FastCourse

Microsoft®

Excel 2016

Level 2

ALEX SCOTT

triOS College

LABYRINTH

LEARNING™

Berkeley, CA

FastCourse Microsoft Excel 2016: Level 2

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Labyrinth Learning
2560 9th Street, Suite 320
Berkeley, California 94710
800.522.9746
On the web at lablearning.com

Product Manager:
Jason Favro

Development Manager:
Laura Popelka

Senior Editor:
Alexandra Mummery

Junior Editor:
Alexandria Henderson

**Assessment and Multimedia
Content Development:**
Ben Linford, Judy Mardar, Andrew
Vaughnley

Production Manager:
Debra Grose

Compositor:
Happenstance Type-O-Rama

Cover Design:
Mick Koller

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EXCEL 2016

Advanced Workbook Formatting

In this chapter, you will work with various tools that are useful when you want to customize your workbook to suit your own specific needs. You will learn about 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
- Add images to a worksheet
- Apply conditional formatting
- Use Zoom tools
- Edit document properties

CHAPTER TIMING

- Concepts/Develop Your Skills: 2 hrs
- Self-Assessment: 20 mins
- Total: 2 hrs 20 mins

PROJECT: PREPARING COMPANY DOCUMENTS

LearnFast College is preparing the annual performance review to report to employees, management, and investors on how well the college did last year. You have been asked to review the Excel file and add appropriate formatting before it is distributed and presented at the annual meeting.

Formatting with Themes

Themes are an easy way to personalize your workbook with a unique set of colors, fonts, and effects. You can apply a different theme to an existing workbook or change the theme when you first begin working on a new workbook. The theme is applied to the whole workbook, so all worksheets will look consistent.
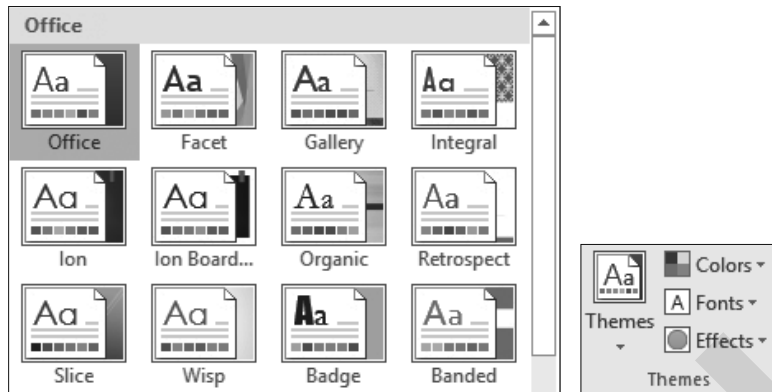
All Office applications have a standard set of themes, and you can scroll through, preview, and select a theme from the gallery; the current theme is highlighted.

Customizing Themes

You can also modify an existing theme by changing each of the three elements individually: the colors, fonts, or effects. To modify the colors, you can choose from the list of color combinations available or customize even further by choosing each theme color yourself.
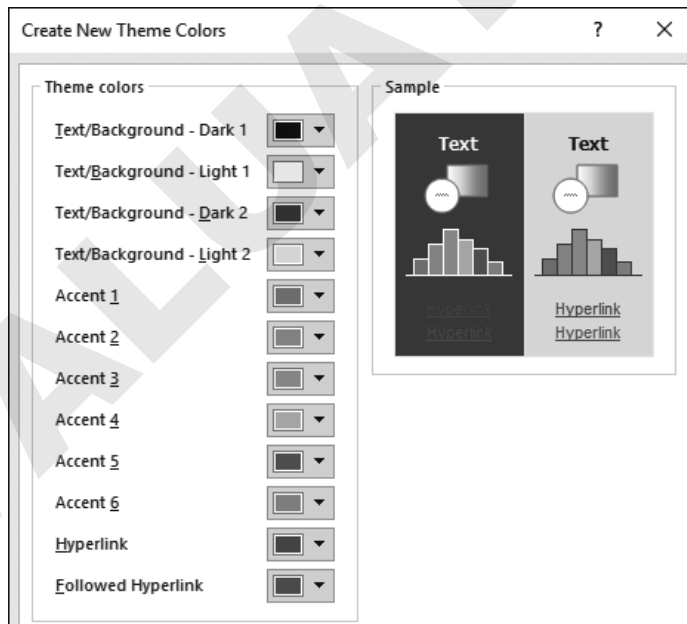
The Create New Theme Colors window allows you to choose the ten theme colors for text/background and accent colors in addition to the colors used for hyperlinks and followed hyperlinks.

To modify the theme fonts, you can again choose from the gallery of options or choose your own custom heading font and body font. After you have modified any part of a theme, you can save the theme to use again in other documents.

≡ Page Layout→Themes

DEVELOP YOUR SKILLS: E1-D1

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

Before You Begin: Be sure to visit the Learning Resource Center at labyrinthelab.com/lrc to retrieve the exercise files for this course before beginning this exercise.

1. Start Excel, open **E1-D1-PerformanceData** from your **Excel Chapter 1** folder, and save it as **E1-D1-PerformanceReport**.

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

3. Choose the **Slice** theme.

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

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

6. Follow these steps to set the colors for Accent 4 and Accent 5:
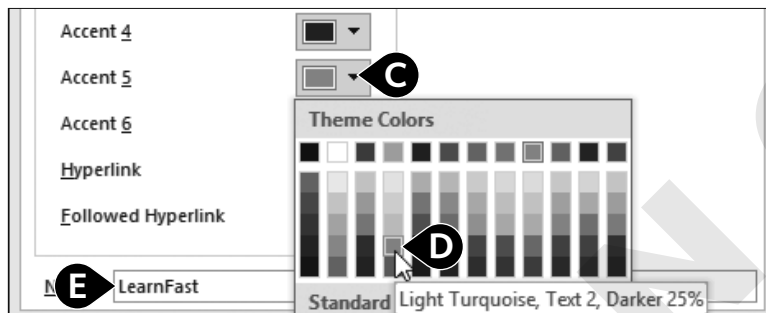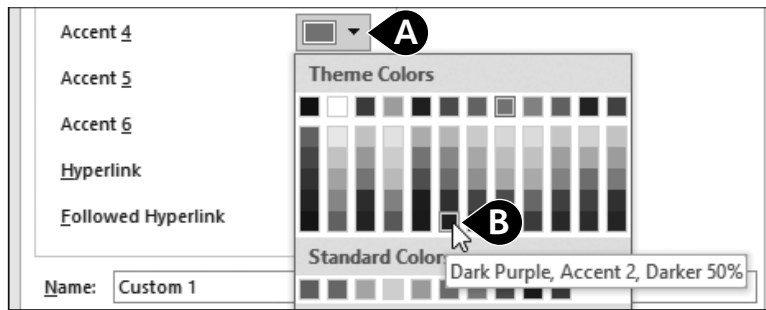
Ⓐ Click the **color menu** button ▼ beside Accent 4.

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

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

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

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

7. Save the file.

Applying Cell Styles

Excel's built-in cell styles can be used to give your worksheet a quick, uniform design. The Cell Styles option combines formatting such as font, color, fill, and alignment. New cell styles can also be created or existing cell styles can be modified; however, these changes would apply only to the current workbook.

≡ Home→ Styles →Cell Styles 🖳

DEVELOP YOUR SKILLS: E1-D2

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

1. Save your file as **E1-D2-PerformanceReport**.

2. Ensure you are on the **2016** sheet and select the Total for the Student Enrollments in the **range A11:C11**.

3. Choose **Home→Styles→Cell Styles** .

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

Titles and Headings					
Headin...	Heading 2	Heading 3	Heading 4	Title	Total

5. Apply the **Total** style to the totals for the 3 other categories of data, in the **ranges E11:G11**, **I11:K11**, and **M11:O11**. (Hint: You can use the Format Painter if you desire.)

6. Select the headings below *Student Enrollments* in the **range A6:C6** and be certain to include the blank in **cell A6**.

7. Apply the **Heading 3** style to the selected range.

8. Apply the same **Heading 3** style to the **ranges E6:G6**, **I6:K6**, and **M6:O6**.

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

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

11. Type the new style name, **LearnFast Heading**, and click **OK** to accept all other settings.

Style	?	×
Style name:	LearnFast Heading	
		Format...
Style includes		
☑ Number	General	
☑ Alignment	Horizontal Center, Bottom Aligned	
☑ Font	Century Gothic (Body) 12, Bold Accent 5, Darker 25%	
☑ Border	No Borders	
☑ Fill	Shaded	
☑ Protection	Locked	
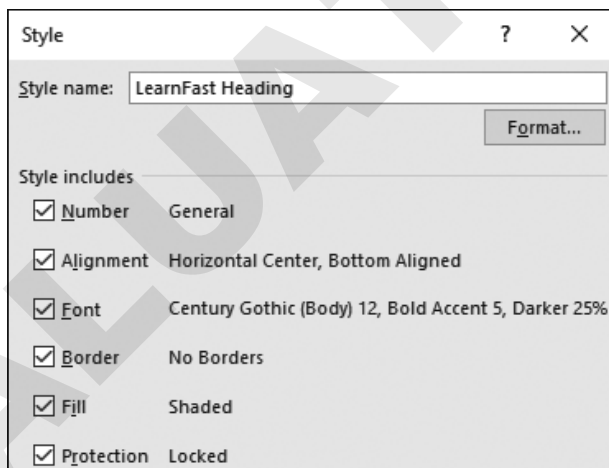
12. Apply the **LearnFast Heading** style to **cells A5**, **E5**, **I5**, and **M5**.

▾				
←.0 .00 .00 →.0	Conditional Formatting ▾	Format as Table ▾	Cell Styles ▾	
Custom				
LearnFast ...				

13. Save the file.
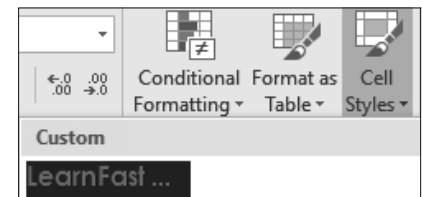
Using the Format Cells Dialog Box

Excel has many exciting features available right from the Ribbon, but there are even more options for formatting cells 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.

These dialog box launchers on the Home tab offer quick, alternative ways to open the Format Cells dialog box.
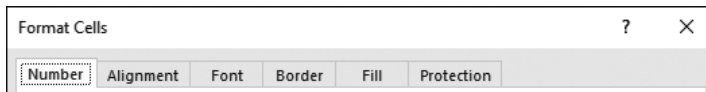
The Format Cells dialog box has six tabs with additional options for formatting; the starting tab will depend on which method you use to open the dialog box.

☰ Home→ Cells →Format ⊞→Format Cells

Cell Borders and Fill

The options for creating borders from the Ribbon are very plain (unless you use the Draw Borders features, which can be difficult). Another option is to select the desired cells and open the Format Cells dialog box, 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 also can see a preview of all of these various options before actually 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: E1-D3

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

1. Save your file as **E1-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:
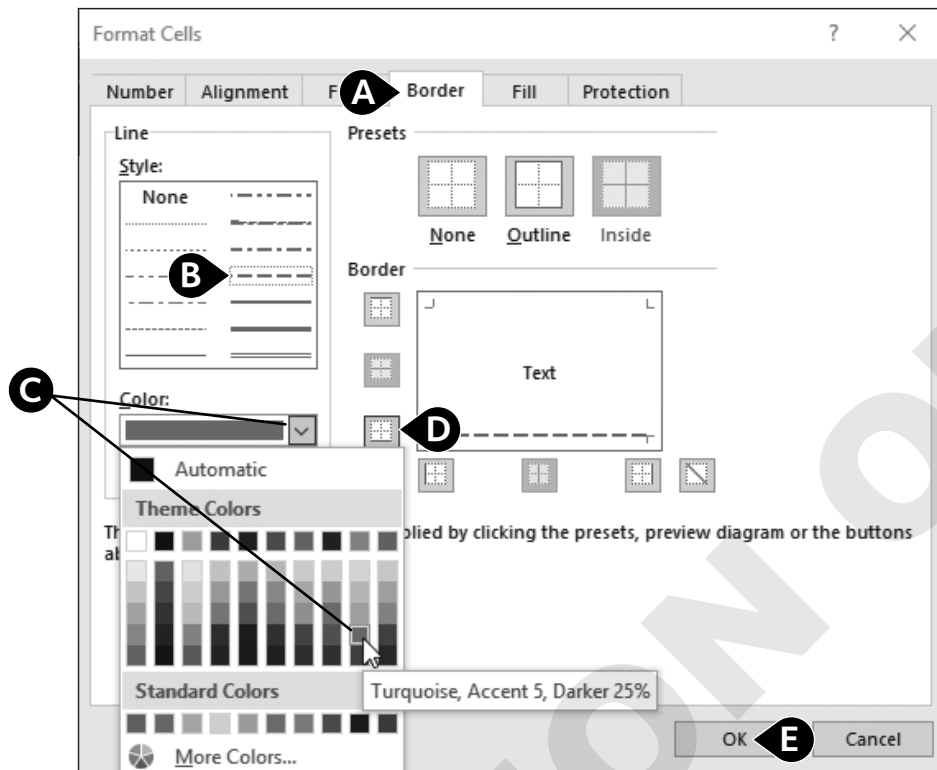
Ⓐ Click the **Border** tab.

Ⓑ Select the thick dashed line style, the 4th option in the 2nd column.

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

Ⓓ 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.)

Ⓔ Click **OK** to finish.

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 the headings.

7. Reopen the Format Cells dialog box by clicking the **Font Settings** dialog box launcher.

Using the Format Cells Dialog Box   **7**
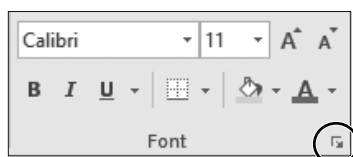
8. Follow these steps to create a pattern fill:
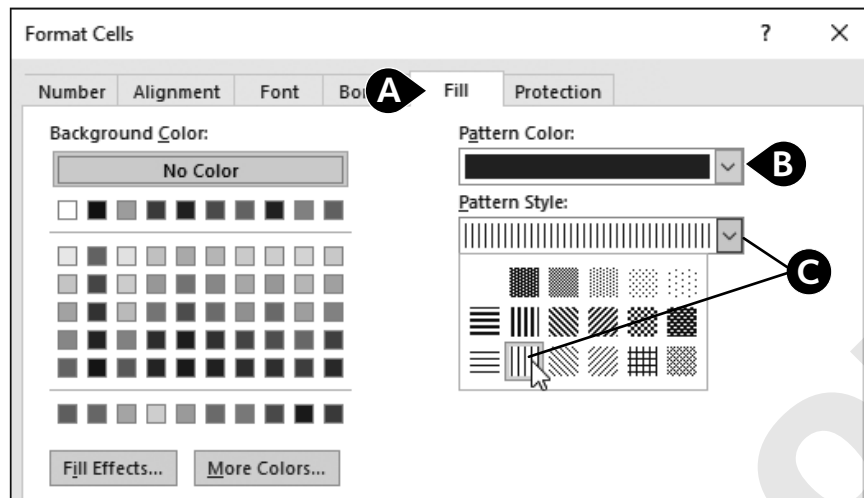
Ⓐ Click the **Fill** tab.

Ⓑ Click the **Pattern Color menu** button ▼ and select **Dark Purple, Accent 4**.

Ⓒ Click the **Pattern Style menu** button ▼ and select **Thin Vertical Stripes**.

9. Click **OK** to finish.

10. Save the file.

Creating Custom Number Formats

Although Excel has many number format options to choose from, there are times that you may 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.

Custom formatting is created in the Format Cells dialog box by using the Custom category and typing the desired format. The following table lists some of the common codes that can be used to create custom number formatting.

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]#,###	123

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

View the video "Custom Number Formatting."

DEVELOP YOUR SKILLS: E1-D4

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

1. Save your file as **E1-D4-PerformanceReport**.

2. Select the **range C7:C11**, which shows the change from the previous year to the current year.

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 inside the **Type** box, delete *General*, and enter **+0.00%;[Red]-0.00%** for the code.
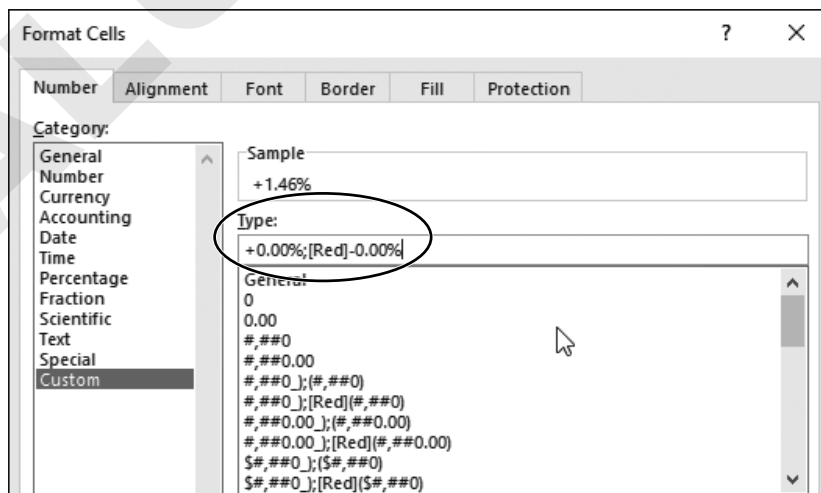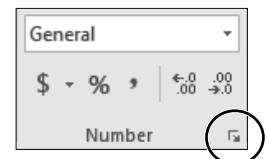
6. Click **OK** to apply the new number formatting.

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**.

9. Reopen the **Format Cells** dialog box.

10. On the Number tab, below Category, select **Custom** and insert the following code in the Type box: `$#,###,"K"`. Click **OK**.

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%**

11. Use the **Format Painter** 🖌 to copy the current year revenue format to the Current Year Expenses in the **range N7:N11**.

12. 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 document.

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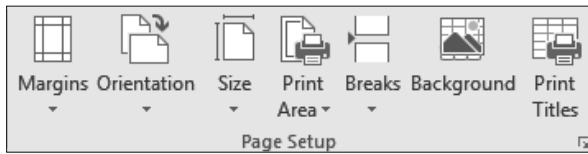
≡ Page Layout→Page Setup

DEVELOP YOUR SKILLS: E1-D5

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

1. Save your file as **E1-D5-PerformanceReport**.
2. Choose **View→Workbook Views→Page Layout** 📄 to switch the view.
3. Choose **Page Layout→Page Setup→Margins** ▥→**Narrow**.
4. Choose **Page Layout→Page Setup→Orientation** 📄→**Landscape**.
5. Choose **Page Layout→Page Setup→Size** 📄→**Legal**.
6. Change the view back to **Normal** view.
7. Insert a background by choosing **Page Layout→Page Setup→Background** 🖼.
8. Beside *From a File*, click **Browse** to insert a file saved on your computer.
9. In the dialog box, navigate to your **Excel Chapter 1** folder, select the **Graduate.jpg** picture, and click **Insert**.
10. Save the file.

Adding Images to a Worksheet

For the most part Excel is used for text and data; however, it is also possible to add pictures and shapes to a worksheet. Pictures might be used to display a company logo, add information to a spreadsheet, or simply add a little excitement to an otherwise plain set of data. Pictures can be added from your computer or from an online search, and many types of shapes can be added via the menu button.

Adding a picture lets you access the Picture Tools features on the Ribbon, and adding a shape allows you to access the Drawing Tools. Both of these contextual tabs give you a great number of

options for changing the style, shape, color, and size and for modifying many other aspects of the image as well.

Allows you to add pictures you have already saved on your computer

Accesses the shapes library here; browse to find the desired shape and click to add it

Will insert pictures from OneDrive or Bing, a web search engine from Microsoft that lets you browse an endless supply of images from the Internet
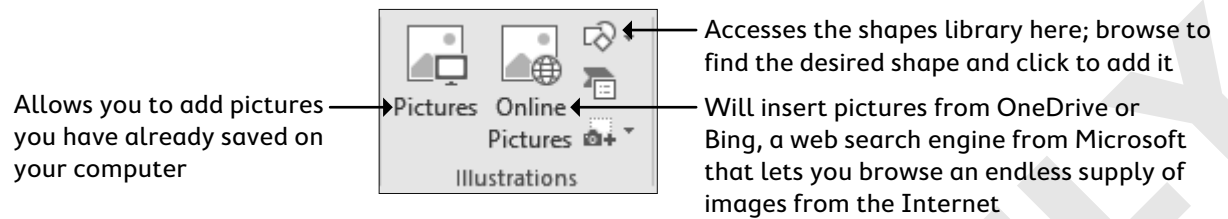
Using Online Pictures to do a Bing Search for Microsoft Excel returns many variations of the Excel logo.

≡ Insert→Illustrations→Pictures *or* Online Pictures *or* Shapes

≡ Insert→Text→Text

≡ For pictures: Picture Tools→Format │ For shapes: Drawing Tools→Format

DEVELOP YOUR SKILLS: E1-D6

1. Save your file as **E1-D6-PerformanceReport.**

2. Select **cell P1** on the **2015** sheet and then choose **Insert→Illustrations→ Online Pictures** to open the dialog box.

3. Search for **graduate** in the Bing Search, choose a suitable image with a graduation cap, and then click **Insert**. Because this is an online search, the results will frequently change, and you may not see the same images from one search to the next.

4. With the image selected, go to **Picture Tools→Format→Size→Height** , type **1** in the box, and then tap Enter .

5. Choose **Picture Tools→Format→Adjust→Color→Dark Purple, Accent color 2 Light** (in the Recolor group).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1									LearnFast College							
2									Annual Performance Review							
3									2015							
4																
5		Student Enrollments				Grad Job Placements				Revenue				Expenses		
6		Current Year	Change			Current Year	Change			Current Year	Change			Current Year	Change	
7	Q1	1230	N/A		Q1	640	N/A		Q1	2297777	N/A		Q1	2136932	N/A	
8	Q2	1150	N/A		Q2	822	N/A		Q2	1972506	N/A		Q2	1913330	N/A	
9	Q3	1400	N/A		Q3	479	N/A		Q3	1952533	N/A		Q3	1893957	N/A	
10	Q4	1373	N/A		Q4	725	N/A		Q4	2682232	N/A		Q4	2172607	N/A	
11	Total	5153	N/A		Total	2666	N/A		Total	8905048	N/A		Total	8116826	N/A	

6. Save the workbook.

Using Conditional Formatting

View the video "Highlighting Data with Conditional Formatting."

Another way to better visualize your data is to use conditional formatting. Conditional formatting takes a set of data, applies a rule or rules, and modifies the formatting of the cells that match the rule. For example, you may have a large set of data containing student grades and want to quickly find the top three marks in the class. Or you may have sales data for a group of products and want to find which product sells the most and which one sells the least. Conditional formatting applies formatting of your choice to the cells that meet these criteria so that you can quickly find them.

Rules can be created to draw attention to the top, or bottom, or to numbers greater than or less than a specific number. You can also highlight a cell with a number equal to a specific amount or a cell that contains certain text; there are so many options!

To apply conditional formatting, the first step is always to select the entire range of data to apply the rule to. For conditional formatting, unlike with charts, you do not include any labels and generally don't include any totals unless you set up a separate rule for total rows or columns. Different rule options are available from the Conditional Formatting drop-down menu, but the criteria and formatting can also be modified to suit your needs. After a rule has been created, you can Clear Rules or Manage Rules to see all existing rules for either the current selection or the entire worksheet.

	A	B	C	D
1		January	February	March
2	Product 1	5	3	12
3	Product 2	8	12	7
4	Product 3	3	9	8
5	Product 4	6	2	11
6	Product 5	10	12	14

The worksheet before creating conditional formatting, with the range selected

	A	B	C	D
1		January	February	March
2	Product 1	5	3	12
3	Product 2	8	12	7
4	Product 3	3	9	8
5	Product 4	6	2	11
6	Product 5	10	12	14

The worksheet after the conditional formatting rule is applied to the range, highlighting the top five items with Light Red Fill and Dark Red Text

After a conditional formatting rule is created, if the data changes, the formatting is automatically updated to reflect the new data.

☰ Home→Styles→Conditional Formatting

DEVELOP YOUR SKILLS: E1-D7

1. Save your file as **E1-D7-PerformanceReport.**

2. Select the **range N7:N10** and choose **Home→Styles→Conditional Formatting→ Highlight Cells Rules**.

3. Choose **Greater Than** and then, in the dialog box that opens, adjust the GREATER THAN value to **2000000** (that is, 2,000,000, with no commas needed). The preview shows which data this will apply to.

Revenue				Expenses		
	Current Year	**Change**			**Current Year**	**Change**
Q1	2297777	N/A		Q1	2136932	N/A
Q2	1972506	N/A		Q2	1913330	N/A
Q3	1952533	N/A		Q3	1893957	N/A
Q4	2682232	N/A		Q4	2172607	N/A
Total	8905048	N/A		Total	8116826	N/A

Greater Than   ?   ×

Format cells that are GREATER THAN:

2000000   with   Light Red Fill with Dark Red Text ▼

OK   Cancel

4. Click **OK** to apply the format and close the dialog box.

5. You need to see the top and bottom agents, so select the **range J7:J10** and choose **Home→ Styles→Conditional Formatting→Top/Bottom Rules→Top 10 Items**.

6. Change the *10* to **1**, change the format to **Green Fill with Dark Green Text**, and click **OK**.

7. With the **range J7:J10** still selected, choose **Home→Styles→ Conditional Formatting→Top/Bottom Rules→Bottom 10 Items**.

8. Change the *10* to **1**, change the format to **Yellow Fill with Dark Yellow Text**, and click **OK**.

9. Before you update the data, you realize a sale was missed in March, so select **cell J7** and change the number from *2297777* to **3297777**; this causes the formatting in that cell to change to show it contains the highest revenue amount.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1							LearnFast College									
2							Annual Performance Review									
3							2015									
4																
5		Student Enrollments				Grad Job Placements				Revenue				Expenses		
6		**Current Year**	**Change**			**Current Year**	**Change**			**Current Year**	**Change**			**Current Year**	**Change**	
7	Q1	1230	N/A		Q1	640	N/A		Q1	3297777	N/A		Q1	2136932	N/A	
8	Q2	1150	N/A		Q2	822	N/A		Q2	1972506	N/A		Q2	1913330	N/A	
9	Q3	1400	N/A		Q3	479	N/A		Q3	1952533	N/A		Q3	1893957	N/A	
10	Q4	1373	N/A		Q4	725	N/A		Q4	2682232	N/A		Q4	2172607	N/A	
11	Total	5153	N/A		Total	2666	N/A		Total	9905048	N/A		Total	8116826	N/A	

10. Save the workbook.

Using Zoom Tools

While working in Excel, you may want to adjust the view to focus on one area of your worksheet, or you may want to get a broad view of the whole worksheet. Changing the view in Excel will not change how the worksheet will print. The Zoom tools allow you to increase or decrease the magnification of your worksheet so you can see more or less of the worksheet at one time. You can select a range of cells and click Zoom to Selection to focus on just that area of the worksheet, or you can jump back to 100% view to see your work in "real" size.
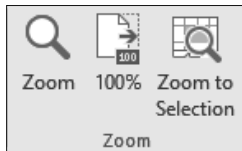
The Zoom tools on the Ribbon allow you to customize magnification settings.

The Zoom slider on the status bar allows you to make quick adjustments by clicking + or –.

☰ View→Zoom 🔍

DEVELOP YOUR SKILLS: E1-D8

In this exercise, you will use the Zoom tools to focus on different areas of the worksheet.

1. Save your file as **E1-D8-PerformanceReport**.

2. Select the student enrollments and grad job placements data in the **range A5:G11**.

3. Choose **View→Zoom→Zoom to Selection** 🔍.

4. Choose **View→Zoom→100%** 🗔.

5. Choose **View→Zoom→Zoom** 🔍.

6. In the dialog box, choose **Custom**, type **120** in the % box, and click **OK**.
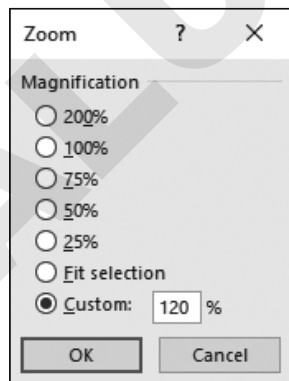
7. On the Zoom slider, click **Zoom Out** to reduce the magnification to 110%.

8. 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 the document. The document properties already include information such as the date the file was created, the date the file was last modified, the document 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: E1-D9

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

1. Save your file as **E1-D9-PerformanceReport**.

2. Choose **File** to go to Backstage view, where the Info tab should be active by default.

3. Click in the **Add a Title** box next to *Title*, type **Final Performance Report**, and tap Tab.

4. Enter the remaining document properties as shown below:

Properties ▾	
Size	70.4KB
Title	Final Performance Report
Tags	Key Performance Indicators
Categories	Operations
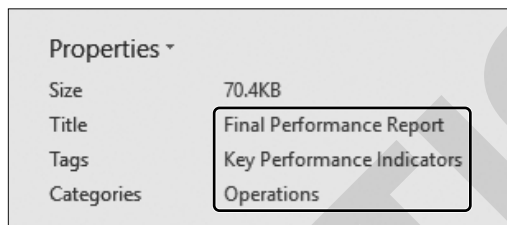
5. Locate the Show All Properties link at the bottom of the Properties list.

Related Documents
☐ Open File Location
Show All Properties
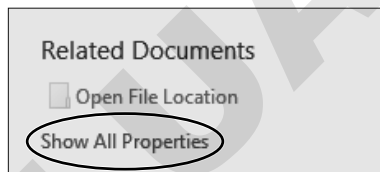
6. Click on **Show All Properties** to expand the list of properties displayed.

7. Locate the subject, click the **Specify the Subject** box, and type **2015 and 2016 Performance**.

8. Use the **Back** button to return to your worksheet.

9. Save and close the file, and then exit Excel.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills by completing the Self-Assessment. The answers to these questions can be found at the back of this book.

1. You can apply a different theme to each worksheet in your workbook. *True False*

2. Each cell style combines formatting such as font, color, fill, and alignment. *True False*

3. You can apply a gradient color to a cell border in the Format Cells dialog box. *True False*

4. After a conditional formatting rule is created, if the data changes, the formatting will be automatically updated to reflect the new data. *True False*

5. Page settings such as margins and orientation can be seen and changed from the Normal worksheet view. *True False*

6. Document properties are visible only to the author or creator of the file. *True False*

7. A theme is made up of which three elements?
   A. Colors, fonts, and shapes
   B. Colors, numbers, and effects
   C. Colors, fonts, and effects
   D. Margins, orientation, and size

8. Alison created a new cell style, which she can use to apply the same formatting to headings in:
   A. The same worksheet
   B. Any Excel file
   C. Any Office document
   D. Any sheet in the current workbook

9. When you open the Format Cells dialog box, the active tab will be:
   A. Either Border or Fill
   B. Any of the tabs, depending on how you open the dialog box
   C. Border
   D. Number, Alignment, or Font

10. Jenny is sending a price list to a Canadian customer, and she wants to ensure the customer understands the prices are in U.S. Dollars by adding the text USD as well as the dollar sign to each number. The custom number format code Jenny should use is:
    A. "USD"00000
    B. $,###USD
    C. $#,###"USD"
    D. $0,000"USD"

(continued)

11. Brian wants to impress his boss by creating a custom number format for the company's year-end reports; if Brian uses the code [Blue]+0.0%;[Red]-0.0%;General, which image would represent his worksheet display?

A.

| Growth | +46.2% | -8.1% | +15.0% | +34.0% | +0.0% | -17.0% | +45.0% |

B.

| Growth | +46% | -8% | +15% | +34% | 0 | -17% | +45% |

C.

| Growth | +0.46 | -0.08 | +0.15 | +0.34 | 0 | -0.17 | +0.45 |

D.

| Growth | +46.2% | -8.1% | +15.0% | +34.0% | 0 | -17.0% | +45.0% |

12. You have selected the range A1:M19 and want to see only this data on your screen. You should choose:

A. View→Zoom→Zoom to Selection

B. View→Zoom→200%

C. View→Zoom→Custom 150%

D. View→Zoom→100%

13. After inserting a picture or shape on a worksheet, which aspects of the image's appearance can you edit?

A. Its size and style

B. Its size and color

C. Its style and color

D. Its size, style, and color

EXCEL 2016

Date Functions and Conditional Formatting

I n this chapter, you will use a variety of methods to work with an important type of data in Excel: date and time information. 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 in Excel
- Create functions using dates
- Perform date and time calculations
- Create customized conditional formatting rules
- Edit rules using the conditional formatting rules manager

CHAPTER TIMING

- Concepts/Develop Your Skills: 1 hr 30 mins
- Self-Assessment: 20 mins
- Total: 1 hr 50 mins

PROJECT: PREPARING COMPANY DOCUMENTS

Airspace Travel prides itself on providing top-notch customer service. As part of its service plan, it carefully tracks its customers' travel dates and flight times, as well as the frequency of their trips. You have been given the task of reviewing and updating this information.

Understanding Date Serial Numbers

In Excel, dates are stored as sequential serial numbers so they can be used in calculations. 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 count up by 1 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.

By using serial numbers for dates, Excel can use dates in calculations and functions. For example, you can use a formula to find the days until a payment is due by taking the due date and subtracting today's date.

	A	B	C
1	Today	Due Date	Days
2	3/8/2016	4/5/2016	28

The formula in cell C2 is *=B2-A2*.

Applying Custom Date Formatting

There are many ways to enter a date into a cell, and depending on how you enter a date into a cell, Excel will apply one of the default date formats, usually either 4/15/2016 or 15-Apr. 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, *4/15/2016* and *Friday, April 15, 2016*, respectively.

Additional date formatting options are available from the Format Cells dialog box, either in the Date category or the Custom category. Each Category has many options to choose from under Type.
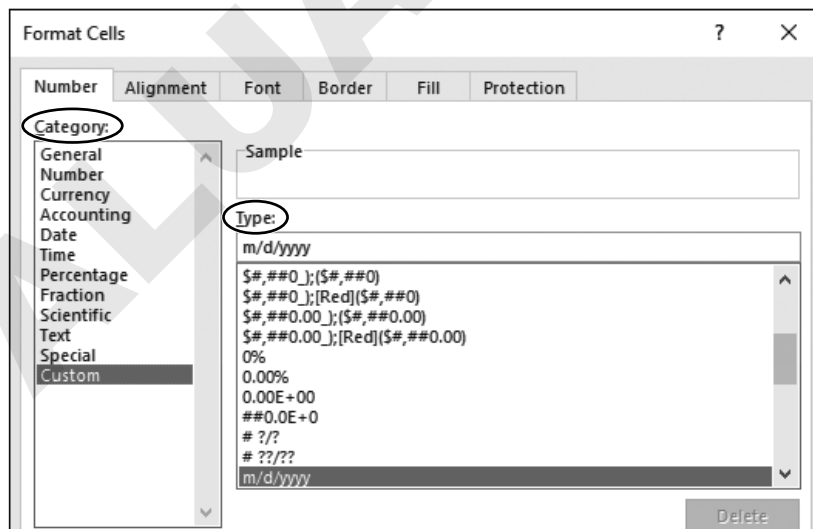
In Custom format, *d* represents the day, *m* represents the month, and *y* represents the year. Below are some examples of date formatting from both categories.

| CUSTOM DATE FORMATTING			
Category	**Format Type**	**Description**	**Display for April 15, 2016**
Date	3/14	Month/Day	4/15
	3/14/12	Month/Day/Year	4/15/16
	March-12	Month-Year	April-16
	March 14, 2012	Month Day, Year	April 15, 2016
Custom	d-mmm	Day-Month	15-Apr
	d-mmmm	Day-Month	15-April
	d-mmm-yy	Day-Month-Year	15-Apr-16
	dddd mmmm "the" d	Weekday Month the Day	Friday April the 15

View the video "Custom Date Formatting."

DEVELOP YOUR SKILLS: E2-D1

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

1. Start Excel and open a new, blank workbook.

2. Save the file in your **Excel Chapter 2** folder as **E2-D1-DaysOld**.

3. In **cell A1**, enter today's date by typing it into the cell in the format mm/dd/yyyy and then tap Enter.

4. In **cell A2**, enter your birth date using the same format and again tap Enter.

5. In **cell A3**, enter the formula **=A1-A2** and complete the entry.

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

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

8. In **cell B3**, type **days old** and tap Enter.

9. Save the file and close it.

10. Open **E2-D1-Invoices** from your **Excel Chapter 2** folder and save it as **E2-D1-Clients**.

11. Select the invoice dates in the **range G4:G13**.

12. Open the **Format Cells** dialog box by clicking the **Number Format** dialog box launcher.

13. Choose **Custom** from the Category list.

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

15. Select the travel dates in the **range J4:J13**.

16. Open the **Format Cells** dialog box once again and choose **Custom** from the Category list.
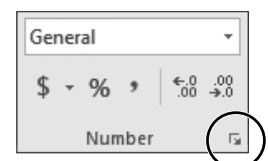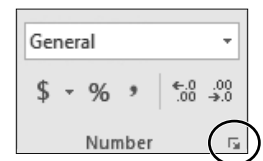
17. In the Type box, enter the code **ddd mmm-d** and click **OK**.

18. Save the file.

Entering Time Information in Excel

Much like dates, times can be entered into Excel the way you want them to appear. For example, if you type 6:00 into a cell, Excel will recognize this as a time entry. Also, like 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 together 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, however, you don'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 the AM/PM designation, 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. If no designation is entered, Excel assumes you are using the 24-hour system and 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 PM	12:00:00 PM or 0.5
13:30	13:30	1:30:00 PM or 0.5625

DEVELOP YOUR SKILLS: E2-D2

In this exercise, you will enter the times for clients' flights into the worksheet.

1. Save your file as **E2-D2-Clients**.

2. Select the flight times in the **range M5:M10**.

3. Choose **Home→Number→Number Format menu button ▼→General**.

4. Ensure only the flight times in the **range M5:M10** are still selected and then open the Format Cells dialog box by clicking the **Number Format** dialog box launcher.

5. Choose **Time** from the Category list.

6. Below *Type*, select the 3rd option, which will display hours:minutes AM/PM, and click **OK**.

7. Enter the remaining clients' flight times into the **range M11:M13**. (Be sure to type *hour:minutes AM/PM* 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

8. Save the file.

Using Date Functions

As you may have noticed, Excel has many Date functions available in the Function Library. Dates are commonly found in Excel sheets because they provide useful information about when a particular event or transaction took place. Date information becomes even more useful if you can use those dates in formulas and functions. For example, date functions can be used to insert the current date or to extract information from a date such as the month or year.

Date functions are entered just like other functions, such as SUM. For example, the TODAY function can be used to enter today's date by entering =TODAY(). For this function, no arguments are entered inside the brackets. Other examples of date functions can be found in the table below.

DATE FUNCTIONS	
Function	**Description**
TODAY()	No arguments are inserted inside the brackets. It displays the current date based on today's serial number; the formula updates the date automatically when the worksheet is recalculated or reopened.
NOW()	No arguments are inserted inside the brackets. This function is similar to the TODAY function but also displays the time, based on your computer's clock.
DATE(year,month,day)	This function returns a specific date, based on the arguments entered.
	Example: Result:
	=DATE(2020,12,20) 12/20/2020
YEAR(date)	Use this function to return the year of the specified date, which can be entered as a serial number or as a cell reference to a cell containing a date.
	Example: Result:
	=YEAR(B23) 2020

DEVELOP YOUR SKILLS: E2-D3

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

1. Save your file as **E2-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.

5. With **cell E3** still selected, choose **Home→Number→Number Format menu button** ▼→ **More Number Formats**.

6. Ensure the Category is Custom and then in the Type box edit the Type code to display **mmmm** only and click **OK**.

7. **Merge & Center** the **range E3:F3**.

8. Select **cell H3**, enter **Year:**, and tap Tab.

9. In **cell I3**, enter the formula **=YEAR(G5)** and complete the entry.

10. **Merge & Center** the **range I3:J3**.

11. Go to the **Client History** worksheet.

12. Insert a new row above the column headings in **row 3** on the worksheet.

13. In **cell A3**, enter **As Of:** and then **Merge & Center** the **range A3:B3**.

14. In **cell C3**, enter the formula **=TODAY()** and then **Merge & Center** the **range C3:F3**.

15. Apply the **Long Date** number format to **cell C3**.

16. Save the file.

# Entering Date and Time Calculations

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

For example, you could use the TODAY function to enter today's date and enter a future date such as Christmas and then subtract the two to find out how many days there are until Christmas. Of course, in business, there are much more practical applications.

C1		× ✓ *fx*	=B1-A1	
	A	B	C	D
1	7/1/2016	12/25/2016	177	Days until Christmas

DEVELOP YOUR SKILLS: E2-D4

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

1. Save your file as **E2-D4-Clients**.

2. Go to the **Sept** worksheet and select **cell L5** below the *Balance Due Date* heading.

3. In **cell L5**, enter the formula **=EDATE(J5,3)** and complete the entry.

4. Copy the formula down the column for the remaining clients.

5. Select **cell N5**, enter the formula **=M5-(1/24*3)**, and then complete the entry.

6. Copy the formula down the column for the remaining clients.

7. Go to the **Client History** worksheet and insert a column to the left of **column F**.

8. In **cell F4**, insert the heading **Days Since Travelled** and tap Enter .

9. In **cell F5**, enter the formula **=$C$3-E5**.

10. With **cell F5** still selected, choose **Home→Number→Number Format menu button ▼→ General**.

11. Copy the formula down the column for the remaining clients.

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

13. In **cell E4**, enter the heading **Years of Loyalty** and tap Enter .

14. In **cell E5**, insert the formula **=YEARFRAC(D5,$C$3)** to find the number of years since each customer first became a client, represented by a fraction rather than just a calculation of the number of days.

15. Choose **Home→Number→Comma Style** to apply the comma number format.

16. Choose **Home→Number→Decrease Decimal** to reduce the decimals to 1.

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

18. Save the file.

Working with Conditional Formatting

The Conditional Formatting command applies formatting to the cells that meet the criteria you set. There are preset options for conditional formatting that can be applied to the top or bottom, or greater than, less than, or equal to, for example. 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 in the applied range changes.

If no preset item on 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, or icon sets. These options provide an alternative way of visualizing your data by breaking data into three 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, but again these graphics can also be added by creating a custom rule.

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 or important information.

Using the Conditional Formatting Rules Manager

The Conditional Formatting Rules Manager can be used 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 Formatting Rules for the current selection or the entire worksheet.
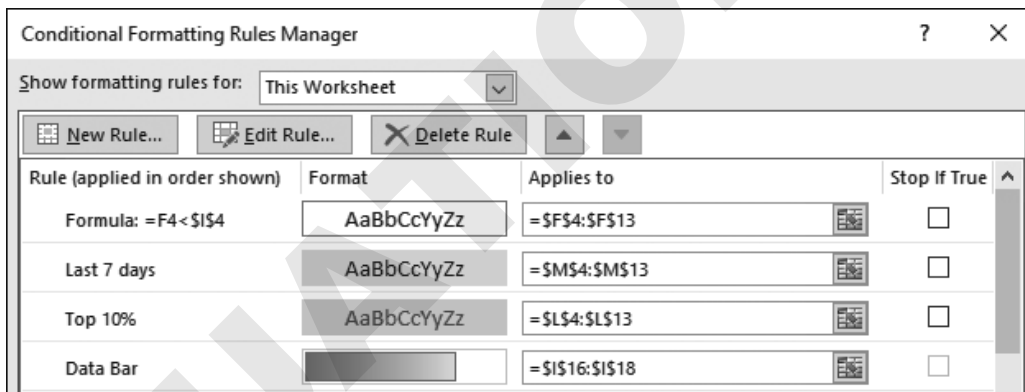
The Rules Manager allows you to add new rules and edit and delete existing rules. In this example, you see the four rules on the current worksheet as well as the ranges the rules apply to.

DEVELOP YOUR SKILLS: E2-D5

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

1. Save your file as **E2-D5-Clients**.

2. Ensure you are on the Client History worksheet and, if necessary, select the data under Years of Loyalty in the **range E5:E14**.

3. Choose **Home→Styles→Conditional Formatting** ▦ **→Icon Sets→3 Stars** (the first option in the Ratings group).

4. In **cell A17**, enter `Loyalty Program`, **Merge & 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,** as shown here.

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

6. To edit the existing rule, choose **Home→Styles→ Conditional Formatting** [icon] **→Manage Rules**.

7. Follow these steps to edit the rule:
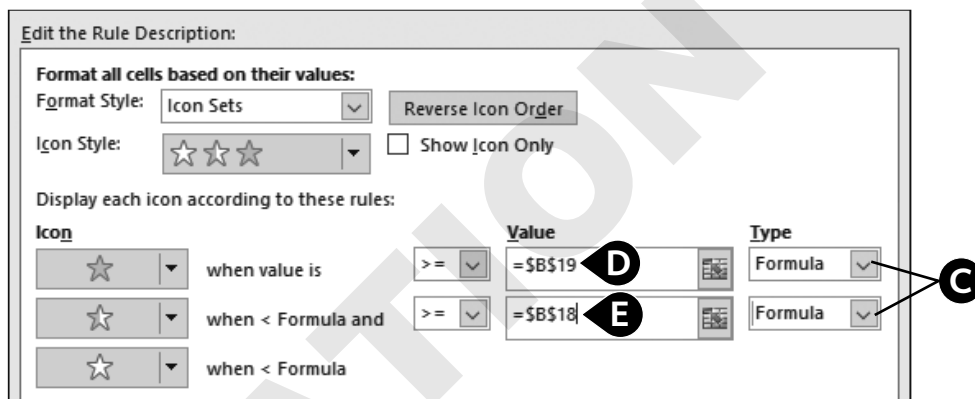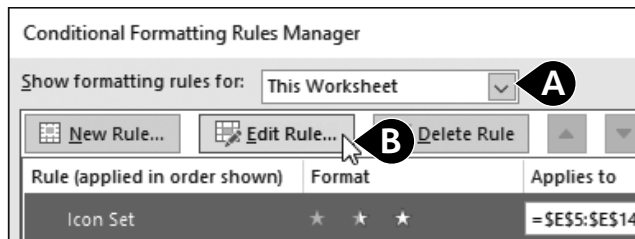
Ⓐ   Select **This Worksheet** to show all rules on the worksheet.

Ⓑ   Click **Edit Rule**.

Ⓒ   In the Edit Formatting Rule dialog box, change the Type to **Formula** for both Values.

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

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

8. Click **OK** to finish editing the rule and then click **OK** to close the Rules Manager.

9. Go to the **Sept** worksheet and select the Invoice Date data in the **range G5:G14**.

10. Choose **Home→Styles→Conditional Formatting** [icon] **→New Rule**.

11. Follow these steps to create the new rule:
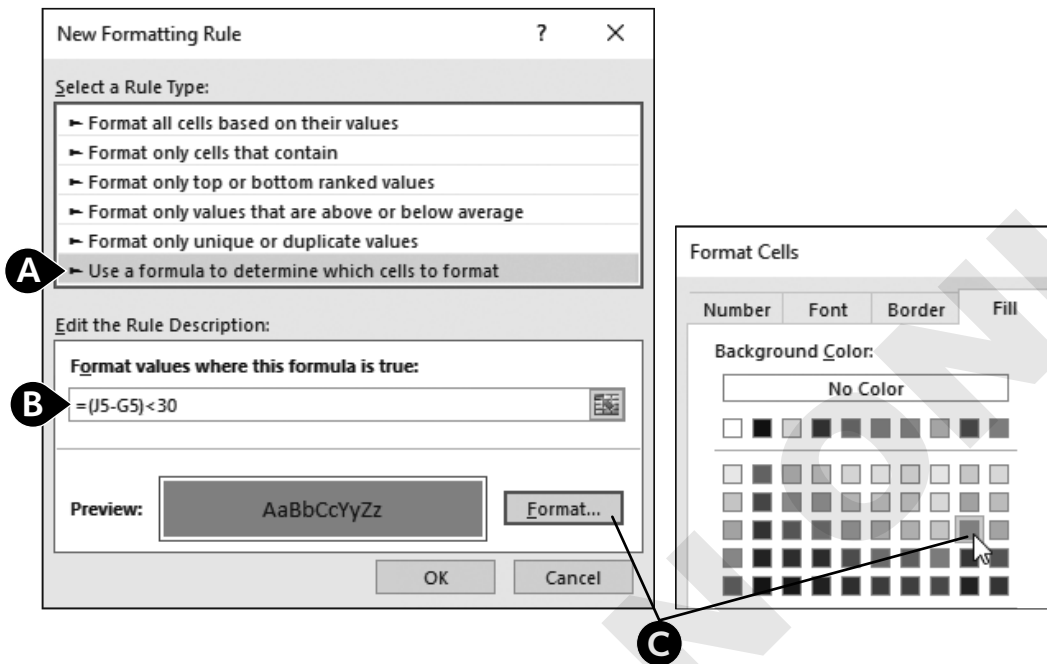
Ⓐ Select **Use a Formula…** to determine which cells to format.

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

Ⓒ Click **Format** and edit the Fill by selecting **Blue, Accent 5, Lighter 40%** (the 9th column, 4th row; there is not a screen tip to display the color name).

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

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 the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills by completing the Self-Assessment. The answers to these questions can be found at the back of this book.

1. The date formatting code mmm displays the first 3 letters of the month only. *True   False*

2. Using serial numbers for dates allows Excel to use dates to perform calculations, such as subtracting one date from another to find the number of days in between. *True   False*

3. The serial number for a day is counted as 1; therefore, 12 hours, or half a day, is counted as 0.5. *True   False*

4. If you enter the formula =TODAY( ) on December 16 and then reopen the Excel file the next day, the cell will show the date of December 17. *True   False*

5. Sharon wants to automatically add 8 days to her customer's order dates to calculate the expected delivery date. If the order date is in cell B7, the formula will be *=B7+8*. *True   False*

6. The Conditional Formatting Rules Manager can be used to create, edit, and delete rules or to rearrange the order in which they are applied. *True   False*

7. If the serial number 1207 is a Tuesday, what day of the week would serial number 1210 be?
   A. Monday
   B. Tuesday
   C. Friday
   D. Saturday

8. The following formula will return what result, in hours and minutes?

	A	B	C
1	6:00	8:30	=B1-A1

   A. 1:30
   B. 2:00
   C. 2:03
   D. 2:30

9. The formula =DATE(2017,7,2) will return which date?
   A. July 2, 2027
   B. February 7, 2017
   C. February 2, 2017
   D. July 2, 2017

10. If you want to find the difference between 2 dates listed in years instead of days, you can use this function:
   A. YEAR
   B. DATE
   C. EDATE
   D. YEARFRAC

11. Which of the following is NOT true regarding the Conditional Formatting Rules Manager?

   A. It allows you to create, edit, and delete rules.

   B. It allows you to rearrange the order of rules.

   C. Once you create a conditional rule, it cannot be changed; you must delete it and create a new one.

   D. It allows you to view rules for a selection of cells or the entire worksheet.

12. If the actual amount of rent were to go up to 26,000 and Difference is calculated as Budget minus Actual, which conditional formatting graphics would change?

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

   A. Actual

   B. Budget

   C. Both Actual and Budget

   D. Both Actual and Difference

EXCEL 2016

Advanced Functions for Text and Analysis

I n this chapter, you will learn new functions that give you greater ability for analysis and decision making. They include functions that either sum or count values that meet certain criteria. You will also explore functions that can be used to clean up or rearrange text on your worksheet, as well as learn what you can do when you find formula errors in your worksheet.

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

CHAPTER TIMING

- Concepts/Develop Your Skills: 2 hrs
- Self-Assessment: 20 mins
- Total: 2 hrs 20 mins

PROJECT: ANALYZING SALES INFORMATION

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

Using Functions to Modify Text

When workbook data comes from sources other than Excel, the data can sometimes be formatted incorrectly. Data may also have been entered by multiple users, with different methods 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, they won't match. Another problem can occur when data is either entered into too few or too many columns, such as entering First Name and Last Name together in one column when it is supposed to be entered in separate columns.

Although many people primarily think of Excel as working with numbers, there are quite a few text functions that allow you to work with text as well. Text functions can be used 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.

◢	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!

As you can see, the function argument is simply the text to convert and can be a cell reference or the text itself.

Extracting Text

In some cases, only a part of the cell contents is needed, or there may be extra characters or spaces that you don't want. The LEFT, MID, and RIGHT functions will 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.

Combining and Separating Text

The CONCATENATE function allows you to combine two or more separate text entries into one cell. The Flash Fill feature is an even better option, as it can also combine multiple entries into one or extract text from one text string into multiple entries, in addition to having a number of other applications. By entering a couple of examples, Flash Fill will look for patterns and automatically fill in the remaining values.

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

The main difference is that Flash Fill will use adjacent data only, whereas CONCATENATE uses a cell reference so the text could be anywhere on the worksheet or even on another worksheet.

Column C uses the CONCATENATE function to combine the text in column A and column B into one cell.

The function arguments are either cell references or actual text. Notice the second argument, " ", inserts the text inside quotations, which is a space, between the First Name in cell A2 and the Last Name in cell B2.

The original data is in column A.

The Area Code 232 was manually entered in cell B2, and the remaining area codes in column B were entered using Flash Fill (from the Data tab on the Ribbon).
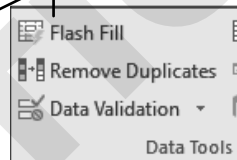
The Flash Fill Options button can Undo or Accept the suggested entries.

Other Text Functions

Exploring some of the other text functions available in Excel can be useful in certain circumstances. There are text functions that allow you to replace or substitute text within a text string, functions for finding the text's position, or functions to calculate text length. You can even insert a function that will repeat a text character a specified number of times. Some of these examples of additional text functions are described in the table below.

TEXT FUNCTIONS		
Function	**Description**	**Example**
REPLACE	Replaces part of a text string with a different text string; for example, 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; for example, replacing *Mgr* with *Manager*	*Cell B4:* Mgr *Formula:* =SUBSTITUTE(B4,"Mgr","Manager") *Result:* Manager
LEN	Determines the number of characters in a cell entry	*Cell B7:* 2223334444 *Formula:* =LEN(B7) *Result:* 10
REPT	Repeats text, for example, repeating the letter *A* five times	*Formula:* =REPT("A",5) *Result:* AAAAA

≡ Data→Data Tools→Flash Fill

≡ Formulas→Function Library→Text

DEVELOP YOUR SKILLS: E3-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 **E3-D1-Sales** from your **Excel Chapter 3** folder, and save it as **E3-D1-SalesAnalysis**.

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 and **AutoFit** the column width.

4. With the **range A5:A33** still selected, choose **Home→Clipboard→Copy** 📋.

5. Without changing the selection, choose **Home→Clipboard→Paste** 📋→**Values** to paste the values only (not the formulas) into the selected range.

6. Now delete the names from the **range B5:B33**.

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

8. In **cell E5**, enter the function **=LEFT(D5,6)** and then fill the formula down the column, making sure to use the **Auto Fill Options** to fill without formatting.

9. With the **range E5:E33** still selected, copy the formulas and then use **Paste Options** to paste the values only into **column D**.

10. Delete the formulas from the **range E5:E33**.

11. In **cell E5**, enter the function **=CONCATENATE(F5," ",G5)** and then fill the formula down the column (again fill without formatting).

12. With the **range E5:E33** still selected, copy the formulas and then paste the values only into **cell F5**.

13. Delete the formulas from the **range E5:E33** and the text in the **range G5:G33**.

14. In **cell B5**, enter the name **Alexander** and then complete the entry.

15. Now choose **Data→Data Tools→Flash Fill** to fill the first names down **column B.**

16. In **cell C5**, enter the name **Robertson**, complete the entry, and use **Flash Fill** to again fill in the rest of the last names down the column.

17. Delete **column A**, removing it entirely from the worksheet.

18. In **cell D4**, enter the heading **Email**.

19. In **cell D5**, enter the email address for Alexander, which is **Alexander.Robertson@ airspace.com**.

20. Double-click the **fill handle** to copy the email address down **column D**; in the **Auto Fill Options**, choose **Flash Fill** to insert the proper email addresses for all other employees in the column.

21. In **cell F5**, type **Miami** without a space, complete the entry, and use **Flash Fill** to fill the rest of the column.

22. Move the **Location** heading from **cell E4** to **cell F4** and delete **column E**.

23. Save the file.

Creating Conditional Functions Using IF Criteria

Conditional functions allow you to sum, count, or find the average of a range of cells if the cells meet your desired criteria. One criterion is entered for the IF functions and multiple criteria are entered for the IFS functions.

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…)

Function Syntax

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	(Optional) This is the range to be summed, which can be different from the range being compared with the criteria. If Sum range is omitted, the range is summed.
Average range	(Optional) Like Sum range, this is the range to be averaged.

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

- How many of your 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. The arguments would be the sum range: criteria1, range1, criteria2, range2.

The Sum Range refers to the sales, to be added together from column C.

The formula in cell G3 is shown in the Formula Bar.

Criteria1 is the product number 2152; no = sign is needed.

The preview of the formula result is shown here.

Criteria_Range1 is the product #s in column A.

Criteria_Range2 is the city, in column B.

Criteria2 is "San Antonio", entered in quotations (or Excel adds quotes).

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.

Creating Conditional Functions Using IF Criteria **37**

DEVELOP YOUR SKILLS: E3-D2

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

1. Save your file as **E3-D2-SalesAnalysis**.

2. In **cell K5**, enter **Miami Employees**.

3. In **cell L5**, enter the formula **=COUNTIF(E5:E33,"Miami")**.

4. In **cell K6**, enter **Miami Employee Commissions**.

5. In **cell L6**, enter the formula **=SUMIF(E5:E33,"Miami",I5:I33)**. The range and the criteria are the same, but the SUMIF function also uses the sum range, which represents the commissions in the **range I5:I33**.

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

7. In **cell K7**, enter **Miami Average Sales**.

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

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

10. In **cell K8**, enter **Miami Employees – Sales >$10,000**.

11. In **cell L8**, enter the formula **=COUNTIFS(E5:E33,"Miami",H5:H33,">10000")**.

12. In **cell K9**, enter **Toronto Employees – Sales >$10,000** and adjust the width of **column K** using **AutoFit**.

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

14. In **cell K10**, enter **Miami Mgr Comm's - Sales <$10,000**.

15. In **cell L10**, enter the formula **=SUMIFS(I5:I33,E5:E33,"Miami",F5:F33, "Manager",H5:H33,"<10000")**. (Hint: Use the Function Arguments dialog box, if desired, to enter formulas with several criteria, such as this one.)


16. Format **cell L10** as **Currency** with no decimals.

17. Save the file.

Nested Functions

In Excel 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 other functions.

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.

✕	✓	*fx*	=ROUND(AVERAGE(F5:F52),0)
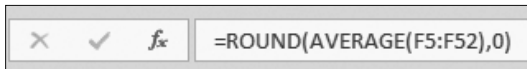
This formula would use the AVERAGE function for the range F5:F52, and then the ROUND function would round the results to zero decimal places.

Another example would be to create an IF function within an IF function if you needed more than one criterion to determine the result. 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.

In the first IF function, the Logical_Test determines IF C3>B3; are Sales greater than the Goal?

The value if this is also true is "Yes," meaning each employee must have more than 15 sales and achieved their goal to return a "Yes."

E3	▾	⋮	✕	✓	*fx*	=IF(C3>B3,IF(D3>15,"Yes","No"),"No")

	A	B	C	D	E	F	G
1							
2	Name	Goal	Sales	# Sales			
3	Bert	$ 1,000	$ 900	18	No		
4	Ernie	1,200	1,300	12	No		
5	Jen	800	950	21	Yes		
6	Sarah	1,000	1,200	17	Yes		

Function Arguments

IF

Logical_test	C3 > B3	
Value_if_true	IF(D3 > 15,"Yes","No")	
Value_if_false	"No"	

If either of these is not true, the Value_If_False for both is "No."

If Sales are greater than the goal, the Value_If_True is another IF function, which is used to determine IF D3>15; does the employee have a minimum of 15 sales?
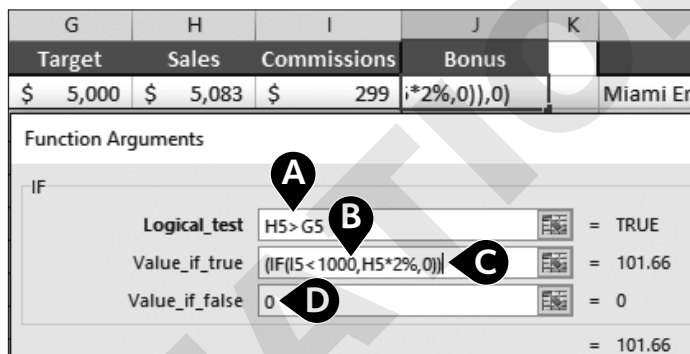
DEVELOP YOUR SKILLS: E3-D3

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

1. Save your file as **E3-D3-SalesAnalysis**.

2. Select the Miami Average Sales Amount in **cell L7**.

3. Increase the decimal to show 3 decimal places.

4. Now follow these steps to edit the formula:

| ✕ | ✓ | *fx* | =ROUND(AVERAGEIF(E5:E33,"Miami",H5:H33),0) |

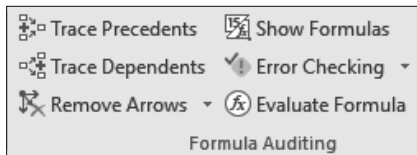Ⓒ   Ⓐ   Ⓑ

Ⓐ In the Formula Bar, click to place the insertion point before AVERAGE and type **ROUND(**.

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

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

5. In **cell L7**, decrease the decimal to remove the decimals from the display.

6. Select **cell J4** and insert a new worksheet column.

7. In **cell J4**, enter the heading **Bonus**.

8. Open the **Insert Function** dialog box and select the **IF** function.

9. Follow these steps to create a nested **IF** function:

	G	H	I	J	K	
	Target	Sales	Commissions	Bonus		
	$ 5,000	$ 5,083	$ 299	;*2%,0)),0)		Miami En

Function Arguments

IF

Logical_test	H5>G5		= TRUE
Value_if_true	(IF(I5<1000,H5*2%,0))		= 101.66
Value_if_false	0		= 0
			= 101.66

Ⓐ In the Logical_Test, enter **H5>G5** to determine whether sales were greater than the target.

Ⓑ In the Value_If_True, for employees who did meet their target, you must determine whether their commission was less than $1,000 by entering **(IF(I5<1000,**.

Ⓒ In the same box, continue by entering **H5*2%,0))**, which will return H5(Sales) times 2% if this is also true and 0 if the second condition is not met.

Ⓓ In the Value_If_False field, enter **0** if the first condition is not met.

10. Click **OK** to enter the formula.

11. Fill the formula down the column for all other employees.

12. Save and close the file.

Troubleshooting Formulas

As you can see, working with formulas can sometimes be challenging. Excel's auditing tools can 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 the current cell is being used in other formulas, as well as locating and correcting errors in formulas.

🖧 Trace Precedents	🔢 Show Formulas
🖧 Trace Dependents	🔍 Error Checking ▾
🖎 Remove Arrows ▾	⨍ₓ Evaluate Formula

Formula Auditing

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 work backwards 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		

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 showing the Sales Above Goal, Trace Precedents is used to show that the Total Goal and Total Sales cells are used to calculate the amount of $350.

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 an easier 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	

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.

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.

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 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 you 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 indicated by an indicator triangle, and sometimes by an error message in the cell instead of the formula result.

Some of the common errors found in formulas are given in the table below.
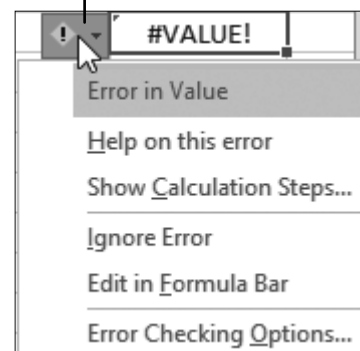
The green error indicator triangle displays in the top left of an unselected cell that contains an error.

#VALUE!

Selecting a cell with an error displays the warning sign.

◇ | #VALUE!
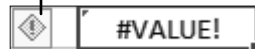
Clicking on the warning sign displays the options for dealing with the error.

! ▾ | #VALUE!

Error in Value
Help on this error
Show Calculation Steps…
Ignore Error
Edit in Formula Bar
Error Checking Options…

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 divides 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 is another common error, which 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 but 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

When reviewing a complex formula, it can be useful to break the formula down into steps and watch how Excel solves the formula. This can help to discover the source of an error or explain why the result does not look the way you expected it to. Not all mistakes are caught by Excel showing an error; sometimes a valid formula is simply showing the incorrect information because it was not created with the correct cell references, functions, or operations.

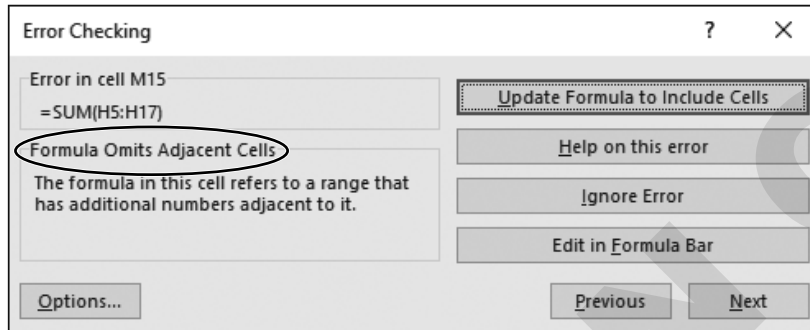≡ Formulas→Formula Auditing

DEVELOP YOUR SKILLS: E3-D4

In this exercise, you will use the Formula Auditing tools to analyze and correct formula errors.

1. Open **E3-D4-Sales** from your **Excel Chapter 3** folder and save it as **E3-D4-SalesSummary**.

2. On the **Aug Sales** sheet, select **cell M10**.

3. Choose **Formulas→Formula Auditing→Trace Precedents** ⊞.
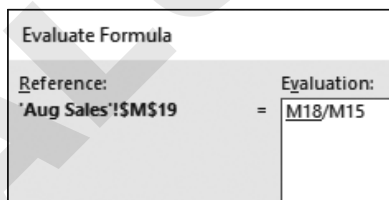
Location	Position	Target	Sales	Commissions	Bonus		Description	Amount
Miami	Agent	$ 5,000	$ 5,083	$ 299	$ 102		Miami Employees	9
Miami	Agent	10,000	13,156	1,196	$ -		Miami Employee Commissions	$6,876
New York	Agent	10,000	10,096	631	$ 202		Miami Average Sales	$10,643
New York	Manager	12,000	12,684	906	$ 254		Miami Employees - Sales >$10,000	4
Toronto	Agent	5,000	5,655	377	$ 113		Toronto Employees - Sales >$10,000	3
Vancouver	Manager	10,000	7,552	472	$ -		Miami Mgr Comm's - Sales <$10,000	$2,012

4. With **cell M10** still selected, again choose **Formulas→Formula Auditing→Trace Precedents** ⊞.

5. With **cell M10** still selected, choose **Formulas→Formula Auditing→Trace Dependents** ⊞.
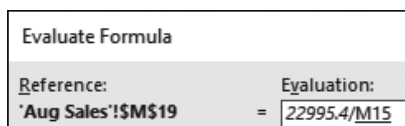
6. Click **OK** to close the warning box.

7. Choose **Formulas→Formula Auditing→Remove Arrows** 📉.

8. Select **cell M18** and again choose **Formulas→Formula Auditing→Trace Precedents** 📊.

9. Edit the formula in **cell M18** to be **=M16+M17**.

10. With **cell M18** still selected, again choose **Formulas→Formula Auditing→ Trace Precedents** 📊 and then click the button a second time.

11. Choose **Formulas→Formula Auditing→Trace Dependents** 📊.

12. Select **cell A1** and choose **Formulas→Formula Auditing→Error Checking** 🔺.

Error Checking	? ✕
Error in cell M15 =SUM(H5:H17)	Update Formula to Include Cells
Formula Omits Adjacent Cells The formula in this cell refers to a range that has additional numbers adjacent to it.	Help on this error
	Ignore Error
	Edit in Formula Bar
Options...	Previous Next

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

14. Again click **Update Formula to Include Cells**.

15. Click **Edit in Formula Bar**, delete the existing cell references, replace with the **range J5:J33** so the formula reads **=SUM(J5:J33)**, and then click **Resume** in the Error Checking dialog box.

16. Click **Edit in Formula Bar**, correct the formula by changing **cell M14** to **cell M15** so the formula is **=M18/M15**, and then click **Resume**.

17. Apply the **Percent** number format to **cell M19**.

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

Evaluate Formula	
Reference: 'Aug Sales'!$M$19	**Evaluation:** = M18/M15

19. Click **Evaluate**.

Evaluate Formula	
Reference: 'Aug Sales'!$M$19	**Evaluation:** = 22995.4/M15

20. Click **Evaluate**.

Evaluate Formula	
Reference:	Evaluation:
'Aug Sales'!$M$19 =	22995.4/327493

21. Click **Evaluate** once more.

22. Click **Close**.

23. 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 this information is on a different sheet 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)

=SUM(January:March!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 March 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: E3-D5

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

1. Save your file as **E3-D5-SalesSummary**.

2. Go to the **Q3 Sales Summary** worksheet.

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 On the Jul Sales worksheet, select **cell G5**, and the Formula Bar will display *=SUM('Jul Sales'!G5*.

C Hold down the Shift key on the keyboard and click the **Sep Sales** sheet tab to select the range of sheets Jul Sales:Sep Sales, which includes the Aug Sales sheet.

5. Complete the entry by clicking ✓ on the Formula Bar, which will automatically return you to the Q3 Sales Summary worksheet. (Do NOT click the Q3 Sales Summary tab as this will change the formula!)

6. Now select **cell H5** and use the method from step 5 to create a formula to add **cell H5** on the Jul Sales, Aug Sales, and Sep Sales sheets; your formula should be *=SUM('Jul Sales:Sep Sales'!H5)* when finished.

7. In **cell I5**, create a formula to add **cell I5** on the **Jul Sales**, **Aug Sales**, and **Sep Sales** sheets; your formula should be *=SUM('Jul Sales:Sep Sales'!I5)* when finished.

8. Select the **range G5:I5**, copy the formulas down all 3 columns using the **fill handle**, and use **Auto Fill Options** to fill without formatting.

9. Save your work and close the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills by completing the Self-Assessment. The answers to these questions can be found at the back of this book.

1. If a worksheet looks messy because it contains names in either all capitals or lowercase letters, you can use the UPPER function to convert all the names to all capitals. *True False*

2. Flash Fill can be used like the CONCATENATE function to combine columns of data anywhere on a worksheet. *True False*

3. To find the sum of the Miami sales employees' commissions, the formula =SUMIF(E5:E33,C5:C90,"Miami",I5:I33) could be used to add all the commissions in the range E5:E33 that match the criteria in columns C and I. *True False*

4. Conditional formulas are useful for analyzing large amounts of data; to search for data that matches certain criteria; and to count, add, or find an average. *True False*

5. To perform more than one function, you must use more than one cell, column, or row. *True False*

6. If Tracing Precedents is compared to looking backward, Tracing Dependents would be comparable to looking forward. *True False*

7. You have created a formula using a 3-D reference that finds the sum of cell B5 across 4 sheets. To add the sum of cell B5 on a new 5th sheet, which was inserted into the worksheet range, you will have to edit the formula to include the sheet. *True False*

8. Geoff is having trouble with a list of product codes that need to be fixed by extracting the first 7 characters only and converting all letters to capitals as shown below. He could do this by manually retyping each code, but because there are hundreds of product codes, Geoff should use which two functions to accomplish this more quickly?

Old Product Code	New Product Code
aE3r4A9iv82s7	AE3R4A9
Cb3r17A9iv82s8	CB3R17A
x9iS8w2dllfn	X9IS8W2
raz4p23lv29zz	RAZ4P23

A. PROPER and UPPER
B. PROPER and RIGHT
C. UPPER and LEFT
D. UPPER and RIGHT

9. You want to know how many total cars in your inventory are red. Based on the image below, the formula =SUMIF(B2:B6,"Red",C2:C6) would return which result?

	A	B	C
1	Model #	Color	Available
2	21367	Red	3
3	211488	Black	1
4	1E4561	Red	0
5	7718384	Black	4
6	2173R8	Red	2

A. 3

B. 4

C. 9

D. 5

10. After marking all of your students' tests, you want to use a function that finds the average of each student's tests (the 5 test grades are entered in the range B2:F2), returns OVER if they averaged 70% or higher, and returns UNDER if they averaged under 70%. Which nested formula would be your best choice to obtain the desired result in cell G2?

	A	B	C	D	E	F	G
1	Student ID	Test 1	Test 2	Test 3	Test 4	Test 5	70% AVG
2	#23894	51%	73%	65%	66%	100%	OVER
3	#23895	83%	89%	80%	42%	81%	OVER
4	#23896	78%	57%	50%	77%	66%	UNDER
5	#23897	71%	66%	48%	57%	48%	UNDER

A. =IF(AVERAGE(B2:F2)>=70%,"OVER","UNDER")

B. =IF(ROUND(B2:F2)>=70%,"OVER","UNDER")

C. =AVERAGE(IF(B2:F2)>=70%,"OVER","UNDER")

D. =ROUND(PROPER(B2:F2)>=70%,"OVER","UNDER")

11. The #VALUE! Error is usually a result of a formula that attempts to perform a mathematical operation on a cell that:

A. Has the wrong number format

B. Is empty

C. Contains text

D. Has been deleted

12. To create a formula on the Total sheet that will add cell B3 from all of the other sheets shown below, you would use a 3-D reference such as:

| | Troy | Shirley | Brita | Abed | **Total** |

A. Troy:Shirley:Brita:Abed!B3

B. Troy:Abed!B3

C. Troy:Shirley!B3

D. Troy:Total!B3

EXCEL 2016

Lookup Functions and Outlines

I n this chapter, you will explore functions used to find data, either 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. It 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

CHAPTER TIMING

- Concepts/Develop Your Skills: 1 hr 10 mins
- Self-Assessment: 20 mins
- Total: 1 hr 30 mins

PROJECT: MANAGING EMPLOYEE RECORDS

The LearnFast 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 then 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 in Excel 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 a simple example of a 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.

The VLOOKUP and HLOOKUP Functions

The VLOOKUP function is the most commonly used lookup function because it is used specifically to look up information arranged in columns (the *V* stands for *vertical*; columns are vertical), which is the format for many databases. The HLOOKUP function has the same arguments but is used when the data is arranged in rows (rows are horizontal). (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)]), and these functions are explained in the table below.

LOOKUP FUNCTION ARGUMENTS	
Argument	**Description**
Lookup_Value	This is the value to be found, either 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.
Column/Row Index Number (Col_Index_Num/Row_Index_Num)	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, the function 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 customers a discount based on their annual spending. The various discount levels could be contained in a table such as the one shown below.

	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%

For each customer, you would look up the amount of money spent to date to determine the discount.

The formula entered in cell C3 appears here.

The Lookup_Value is in cell B3, which is the spending to date for Robert, totaling $28,000.

C3   ▼   :   ✕   ✓   *fx*   =VLOOKUP(B3,$E$3:$F$7,2)

▲	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	$F$7,2)		$0	0.00%
4	James Tolkien	$41,500			$20,000	2.00%
5	Nancy Andrews	$49,600				
6	Beth Kappers	$34,000				
7	Lidia Clark	$78,250				
8						
9						
10						
11						

Function Arguments

VLOOKUP

Lookup_value   B3

Table_array $E$3:$F$7

Col_index_num   2

Range_lookup

The Table_Array is the information found in the range E3:F7; it must be an absolute reference if the formula is to be copied (the table array does not include the column headings)

The Range_Lookup can be omitted because the Lookup Value does NOT need to be an exact match, and the table is sorted in ascending order (lowest to highest)

The value to be retrieved is in column 2 of the table and is the DISCOUNT RATE.

The result of the formula 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 rest of the customer discounts can then be calculated by copying the formula down the column, as shown below.

▲	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%

Introducing Lookup Functions   **53**

DEVELOP YOUR SKILLS: E4-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 **E4-D1-Database** from your **Excel Chapter 4** folder, and save it as **E4-D1-DataLookup**.

2. In **cell B5**, type the name **Ed Neal**.

3. Select **cell E5**, type **=VLOOKUP(**, and then click **Insert Function** fx in the Formula Bar.

4. Follow these steps to create a formula using VLOOKUP:

Function Arguments	
VLOOKUP	
Lookup_value	B5 Ⓐ
Table_array	$A$8:$G$20 Ⓑ
Col_index_num	3 Ⓒ
Range_lookup	FALSE Ⓓ

Ⓐ For the Lookup_Value, select **cell B5**.

Ⓑ For the Table_Array, use the mouse to select the **range A8:G20** and then use the F4 key to make the range reference absolute.

Ⓒ For the Col_Index_Num, enter **3**.

Ⓓ In the Range_Lookup box, type **FALSE**; you are looking for an exact match in this case, so do not leave this argument blank.

5. Click **OK** to enter the formula.

6. Select **cell B5** and type **Patty Mills**.

7. Select **cell G8**.

8. Choose **Formulas→Function Library→Lookup & Reference** 🔍 **→VLOOKUP** to insert the VLOOKUP function.

9. Select **cell F8** for the Lookup_Value.

10. To specify the Table_Array, choose the **Tax Rate** sheet, select the table without the headings, and press **F4** to make the table reference absolute.

11. Enter **2** as the Col_Index_Num.

Function Arguments	
VLOOKUP	
Lookup_value	F8
Table_array	'Tax Rate'!$A$3:$B$8
Col_index_num	2
Range_lookup	

12. Click **OK**.

13. Apply the **Percent Style** number format and increase the decimal to show 1 decimal place.

14. Copy the formula down the column for the other employees.

15. Save the file.

Using the Outline Feature

The Outline feature in Excel allows you to group related information together, which can also be useful for quickly calculating subtotals and totals. Groups can be created by either rows or columns. Creating an Outline means you can control which data to display or hide, or 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.
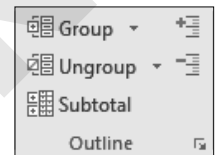
An Outline can be created either manually or automatically using Auto Outline. To create an Auto Outline, you must have inserted formulas that sum or subtotal information from groups of rows or columns. For example, if you have created a sum below each Position category, as shown below in rows 6, 12, and 18, the Auto Outline command will recognize these are distinct areas of data and group each accordingly. Likewise, column H is a sum of the sales figures contained in columns F and G.

Formula that finds the sum of ModSales and AppSales

	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

Formulas that find the sum of each respective group

Formula that finds the sum of the three subtotals

The Auto Outline then adds the Outline structure along the top and left sides of the worksheet, which contain the outline symbols for adjusting the outline view as shown below.

Row levels will show three levels of detail, with one being the least and three being the greatest amount of detail, by collapsing or expanding all groups in that level at once.

Column levels show or hide column details.

These row buttons collapse individual groups one at a time.

	Last Name	First Name	Position	Region	State	ModSales	AppSales	Total Sales
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

Rows 13 to 17 are currently hidden; the expand button can be used to display them once again.

The collapse [−] buttons show less detail by hiding the detail contained in that particular group of rows or columns, and the expand [+] buttons will show the hidden group once again. An outline can be removed at any time using the Clear Outline command.

View the video "Creating Outlines and Subtotals."

≡ Data→Outline→Group
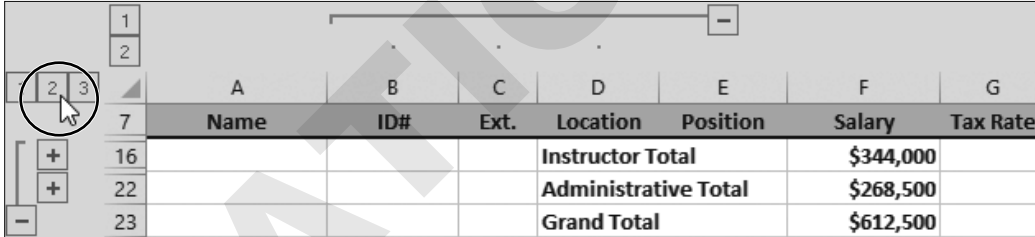
≡ Data→Outline→Ungroup

DEVELOP YOUR SKILLS: E4-D2

In this exercise, you will create an outline to group data for employees based on their positions.

1. Save your file as **E4-D2-DataLookup**.

2. Select the **range E8:E15**.

3. Choose **Data→Outline→Group** .

4. In the Group dialog box, ensure **Rows** is selected and click **OK**.

5. Click the **collapse** button to hide **rows 8:15**.

6. Choose **Data→Outline→Ungroup** 📑 **menu button** ▼→**Clear Outline**.

7. Insert a new blank row above **row 16**.

8. In the new blank row, insert the text **Instructor Total** in **cell D16**.

9. In **cell F16**, choose **Home→Editing→AutoSum** ∑ to calculate the combined total for instructor salaries.

10. In **cell D22**, enter **Administrative Total** and then use **AutoSum** in **cell F22** to calculate the sum of the remaining employee salaries.

11. In **cell D23**, enter **Grand Total**, select **cell F23**, and choose **Home→Editing→ AutoSum** ∑.

12. Apply **Bold** to the **ranges D16:F16** and **D22:F23**.

13. If necessary, deselect the **range D22:F23** and select a single cell only, anywhere on the worksheet.

14. Choose **Data→Outline→Group** 📑 **menu button** ▼→**Auto Outline**.

15. Click on the **Level** 2 outline symbol, as shown below, which provides the second level of detail; it collapses the Instructor and Administrative groups but displays both subtotals as well as the grand total.

16. Save your work and close the file.

Creating Subtotals

In some ways, the Subtotal command is simpler and quicker than grouping rows or using Auto Outline; however, there are a few more steps in the process. Deciding between the two 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, you must first sort the list on the column that you will use to group the subtotals. For example, to create a subtotal for each city, your data must be sorted by city so each city is listed together. Then when you use the Subtotal command, you can group those cities together to perform the subtotal calculation.

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

A worksheet, sorted by Region, which 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.

The column to create groups; usually the list is also sorted by this column, so that for each different Region a subtotal will be added

The function to use in the subtotal calculation, such as Sum, Count, Average, Max, or Min

The column or columns where the subtotal will be calculated, so for each Region a Sum will be calculated for the ModSales, AppSales, and Total Sales columns

1 2 3		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

DEVELOP YOUR SKILLS: E4-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 **E4-D3-Database** from your **Excel Chapter 4** folder and save it as
   E4-D3-DataLookup.

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. Now follow these steps to create the subtotal:
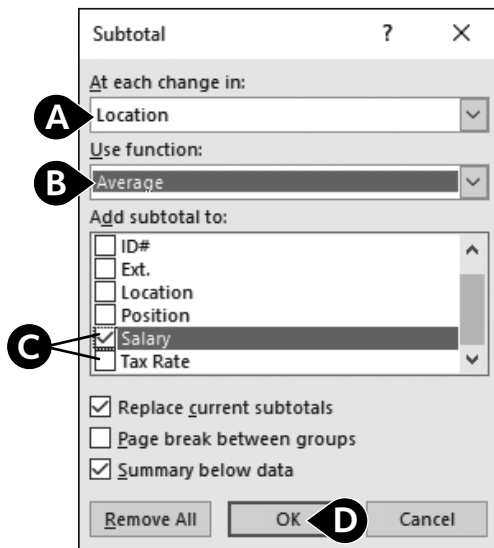
Ⓐ Choose **Location** from the drop-down list.

Ⓑ Choose **Average** from the drop-down list.

Ⓒ Select **Salary** and deselect the **Tax Rate** checkbox.

Ⓓ Keep the other default settings and click **OK**.

5. Save your work.

Using the Quick Analysis Tool

The Quick Analysis tool gives the user quick and easy access to several popular analysis options that are 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 the expenses. To access the Quick Analysis tool, simply select any range of two or more cells that contain data.

The selected data   The Quick Analysis tool button
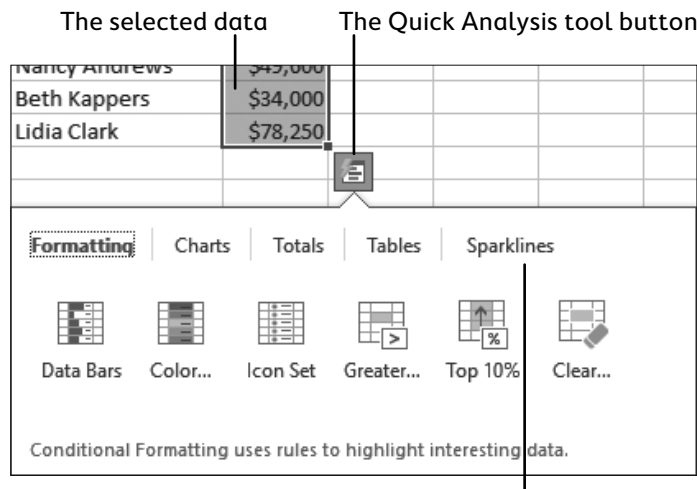
The Quick Analysis options, which contain five categories and are based on the type of data selected

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 inserting sparklines

You can see a preview of each option by holding the mouse pointer over the option.

DEVELOP YOUR SKILLS: E4-D4

In this exercise, you will use the Quick Analysis tool to add conditional formatting and create a chart using the employee salary and tax rate data.

1. Save your file as **E4-D4-DataLookup**.

2. Begin by selecting a cell in the Salary column, **column F**.

3. Choose **Home→Editing→Sort & Filter** ⧎**→Sort Smallest to Largest**.

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 do not see the button, move the mouse near the bottom-right corner of the selection.)
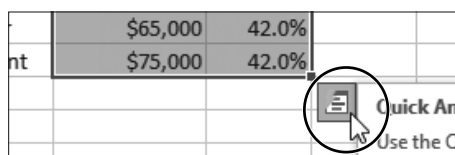
7. Click **Charts**.

8. Click the second chart option, the **Clustered Column** chart.
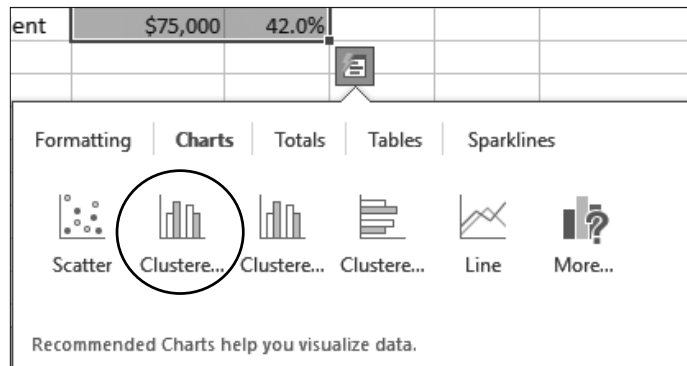
9. Edit the chart title to be `Salary and Tax Rate Comparison`.

10. Move the chart to a new sheet called `Comparison Chart`.

11. Return to the **Database** sheet.

12. Select the salary info in the **range F8:F20**.

13. Click on **Quick Analysis** and then choose **Icon Set** from the list of Formatting options.

14. Select the tax rate info in the **range G8:G20**.

15. Click **Quick Analysis** and then choose **Color Scales** from the list of Formatting options.

16. Save your work and close the file.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills by completing the Self-Assessment. The answers to these questions can be found at the back of this book.

1. The VLOOKUP and HLOOKUP functions require three arguments, and the fourth argument is optional.   *True   False*

2. The formula =VLOOKUP(2,A2:B6,2,TRUE) will return the value 7% from the following table.   *True   False*

⬧	A	B
1	Years	Rate
2	1	5%
3	2	7%
4	3	10%
5	4	12%
6	5	13%

3. To create an Auto Outline, you must have already inserted formulas that sum or subtotal information from groups of rows or columns.   *True   False*

4. The row level 3 in the Outline structure shows the greatest amount of detail in an outline.   *True   False*

5. To use the Subtotal command, your list must be sorted by the row you will use to group the subtotals.   *True   False*

6. Creating a subtotal takes 3 steps: choosing which column to create groups by, choosing the function to use, and choosing which columns to create subtotals for.   *True   False*

7. The Quick Analysis tool gives the user quick and easy access to several popular analysis options that are not available from the Ribbon.   *True   False*

8. If the value in cell A3 is $27,000, the result of the following formula would be:

=VLOOKUP(A3,$D$3:$E$7,2)		
D	E	F
Discount Table		
Annual Spending	Discount Rate	
$0	0.00%	
$20,000	2.00%	
$30,000	3.00%	
$40,000	4.50%	
$50,000	6.50%	

A. 0.00%

B. 2.00%

C. 3.00%

D. 2.70%

(continued)

9. In the following formula, =VLOOKUP(A2,A3:H56,5,TRUE), the number 5 represents:
   A. The Lookup Value
   B. The Table Array
   C. The Criteria
   D. The fifth column in the table

10. Which button shows less detail in an outline by hiding the detail contained in that particular group of rows or columns?
   A. Expand button
   B. Collapse button
   C. Outline button
   D. Group button

11. To create subtotals for the following data, you should choose to add subtotals at each change in:

	A	B	C	D
1	First Name	Last Name	Team	Total
2	Jaime	Burgess	Red	57
3	Ashley	Bradford	Red	62
4	Deborah	Secrett	Red	19
5	Steven	Samuel	Blue	38
6	Don	Woods	Blue	55
7	Sarah	Albert	Blue	33

   A. First Name
   B. Last Name
   C. Team
   D. Total

12. The Quick Analysis tool gives you several analysis options grouped into 5 categories, such as conditional formatting and charts, but does NOT include:
   A. Totals
   B. Sparklines
   C. Tables
   D. Slicers

Self-Assessment Answer Key

CHAPTER 1: ADVANCED WORKBOOK FORMATTING

Item	Answer	Page Number
1	False	2
2	True	4
3	False	6
4	True	13
5	False	10
6	False	16
7	C	2
8	D	4
9	B	6
10	C	9
11	D	9
12	A	15
13	D	12

CHAPTER 2: DATE FUNCTIONS AND CONDITIONAL FORMATTING

Item	Answer	Page Number
1	True	21
2	True	20
3	True	22
4	True	23
5	True	24
6	True	26
7	C	20
8	D	24
9	D	23
10	D	25
11	C	26
12	D	26

CHAPTER 3: ADVANCED FUNCTIONS FOR TEXT AND ANALYSIS

Item	Answer	Page Number
1	True	32
2	False	33
3	False	37
4	True	36
5	False	39
6	True	41
7	False	45
8	C	32
9	D	36
10	A	39
11	C	43
12	B	45

CHAPTER 4: LOOKUP FUNCTIONS AND OUTLINES

Item	Answer	Page Number
1	True	52
2	True	53
3	True	55
4	True	56
5	True	58
6	True	58
7	False	60
8	B	53
9	D	52
10	B	56
11	C	58
12	D	61

Index

Note: Index entries ending in "V" indicate that a topic is discussed in the video referenced on that page.

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