold by Maria.
11. Apply the Currency number format to the **range C19:C20** and remove the decimals.
12. Save your work and close Excel.

Project Grader

If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.

PROJECT GRADER: E9-P1

Updating Distributor Data Using Text Functions, Conditional Functions, and Formula Auditing

Taylor Games is updating its distributor worksheets to display sales by distributor. In this exercise, you will create formulas that will capitalize the last names of distributors, create a distributor ID using first and last name data, and calculate annual sales using a 3-D reference. You will then compare these sales with the annual sales goal using IF functions.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E9_P1_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E9_P1_Start** from your **Excel Chapter 9** folder.
2. In **cell J7** of the **Distributors** worksheet, use the PROPER function to reference **cell B7**, creating a capitalized copy of the last name (*Gilson*).
3. Copy the formula in **cell J7** to the **range J8:J36**.
4. Copy the **range J7:J36** and paste only the values in the **range B7:B36** to replace the last names in column B with properly formatted replacements.
5. Hide **column J**.
6. In **cell D7**, combine the first name and last name from **cells A7** and **B7** using the CONCATENATE function with the following nested arguments:
   - Argument1: Use the UPPER function to convert the text in **cell B7** to uppercase.
   - Argument2: Use the LEFT function to extract the first letter of the first name from **cell A7**.

   Your nested functions should produce the following result in cell D7:

First Name	Last Name	Distributor #	Distributor ID
Carey	Gilson	453678	GILSONC

7. Copy the nested functions to the **range D8:D36**.
8. Use these guidelines to create a function with a 3-D cell reference:
   - Use the SUM function in **cell E7**.
   - Use a 3-D reference to add up the values in **cell B7** in all four **Distributor Sales** worksheets (**Distributor Sales Q1:Distributor Sales Q4**).
9. Change the number format of **cell E7** to Accounting and apply bold formatting.
10. Copy the formula in **cell E7** to the **range E8:E36**.
11. In **cell I3**, use the COUNTIF function to determine the number of distributors in the **range E7:E36** with annual sales that are greater than or equal to $1,000.

12. In **cell I4**, use the COUNTIF function to determine the number of distributors with annual sales that are less than $1,000.
13. Save your workbook.
    - *Using eLab:* Save it to your **Excel Chapter 9** folder as **`E9_P1_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 9** folder as: **`E9_P1_Submission`**

PROJECT GRADER: E9-P2

Calculating Membership Car Value

Classic Cars Club would like to evaluate the types of cars and corresponding values for their members. In this exercise, you will create a club profile using single and multiple criteria functions to display the amount and values of classic and antique cars. You will also generate email addresses for each member based on the member's name and the club's email domain.

1. Download and open your Project Grader starting file.
    - *Using eLab:* Download **E9_P2_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
    - *Not using eLab:* Open **E9_P2_Start** from your **Excel Chapter 9** folder.

    Note: When creating conditional functions in steps 2–11, you can use either ranges in your arguments or reference the Car Values table. For example, using the range F8:F37 will produce the same outcome as referencing the table CarValues[Status]. Feel free to use either approach.
2. Enter a formula in **cell I9** of the **Car Values** worksheet that will count the number of cars with a status of *classic*.
3. Enter a formula in **cell J9** that will count the number of cars with a status of *antique*.
4. Enter a formula in **cell I11** that will count the number of cars with a status of *classic* and a car value greater than $100,000.
5. Enter a formula in **cell J11** that will count the number of cars with a status of *antique* and a car value greater than $100,000.
6. Enter a formula in **cell I13** that will count the number of cars with a status of *classic* and a car value less than $50,000.
7. Enter a formula in **cell J13** that will count the number of cars with a status of *antique* and a car value less than $50,000.
8. Enter a formula in **cell I15** that will average the car values for all cars with a status of *classic*.
9. Enter a formula in **cell J15** that will average the car values for all cars with a status of *antique*.
10. Enter a formula in **cell I17** that will add up the car values for all cars with a status of *classic*.
11. Enter a formula in **cell J17** that will add up the car values for all cars with a status of *antique*.

12. In **cell D7** of the **Membership List** worksheet, use these guidelines and a CONCATENATE function to turn names into email addresses:
    - Argument1: Use a nested LEFT function to extract the first letter of the first name from **cell A7**.
    - Argument2: Reference **cell B7** to extract the entire contents of the cell.
    - Argument3: Enter the literal text string: **`"@ClassicClub.Org"`**

    Your formula should produce the following result in cell D7:

First Name	Last Name	Membership #	Email
Betsy	Lindburgh	CC-32467	BLindburgh@ClassicClub.Org
Loretta	Lemon	CC-56478	

13. Copy the formula in **cell D7** and paste it to the **range D8:D36**.
14. Save your workbook.
    - Using eLab: Save it to your **Excel Chapter 9** folder as **`E9_P2_eSubmission`** and attach the file to your eLab assignment for grading.
    - *Not using eLab:* Save it to your **Excel Chapter 9** folder as: **`E9_P2_Submission`**

Extend Your Skills

These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.

E9-E1 That's the Way I See It

After tracking your personal budget for six months, you want to analyze your spending. Open **E9-E1-Budget** and save it as: **E9-E1-BudgetAnalysis**

Fill the Budget Total and Actual Total formulas down the respective columns and then use the Error Checking feature to remove any errors from the worksheet (except those found in column J). Then, in the range M5:M11, use the COUNTIF function to count the number of months from January to June that exceeded the budget amount in column B. (Hint: Do not use a cell reference for the criteria; type in the budget amount.) Again, use Error Checking as necessary to remove any errors.

E9-E2 Be Your Own Boss

It's year-end, and you're analyzing the annual income at Blue Jean Landscaping. You've already calculated the revenue by month, and now you're ready to find the annual totals. Open **E9-E2-Revenue** and save it as: **E9-E2-RevenueSummary**

There are four quarterly worksheets. On the Summary sheet, use a SUM function in column C that adds each of the individual months on the four quarter sheets. After you have the annual totals calculated for both the Private and Corporate divisions, use a formula in cell D15 to tell you in one step which division had higher revenue. Use a nested IF function; for the logical test, compare the sum of private revenue with the sum of corporate revenue (using the SUM function twice). Return either *Private* or *Corporate* based on the result.

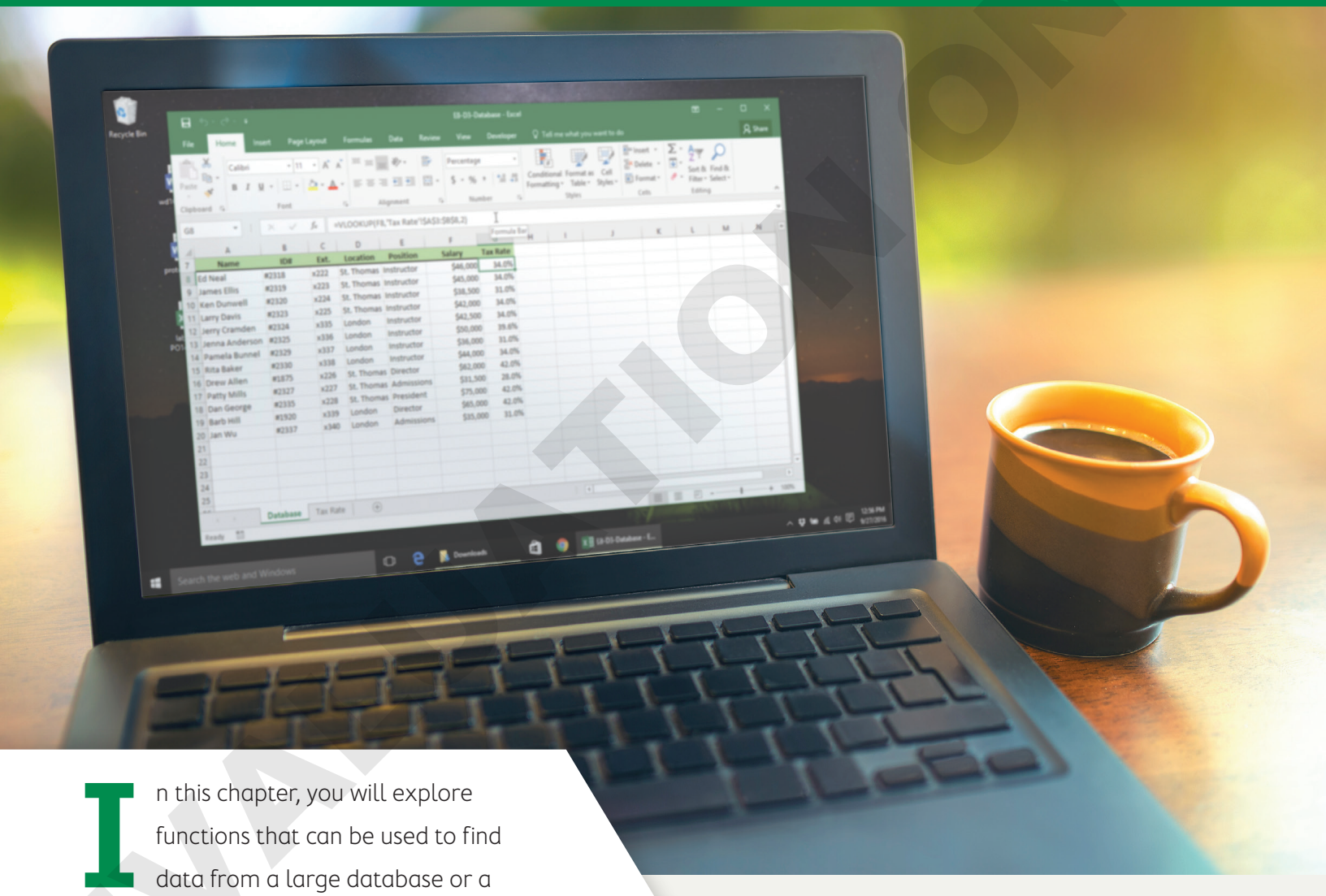
E9-E3 Demonstrate Proficiency

Stormy BBQ has expanded BBQ sauce sales to grocery stores in several cities, and you want to find out where the different flavors are selling the best. Open **E9-E3-Sales** and save it as: **E9-E3-SalesComparison**

Use the SUMIFS function to fill in the table in the range I5:K7, using two criteria each time: Sauce Type and Location. In the range J10:J12, use COUNTIFS to find the number of times each city placed an order for $3,000 or more.

EXCEL

10 Lookup Functions and Outlines



In this chapter, you will explore functions that can be used to find data from a large database or a small lookup table. You will also learn about the Outline feature, which can be used to group information or create subtotals and is also a handy tool for data analysis.

LEARNING OBJECTIVES

- Create formulas using lookup functions
- Use the Outline feature
- Create subtotals
- Use the Quick Analysis tool

Project: Managing Employee Records

LearnFast College provides fast-paced learning programs for college students. You're an instructor at the college, and you also assist the office with various Excel tasks. The college employee records are saved in an Excel spreadsheet and contain confidential information about employees, including their salaries. You have been asked to create a method for entering employees' names to quickly find their extension numbers and also to enter the tax rates for each employee based on salary. You will work with Excel to accomplish these tasks and use the outline tools to analyze the information further.

Introducing Lookup Functions

Lookup functions are used to retrieve a piece of data from a table (usually a large table). By knowing one piece of information from a record, you can use it to find other information from that record. A phonebook is an example of a simple lookup. You know a person's name, so you look for it in the first column on the left, and when you find it you look across to the column that contains the phone number.

VLOOKUP and HLOOKUP

The VLOOKUP function is the most commonly used lookup function because it's used specifically to look up information arranged in columns, which is the format for many databases.

Tip! *The V in VLOOKUP stands for vertical; columns are vertical. Conversely, the H in HLOOKUP stands for horizontal; rows are horizontal.*

The HLOOKUP function has the same arguments and is used when the data is arranged in rows. The LOOKUP function is another option, but it is primarily available because older versions of Excel did not have VLOOKUP and HLOOKUP.

The VLOOKUP function arguments are:

=VLOOKUP(Lookup Value, Table Array, Column Index Number, [Range Lookup(Optional)])

LOOKUP FUNCTION ARGUMENTS

Argument	Description
Lookup_Value	This is the value to be found in the first column (VLOOKUP) or row (HLOOKUP) of the table.
Table_Array	This is the range of cells used to search for the lookup value and retrieve the result.
Col_Index_Num or Row_Index_Num (Column/Row Index Number)	This number indicates the column (VLOOKUP) or row (HLOOKUP) in the table from which the matching value will be retrieved; the first column/row in the Table Array is always 1.
Range_Lookup (Optional)	If TRUE or omitted, this function searches for the value closest to but less than the lookup value; if FALSE, it searches for exact matches only. If TRUE or omitted, the data must be sorted in ascending order.

Looking up a tax rate or discount rate is a good example of when you might use the VLOOKUP function. To encourage customer spending, a business may offer a discount based on annual spending. The various discount levels would be contained in a table.

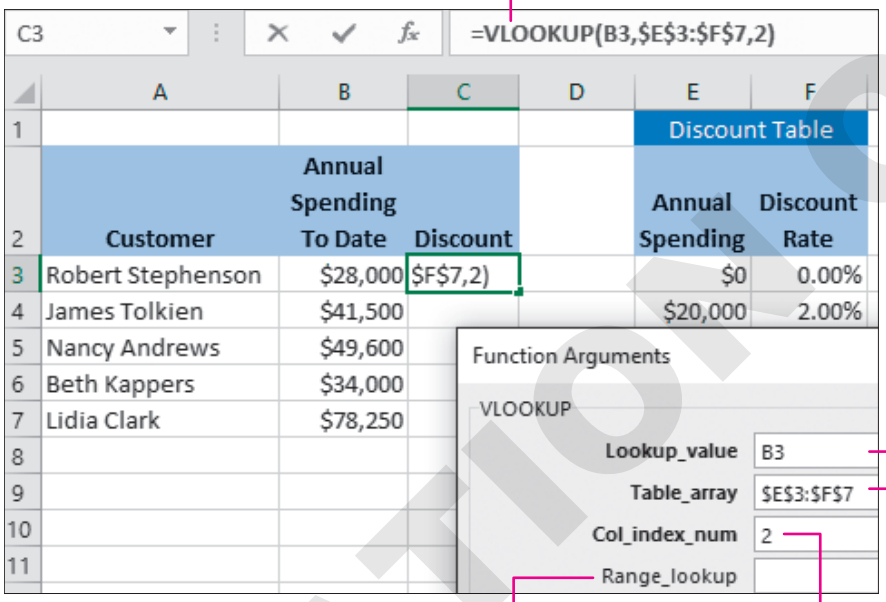
	E	F
1	Discount Table	
2	Annual Spending	Discount Rate
3	$0	0.00%
4	$20,000	2.00%
5	$30,000	3.00%
6	$40,000	4.50%
7	$50,000	6.50%

Note! *Because the information is arranged in two columns, you would use the VLOOKUP function.*

For each customer, you would look up the amount of money spent to date to determine the discount.

This is the full formula in cell C3.

The Lookup_Value is in cell B3, Robert's total spending to date (*$28,000*).



The Table_Array is the information in the range E3:F7. If the range uses absolute references, the formula can be copied. Do not include column headings.

There is no Range_Lookup here because the Lookup_Value doesn't have to be an exact match, and the table is sorted in ascending order.

The value to be retrieved is in column 2 (*Discount Rate*) of the table.

The result for the first customer, Robert, is 2% because he spent more than $20,000 but less than the $30,000 required to qualify for a 3% discount; $20,000 is the closest value that *does not exceed* the $28,000 lookup value. The remaining customer discounts can then be calculated by copying the formula down the column.

	A	B	C	D	E	F
1					Discount Table	
2	Customer	Annual Spending To Date	Discount		Annual Spending	Discount Rate
3	Robert Stephenson	$28,000	2.0%		$0	0.00%
4	James Tolkien	$41,500	4.5%		$20,000	2.00%
5	Nancy Andrews	$49,600	4.5%		$30,000	3.00%
6	Beth Kappers	$34,000	3.0%		$40,000	4.50%
7	Lidia Clark	$78,250	6.5%		$50,000	6.50%

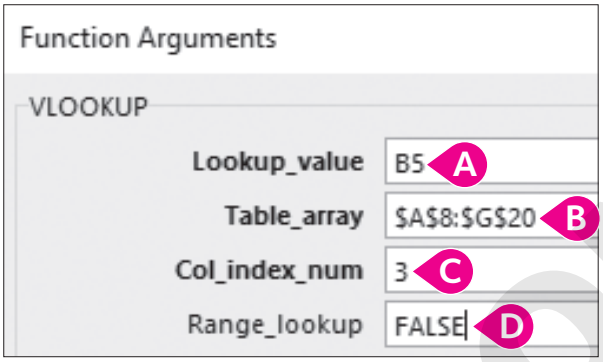
DEVELOP YOUR SKILLS: E10-D1

In this exercise, you will use the VLOOKUP function to both find an employee's phone extension by typing in the name and look up the tax rates for all employees in a tax table.

1. Start Excel, open **E10-D1-Database** from your **Excel Chapter 10** folder, and save it as: **`E10-D1-DataLookup`**

   To make it possible to search through the employee list and find the extension number, you will create a formula with the VLOOKUP function.

2. In **cell B5**, enter the name: **`Ed Neal`**
3. Select **cell E5** and choose **Formulas→Function Library→Lookup & Reference→VLOOKUP**.
4. Follow these steps to create a formula using VLOOKUP:



   A. For the lookup value argument, select **cell B5**.
   B. For the table array value, select the **range A8:G20** and tap F4 to make the range reference absolute (cells A8 and G20 both need to be absolute).
   C. Type **3** in the Col_Index_Num box.
   D. Type **`FALSE`** in the Range_Lookup box. (You're looking for an exact match here, so this argument should not be omitted.)
   E. Click **OK**.

   The formula in the Formula Bar displays =VLOOKUP(B5,$A$8:$G$20,3,FALSE) *and the result in cell E5 is* x222.

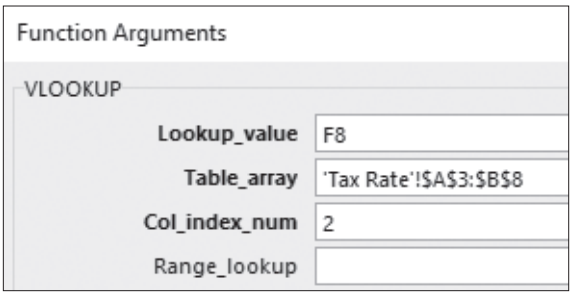
5. Select **cell B5** and enter: **`Patty Mills`**

   The result in cell E5 updates to show the extension for Patty Mills, x227.

   Next you will look up the tax rate for each employee on the Tax Rate sheet.

6. Select **cell G8** and insert the VLOOKUP function.
7. Select **cell F8** for the Lookup_Value argument.
8. To specify the table array argument, choose the **Tax Rate** sheet, select the table without the headings, and press F4.

9. Enter **2** as the Col_Index_Num argument.



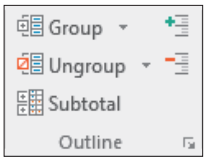
A range lookup is not necessary because you're not looking for an exact match.

10. Click **OK**.

The result for the first employee, Ed Neal, is 0.34.

11. Apply the **Percent Style** number format and increase the decimal places to one.
12. Copy the formula down the column for the other employees.
13. Save the file.

The Outline Feature



You can use the Outline feature to group related information, which can also be useful for quickly calculating subtotals and totals. Groups can be created by either rows or columns. Having an outline means you can control which data to display and hide, and you can choose between a detailed view of data or to hide the details and view only a summary. Outlines are best used with normal data ranges, rather than tables.

You can create an outline manually or by using Auto Outline. To use Auto Outline, you must have inserted formulas that sum or subtotal information from groups of rows or columns. For example, in the following illustration there is a sum below each Position category (rows 6, 12, and 18). The Auto Outline command will recognize these as distinct areas of data and group each accordingly. Likewise, column H is a sum of the sales figures contained in columns F and G.

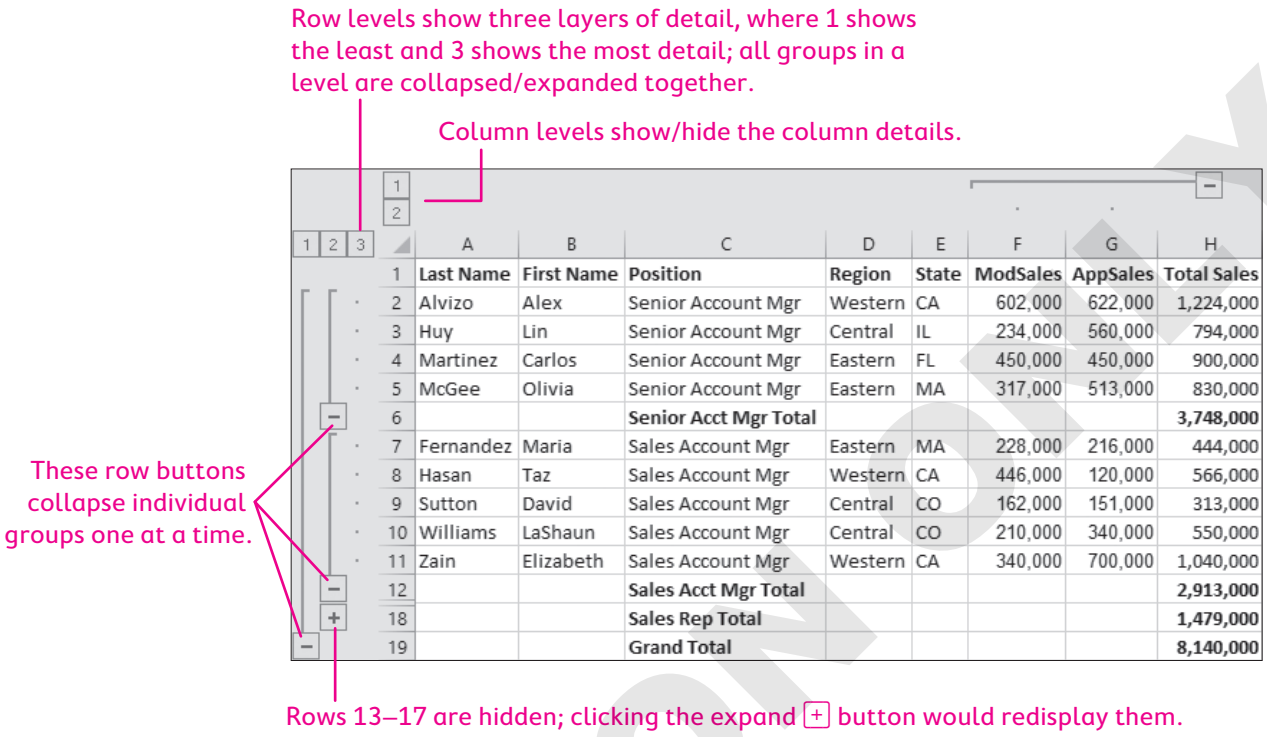
	A	B	C	D	E	F	G	H
1	**Last Name**	**First Name**	**Position**	**Region**	**State**	**ModSales**	**AppSales**	**Total Sales**
2	Alvizo	Alex	Senior Account Mgr	Western	CA	602,000	622,000	1,224,000
3	Huy	Lin	Senior Account Mgr	Central	IL	234,000	560,000	794,000
4	Martinez	Carlos	Senior Account Mgr	Eastern	FL	450,000	450,000	900,000
5	McGee	Olivia	Senior Account Mgr	Eastern	MA	317,000	513,000	830,000
6			**Senior Acct Mgr Total**					**3,748,000**
7	Fernandez	Maria	Sales Account Mgr	Eastern	MA	228,000	216,000	444,000
8	Hasan	Taz	Sales Account Mgr	Western	CA	446,000	120,000	566,000
9	Sutton	David	Sales Account Mgr	Central	CO	162,000	151,000	313,000
10	Williams	LaShaun	Sales Account Mgr	Central	CO	210,000	340,000	550,000
11	Zain	Elizabeth	Sales Account Mgr	Western	CA	340,000	700,000	1,040,000
12			**Sales Acct Mgr Total**					**2,913,000**
13	Clayton	Taneisha	Sales Rep	Central	IL	230,000	120,000	350,000
14	Cray	Karen	Sales Rep	Western	WA	123,000	130,000	253,000
15	Hill	Patricia	Sales Rep	Central	IL	120,000	170,000	290,000
16	Knapp	Mai	Sales Rep	Eastern	FL	140,000	130,000	270,000
17	Mathis	Gerhardt	Sales Rep	Western	CA	156,000	160,000	316,000
18			**Sales Rep Total**					**1,479,000**
19			**Grand Total**					**8,140,000**

Formula that finds the sum of ModSales and AppSales

Formulas that find the sum of each respective group

Formula that finds the sum of the three subtotals

Auto Outline then adds the outline structure along the top and left sides of the worksheet that contains the outline symbols for adjusting the view.



	A	B	C	D	E	F	G	H
1	Last Name	First Name	Position	Region	State	ModSales	AppSales	Total Sales
2	Alvizo	Alex	Senior Account Mgr	Western	CA	602,000	622,000	1,224,000
3	Huy	Lin	Senior Account Mgr	Central	IL	234,000	560,000	794,000
4	Martinez	Carlos	Senior Account Mgr	Eastern	FL	450,000	450,000	900,000
5	McGee	Olivia	Senior Account Mgr	Eastern	MA	317,000	513,000	830,000
6			**Senior Acct Mgr Total**					**3,748,000**
7	Fernandez	Maria	Sales Account Mgr	Eastern	MA	228,000	216,000	444,000
8	Hasan	Taz	Sales Account Mgr	Western	CA	446,000	120,000	566,000
9	Sutton	David	Sales Account Mgr	Central	CO	162,000	151,000	313,000
10	Williams	LaShaun	Sales Account Mgr	Central	CO	210,000	340,000	550,000
11	Zain	Elizabeth	Sales Account Mgr	Western	CA	340,000	700,000	1,040,000
12			**Sales Acct Mgr Total**					**2,913,000**
18			**Sales Rep Total**					**1,479,000**
19			**Grand Total**					**8,140,000**

The collapse [-] buttons show less information by hiding the detail in a group of rows or columns, while the expand [+] buttons show the hidden group. And removing an outline is easy; just use the Clear Outline command.

View the video "Creating Outlines and Subtotals."

Data→Outline→Group

Data→Outline→Ungroup

DEVELOP YOUR SKILLS: E10-D2

In this exercise, you will create an outline to group data for employees based on their positions.

1. Save your file as: **`E10-D2-DataLookup`**
2. Select the **range E8:E15** and choose **Data→Outline→Group**.
3. In the Group dialog box, ensure **Rows** is selected and click **OK**.

   One group level is added, encompassing rows 8–15.
4. Click the collapse button to hide **rows 8–15**.

   The information in rows 8–15 is hidden but, considering there are no subtotals to show a summary of the hidden information, there is no real benefit to hiding these rows.

5. Choose **Data→Outline→Ungroup menu button →Clear Outline**.

   The outline is cleared. Now you will insert subtotal formulas and a grand total and then use Auto Outline to group the data.

6. Insert a new row above **row 16** then enter **`Instructor Total`** in the empty **cell D16**.

7. In **cell F16**, choose **Home→Editing→AutoSum** and insert the formula to calculate the combined total for instructor salaries.

   The remaining employee positions are grouped together as administrative positions.

8. In **cell D22**, enter **`Administrative Total`** and then use **AutoSum** in **cell F22** to calculate the sum of the remaining employee salaries.

   Notice that AutoSum recognizes the subtotal in cell F16 and automatically selects the range F17:F21.

9. In **cell D23**, enter **`Grand Total`** and then use **AutoSum** in **cell F23**.

   This time AutoSum uses the two subtotals in cells F22 and F16.

10. Apply bold formatting to the **ranges D16:F16** and **D22:F23**.

11. Now select a single cell only, anywhere on the worksheet.

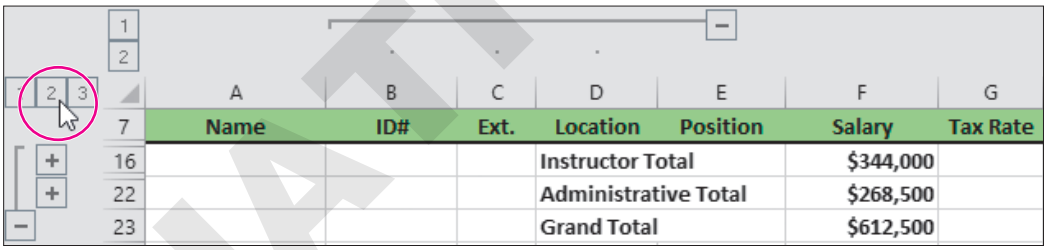
    Auto Outline will not work while a range of cells is selected.

12. Choose **Data→Outline→Group menu button →Auto Outline**.

    Auto Outline adds groups to the rows for each subtotal and one group for the grand total.

13. Click the **2** outline symbol to show the second level of detail.

    The Instructor and Administrative groups are collapsed, but both subtotals as well as the grand total are visible.



	A	B	C	D	E	F	G
7	Name	ID#	Ext.	Location	Position	Salary	Tax Rate
16				Instructor Total		$344,000	
22				Administrative Total		$268,500	
23				Grand Total		$612,500	

14. Save your work and close the file.

Subtotals

In some ways, using the Subtotal command is simpler and quicker than grouping rows or using Auto Outline, although there are a few more steps in the process. Which option to use depends on the existing state of your data. For example, if your data already has subtotals inserted, then using Auto Outline will be quick and easy for you. If your data is in one large block with *no dividers or subtotals*, then the Subtotal command will add the outline and create the subtotals by group all at once.

To use the Subtotal command, start by sorting the list on the column you will use to group the subtotals. For example, to create a subtotal for each city, your data must be sorted by city.

Last Name	First Name	Position	Region	State	ModSales	AppSales	Total Sales
Huy	Lin	Senior Account Mgr	Central	IL	234,000	560,000	794,000
Sutton	David	Sales Account Mgr	Central	CO	162,000	151,000	313,000
Williams	LaShaun	Sales Account Mgr	Central	CO	210,000	340,000	550,000
Clayton	Taneisha	Sales Rep	Central	IL	230,000	120,000	350,000
Hill	Patricia	Sales Rep	Central	IL	120,000	170,000	290,000
Martinez	Carlos	Senior Account Mgr	Eastern	FL	450,000	450,000	900,000
McGee	Olivia	Senior Account Mgr	Eastern	MA	317,000	513,000	830,000
Fernandez	Maria	Sales Account Mgr	Eastern	MA	228,000	216,000	444,000
Knapp	Mai	Sales Rep	Eastern	FL	140,000	130,000	270,000
Alvizo	Alex	Senior Account Mgr	Western	CA	602,000	622,000	1,224,000
Hasan	Taz	Sales Account Mgr	Western	CA	446,000	120,000	566,000
Zain	Elizabeth	Sales Account Mgr	Western	CA	340,000	700,000	1,040,000
Cray	Karen	Sales Rep	Western	WA	123,000	130,000	253,000
Mathis	Gerhardt	Sales Rep	Western	CA	156,000	160,000	316,000

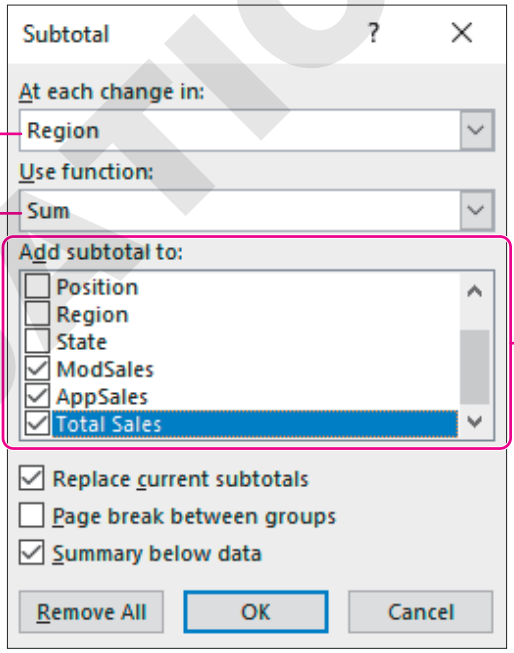
This worksheet, sorted by Region, is ready for the user to create a Subtotal to sum the sales for each region.

The Subtotal Dialog Box

The Subtotal dialog box gives you a step-by-step process to simplify creating the subtotals.

Indicate the column to use for grouping. Data should be sorted by this column; in this case, you want a subtotal for each region.

Indicate the function to use in the subtotal calculation (SUM, COUNT, AVERAGE, MIN, MAX).



Indicate the column(s) to calculate a subtotal. In this case, the ModSales, AppSales, and Total Sales columns will be summed by region.

	A	B	C	D	E	F	G	H
1	Last Name	First Name	Position	Region	State	ModSales	AppSales	Total Sales
2	Huy	Lin	Senior Account Mgr	Central	IL	234,000	560,000	794,000
3	Sutton	David	Sales Account Mgr	Central	CO	162,000	151,000	313,000
4	Williams	LaShaun	Sales Account Mgr	Central	CO	210,000	340,000	550,000
5	Clayton	Taneisha	Sales Rep	Central	IL	230,000	120,000	350,000
6	Hill	Patricia	Sales Rep	Central	IL	120,000	170,000	290,000
7				**Central Total**		956,000	1,341,000	2,297,000
8	Martinez	Carlos	Senior Account Mgr	Eastern	FL	450,000	450,000	900,000
9	McGee	Olivia	Senior Account Mgr	Eastern	MA	317,000	513,000	830,000
10	Fernandez	Maria	Sales Account Mgr	Eastern	MA	228,000	216,000	444,000
11	Knapp	Mai	Sales Rep	Eastern	FL	140,000	130,000	270,000
12				**Eastern Total**		1,135,000	1,309,000	2,444,000
13	Alvizo	Alex	Senior Account Mgr	Western	CA	602,000	622,000	1,224,000
14	Hasan	Taz	Sales Account Mgr	Western	CA	446,000	120,000	566,000
15	Zain	Elizabeth	Sales Account Mgr	Western	CA	340,000	700,000	1,040,000
16	Cray	Karen	Sales Rep	Western	WA	123,000	130,000	253,000
17	Mathis	Gerhardt	Sales Rep	Western	CA	156,000	160,000	316,000
18				**Western Total**		1,667,000	1,732,000	3,399,000
19				**Grand Total**		3,758,000	4,382,000	8,140,000

This figure shows the results after the Subtotal on the previous page is applied to sales data.

DEVELOP YOUR SKILLS: E10-D3

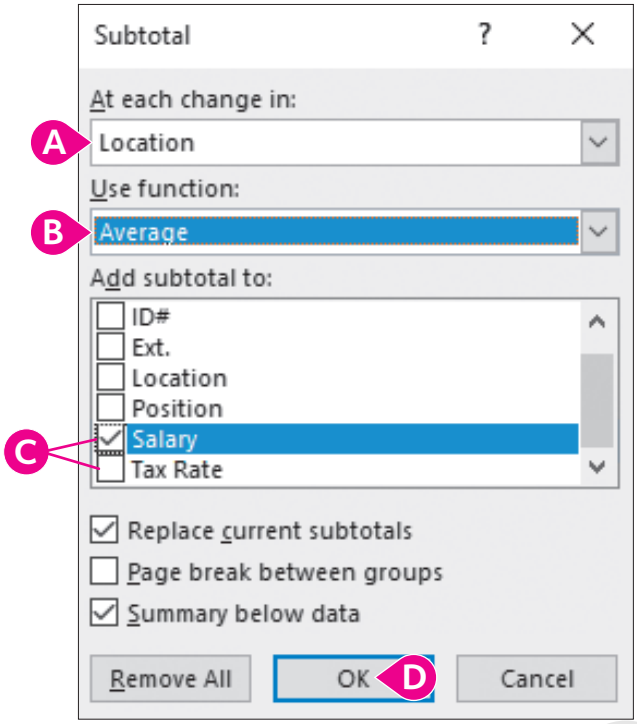
In this exercise, you will rearrange the employee data to find average salaries for each location by creating an outline using the Subtotal command.

1. Open **E10-D3-Database** from your **Excel Chapter 10** folder and save it as: **`E10-D3-DataOutline`**

   You have to sort the data by location first to create subtotals for each location.

2. Select a cell in **column D** below the *Location* heading and choose **Home→Editing→ Sort & Filter →Sort A to Z**.
3. Choose **Data→Outline→Subtotal** .

4. Follow these steps to create the subtotal:



- A Choose **Location** as the column for grouping.
- B Choose **Average** as the function.
- C Select **Salary** and deselect the **Tax Rate** checkbox.
- D Keep the other default settings and click **OK**.

Notice the options to remove all subtotals or to insert page breaks between groups.

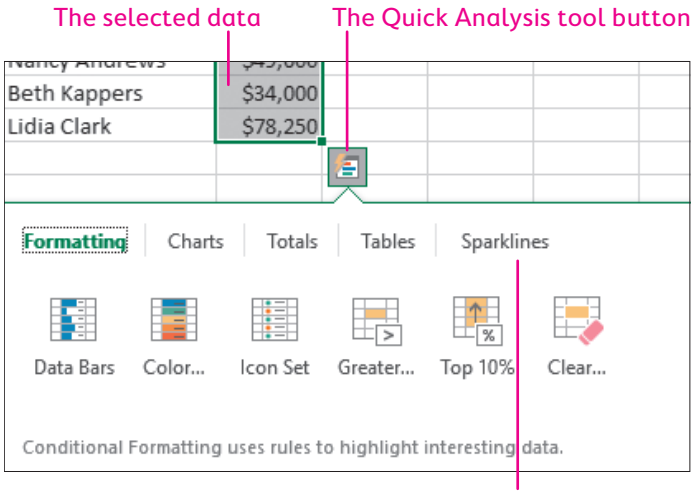
5. Save your work.

The Quick Analysis Tool

The Quick Analysis tool offers quick and easy access to several popular analysis options also available from the Ribbon. For example, you might have a list of expense data, and you want to quickly highlight the expenses that went over budget with conditional formatting or insert a chart of all expenses.

To access the Quick Analysis tool, simply select any range of two or more cells that contain data.

Note! *The Quick Analysis tool button appears only when the mouse is near the selected range of data!*



Each category name will display the menu of options, which include:

- Adding conditional formatting to your selection
- Creating a chart
- Inserting totals such as sum, average, or count, either in the row below or the column to the right of the selection
- Inserting tables, including PivotTables (depending on the data), or sparklines

You can see a preview of each option by holding the mouse pointer over the option.

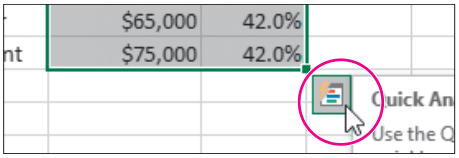
DEVELOP YOUR SKILLS: E10-D4

In this exercise, you will use the Quick Analysis tool to add conditional formatting and then create a chart using the employee salary and tax rate data.

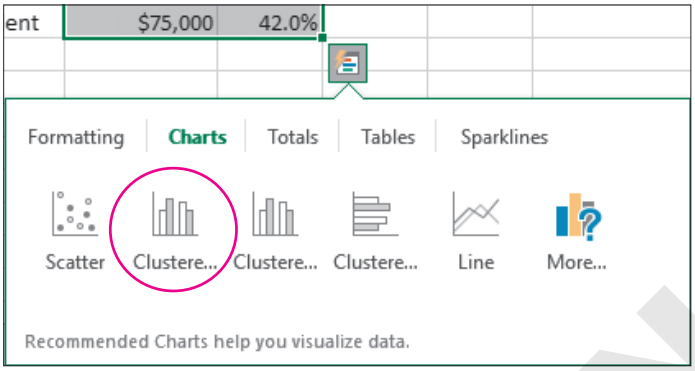
1. Save your file as: **`E10-D4-DataAnalysis`**
2. Begin by selecting a cell in the Salary column, **column F**.
   You will sort the data by Salary first before creating your chart.
3. Choose **Home→Editing→Sort & Filter →Sort Smallest to Largest**.
   You will see a warning window that tells you that sorting will remove the subtotals.
4. Click **OK** to accept and remove the subtotals.
5. Select the Salary and Tax Rate headings and data in the **range F7:G20**.

6. Click the **Quick Analysis** tool button.

   Hint: If you don't see the button, move the mouse pointer near the bottom-right corner of the selection.



7. Click **Charts** and then click the second chart option (**Clustered Column**).



8. Edit the chart title to: **`Salary and Tax Rate Comparison`**
9. Move the chart to a new sheet called: **`Comparison Chart`**
10. Return to the **Database** sheet and select the salary data in the **range F8:F20**.
11. Click **Quick Analysis** and then choose **Icon Set** from the Formatting category.
12. Select the tax rate data in the **range G8:G20**.
13. Click **Quick Analysis** and then choose **Color Scales** from the Formatting category.

    The arrow icons are added to the salaries, and the red and green fill is added to the tax rate data to show groups of low, middle, and high data for each column side by side.
14. Save your work and close the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).

Reinforce Your Skills

REINFORCE YOUR SKILLS: E10-R1

Use the VLOOKUP Function and Quick Analysis

In this exercise, you will create formulas to find the Kids for Change race results for the various participating cities. You will also use Quick Analysis to create a visual representation of the data.

1. Open **E10-R1-Race** from your **Excel Chapter 10** folder and save it as: **`E10-R1-ResultsLookup`**
2. Select **cell B4** and enter **`Denver`** as the first city you will look up.

   You want to quickly find the participants and funds raised for any given city, so you will enter lookup functions in cells E4 and G4.
3. Select **cell E4** and choose **Formulas→Function Library→Lookup & Reference →VLOOKUP**.
4. Fill in the Function Arguments dialog box as indicated:
   - Lookup_Value: **cell B4**

     Cell B4 is where the city name was entered; other cities can be looked up by changing Denver to a different city name.
   - Table_Array: **range A7:G21**

     The city name is in column A, starting in cell A7, and the data extends to column G, cell G21.
   - Col_Index_Num: **3**

     The participant information is in column C, the third column.
   - Range_Lookup: **`FALSE`**

     For this lookup, you want an exact match or no result at all.
5. Click **OK**.

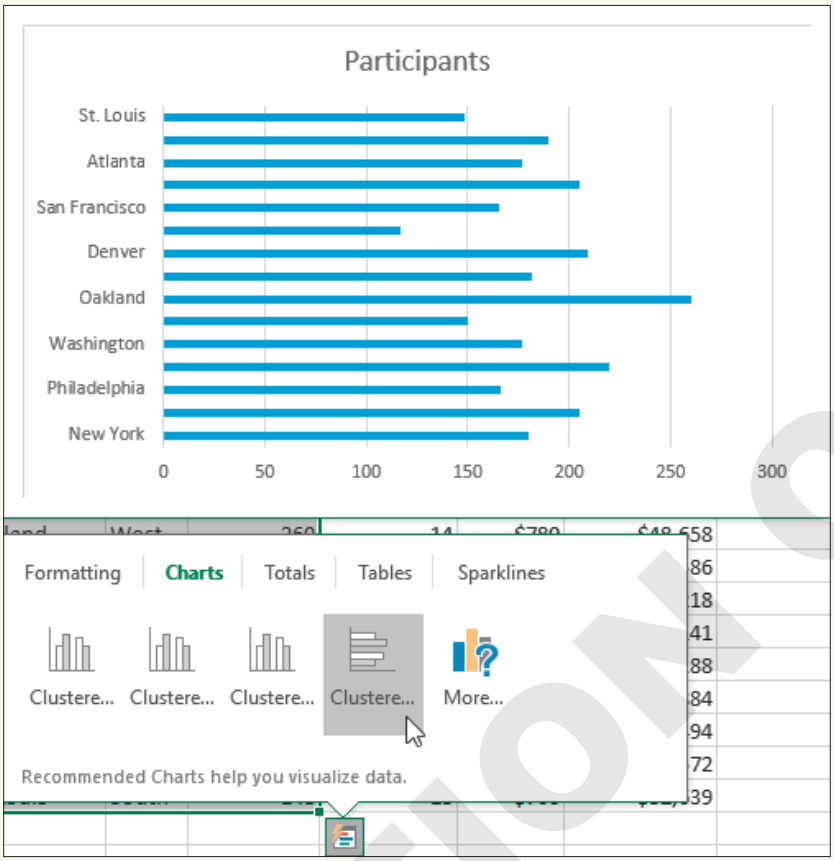
   The result in cell E4 shows there were 209 participants in Denver.
6. Select **cell G4**.

   The formula in cell G4 will also use the VLOOKUP function. The arguments will be similar except the Col_Index_Num will change to return the funds-raised info.
7. Insert another **VLOOKUP** function with these arguments:
   - Lookup_Value: **cell B4**
   - Table_Array: **range A7:G21**
   - Col_Index_Num: **6**
   - Range_Lookup: **`FALSE`**

   The Col_Index_Num is 6 because the funds-raised information is found in the sixth column from the left.

   The result is $46,218 *raised for Denver.*
8. Apply the Accounting number format to **cell G4** and remove both decimal places.
9. Select **cell B4** and type **`Atlanta`** to find the participants and funds raised for Atlanta.
10. Select the **range A6:C21**.

11. Click the **Quick Analysis** tool; click **Charts** and select the fourth option to insert a chart showing the total participants by city.



12. Drag the chart to move it directly below the data.
13. Select the **range F7:F21** and use Quick Analysis to add data bars to the selected range.
14. Save your work.

REINFORCE YOUR SKILLS: E10-R2

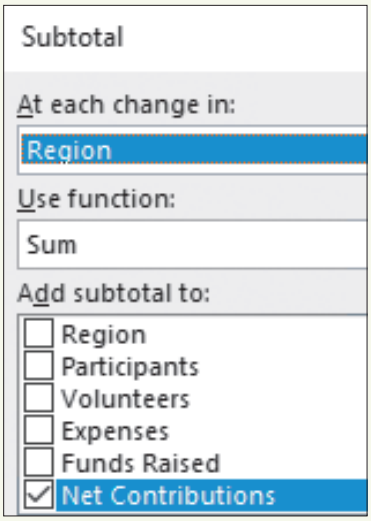
Create Subtotals

In this exercise, you will use the Subtotals feature to find the region that had the highest number of participants and volunteers and the highest net contributions.

1. Save your file as: **`E10-R2-ResultsLookup`**
2. Select **cell A7**.

   The data is already sorted by region, which will allow you to create subtotals by region and also find the grand total for contributions.
3. Choose **Data→Outline→Subtotal**.

4. Find the subtotal for each change in the Region column and leave the other default selections as shown:



5. Click **OK** to insert the subtotals.

   The regional totals and grand total are added to the sheet, as well as the outline. Now you want to add totals to the Participants and Volunteers columns.

6. Choose **Data→Outline→Subtotal** once again.
7. Leave the settings as they are but add a checkmark beside **Participants** and **Volunteers** to add subtotals to these columns, as well as to Net Contributions.
8. Click **OK** to insert the new subtotals.
9. Autofit the width of **column B** to properly display the subtotal headings.

   The West region had the highest number of participants and volunteers as well as the highest net contributions.

10. Save your work and close the file.

REINFORCE YOUR SKILLS: E10-R3

Calculate Company Matching Amount

In this exercise, you will look up the amount employees will receive into their retirement savings after Kids for Change implements a tiered system to encourage employees to save more for retirement.

1. Open **E10-R3-Savings** from your **Excel Chapter 10** folder and save it as: **`E10-R3-SavingsMatched`**
2. In **cell H8**, insert a VLOOKUP function with these arguments:
   - Lookup_Value: **cell G8**
   - Table_Array: **range $K$2:$M$6** (Use F4 to create an absolute reference for the range.)
   - Col_Index_Num: **3**
   - Range_Lookup: **`TRUE`** or omitted

3. Apply the Percent Style number format and then copy the formula down the column for all employees.

   Now you will calculate the company amount by multiplying each employee's annual total by the rate.

4. In **cell I8**, enter **`=G8*H8`** and copy the formula all the way down.

   Next you will sort the list and add subtotals by department.

5. Select **cell B8** and choose **Home→Editing→Sort & Filter →Sort A to Z**.
6. Choose **Data→Outline→Subtotal** .
7. Add a subtotal at each change in department by using the Average function and insert the subtotal for the Annual Total, Rate, and Company Amount columns.
8. Apply the Total cell style to the **ranges G12:I12**, **G18:I18**, and **G23:I24**.
9. Collapse the three groups so only the three subtotal headings and the *Grand Average* heading are displayed.
10. Save your work and close Excel.

Apply Your Skills

APPLY YOUR SKILLS: E10-A1

Calculate a Client Discount

In this exercise, you will use VLOOKUP to find the discount Universal Corporate Events will offer each of its clients. The more they spend, the bigger the discount they receive.

1. Open **E10-A1-Invoices** from your **Excel Chapter 10** folder and save it as: **`E10-A1-InvoiceDiscounts`**
2. In **cell G5**, insert a VLOOKUP function with these arguments:
   - Lookup_Value: **cell F5**
   - Table_Array: **Discount Rates** sheet, **range $A$2:$B$4** (Use F4 to create an absolute reference for the range.)
   - Col_Index_Num: **2**
   - Range_Lookup: **`TRUE`** or omitted
3. Apply the Percent Style number format.

   Airspace Travel qualifies for a discount that is 3% off of its fee.
4. Use the **fill handle** to copy the discount formula down the column for all clients.
5. Save your work.

APPLY YOUR SKILLS: E10-A2

Summarize Events

In this exercise, you will create an outline to group the different types of events and use the Quick Analysis tool to apply conditional formatting to highlight each group.

1. Save your file as: **`E10-A2-InvoiceDiscounts`**
2. Sort the list by the event name in **column C**, from A to Z.
3. Insert a new, blank row beneath each different event type, *Staff Party* and *Team Building*.
4. Insert the word **`Subtotal`** in **column B** in the blank rows, as well as in the first blank row below the training events (**cells B10**, **B13**, and **B19**).
5. In each subtotal row, add a subtotal using AutoSum for the fees in **column F**.
6. In **row 20**, enter **`Grand Total`** in **cell B20** and use AutoSum in **cell F20** to add the three subtotals.
7. With **cell F20** still selected, add an outline to the data using Auto Outline.
8. Select **cell A4** and use the Format Painter to apply the formatting to the **range B10:F10**.
9. Apply the Currency number format to **cell F10**.
10. Use the Format Painter again to apply the format in the **range B10:F10** to the **ranges B13:F13** and **B19:F20**.
11. Use the Quick Analysis tool to apply conditional formatting to the top 10% of fees for each group.

    Hint: Select the range F5:F9, then F11:F12, and then F14:F18.
12. Save your work and close Excel.

APPLY YOUR SKILLS: E10-A3

Schedule a Client Team-Building Event

In this exercise, you will set up the schedule for a team-building event UCE is hosting for Airspace Travel, arranging participants into teams that will start the activities at different times throughout the day.

1. Open **E10-A3-AirspaceEvent** from your **Excel Chapter 10** folder and save it as: **`E10-A3-AirspaceTeams`**

   You will insert an HLOOKUP function, using the same format as the VLOOKUP function but using rows instead of columns.

2. Select **cell C8** and insert an HLOOKUP function with these arguments:
   - Lookup_Value: **cell B8** (has the employees' assigned team number)
   - Table_Array: **range $F$2:$J$5**. (Use F4 to create an absolute reference for the range.)

     The HLOOKUP function will look in the top row for the matching team number and then look into the desired row for the result.
   - Row_Index_Num: **`4`**

     Row 4 contains the assigned lunch time for each team.
   - Range_Lookup: **`FALSE`**
3. Click **OK** to insert the function and then copy it down the column.
4. Select the **range D8:D23** and use the Quick Analysis tool to add the Conditional Formatting icon set to the QA scores.
5. Select **cell B8** and sort by team number from smallest to largest.
6. Insert a blank row between each different team (between Steven in Team 1 and Timothy in Team 2 and so on).
7. Select the **range A8:A11**, which contains the names of the four Team 1 employees.
8. Create an outline by grouping **rows 8–11**.
9. Create groups for Teams 2, 3, and 4 by grouping **rows 13–16**, **18–21**, and **23–26**.
10. Use the **collapse** buttons to hide Teams 2, 3, and 4; leave Team 1 displayed.
11. Save your work and close Excel.

Project Grader

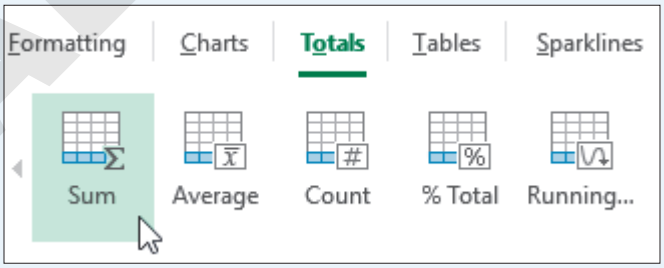
If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.

PROJECT GRADER: E10-P1

Calculating Distributor Sales Totals and Rebates

Taylor Games would like to offer rebates to distributors in hopes of incentivizing product sales and placement. Before calculating rebates, they would like to know which types of distributors are generating the most sales. In this exercise, you will create subtotals for each category, apply grouping to the data, and calculate rebates based on a lookup table.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E10_P1_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E10_P1_Start** from your **Excel Chapter 10** folder.
2. In **cells F15**, **F24**, **F29**, and **F40** of the **Distributors** worksheet, use SUM functions to add up the annual sales for each category.
3. Create a grand total in **cell F41** using a SUM function on **cells F15**, **F24**, **F29**, and **F40**.
4. Use **Auto Outline** to outline the **Distributors** worksheet data.
5. In **cell G7**, create a formula that references the annual sales in **cell F7** multiplied by a VLOOKUP function *=F7*VLOOKUP* using these VLOOKUP arguments:
   - Lookup_Value: Category data (**cell E7**)
   - Table_Array: **Range A3:C6** in the **Rebate Table** worksheet using an absolute cell reference
   - Col_Index_Num: Use the **Rebate Amount** column.
   - Range_Lookup: **`FALSE`**
6. Copy the formula to the **range G8:G39** and delete the formula from any cells displaying *#N/A*.
7. Use the Quick Analysis tool's Sum option on the range **G7:G40** to create a grand total in **cell G41**. If necessary, move the formula from **cell G40** to **cell G41** after it's inserted by the Quick Analysis tool.



8. Save your workbook.
   - *Using eLab:* Save it to your **Excel Chapter 10** folder as **`E10_P1_eSubmission`** and attach the file to your eLab assignment for grading.
   - *Not using eLab:* Save it to your **Excel Chapter 10** folder as: **`E10_P1_Submission`**

PROJECT GRADER: E10-P2

Calculating Car Value Totals and Member Rewards

Classic Cars Club would like to see subtotals and grand totals within the Car Values worksheet. They would also like to calculate member rewards for the current year. In this exercise, you will calculate subtotals for both the Antique and Classic cars along with a grand total, and then convert the car value data range back to a table. You will also calculate membership rewards by looking up the data in a table.

1. Download and open your Project Grader starting file.
   - *Using eLab:* Download **E10_P2_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
   - *Not using eLab:* Open **E10_P2_Start** from your **Excel Chapter 10** folder.
2. In the **Car Values** worksheet, subtotal the **range A7:G37** using these guidelines:
   - Prepare the worksheet to subtotal on the **Status** field so the Antique subtotals will appear first followed by the Classic subtotals.
   - At each change in status use the SUM function to subtotal the Car Value.
   - Leave all other settings at their defaults.
3. Use the Quick Analysis tool to convert the **range A7:G40** to a table.
4. In **cell N7** of the **Membership List** worksheet, create an HLOOKUP function using these guidelines:
   - Lookup_Value: Years active (**cell M7**)
   - Table_Array: **Range B8:K9** in the **Rewards** worksheet using an absolute cell reference
   - Col_Index_Num: Use the **Contract Reward** row in the **Rewards** worksheet.
   - Range_Lookup: **`TRUE`**
5. Copy the lookup function and paste it in the **range N8:N36**.
6. Apply the Accounting number format with zero decimal places to the **range N7:N36**.
7. Save your workbook.
   - *Using eLab:* Save it to your **Excel Chapter 10** folder as **`E10_P2_eSubmission`** and attach the file to your eLab assignment for grading.
   - *Not using eLab:* Save it to your **Excel Chapter 10** folder as: **`E10_P2_Submission`**

Extend Your Skills

These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.

E10-E1 That's the Way I See It

Your friend, Tobias, owns a service company and has asked for your Excel expertise. He has a list of hours worked for his clients and, rather than typing in the rate for each, he wants you to create a formula that automatically looks up the rate based on the type of service performed. Open **E10-E1-TBPS** and save it as: **E10-E1-TBServices**

In the Rate column, insert a lookup function that uses the service type to find the rate from the table in the range A17:B18. After doing this for all customers, multiply the rate by the hours to get the total fees. Then sort the list by the Service column and insert a subtotal of total fees for each type of service.

E10-E2 Be Your Own Boss

Information for client hours at Blue Jean Landscaping has been entered into an Excel worksheet, and now you want to insert quarterly subtotals for the clients. Open **E10-E2-ClientHours** and save it as: **E10-E2-ClientHoursQuarterly**

Insert a blank column after every three months—between Mar and Apr, Jun and Jul, etc. Enter Q1 in the first new column, Q2 in the next, etc., in the header row and then enter a formula to sum the three months for all clients. Enter a sum to add each of the quarters for an annual total. Sort the data by category and create an outline using Auto Outline.

E10-E3 Demonstrate Proficiency

Stormy BBQ keeps track of employee information in a database. Some information is contained in separate worksheets, and you need to import the salary information from the Salary sheet by looking up the employee ID# using a VLOOKUP. Open **E10-E3-Employees** and save it as: **E10-E3-EmployeesRevised**

Insert a VLOOKUP function in column G to find employees' salaries from the Salary sheet by using employee IDs. Format the salary appropriately. Sort the employees by position and insert a subtotal of salaries for each grouped position. Use the Quick Analysis tool to add conditional formatting of your choice to the Years of Employment, Last Review, and Salary columns (do each column separately) to highlight the important data.

Glossary

3-D reference Cell reference in a formula that refers to the same cell or range in multiple adjacent worksheets

auditing Process of reviewing to check for errors, specifically in formulas

Bing The Internet search engine provided by Microsoft

codes Characters or symbols that have special meaning when creating custom number and date formatting

data tables Analysis tools that substitute multiple values from a list for either one or two input cells in a formula; display results for each combination of values

dialog box launchers Small icons that appear in the lower-right corner of some Ribbon groups; click to open a dialog box or task pane related to the group

Flash Fill Combines multiple entries into one cell (combining a first name from one cell and a last name from another) or extracts text from one string into multiple entries (separating first and last name in one cell to two separate cells)

Goal Seek Analysis tool that calculates and replaces the value of one input cell to achieve a formula result

lookup functions Can be used in formulas to retrieve a piece of data from a lookup table, which can be any data range and doesn't have to be formatted as an Excel table

OneDrive Online file storage provided by Microsoft that allows you to access your pictures, workbooks, and other files from any computer

outline symbols Used to change the view of an outlined worksheet by showing or hiding levels of data detail; include the plus sign, minus sign, and the numbers 1, 2, 3, and 4 (refer to outline levels)

Quick Analysis Tools that allow for the easy formatting, charting, and summarizing of a highlighted range; accessed via a button that appears at the bottom-right corner of the selection

Scenario Manager Analysis tool for creating what-if analysis; can be used to replace worksheet values or to generate a report

styles Collections of formatting options that can be applied as a group in one step

text string Also known as *string* or *text*; refers to data in a single cell that consists of a group of characters (often but not required to be alphabetic) formatted as text, such as "Monthly" and "Quarter 3"

Trace Dependents Indicates what cells use the selected cell in a formula by drawing arrows from the selected cell to those dependent cells; opposite of the Trace Precedents command

Trace Precedents Indicates the cells that affect the value of the selected cell by drawing arrows from those precedent cells to the selected cell; opposite of the Trace Dependents command

What-If Analysis The process of changing or testing different values for the cell references being used in a formula

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