Instructor-Led Training

Microsoft Excel 2016

Level 2

Instructor Edition

- ✓ Maps to Microsoft Office Specialist (MOS) objectives for exam for Excel 2016
- ✓ Realistic, hands-on exercises
- ✓ Downloadable ancillaries at 30bird.com

EXEL2016-L2-R10-ICB

Excel 2016 Level 2

Instructor Edition

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Excel 2016 Level 2

Instructor Edition

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Introduction

Welcome to *Excel 2016 Level 2*. This course builds on the basic concepts and skills of our Level 1 course to provide more advanced tools for analysis and presentation of complex, realistic data in Microsoft Excel 2016: how to manage complex workbooks, build more complex functions, use data analysis tools, make an impact with powerful chart and presentation features, and collaborate with other users. The three levels of our Excel 2016 courses map to the objectives of the Microsoft Office Specialist Core and Expert exams for Excel 2016. Objective coverage is marked throughout the course, and you can download an objective map for the series from http://www.30bird.com.

You will benefit most from this course if you want to use Excel 2016 to perform real-world tasks, such as rearranging and presenting complex data. If you intend to take a Microsoft Office Specialist or Expert exam for Excel, this course continues your preparation, but you need to continue on to the Level 3 course, particularly to prepare for the Expert exam.

The course assumes you know how to use a computer, that you're familiar with Microsoft Windows, and that you've taken the Level 1 course or have equivalent introductory experience with Excel.

After you complete this course, you will know:

- How to manage workbooks and customize the Excel environment
- How to use named ranges in formulas
- About Excel tables and how to sort data, use filtering features, use structured references, validate data, and transpose rows and columns
- How to consolidate data from more than one range or workbook, and how to use subtotals
- How to use PivotTables to summarize and rearrange large amounts of data in a list, and how to use PivotCharts to present such data
- How to use conditional formatting to format data when it meets a condition, how to create custom number and date formats, and how to insert and manipulate graphics
- How to use special chart features, how to insert sparklines to take snapshots of data, and how to use Quick Access features to conveniently analyze data
- How to use permissions to control access to and prevent changes in your workbooks, and about sharing features, such as comments and change tracking

This is the second course in a series. After you complete it, consider going on to the third course:

- *Excel 2016: Level 3*

Course setup

To complete this course, each student and instructor needs to have a computer running Excel 2016. Setup instructions and activities are written assuming Windows 10; however, with slight modification the course will work using Windows 7 SP 1 or Windows 8.x.

Hardware requirements for Windows 10 course setup include:

- 1 GHz or faster processor
- 2GB RAM
- 25 GB total hard drive space (50GB or more recommended)
- DirectX 10 (or later) video card or integrated graphics, with a minimum of 128 MB of graphics memory
- Monitor with 1280x800 or higher resolution
- Wi-Fi or Ethernet adapter

Software requirements include:

- Windows 10 (or alternative as above)
- Microsoft Excel 2016 or any Microsoft Office 2016 edition including Excel
- The Excel 2016 Level 2 data files and PowerPoint slides, available at http://www.30bird.com

Network requirements include:

- An Internet connection for the exercise covering inserting graphics from the Internet (which can be skipped or demonstrated by the instructor)

Because the exercises in this course include viewing and changing some Excel defaults, it's recommended that you begin with a fresh installation of the software. But this is certainly not necessary. Just be aware that if you are not using a fresh installation, some exercises might work slightly differently, and some screens might look slightly different.

1. Install Windows 10, including all recommended updates and service packs. Use a separate computer and user name for each student.
2. Install Microsoft Excel 2016, using all defaults during installation.
3. Update Excel or Office using Windows Update.
4. Copy the Excel 2016 Level 2 data files to the Documents folder.

Chapter 1: Managing workbooks

You will learn how to:

- Manage worksheets in a workbook that contains many
- Customize the Quick Access toolbar and the ribbon, and create a custom view

Learning time: 45 minutes

Module A: Managing worksheets

A new workbook, by default, has three worksheets. But you can add as many as you want. You can insert and delete worksheets, and copy or move them. You can also organize them by changing their names or the colors of their tabs. You can work with more than one worksheet at a time by grouping them, and you can hide worksheets you don't want some users to be able to see.

You will learn how to:

- Insert and delete one or more worksheets
- Rearrange worksheets by moving or copying them either within or between workbooks
- Rename worksheets, change their tab color, and hide worksheets
- Refer to cells and ranges in another workbook

Inserting and deleting worksheets

By default, a blank workbook has a single worksheet. It's very simple to add more when you need them, or delete them when you don't.

Inserting a worksheet

You can quickly add a worksheet to a workbook in one of several ways.

There are a couple of other ways to insert a single worksheet in a specific location. This is a simple way:

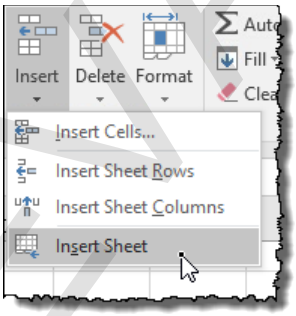
Exam Objective: MOS Excel Core 1.1.3

- Clicking the New Worksheet button to the right of the last worksheet tab.

This inserts a new worksheet after the active worksheet in the current workbook.

- On the Home tab, display the Insert menu (click its dropdown arrow), then click **Insert Sheet**.

The Insert button is in the Cells group, on the right of the Home tab.



This inserts a worksheet before the active one.

- Right-click the sheet tab before which you want to insert a worksheet, click **Insert**, click **worksheet**, and click **OK**.

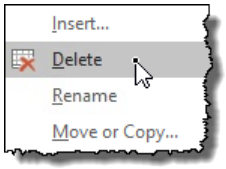
This also inserts before the active worksheet.

A new worksheet appears in the workbook, to the left of what was the active worksheet.

Deleting a worksheet

You can delete worksheets by using the Delete menu on the ribbon, but here is another simple method.

1. Right-click the tab of the worksheet you want to delete, then click **Delete**.



   If the sheet was empty, Excel simply deletes it. If the sheet contained data, Excel displays a message asking you to confirm the deletion. Deleting a worksheet cannot be undone.

2. Click **Delete** to confirm the deletion, if necessary.

Inserting or deleting multiple worksheets

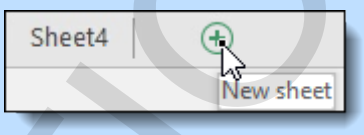
You can insert or delete multiple worksheets in a single step. To do so, simply select the number of worksheets you want to insert—or the specific worksheets you want to delete—before issuing the **Insert** or **Delete** command. Here's how to select multiple worksheets.

1. Click the tab of the first worksheet you want to select.
2. Hold down **Ctrl**, and click the tabs of the other worksheets you want to select.

All the selected workbook tabs are highlighted. You can then click an **Insert** command to insert as many new worksheets as you have selected sheets, or click a **Delete** command to delete all the selected worksheets.

Exercise: Inserting and deleting worksheets

Exam Objective: MOS Excel Core 1.1.3

Do This	How & Why
1. Open `Managing Worksheets`.	From the `Managing Workbooks` data folder. The first sheet in this workbook contains invoice data.
2. Observe the other worksheets.	Click their tabs one by one. Each of the other three worksheets contains a report based on the invoice data.
3. Activate Sheet4, then click the New sheet button.	 A new worksheet, Sheet5, appears in the workbook.
4. Insert four new worksheets to the left of Sheet2.	
a) Click the Sheet2 tab.	
b) Hold down **Ctrl**, and click the Sheet3, Sheet4, and Sheet5 tabs.	To select them all. They all appear highlighted.
c) Display the Insert menu, then click **Insert Sheet**.	Click the Insert menu's dropdown arrow. The Insert menu is in the Cells group on the Home tab. Four new sheets appear in the workbook, to the left of the first selected worksheet.
5. Delete all the empty worksheets.	
a) Select the tabs for Sheets 5, 6, 7, 8, and 9.	It is hard to know what is on the sheets when their names are simple numbers, but you can rename the sheet tabs.
b) Right-click one of the selected worksheet tabs, then click **Delete**.	The selected sheets disappear.
6. Right-click the Sheet4 tab, then click **Delete**.	Because this sheet wasn't empty, Excel prompts you to ask if you really want to delete this worksheet. Worksheet deletions cannot be undone, so be careful.
7. Click **Cancel**.	

Rearranging worksheets

You can rearrange worksheets very quickly in a number of ways. Within a workbook, you can simply drag worksheet tabs. You can also copy or move a worksheet, either within or between workbooks.

Dragging worksheet tabs

To move a worksheet within a workbook, simply drag its tab to another location.

Exam Objective: MOS Excel Core 1.1.4, 1.3.3

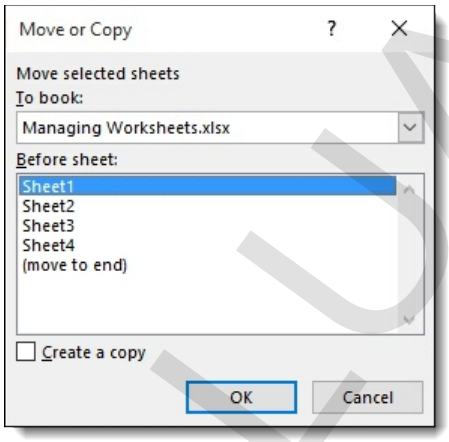
Moving worksheets

You move a worksheet much as you would any other data. You just need to tell Excel what you want to move, and where you want to move it.

Exam Objective: MOS Excel Core 1.1.4

1. Right-click the worksheet you want to move, then click **Move or Copy**.

   The Move or Copy window appears, giving you choices about where to move the worksheet.

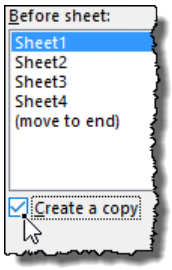


2. In the "To book" list, click the workbook to which you want to move the worksheet:
   - The current workbook, which is the default choice
   - Another open workbook
   - A new workbook, which can be an excellent choice when you want to create a new workbook based on a worksheet in an existing workbook.
3. Use the "Before sheet" list to specify where you want the worksheet to appear within the selected workbook.
4. Click **OK**.

Copying worksheets

You copy a worksheet in the same way that you move one, except that you need to click **Create a Copy** in the Move or Copy window.

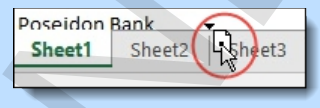
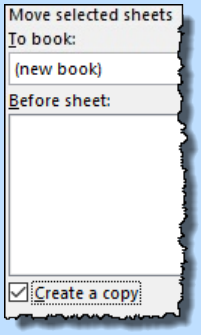
Exam Objective: MOS Excel Core 1.1.4



Exercise: Rearranging worksheets

Managing worksheets is open.

Exam Objective: MOS Excel Core 1.1.4, 1.3.3

Do This	How & Why
1. Move Sheet1 to the end of the workbook.	
a) Point to the Sheet1 tab.	
b) Drag the Sheet1 tab after Sheet4.	As you drag, the pointer includes a document icon, and a small, black arrow indicates where the worksheet will go. 
2. Make a copy of Sheet2 in a new workbook.	
a) Right-click the Sheet2 tab, then click **Move or Copy**.	
b) In the "To book" list, click **(new book)**.	
c) Click **Create a copy**.	The window should look like this. 

Do This	How & Why
d) Click **OK**.	The worksheet now appears in a new workbook.
3. Save the new workbook as `My Sales by Rep`, then close it.	Save it in the current data folder. Notice that the worksheet is still in the original workbook. When you make a copy, the worksheet stays in the original location.
4. Move Sheet2 between Sheet3 and Sheet4.	You can do it by dragging, but we're going to use another method.
a) Right-click the Sheet2 tab, then click **Move or Copy**.	
b) In the "Before sheet" list, click **Sheet4**.	
c) Click **OK**.	To move the worksheet between Sheet3 and Sheet4.
5. Save the workbook as `My Managing Worksheets`.	

Organizing worksheets

It can be hard to understand what is in a workbook with the default, number-based sheet names. Fortunately, you can rename them. You can also color-code sheet tabs, and hide and unhide worksheets, so you're showing only what you want to show to a particular user or users.

Renaming worksheets

Your workbooks are much easier to understand if you give your them descriptive names. Worksheet names must follow a few simple rules:

Exam Objective: MOS Excel Core 1.3.2

- They must be unique within a workbook.
- They must have 31 or fewer characters.
- They cannot contain the following special characters: /, \, *, ?, ;, [, or].

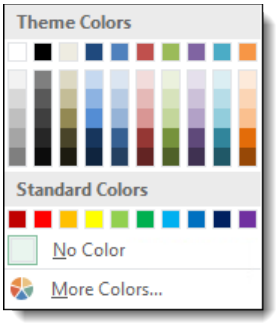
1. Double-click the tab for the worksheet you want to rename. Its name is selected.
2. Type a new name.
3. Press **Enter**.

Changing worksheet tab color

You can also use the Tab Color command to distinguish your worksheets.

Exam Objective: MOS Excel Core 1.3.1

1. Right-click a worksheet tab.
2. Click **Tab Color**, then select a color from the gallery.



Hiding and unhiding worksheets

You can hide worksheets when you don't want users to see what they contain.

Exam Objective: MOS Excel Core 1.4.1

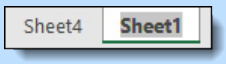
1. Right-click the tab of the worksheet you want to hide.
2. Click **Hide**.

When there are hidden worksheets in a workbook, the Unhide command is available in the context menu for those worksheet tabs. To unhide a worksheet, click **Unhide**, select the sheet you want to see, then click **OK**.

Exercise: Organizing worksheets

My Managing Worksheets is open.

Exam Objective: MOS Excel Core 1.3.1, 1.3.2, 1.4.1

Do This	How & Why
1. Rename Sheet1 as `Invoice Data`.	
a) Double-click the Sheet1 tab.	To select its name. 
b) Type `Invoice Data` and press **Enter**.	To rename the sheet. 
2. Rename the other worksheets as shown.	Double-click each tab, type its new name, and press **Enter**. 

Do This	How & Why
3. Change the color for the By Rep tab to red.	
a) Right-click the By Rep tab.	
b) Click **Tab Color**, then click the red box.	In the Standard Colors section of the gallery.
c) Click another tab.	So you can see the color applied to the tab.
4. Hide the By Customer worksheet.	
a) Right-click the By Customer tab.	
b) Click **Hide**.	The worksheet is no longer visible.
5. Unhide the By Customer worksheet.	
a) Right-click any tab.	Notice that the Unhide command is now available.
b) Click **Unhide**.	The Unhide window appears, showing any hidden worksheets. "By Customer" is selected.
c) Click **OK**.	To unhide the By Customer worksheet.
6. Save and then close the workbook.	

Hyperlinks

A *hyperlink* is a link in a file that, when clicked, brings the user to another location in the same file or a different one. The text you click to move around on web pages are hyperlinks. You can insert hyperlinks in Excel cells when you want to provide access to files, Internet locations, or the ability to compose an email.

Inserting hyperlinks

If you type a web address that Excel recognizes in a cell, Excel automatically formats it as a hyperlink. But there's a method for inserting hyperlinks that gives you more control over the process.

Exam Objective: MOS Excel Core 1.2.3

1. Select the cell where you want the hyperlink.
2. On the Insert tab, in the Links group, click **Hyperlink**.
   To display the Insert Hyperlink window.
3. Select a "Link to" type.
   - *Existing File or Web Page* allows you to link to a file or other location that already exists.
   - *Place in This Document* creates a link that leads to another location in the current workbook.
   - *Create New Document* creates a new workbook and a link to its location.
   - *E-mail Address* creates a link that launches the user's mail program and composes a new message to a predetermined address.
4. Navigate to and select a file to which you wish to link.

You can instead type an address in the Address box, or paste a copied address there. If you're linking to a Web location, the best way is often to use a browser to navigate to that page, copy the address from the browser's Address bar, and then paste it here.

5. In the "Text to display" box, enter the text that you want users to see in the cell.
   If there was already text in the cell when you clicked the Hyperlink button, that text appears here.
6. Click **OK**.

Modifying hyperlinks

To modify a hyperlink, right-click its cell, and then click **Edit Hyperlink**. The Edit Hyperlink window provides the same options as the Insert Hyperlink window.

Removing a hyperlink

You can either delete a hyperlink and its text completely, or remove the hyperlink itself while leaving the text in the cell.

- To delete the contents of a cell and its associated hyperlink, right-click the cell, and then click **Clear Contents**.
- To remove the hyperlink functionality without deleting the cell's other contents, right-click the cell, and then click **Remove Hyperlink**.

Exercise: Inserting and modifying hyperlinks in a workbook

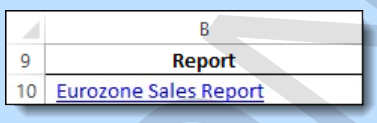
You need to have a browser installed to perform this activity.

Exam Objective: MOS Excel Core 1.2.3

Do This	How & Why
1. Open `Hyperlinks`.	From the `Managing Workbooks` data folder. The workbook contains a simple workbook on which you will place hyperlinks to three regional sales reports.
2. Enter the text as shown here.	This text will be what users see for the links to the report files.
3. In B10, insert a hyperlink to the EurozoneSales.htm file.	
a) Select B10.	
b) On the Insert tab, in the Links group, click **Hyperlink**.	To display the Insert Hyperlink window. Notice that "Eurozone Sales Report" appears in the "Text to display" box.
c) Under Link to, click **Existing File or Web Page**.	

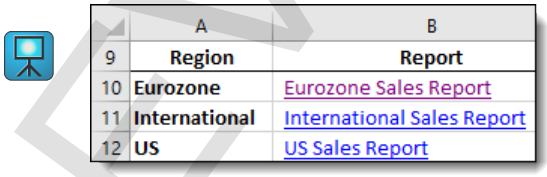
	B
9	**Report**
10	Eurozone Sales Report
11	International Sales Report
12	US Sales Report

Do This	How & Why
d) Under "Look in," select the **Managing Workbooks** folder.	If necessary.
e) Select **EurozoneSales** from the file list, and click **OK**.	To insert the hyperlink, which becomes blue, underlined text.
4. Click the hyperlink.	The linked file, which shows sales for Eurozone reps, appears in a browser window.
5. Close the browser and return to Excel.	
6. Copy B10 to B11.	
7. Edit the hyperlink in B11 to point to the InternationalSales file.	
a) Right-click B11, then click **Edit Hyperlink**.	
b) Change the Text to display to `International Sales Report`.	
c) In the file list, select **InternationalSales**.	
d) Click **OK**.	
8. In B12, insert the correct hyperlink to the USSales file.	
9. Save the workbook as `My Hyperlinks`.	



	B
9	**Report**
10	Eurozone Sales Report

The workbook with hyperlinks.

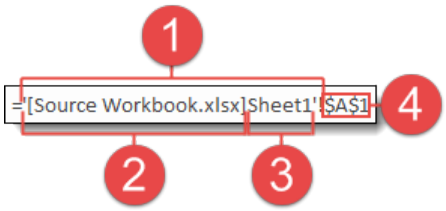


	A	B
9	**Region**	**Report**
10	**Eurozone**	Eurozone Sales Report
11	**International**	International Sales Report
12	**US**	US Sales Report

Linking to other workbooks

You create links between workbooks by entering references that include the name of the workbook to which they refer. The syntax can be tricky, but such references are easy to insert by using the the Copy and Paste Link commands. Here's what a reference to another workbook looks like.

Elements of an External Reference



1. The entire *external workbook reference* includes both the name of the workbook and the name of the worksheet, enclosed within single quotation marks. It is separated from the cell, range, or name reference by an exclamation point.
2. The name of the external workbook is enclosed within brackets.
3. The name of the worksheet comes after the name of the workbook.
4. The reference to a cell, range, or name in the external workbook comes last, after the exclamation point.

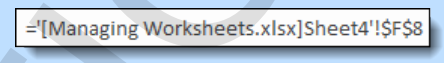
Rather than trying to type external references, you should paste links.

1. In the source workbook, select the cell or range to which you want to create a link.
2. Click **Copy**.
3. Switch to the destination workbook and select the cell where you want the external reference.
4. In the paste options gallery, click the Paste Link button.

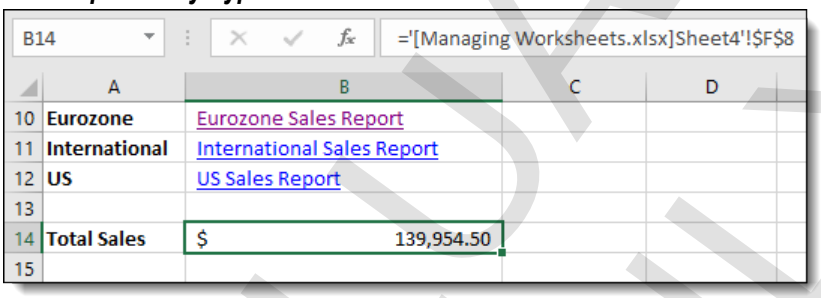
Exercise: Linking to an external workbook

My Hyperlinks is open.

Do This	How & Why
1. In A14, enter `Total Sales`.	This will be the label for cell B14, where you will enter a link to the total sales value in a different workbook.
2. Open Managing Worksheets.	From the `Managing Workbooks` folder. This workbooks contains invoices and sales reports, as you saw earlier.
3. On Sheet4, copy cell F8.	You will create a link to this value in the other workbook.
4. Paste a link to the copied cell in B14 on My Hyperlinks. a) Activate My Hyperlinks and select B14.	

Do This	How & Why
b) In the paste options gallery, click  .	To paste a link to the copied cell. The value, $139,954.50 appears on the worksheet.
5. Select B14.	If necessary. The formula shows a link to the value in the other workbook. It contains a reference to the workbook name, which is enclosed in brackets. Then comes the sheet name. Both the workbook and sheet name are surrounded by single quotation marks, and then there is an exclamation point before the cell reference. Pasting a link is much easier than entering a reference like this manually. 
6. Save and then close My Hyperlinks.	
7. Close Managing Workbooks.	You don't need to save changes if prompted.

The completed my hyperlinks workbook



Assessment: Managing worksheets

You use the Insert tab on the ribbon to insert new worksheets. True or False?

- True
- **False**

Which of the following are options for moving or copying a worksheet? Choose all that apply.

- **Moving or copying to a new workbook.**
- **Moving or copying within the current workbook.**
- Moving or copying to Microsoft Word.
- Moving or copying to a workbook that is not currently open.

Which of the following is *not* a valid worksheet name?

- Sales 2014
- **Sales/Rep**
- 2014 Sales

You cannot use hyperlinks to send email. True or false?

- True
- **False**

Which of the following is the character that separates the workbook and worksheet name from the cell reference in an external reference? Choose the single correct answer.

- Single quotation mark (')
- **Exclamation point (!)**
- Closing bracket (])

Module B: Customizing Excel

After you start working with Excel, you'll probably want to change some things about how it works to suit your own work style and needs. You can customize both the Quick Access toolbar and the ribbon.

You will learn how to:

- Customize the Quick Access toolbar
- Customize the ribbon, including adding tabs and groups

The Quick Access toolbar and the ribbon

The ribbon is the most common way that you interact with your workbooks. And the Quick Access toolbar can be a great time saver. You can add to, delete from, and rearrange either one to better suit your needs.

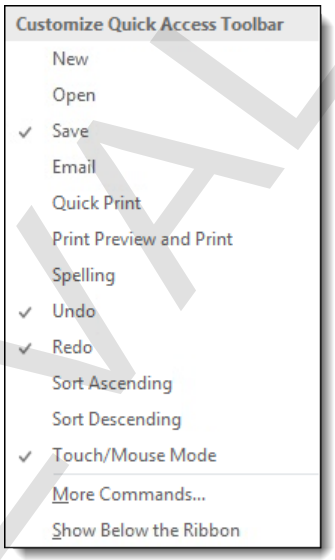
Customizing the Quick Access toolbar

The Quick Access toolbar should be just what its name implies: a home for the commands you access most frequently. By default, it shows just a few common buttons, such as Save, Undo, and Redo. But you can easily add other buttons or remove ones you don't feel you need.

Exam Objective: MOS Excel Core 1.4.3

1. Click the Customize Quick Access Toolbar button.
   It is the arrow on the right side of the toolbar.

2. In the menu, click the commands you want to add to or remove from the Quick Access toolbar.



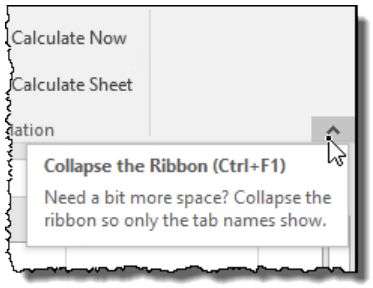
3. Click **More Commands** to access the Excel Options window, where you can add any Excel command.

Collapsing or pinning the ribbon

The ribbon is always available at the top of the Excel window, but if it's taking up too much space, you can collapse it. When the ribbon is collapsed, all you can see are its tabs. Clicking a tab temporarily opens the ribbon so you can use its commands.

You can collapse or *pin* (restore) the ribbon in several ways.

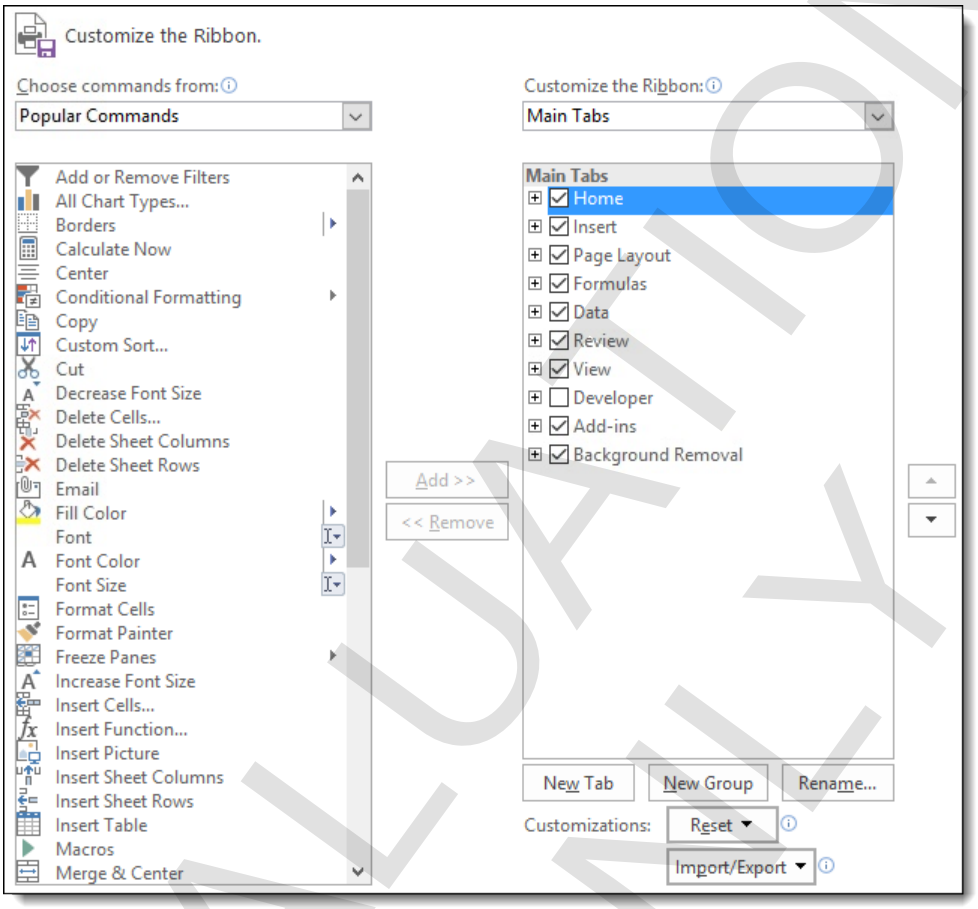
- Press **Ctrl**+**F1**.
- Double-click the active ribbon tab.
- Right-click anywhere on the ribbon, and click **Collapse the Ribbon**.
- Click the **Collapse the Ribbon** button.



Rearranging ribbon commands

You can rearrange the order of the ribbon's tabs and groups or hide tabs entirely. To do so, right-click the ribbon, then click **Customize the Ribbon**. Either method displays the Customize the Ribbon options. The list on the left shows all of Excel's commands, and the one on the right shows all the tabs currently on the ribbon.

Exam Objective: MOS Excel Expert 1.6.1



- Use the + and - buttons to expand and collapse tabs and groups (on the right).
  Note that although you can expand a group to view the commands inside, you can't change the commands themselves.
- To move a tab or group, select it and click either ▲ or ▼. You can use this method to move a group from one tab to another.
- To rename a tab or group, select it and click **Rename**.
- To show or hide a tab, toggle its check box.
- To remove a group, select it and click **Remove**.

Changes you make to the ribbon don't take effect until you click **OK**. If you make any changes you don't want to keep, click **Cancel**.

Adding tabs and groups

You can't change or move commands inside an existing group. Instead, you can create a new group and place any commands you like inside it. You can also create new tabs.

You can add groups to standard tabs or to custom tabs. Once they're created, you can move both standard and custom groups between standard and custom tabs.

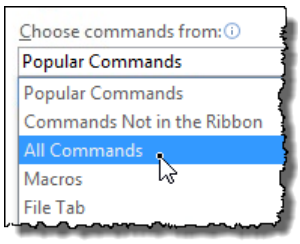
1. Right-click the ribbon, then click **Customize the Ribbon**.
2. Click **New Tab**.

   When you create a custom tab, it automatically contains one custom group. You can use the **New Group** button to add more.

Custom tabs and groups are called "New Tab" and "New Group" by default, but you can rename them however you like. A new group is empty by default, so you'll have to add commands next.

Adding commands to the ribbon

Once you've made a custom group, you can add commands to it. You can add any command to the Excel ribbon, but because there are so many to choose from, the "Choose commands from" list has several categories to help narrow your choices. You can even look for commands not already on the ribbon.



1. In the list of current ribbon contents, select the custom group to which you wish to add commands.
2. In the "Choose Commands from" list, click the category you want.
3. Click any command in the list to select it.
4. Click **Add.**
5. To rename a command you've added, or to change its icon, select it, and click **Rename**.
6. If you want to remove a command you've already added, select it, and click **Remove**.
7. When you're finished adding commands, click **OK**.

Resetting customizations

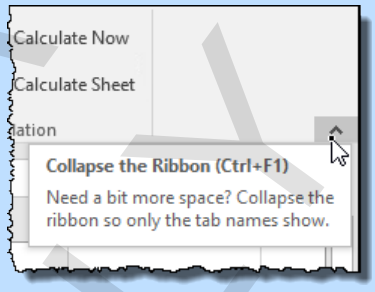
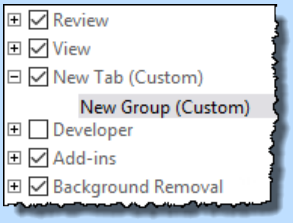
You might want to undo a ribbon customization you've made. It's easy enough to restore hidden tabs or remove custom commands, but for other changes, it's easiest to merely reset a tab or the entire ribbon. The Reset commands are available in the Ribbon Customization options.

Similarly, if you want to reset the Quick Access toolbar to its default state, you can do so from the Quick Access Toolbar section of the Excel Options window.

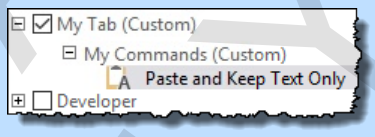
- To reset a single tab to its defaults, in the Ribbon options, select it, and click **Reset > Reset only selected Ribbon tab**.
- To reset the Quick Access toolbar, open its customization options, then click **Reset > Reset only Quick Access Toolbar**.
- To reset all customization of both the ribbon and Quick Access toolbar, open the options for either. Then click **Reset > Reset all customizations**. Finally, click **Yes** to verify the change.

Exercise: Customizing the Quick Access toolbar and the ribbon

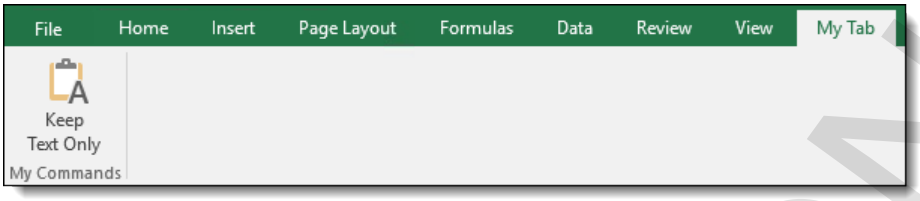
Exam Objective: MOS Excel Core 1.1.6 and Expert 1.4.3

Do This	How & Why
1. Open Customization.	From the `Managing Workbooks` data folder. The workbook contains customer information for Java Tucana.
2. Click the **Customize Quick Access Toolbar** button.	The small arrow to the right of the toolbar.  A menu appears showing commands currently in the toolbar and ones you can quickly add.
3. Click **Open**.	To add its button to the Quick Access toolbar. 
4. Collapse the ribbon using any of these methods. • Press **Ctrl+F1**. • Double-click the ribbon. • Right-click the ribbon, then click **Collapse the Ribbon**. • Click the **Collapse the Ribbon** button.	
5. Expand the ribbon.	Use any of the methods in the previous step.
6. Add a custom tab to the ribbon.	
a) Right-click the ribbon, then click **Customize the Ribbon**.	To display the Customize Ribbon options in the Excel Options window.
b) On the right, click **View**.	You'll insert the custom tab to the right of this tab.
c) Click **New Tab**.	A new tab with one new group appears in the list. 

Continued...

Do This	How & Why
7. Rename the new tab and group.	
a) Click **New Tab (Custom)**, then click **Rename**.	
b) In the rename box, type `My Tab`, then click **OK**.	
c) Rename the custom group `My Commands`.	Select the group, click **Rename**, type the new name, and click **OK**. Notice that, with a group, you can assign a symbol.
8. Add the "Paste and Keep Text Only" command to the My Commands group.	
a) In the "Choose commands from" list, click **Commands Not in the Ribbon**.	
b) Click **Paste and Keep Text Only**.	
c) Click **Add**.	The right-hand list should look like this. 
9. Observe the Move Up and Move Down buttons.	On the right of the lists of tabs. You can use these to reposition a tab, group, or command. 
10. Click **OK**, then click **My Tab**.	Your custom tab now appears on the ribbon.
11. Reset the ribbon and the Quick Access toolbar.	
a) Display the Customize the Ribbon options.	Right-click the ribbon, then click **Customize the Ribbon**.
b) Click **Reset**, then click **Reset All Customizations**.	Excel prompts you to confirm that you really want to do this.
c) Click **Yes**.	
d) Click **OK**.	The custom tab, group, and command are gone from the ribbon. The Open command is also gone from the Quick Access toolbar.
12. Close the workbook.	You do not need to save any changes.

A custom tab on the ribbon



Assessment: Customizing Excel

You must use the Excel Options window to customize the Quick Access toolbar. True or false?

- True
- **False**

You can add buttons only to a custom ribbon group. True or False?

- **True**
- False

How do you rearrange commands or groups on the ribbon?

- Drag them where you want them.
- Right-click the ribbon, and click Rearrange.
- **Use the Move Up and Move Down buttons in the Customize Ribbon options of the Excel Options window.**

Summary: Managing workbooks

You should now know how to:

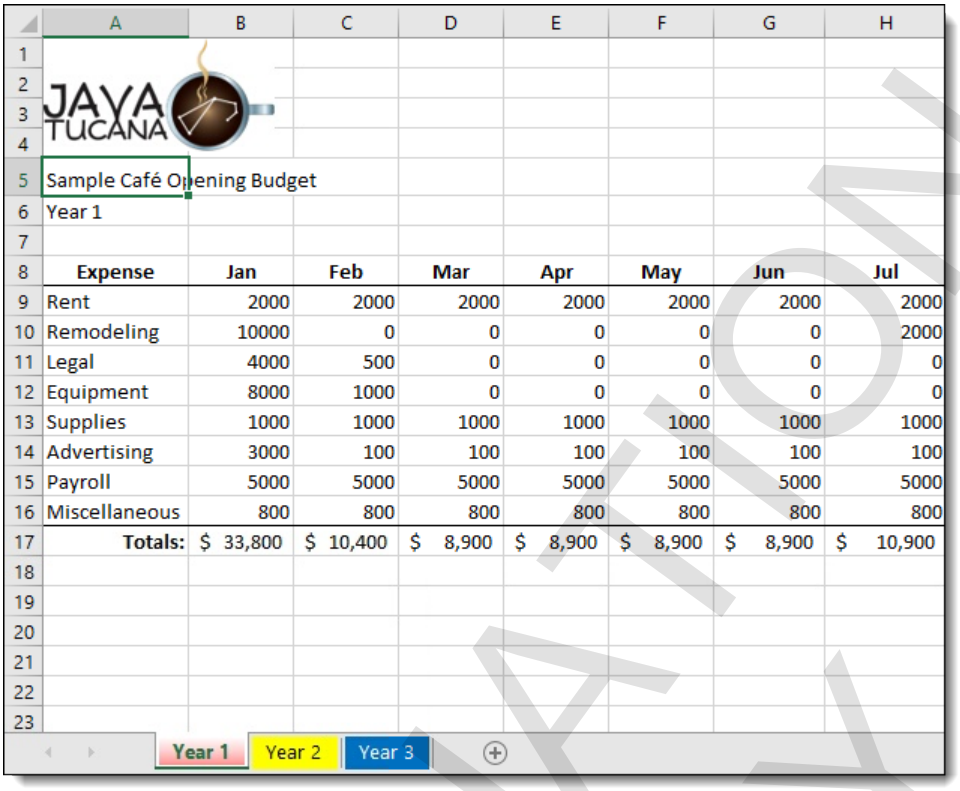
- Insert, delete, move, copy, rename, and group worksheets, as well as change their tab color and hide or unhide them; insert and manage hyperlinks in a worksheet; and create links to cells and ranges in another workbook
- Customize the Quick Access toolbar; and collapse the ribbon or add custom tabs, groups, and commands to it

Synthesis: Managing Workbooks

In this synthesis exercise, you'll open a workbook that contains two years of a café budget, and move a worksheet for a third year's budget from another workbook into this one. You'll also move, rename, and recolor worksheet tabs. You'll also experiment with customizing the Quick Access toolbar and ribbon.

1. Open `Managing Workbooks Synthesis`.
   From the `Managing Workbooks` data folder. This workbook contains two years of a café budget.
2. Open `Year 3 Budget`.
   This workbook contains a third year of the budget.
3. Copy the Year 3 budget worksheet into the Managing Workbooks Synthesis workbook. Place it at the beginning of the workbook.
4. Close the Year 3 Budget workbook.
5. Save the Managing Workbooks Synthesis workbook as `My Managing Workbooks Synthesis`.
6. Move the worksheet with the year 3 budget to last.
7. Rename the worksheets `Year 1`, `Year 2`, and `Year 3`.
8. Color the three worksheet tabs any way you like.
9. Add the New command to the Quick Access toolbar.
10. Add a new group at the end of the ribbon's Home tab, and rename it `My Group`.
11. Add two commands to your custom ribbon group.
12. Reset the Quick Access toolbar and the ribbon.
13. Update and close the workbook.

Colored and named worksheet tabs.



	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5	Sample Café Opening Budget							
6	Year 1							
7								
8	**Expense**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**
9	Rent	2000	2000	2000	2000	2000	2000	2000
10	Remodeling	10000	0	0	0	0	0	2000
11	Legal	4000	500	0	0	0	0	0
12	Equipment	8000	1000	0	0	0	0	0
13	Supplies	1000	1000	1000	1000	1000	1000	1000
14	Advertising	3000	100	100	100	100	100	100
15	Payroll	5000	5000	5000	5000	5000	5000	5000
16	Miscellaneous	800	800	800	800	800	800	800
17	**Totals:**	$ 33,800	$ 10,400	$ 8,900	$ 8,900	$ 8,900	$ 8,900	$ 10,900
18								
19								
20								
21								
22								
23								

Year 1 | Year 2 | Year 3

Chapter 2: Named ranges

You will learn how to:

- Assign names to values, cells, and ranges, and use names in formulas

Learning time: 35 minutes

Module A: Using names in formulas

You can assign meaningful names to ranges, cell references, and formula values to make them easier to understand.

You will learn how to:

- Assign a name to a range
- Use a name instead of a reference in a formula
- Use a name for a formula value
- Create names from the labels in a selected range
- Apply names to references in selected formulas

Names

Referring to cells and ranges is what makes Excel dynamic. Using *names* for those references can unlock even more power. If you've set a print area, you've already used a name, because when you do so, Excel defines the name "Print_Area" to refer to the range you set. But you can assign your own names to cells, ranges, values, and even formulas. You can then use those names in your own formulas to make them easier to construct and understand in the future.

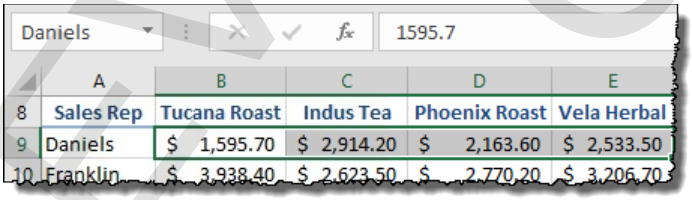
Naming a range

There are many ways to name ranges, and Excel even creates some range names automatically. One simple way to name a range is to use the Name box.

Exam Objective: MOS Excel Expert 3.6.1, 3.6.2

1. Select the cell or range for which you want to create a name.
2. Click in the name box, and type the name you'd like to use.
   Names can be up to 255 characters long. Most characters are valid, but you cannot use spaces, and you cannot create names that resemble cell references, such as "A34" or "R3C5."
3. Press **Enter**.

After you create a name, you can go to the named range by selecting it in the name box (or by typing it there).



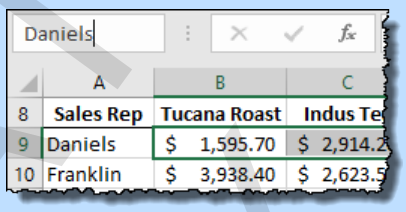
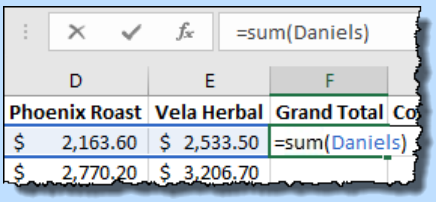
Using a name in a formula

After you define a name, there are several ways to use it in a formula.

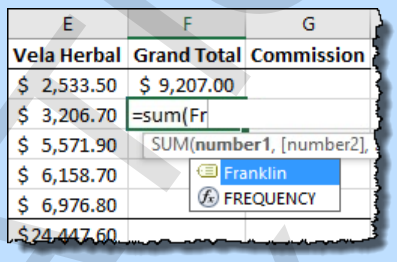
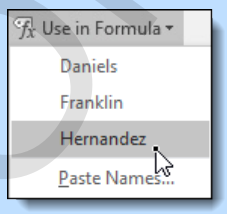
- While entering a formula, type the name instead of a cell reference.
- Start to type the name, then, when Excel recognizes the name you're beginning to type, select it from the Formula AutoComplete list. If Excel selects the name, you can press **Tab** to select it.
- Begin to enter the formula, then, on the Formula tab of the ribbon, click **Use in Formula**, and click the name you want.

Exercise: Naming a range and using it in a formula

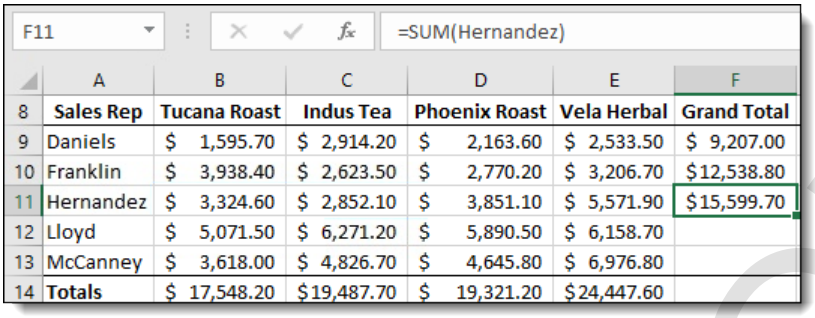
Exam Objective: MOS Excel Expert 3.6.1, 3.6.2

Do This	How & Why
1. Open `Named Ranges`.	From the `Named Ranges` data folder. This workbook contains sales data for Java Tucana. You'll define names to refer to the sales data for particular sales representatives, then use those names in Grand Total formulas.
2. Define the name "Daniels" for that representative's data.	
a) Select B9:E9.	This is the sales data for Daniels.
b) Click in the Name box.	
c) Type `Daniels`.	
d) Press **Enter**.	
3. Select any cell.	To deselect the range.
4. In the Name box list, click **Daniels**.	After you create a name, you can use it to quickly select the range to which it refers.
5. Define the name "Franklin" to refer to Franklin's sales data.	Select B10:E10, click in the Name box, type `Franklin`, and press **Enter**.
6. Define the name "Hernandez" to refer to Hernandez's sales data.	It is in the range B11:E11.
7. Use a name to enter Daniels's total formula.	
a) Select F9.	
b) Type `=sum(Daniels)`.	
c) Press **Enter**.	

Continued...

Do This	How & Why
d) Select and observe the formula.	A formula that uses a name is very easy to understand. This formula, for example, obviously calculates the sum of Daniels's sales.
8. Use Formula AutoComplete to enter Franklin's total formula.	
a) Select F10.	
b) Type `=sum(Fr`, then stop.	The Formula AutoComplete feature displays a list of names and functions you can insert that begin with "Fr." The name "Franklin" is highlighted. 
c) Press **Tab**.	To enter the highlighted name in the formula.
d) Type `)` and press **Enter**.	To complete the formula.
9. Use the Use in Formula list to enter Hernandez's total formula.	
a) Select F11.	
b) Type `=sum(`, then stop.	
c) On the Formula tab, click **Use in Formula**.	It is in the Defined Names group. 
d) Click **Hernandez**.	To enter the name in the formula.
e) Type `)` and press **Enter**.	To complete the formula. There are many ways to enter names. Use the one that works best for you.
10. Save the workbook as `My Named Ranges`.	

Three totals formulas entered using named ranges.



	A	B	C	D	E	F
8	**Sales Rep**	**Tucana Roast**	**Indus Tea**	**Phoenix Roast**	**Vela Herbal**	**Grand Total**
9	Daniels	$ 1,595.70	$ 2,914.20	$ 2,163.60	$ 2,533.50	$ 9,207.00
10	Franklin	$ 3,938.40	$ 2,623.50	$ 2,770.20	$ 3,206.70	$12,538.80
11	Hernandez	$ 3,324.60	$ 2,852.10	$ 3,851.10	$ 5,571.90	$15,599.70
12	Lloyd	$ 5,071.50	$ 6,271.20	$ 5,890.50	$ 6,158.70	
13	McCanney	$ 3,618.00	$ 4,826.70	$ 4,645.80	$ 6,976.80	
14	**Totals**	$ 17,548.20	$19,487.70	$ 19,321.20	$24,447.60	

Other ways to use names

In addition to referring to ranges, names can refer to single cells, values, and formulas. All of these can be useful.

Naming a value

If you have constant values that you want to use in formulas, such as tax or commission rates, you can assign names to refer to those values, and then use those names in your formulas. To assign a name to a value, you need to use the **Define Names** command.

1. On the Formula tab, click **Define Name**.

   To display the New Name window.
2. Type a name for the value in the Name box.
3. Select a scope for the name.

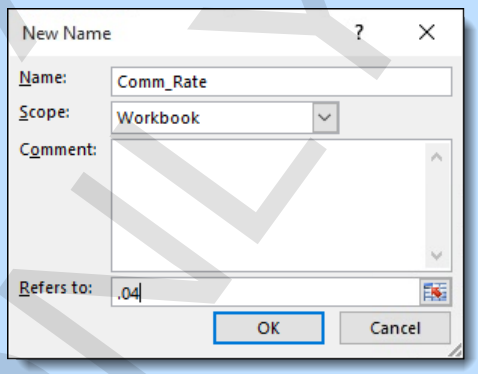
   The *scope* of a name means the worksheets or workbooks in which the name is valid without having to specify a worksheet name. The default is Workbook, meaning that you can use the name in the entire workbook. But if you intend to use the same name to mean different things on different worksheets—say, for a different tax rate—you can limit the scope to a particular worksheet.
4. In the Refers to box, type = then the value.
5. Click **OK**.

The name is now assigned to that value, and you can use it in formulas.

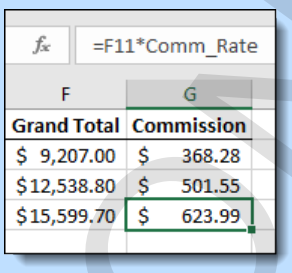
Exercise: Naming a value and using it in a formula

The My Named Ranges workbook is open.

Do This	How & Why
1. Observe column G.	This column will contain commission formulas. You'll assign a name to the commission rate value, then use it in those formulas.
2. Assign the name Comm_Rate to the value .04.	
a) On the Formula tab, click **Define Name**.	To display the New Name window.
b) In the Name box, type `Comm_Rate`.	
c) Observe the Scope box.	The scope is set to "Workbook," meaning that you can use the name anywhere in this workbook. You can instead limit a name's scope to a particular worksheet, although in this case, having the scope set to the whole workbook is fine.
d) In the "Refers to" box, type `=.04`.	To indicate that you want a commission rate of 4%.
e) Click **OK**.	
3. Enter Daniels's commission formula, using the Comm_Rate name.	
a) Select G9.	
b) Type `=F9*`.	To begin to enter the commission formula.
c) Insert the Comm_Rate name.	You can type it, use Formula AutoComplete, or use the Use in Formula feature on the ribbon.
d) Press **Enter**.	The commission amount appears in cell G9.



Do This	How & Why
4. Copy the formula from cell G9 to range G10:G11.	Note that when you copy a formula using a name, the issue of absolute and relative references isn't as important.
5. Update the workbook.	



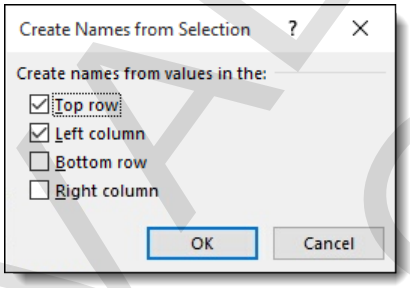
Naming shortcuts

You can create many names at one time by using the **Create from Selection** command. You can also apply many names to formulas in a single step.

Creating names from a selection

If you have a range of data with labels, you can create many names based on those labels in a single step.

1. Select the range for which you want to create names.
   Be sure to include both the data you want to name and the labels that you want to use as names.
2. On the Formula tab, click **Create from Selection**.
   To display the Create Names from Selection window. You can use labels above, to the left, below, or to the right of the data. If your labels don't make valid Excel names (if they have spaces, for example), Excel alters them to be valid (inserting underscores for spaces).



3. If necessary, check the locations corresponding to where you have the labels you want to use as names.
4. Click **OK**.

Excel creates a name for each label. **Top row** labels refer to the ranges directly below them; **Left column** labels refer to the ranges to their right.

Applying names to formulas

If you've created a number of names, and already have formulas that contain references instead of those names, you can replace those references with names in a single step.

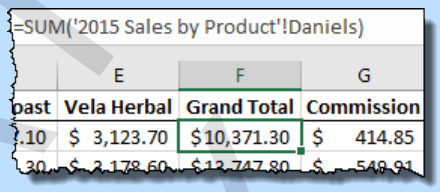
1. Select the range containing the formulas that contain references you want to replace with names.
2. On the Formula tab, click **Define Name > Apply Names**.
   Be sure to click the dropdown arrow on the Define Name button.
3. Click each of the names you want to apply to the formulas.
4. Click **OK**.

Where appropriate, the references in the selected formulas are replaced by names.

Exercise: Creating multiple names and applying them to a range of formulas

My Named Ranges is open.

Do This	How & Why
1. Activate the 2015 Sales by Product worksheet.	This worksheet is very much like the other, but contains 2015 data and has the formulas filled in. However, the formulas use references, not names. You'll create a series of names and apply them to the formulas.
2. Create names based on sales rep names and products.	
a) Select A9:E13.	This range contains the raw data for sales representatives, as well as their name labels in the left row.
b) On the Formula tab, click **Create from Selection**.	To display the Create Names from Selection window. Because you selected a range with labels on the left and at the top, Excel guesses that those are the locations from which you want to create names.
c) Click **OK**.	
3. Observe the names you just created.	
a) Click the Name box dropdown arrow.	
b) Press **Esc**.	
4. Apply the rep names to the Grand Total formulas.	
a) Select F9:F13.	

Do This	How & Why
b) On the Formula tab, click **Define Name > Apply Names**.	The Apply Names window appears, with all of the names in the worksheet selected.
c) Observe the selected names.	All of the new rep names are selected. You can deselect or select names here by clicking them. But you want to apply all the names, so leave them as they are.
	
d) Click **OK**.	
5. Select and observe the Grand Totals formulas.	They now use the names.
	
6. Update the workbook.	

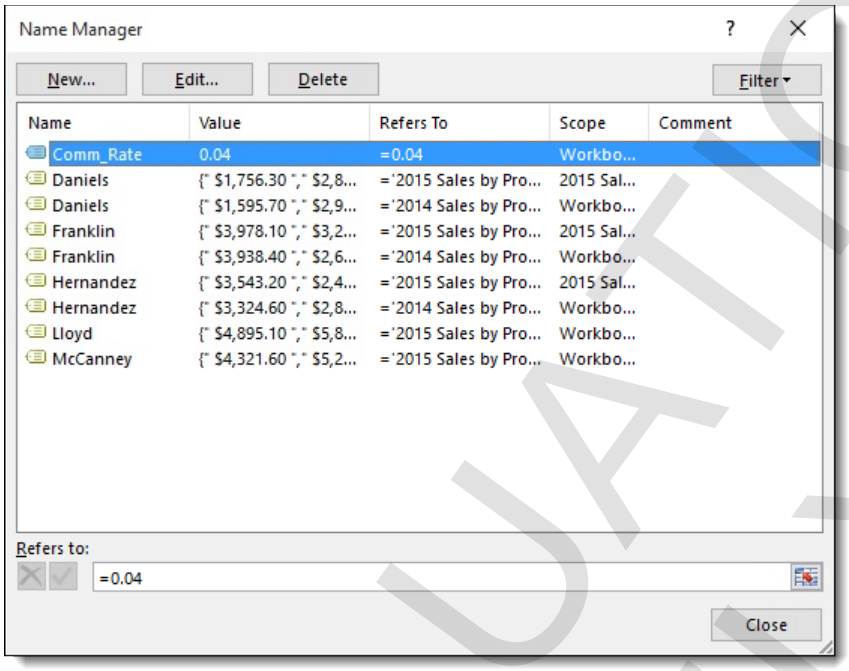
Managing names

At times, you might need to get information about, add, edit, or delete names.

The Name Manager

The Name Manager allows you to view, add, delete, and edit names in a workbook.

Exam Objective: MOS Excel Expert 3.6.4



Name The name assigned to the range, value, or formula.

Refers To The range, value, or formula to which the name refers.

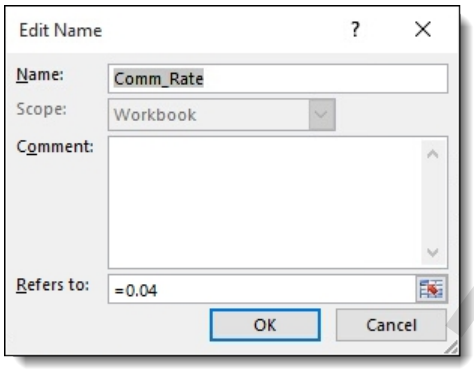
Scope The scope of the name.

You can click **Filter** to view only certain names, such as those that produce errors or those scoped to a particular worksheet. You can create a new name by clicking **New**, or edit or delete a name by clicking it and then clicking **Edit** or **Delete**.

Editing names

Use the Name Manager to edit the reference to which a name refers, or to rename it.

1. On the Formula tab, click **Name Manager**.
   To display the Name Manager window.
2. Click the name you want to edit, then click **Edit**.
   To display the Edit Name window.

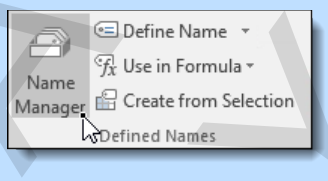


3. Make any changes you want.
   - Use the Name box to rename the name.
   - Use the Refers to box to change the range, value, or formula to which the name refers.
   - Use the Comment box to add a comment.
4. Click **OK**.

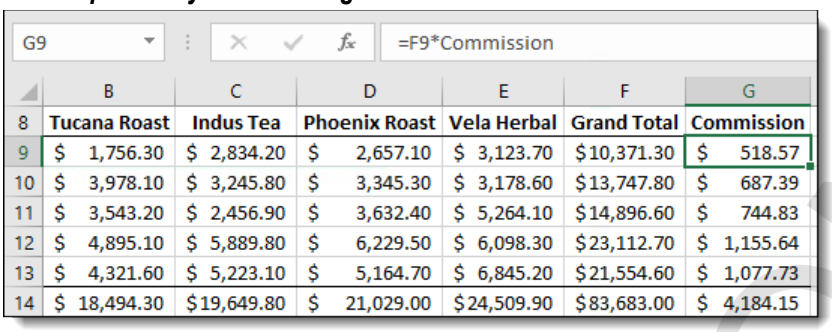
Exercise: Managing names

`My Named Ranges` is open.

Exam Objective: MOS Excel Expert 3.6.4

Do This	How & Why
1. Select G9:G13.	These cells calculate commissions by multiplying the sales total by .04 (4%). These would work better if they used a named value for the commission rate.
2. Edit the commission formulas to use the named value, Comm_Rate.	
a) With the range selected, edit G9 to read `=F9*Comm_Rate`.	
b) Press **Ctrl**+**Enter**.	To enter the new formulas throughout the selected range. This is a better formula, but what if you want to rename the assigned name, or change the commission rate?
3. Edit the Comm_Rate name to be `Commission`.	
a) On the Formula tab, click **Name Manager**.	 To display the Name Manager window.
b) Click **Comm_Rate**, then click **Edit**.	To display the Edit Name window.
c) Change the name to `Commission`, then click **OK**.	You've returned to the Name Manager, and you can see the name has changed.
d) Click **Close**, then observe the formulas.	They've all been updated to reflect the new name, "Commission."
4. Edit the Commission name to refer to `.05`.	
a) Note the commission total for Daniels.	It is currently 414.85.
b) Edit the Commission name.	Display the Name Manager, click **Commission**, then click **Edit**.
c) Edit the "Refers to" box to read `=.05`.	To change the value to which the name refers.
d) Click **OK**, then click **Close**.	To return to the worksheet. Daniels's commission amount is now 518.57, reflecting the new commission rate. Managing named values in this way can make changes very efficient.
5. Update and close the workbook.	

The completed My Named Ranges workbook



G9 | =F9*Commission

	B	C	D	E	F	G
8	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	Grand Total	Commission
9	$ 1,756.30	$ 2,834.20	$ 2,657.10	$ 3,123.70	$10,371.30	$ 518.57
10	$ 3,978.10	$ 3,245.80	$ 3,345.30	$ 3,178.60	$13,747.80	$ 687.39
11	$ 3,543.20	$ 2,456.90	$ 3,632.40	$ 5,264.10	$14,896.60	$ 744.83
12	$ 4,895.10	$ 5,889.80	$ 6,229.50	$ 6,098.30	$23,112.70	$ 1,155.64
13	$ 4,321.60	$ 5,223.10	$ 5,164.70	$ 6,845.20	$21,554.60	$ 1,077.73
14	$ 18,494.30	$19,649.80	$ 21,029.00	$24,509.90	$83,683.00	$ 4,184.15

Assessment: Using names in formulas

Which of the following can Excel names refer to? Choose all that apply.

- **Ranges**
- **Values**
- Formats
- **Formulas**

Which of the following is *not* a valid Excel name?

- **Commission Rate**
- Commission
- Commission_for_Sales_in_Pacific_Region

Which of the following are ways to define names? Choose all that apply.

- **Select a range and then type a name in the Name box.**
- **Click Define Name.**
- Use the Insert tab of the ribbon.
- **Select a range and click Create from Selection.**

The only way to use a name for a reference in a formula you've already created is to edit the formula. True or false?

- True
- **False**

You use the Name Manager to make changes to a name, such as changing the reference to which it refers or its name. True or false?

- **True**
- False

Summary: Named Ranges

You should now know how to:

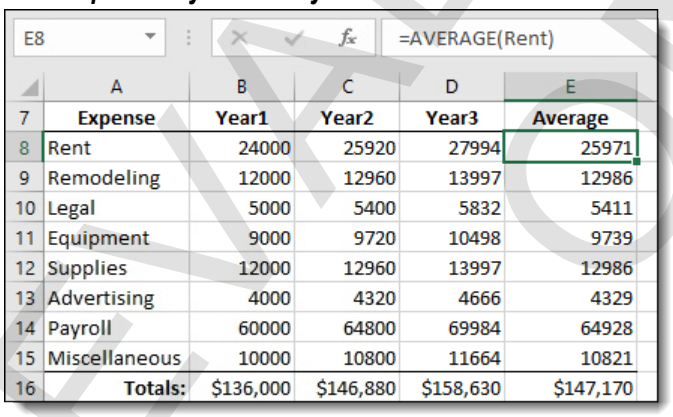
- Define a name to refer to a cell, a range, or a value; use names in a formula; create names from a selected range and apply them to formulas; and use the name manager to edit existing names.

Synthesis: Named Ranges

In this synthesis exercise, you'll open a café budget workbook, define a name for a yearly budget increase percentage, create year 2 and year 3 budget formulas, create names from a selection, and apply names to formulas.

1. Open `Names Synthesis`.
   From the `Named Ranges` data folder. This workbook contains a three-year projected budget for a café.
2. Define the name Yearly_Budget_Increase to refer to the value 1.05.
3. Use the name you just defined to create the Year2 budget formulas.
   Multiply the Year1 budget values by Yearly_Budget_Increase.
4. Copy the Year2 budget formulas to the Year3 column.
5. Create names for the data according to the expense and year labels.
6. Apply the expense names you just created to the formulas in the range E8:E15.
7. Apply the year names to the formulas in the range B16:D16.
8. Edit the Yearly_Budget_Increase name to refer to 1.08.
9. Save the workbook as `My Names Synthesis`, and then close it.

The completed My Names Synthesis workbook.



E8 =AVERAGE(Rent)

	A	B	C	D	E
7	**Expense**	**Year1**	**Year2**	**Year3**	**Average**
8	Rent	24000	25920	27994	25971
9	Remodeling	12000	12960	13997	12986
10	Legal	5000	5400	5832	5411
11	Equipment	9000	9720	10498	9739
12	Supplies	12000	12960	13997	12986
13	Advertising	4000	4320	4666	4329
14	Payroll	60000	64800	69984	64928
15	Miscellaneous	10000	10800	11664	10821
16	**Totals:**	$136,000	$146,880	$158,630	$147,170

Chapter 3: Tables

You will learn:

- How to sort data in a range by the values in one or more columns
- About Excel tables, and how to filter data in a table to show only what you want to see
- How to use structured references to create formulas based on table data
- How to use validation to ensure that the data entered in a worksheet is appropriate
- How to transpose rows and columns of data

Learning time: 75 minutes

Module A: Sorting

You can sort data in a column or a range to put it in the order you want. You can sort by the values in one or more columns.

You will learn how to:

- Sort the rows in a range by putting a single column in alphabetical, numeric, or chronological order
- Sort the rows in a range by more than one column of values

Sorting by values

You can sort ranges to put them in order by the values in a particular column. You can sort text alphabetically, as shown here:

Customer
Accounts Now
Award Sportswear
Blastera
BlazerFire
Brocadero
Callinsure
Central
Central-West Bank
Chaplan Home Stores
CrossCountry Airways
Custom Boat Co.

Or, you can sort by numerical values. Here, the customers are sorted by descending values of sales for the Tucana Roast product.

Customer	Tucana Roast
Eatenbread Digital Productions	$ 1,625
Diallonics	$ 1,591
WeekendBreak Airways	$ 1,590
Sharp-End Tools	$ 1,522
Blastera	$ 1,328
Unito Games	$ 1,183
Smooth Lane, Inc.	$ 1,040
Red Rock Mountain Tours	$ 1,009
Accounts Now	$ 975
YourWay Airline	$ 964

Sorting by a single column

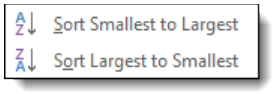
You can easily sort by a single column using the **Soft & Filter** button on the home tab.

Exam Objective: MOS Excel Core 3.3.3

1. Select the range you want to sort.
   If you select a row of headings, Excel usually knows not to sort the labels with the other rows. But you do not have to select the headings. If you select only a single cell, Excel usually can determine what range you want to sort, but not always. It's best practice to select the entire range first.
2. Use the **Tab** key to activate a cell in the column by which you want to sort.
   Pressing Tab while a range is selected moves the active cell while keeping the same range selected.

3. On the Home tab, in the Editing group, click **Sort & Filter**.

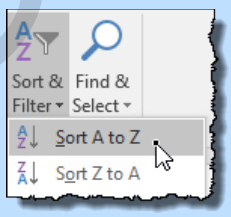
   You see different sorting commands, depending on whether the active column contains text, values, or dates.



4. Click the sort command you want to use.

Exercise: Sorting a range alphabetically or numerically

Exam Objective: MOS Excel Core 3.3.3

Do This	How & Why
1. Open `Sorting`.	From the `Tables` data folder. This workbook contains fictional employee information for Java Tucana. You will sort this in several different ways.
2. Sort the employee data by last name in alphabetical order.	
a) Select A8:E507.	Select A8, hold down **Ctrl** and **Shift**, press the Right Arrow key, then the Down Arrow key. When you select a range to sort, do not include the row of column labels.
b) Press **Tab** to activate cell B8.	You will sort alphabetically by the data in this column (last names).
c) Click **Sort & Filter > Sort A to Z**.	The Sort & Filter button is in the Editing group, to the right of the Home tab. Note that you can also sort in reverse order.  The employees are now in ascending order by last names.
3. Sort the employee data in descending order by Salary.	
a) Select A8:E507.	If necessary.

Continued...

Do This	How & Why
b) Activate a cell in column E.	Use the **Tab** key.
c) Click **Sort & Filter > Sort Largest to Smallest**.	The employees are now arranged in descending order by salary (with the highest-paid employees at the top).
4. Sort the employees by Date of Hire, with the longest-tenured employees at the top.	Select A8:E507, activate a cell in column D, then click **Sort & Filter > Sort Oldest to Newest**.
5. Save the workbook as `My Sorting`.	

Employees sorted chronologically by Date of Hire.

	A	B	C	D	E
7	**First**	**Last**	**Dept**	**Date of Hire**	**Salary**
8	Lessie	Oberlander	Café Management	3/13/1984	$ 30,000
9	Jacquie	Toenjes	Customer Service	3/24/1984	$ 44,000
10	Lindsey	Stairs	Café Management	4/16/1984	$ 44,000
11	Ginger	Luppino	Legal	5/14/1984	$ 77,000
12	Patrica	Seibold	Customer Service	5/15/1984	$ 96,000
13	Candie	Mettler	Corporate	6/11/1984	$ 113,000
14	Sheron	Minard	Customer Service	6/14/1984	$ 124,000
15	Reda	Koller	Café Management	6/15/1984	$ 71,000
16	Winter	Viernes	Customer Service	8/11/1984	$ 76,000

Custom sorts

If you want to do more complicated sorting, for example, sorting by more than one column or by cell attributes other than values, you can use the **Custom Sort** command in the Sort & Filter menu.

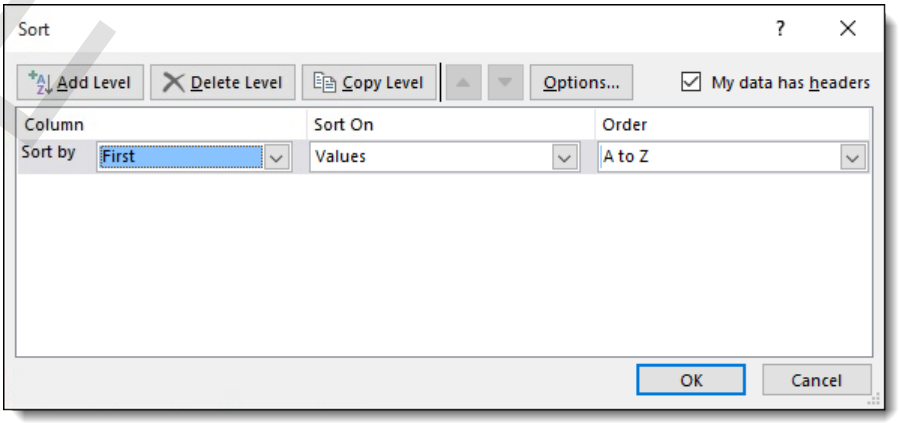
Sorting by more than one column

To sort a range by more than one column—by last name and then first name, for example—you need to use the Sort window.

Exam Objective: MOS Excel Core 3.3.2

1. Select the range you want to sort. Again, Excel does a good job of guessing the range you want, even if you select a single cell. But it's best to be specific.
2. Click **Sort & Filter > Custom Sort**.

   To display the Sort window. Here, you can sort in much more complex ways.

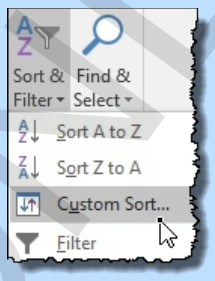


3. Set the sort options for the first column.
   - In the "Sort by" list, click the column by which you want to sort. If you have labels in the row above your selected range, Excel displays them in this list.
   - In the "Sort On" list, click an option to sort by a value or some other cell attribute.
   - In the Order list, click the order in which you want to sort.
4. Click **Add Level**, and then set the sort options for a second column.
   You can also use the **Copy Level** button to create a similar level of the sort.
5. Add as many levels as you like.
   The range will be sorted by the first level first, then, when there are ties, within the second level, and so on.
6. Click **OK**.

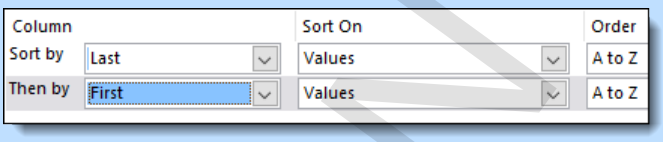
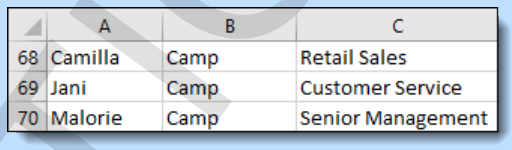
Exercise: sorting by last name and first name

`My Sorting` is open.

Exam Objective: MOS Excel Core 3.3.2

Do This	How & Why
1. Select A7:E507.	You will sort the list by last name and then by first name. When you perform a custom sort using the Sort window, you can specify a headings row.
2. Click **Sort & Filter > Custom Sort**.	To display the Sort Window. 
3. Set the first level of the sort for the Last column values in alphabetical order. a) In the "Sort by" list, click **Last**. b) Verify that the Order is **A to Z**.	
4. Add a second level to the sort for the First column values in alphabetical order. a) Click **Add Level**.	There is now a "Then by" row of sort options.

Continued...

Do This	How & Why
b) In the "Then by" list, click **First**.	The Order is **A to Z** by default. The window should look like this. 
5. Click **OK**.	To sort the list by last name, then by first name.
6. Scroll down to see the three employees with the last name "Camp."	In rows 68–70. They are in ascending alphabetical order by first names. 
7. Save and close the workbook.	

Assessment: Sorting

Which of the following are ways you can sort data?

- **By numerical values**
- **By dates**
- By number formats
- **Alphabetical order**

You always need to use the Sort window to sort a range. True or false?

- True
- **False**

Module B: Filtering tables

In a sense, everything you do in Excel is a "table"—rows and columns of structured data. But in Excel terms, a *table* is a particular structure that you or Excel defines, and that provides you with many special features. One of the most useful things you can do with a table is to *filter* it to find particular data or to show only the data you want to see.

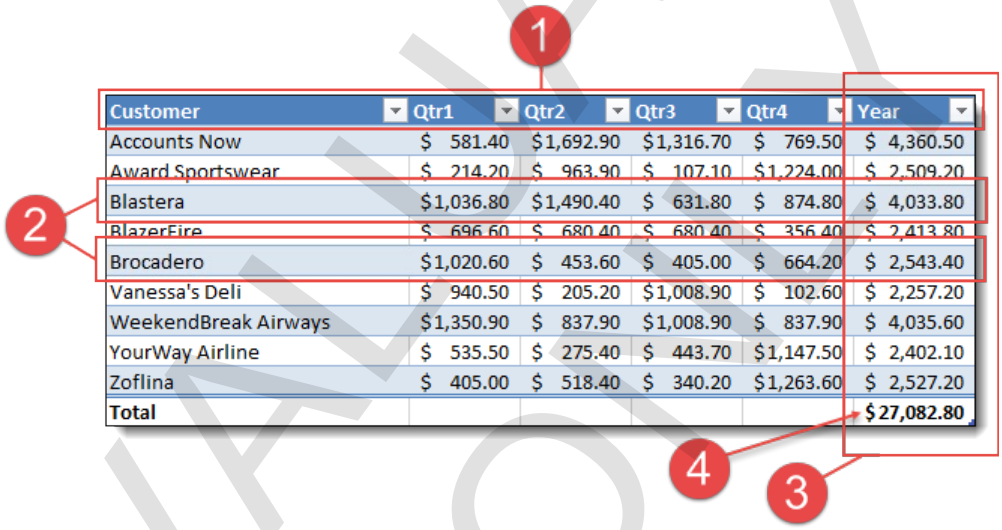
You will learn how to:

- Create an Excel table and understand its features and their uses
- Use AutoFilter to quickly show only certain table data
- Create advanced criteria for filtering tables in a very focused way
- Remove duplicate values from a table

Tables

When you specify a range as an Excel table, you can then manage its data in many convenient ways. It's easier to add, sort, and analyze data in tables.

Excel table elements.



Customer	Qtr1	Qtr2	Qtr3	Qtr4	Year
Accounts Now	$ 581.40	$1,692.90	$1,316.70	$ 769.50	$ 4,360.50
Award Sportswear	$ 214.20	$ 963.90	$ 107.10	$1,224.00	$ 2,509.20
Blastera	$1,036.80	$1,490.40	$ 631.80	$ 874.80	$ 4,033.80
BlazerFire	$ 696.60	$ 680.40	$ 680.40	$ 356.40	$ 2,413.80
Brocadero	$1,020.60	$ 453.60	$ 405.00	$ 664.20	$ 2,543.40
Vanessa's Deli	$ 940.50	$ 205.20	$1,008.90	$ 102.60	$ 2,257.20
WeekendBreak Airways	$1,350.90	$ 837.90	$1,008.90	$ 837.90	$ 4,035.60
YourWay Airline	$ 535.50	$ 275.40	$ 443.70	$1,147.50	$ 2,402.10
Zoflina	$ 405.00	$ 518.40	$ 340.20	$1,263.60	$ 2,527.20
Total					**$27,082.80**

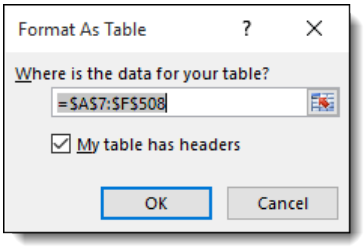
1. The *header row* identifies the data in the table's columns and provides filter arrows.
2. *Banded rows* make the data easier to distinguish.
3. *Calculated columns* are data based on formulas, and will be automatically entered when you enter your other table data.
4. Tables may or may not have a *totals row.*

Creating tables

It's simple to create an Excel table from a range of data.

Exam Objective: MOS Excel Core 3.1.1, 3.1.2

1. Select a range.
   It can contain headings but doesn't have to. If you select a single cell, Excel guesses at the range you want to use.
2. On the Home tab, in the Styles group, click **Format as Table**, then click a table style.
   The Format as Table window appears.



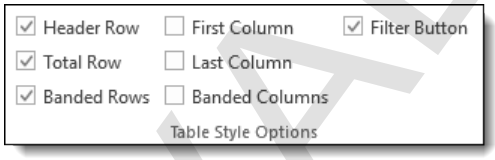
3. Correct the range, if necessary, specify whether the table has headers, and then click **OK**.

The range will now be formatted as a table, and will have access to all the table features. If you need to convert an Excel table back into a regular range, select a cell within the table, then click **Convert to Range** in the Tools group on the Table Tools Design tab of the ribbon.

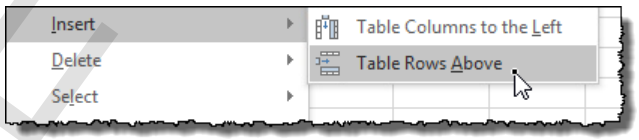
Controlling table features

Tables have many useful features that allow you to add and remove columns and rows, band the rows, or add a totals row. The tools in Table Style Options group of the Table Tools Design tab are particularly useful.

Exam Objective: MOS Excel Core 3.1.3, 3.2.2,3.2.3

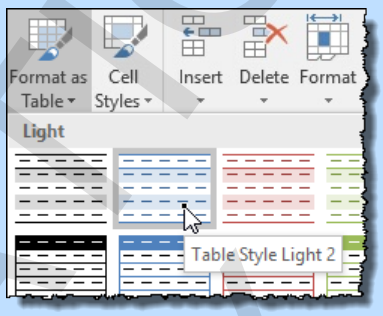


- To add or remove a total row, check or clear **Total Row**.
- To add or remove banding to the rows of the table, check or clear **Banded Rows**.
- To insert or delete rows and columns, right-click where you want do so, then click **Insert** or **Delete**, and click an options.



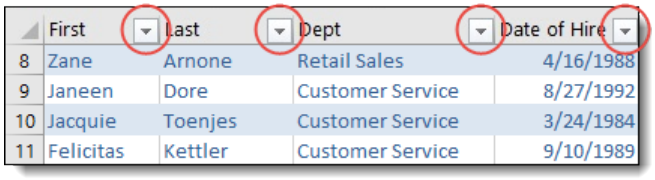
Exercise: Creating and examining a table

Exam Objective: MOS Excel Core 3.1.1, 3.1.3, 3.2.2, 3.2.3

Do This	How & Why
1. Open `Filtering`.	From the `Tables` data folder. The workbook contains employee data: names, departments, hire dates, years of service (which are calculated), and salaries.
2. Create a table based on employee data.	
a) Select any cell within the data.	
b) On the Home tab, in the Styles group, click **Format as Table**, then click **Table Style Light 2**.	
	The Format as Table window appears.
c) Observe the window.	Excel correctly guesses the range to use (=$A$7:$F$508) and includes the header row, because that option is checked.
d) Click **OK**.	To create the table.
3. Observe the header row.	Each heading has a filter arrow next to it. You can use these to filter the table by column values.
4. Observe the banded rows.	Although not a necessary table feature, banded rows make the data easier to read.
5. Select a cell in the Years column.	This is a calculated column, based on formulas.
6. Observe the Table Tools Design tab.	This tab is visible whenever you select any part of a table. You can easily add and remove table features here.
7. Click **Total Row**.	A total row now appears at the bottom of the table.
8. Select cell F508, and press **Tab**.	To add a new row to the table. Notice that the calculated column formulas have already been entered for you.
9. Click .	To undo the added row.
10. Save the workbook as `My Filtering`.	

Using AutoFilter

When you create a table, the headings in the header row all have small filter arrows next to them.

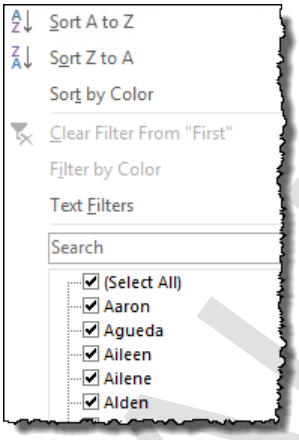


	First	Last	Dept	Date of Hire
8	Zane	Arnone	Retail Sales	4/16/1988
9	Janeen	Dore	Customer Service	8/27/1992
10	Jacquie	Toenjes	Customer Service	3/24/1984
11	Felicitas	Kettler	Customer Service	9/10/1989

You can click these arrows to access a whole range of AutoFilter features that enable you to filter the table to show only those rows that meet a criterion.

Exam Objective: MOS Excel Core 3.3.1

1. If you have not formatted the range as a table, click within the range, then click **Sort & Filter > Filter**.
   This enables the filter arrows.
2. Click the filter arrow for the column by which you want to filter.
   To display the Filter menu for the column. The exact commands that appear depend on the type of data in the column (just as the commands vary for sorting). In fact, the sort commands appear at the top of the Filter menu. This is a Filter menu for a text column.



3. Filter the column any number of ways.
   - To search for particular data, type it in the Search box. You can, for example, search for a particular value, or for items that contain particular text.
   - To show certain values but not others, click **Select All** to clear all the values, then click each value you want to show.
   - Display a submenu (Text Filters, Date Filters, or Number Filters) to access commands for more complex criteria.
4. Click **OK**.
   Only rows that match the criterion you specified appear.
5. If you like, add a filter to another column.
   Only rows that meet the criteria set in *both* columns appear.

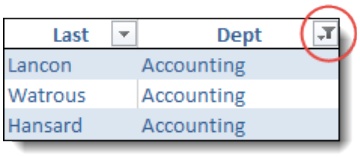
Filtering by a cell value

You can also filter by a cell's value without using the AutoFilter features.

1. Right-click the cell by which you want to filter.
2. Click **Filter > Filter by Selected Cell's Value**.

Clearing a filter

When you apply a filter to a column, you can see its effect easily by the change in the icon on the filter arrow. It's easy to remove a filter from a column.



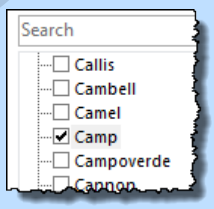
- Click the filter arrow for the filtered column, then click **Clear filter from <column_name>**.
- To remove all filters (from any columns) at the same time, activate the Data tab, then, in the Sort & Filter group, click **Clear**.

Exercise: Using AutoFilter with a table

`My Filtering` is open.

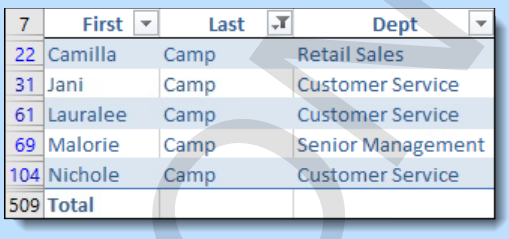
Exam Objective: MOS Excel Core 3.3.1

Do This	How & Why
1. Filter for employees with the last name "Camp."	
a) Click the filter arrow for the Last column.	
b) Click **Select All** to clear all the values in the list.	
c) Click **Camp**.	You'll need to scroll down to find it.



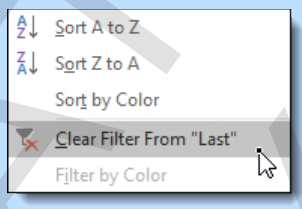
Continued...

Do This	How & Why
d) Click **OK**.	The table shows only employees with the last name "Camp." Note the difference in the filter arrow, now that the column is filtered.



7	First	Last	Dept
22	Camilla	Camp	Retail Sales
31	Jani	Camp	Customer Service
61	Lauralee	Camp	Customer Service
69	Malorie	Camp	Senior Management
104	Nichole	Camp	Customer Service
509	Total		

2. Remove the filter from the Last column.	
a) Click the Last filter arrow.	
b) Click **Clear Filter from "Last"**.	



3. Filter for employees who work in any Management department.	
a) Click the Dept filter arrow.	
b) In the Search box, type `Management`.	After a moment, the values list shows only the departments containing that text.
c) Click **OK**.	The table shows only those employees who work in a department with a name that includes "Management."
4. Filter for all employees in the IT department.	
a) Clear the current filter from the Dept column.	Click the Dept filter arrow, then click **Clear Filter from "Dept"**.
b) Right-click cell C36.	Karla Buttram's Dept cell.
c) Click **Filter > Filter by Selected Cell's Value**.	Now you see only those employees in the IT department.
5. Save the workbook.	

Complex criteria

Often, the filters you want to use aren't as simple as looking for a specific value or text in column. You might want to filter for values that fall between two numbers, or dates before a certain date. The commands in the context-sensitive Filters menus—**Text Filters**, **Number Filters**, and **Date Filters**—enable you to do this kind of comparison-based filtering.

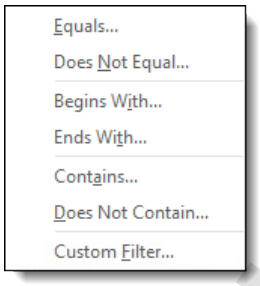
You can also use these commands to combine two criteria. If you put together one criterion *AND* another, you make the conditions more restrictive. The filtered rows must meet both criteria to pass.

Combining criteria using *OR* makes the conditions more inclusive. The filtered rows can meet one or the other criterion, but don't need to meet both.

Creating complex text criteria

Use the commands in the Text Filters submenu to create more complex criteria for filtering by text columns.

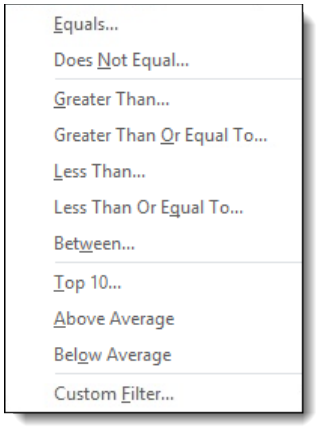
1. Click the filter arrow for a text column, then click **Text Filters**.
2. Click one of the Text Filters commands.



   - Click **Equals** or **Does Not Equal** to find or exclude exact text.
   - Click **Begins With** or **Ends With** to find text at the beginning or end of the text in the column's cells.
   - Click **Contains** or **Does Not Contain** to find or exclude text within the text in the column's cells.
   - Click **Custom Filter** to create your own custom filters. In fact, all of the commands in this menu lead to the Custom Filter window, but the others all have criteria partially built for you.
3. Type in the text you want to find or exclude.
4. Click **OK**.

Creating complex number filters

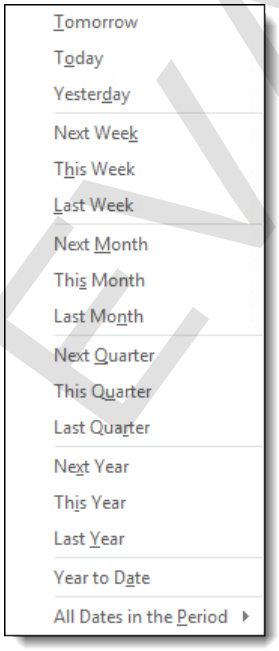
You create a number filter in the same way that you create a text filter, except that the commands in the Number Filters submenu relate to numbers.



1. Click a numeric column's filter arrow, then click **Number Filters**.
2. Click a number filter command.
   - Specify ranges of numbers by clicking **Greater Than**, **Greater Than Or Equal To**, **Less Than**, **Less Than Or Equal To**, or **Between**.
   - Filter statistically by clicking **Top 10**, **Above Average**, or **Below Average**.
3. Specify any settings you need, and click **OK** (if necessary).
   Some of the commands, like **Above Average**, have a direct effect without any further settings.

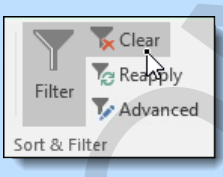
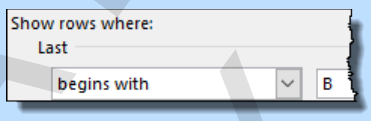
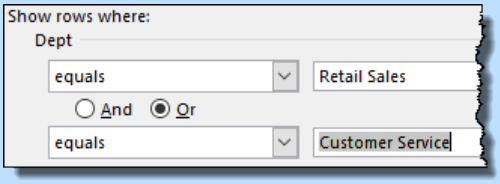
Creating complex date filters

The Date Filters menu has some similar commands to those in the Number Filters menu, such as **Equals**, **Before**, **After**, and **Between**, but it also has many commands that quickly show you rows from a particular time in relationship to the current data. You use these commands much as you would other filter commands.



Exercise: Filtering a table using complex criteria

`My Filtering` is open.

Do This	How & Why
1. On the Data tab, in the Sort & Filter group, click **Clear**.	To clear the current filters. 
2. Filter the table for last names that begin with "B."	
a) Click the Last filter arrow, then click **Text Filters > Begins With**.	To display the Custom AutoFilter window. Notice that the column is already set (Last), and "Begins with" is selected.
b) In the box on the right, type `B`.	The window should look like this. 
c) Click **OK**.	Only employees whose names begin with "B" appear in the table.
d) Remove the filter.	On the Data tab, in the Sort & Filter group, click **Clear**.
3. Filter the table for employees in either the Retail Sales or Customer Service departments.	
a) Click the Dept filter arrow, then click **Text Filters > Equals**.	
b) In the dropdown list on the right, click **Retail Sales**.	
c) Click **Or**.	To begin to create an OR criterion.
d) In the second list on the left, click **Equals**.	
e) In the second list on the right, click **Customer Service**.	The window should look like this. 
f) Click **OK**.	The table shows employees from only these two departments.

Continued...

Do This	How & Why
g) Remove the filter.	
4. Filter the table to display employees hired before January 1, 2000.	
a) Click the Date of Hire filter arrow, then click **Date Filters > Before**.	
b) In the box on the right, type `1/1/2000`.	
c) Click **OK**.	The table shows only those employees hired before January 1, 2000. Do *not* clear this filter.
5. Add a filter to show only those employees whose salary is less than $60,000.	
a) Click the Salary filter arrow, then click **Number Filters > Less Than**.	
b) Type `60000`, then click **OK**.	Now, you are seeing only those employees hired before January 1, 2000, who make less than $60,000 annually.
c) Observe the status bar.	It shows that 83 of the 501 records (rows) meet the criteria. 
6. Save the workbook.	

The employee table filtered on hire date and salary.

First	Last	Dept	Date of Hir	Years	Salary
Zane	Arnone	Retail Sales	4/16/1988	27.7	$ 50,000
Janeen	Dore	Customer Service	8/27/1992	23.3	$ 38,000
Jacquie	Toenjes	Customer Service	3/24/1984	31.7	$ 44,000
Tianna	Pooley	Retail Sales	5/25/1988	27.6	$ 57,000
Lindsey	Stairs	Café Management	4/16/1984	31.7	$ 44,000
Sook	Leaks	Customer Service	8/7/1986	29.4	$ 48,000
Judy	Bogar	Café Management	5/25/1995	20.6	$ 32,000
Kyle	Boss	Senior Management	4/17/1999	16.7	$ 57,000
Harland	Grahm	Customer Service	2/10/1999	16.9	$ 53,000
Stacia	Vallery	Corporate	11/3/1996	19.1	$ 58,000
Lauralee	Camp	Customer Service	6/27/1988	27.5	$ 32,000
Isaiah	Mitton	Customer Service	9/8/1991	24.3	$ 30,000

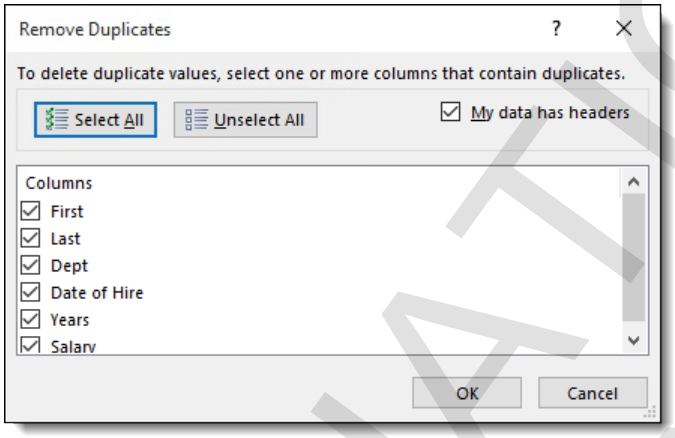
Removing duplicate rows

Sometimes, data have duplicate information. It can be tedious to find and remove duplicates, and duplicate data can throw off your reports.

Exam Objective: MOS Excel Core 3.3.4

1. Format your data as a table, if necessary.
2. On the Table Tools Design tab, in the Tools group, click Remove Duplicates.

   To display the Remove Duplicates window.



3. Select the columns that you want to use to define a duplicate.

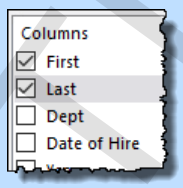
   For example, if you want to remove only those rows where all columns contain duplicate values, leave all the columns selected. If you want to remove all rows that have the same first and last name, click **Unselect All**, then click only the First and Last columns.
4. Click **OK**.

   Excel displays a message telling you how many duplicates have been removed.

Exercise: Removing a duplicate row from a table

My Filtering is open.

Exam Objective: MOS Excel Core 3.3.4

Do This	How & Why
1. Clear any filters from the table.	
2. On the Table Tools Design tab, click **Remove Duplicates**.	It is in the Data Tools group. The Remove Duplicates window appears.
3. Click **Unselect All**, then click **First** and **Last**.	You'll remove any row in which both the first and last name are the same as an earlier row. 
4. Click **OK**.	A message appears telling you that 1 set of duplicate values was found and removed.
5. Click **OK**.	
6. Save and close the workbook.	

Assessment: Filtering tables

An Excel table must have a header row. True or false?

- True
- **False**

Which of the following is NOT a type of data by which you can filter a table? Select the correct answer.

- Text
- **Formulas**
- Numbers
- Dates

Does adding a condition using AND make criteria more or less restrictive?

- **More restrictive**
- Less Restrictive

How would you create criteria to filter for numbers below a minimum value or above a maximum value?

- Use the Between number filter command.
- **Use an OR condition.**
- Use the Not Between filter command.

Module C: Structured references

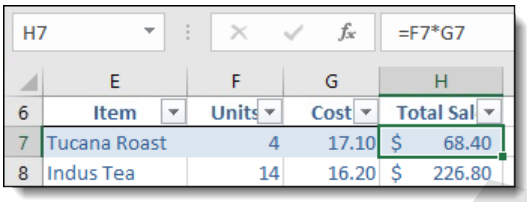
When you create a table from a range, Excel creates special names, called *structured references*, that you can use to refer to the table, its fields (columns), and values. You can then use these structured references to create simple, flexible, and readable formulas.

You will learn how to:

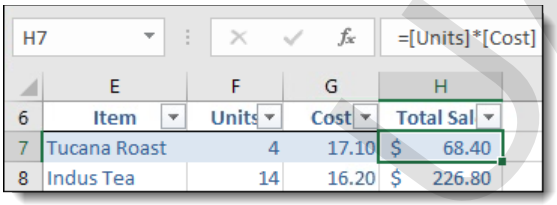
- Use structured references to create formulas based on tables.

About structured references

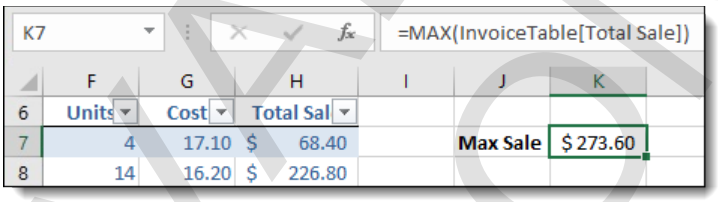
In this figure, the total sales is calculated using a SUM function that refers to cell references for the units and cost.



But in the next example, the formulas uses *structured references*, which are names for the *fields* (or columns in the table) that are based on the table headings.



In the preceding example, the references to the fields are enclosed in brackets, and because the formulas are within the table, do not need to be preceded by the name of the table itself. If you want to use structured references in formulas outside a table, those references do need to include the table name, as in this example.



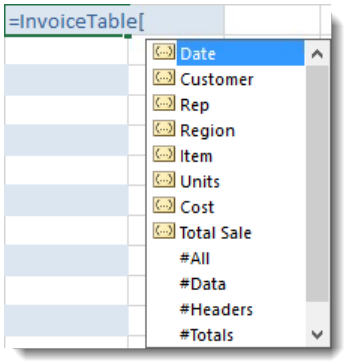
Using structured references

Structured references consist of table names, field names, and *special item specifiers*. Understanding the full syntax for structured references is complicated, but you can use Formula AutoComplete to enter formulas that used structured references fairly easily.

Exam Objective: MOS Excel Expert 1.1.4, 3.6.3

1. Format the range you want to use as a table, if necessary.
2. Name the table something descriptive and easy to remember.
   a) Select a cell within the table.
   b) On the Table Tools Design tab, in the Properties group, enter a name for the table.
   The table name must follow Excel's normal naming rules. Be sure not to use any spaces.
3. Select the cell where you want to enter a formula, then begin to enter the formula.

4. When you get to the needing to enter a reference to something in the table, use a structured reference instead.
   - If you are entering a formula within the table, type `[`, and Formula AutoComplete will give you a list of fields (columns) within the table from which to choose. Select the one you want, then type `]`.
   - If you are entering a formula outside the table, or want to use special item specifiers, you will need to enter the name of the table first. Simply begin to type the name, then select it from the Formula AutoComplete list. When you type [, you will see a list of both fields and special item specifiers, such as #All (all items in table, including headers and totals), #Data (just data rows), #Headers (the headers row), #Totals (the totals row), and #This Row (cells in the same row as the formula).



5. Complete the formula using operators and more structured references.

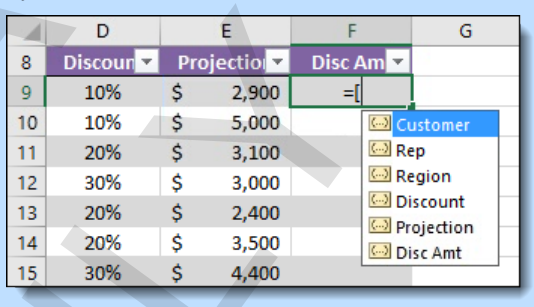
Formulas that use structured references are generally easier to understand. But they are also more flexible, because they update automatically as the structure of the table changes. When you change column names, add rows, or add columns, for example, the formulas will update automatically.

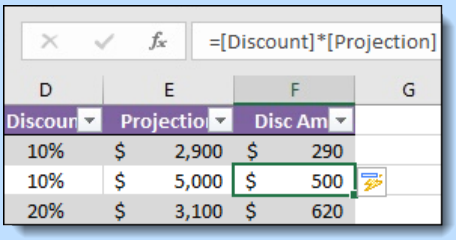
Exercise: Creating formulas using structured references

Exam Objective: MOS Excel Expert 1.1.4, 3.6.3

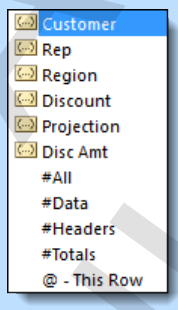
Do This	How & Why
1. Open Structured References.	From the `Tables` data folder. The worksheet contains sales projections for various customers, along with their discount percentages.
2. Convert the range to a table.	
a) Select a cell within the data, then, in the Format as Table gallery, click a style.	The Format as Table window appears.
b) Click **OK**.	
3. Right click the Projection column, then click **Insert Column > Table Column to the Right**.	
4. Rename the new column `Disc Amt`.	Select the heading and enter the new label. You will enter a formula in this column that uses structured references to calculate the customer's projected discount amount.

Do This	How & Why
5. Name the table `SalesProjections`.	
a) Select a cell within the table.	
b) On the Table Tools Design tab, enter SalesProjections as the table name.	In the Table Name box in the Properties group on the left. Tables have default names (the word "Table" and a number), but using descriptive names will make your structured references easier to create and understand.
6. Using structured references, enter a discount formula for the first customer.	
a) Select F9.	
b) Type `=[`, then stop.	Formula AutoComplete displays a list of fields (column headings) in the table. When you use these in a formula in this way, they refer to that field's value in the current row.
c) Select **Discount**, press **Tab**, then type `]`.	To enter a structured reference to the Discount field value for this customer.
d) Type `*`, then enter a structured reference to the Projection field value.	Type `[`, begin to type "Projection," select it from the Formula AutoComplete list, press **Tab**, then type `]`.
e) Enter the formula.	The formula calculates the discount amount not only for the cell, but for the entire column.
7. Click  .	The AutoCorrect Options button. Note that you can choose not to have Excel automatically enter calculated columns, but it's a very handy feature.

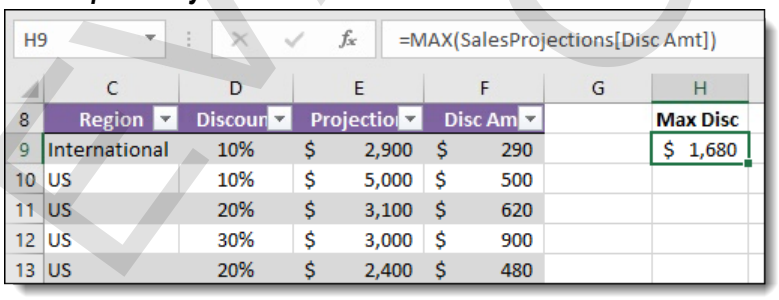




Continued...

Do This	How & Why
8. Save the workbook as My Structured References.	In the `Tables` data folder.
9. In H8, enter `Max Disc`, then make it bold.	You'll enter a formula below this to calculate the highest projected discount amount in the table.
10. In H9, enter a formula using a structured reference to calculate the maximum discount.	
a) In H9, type `=Max(`.	To begin to enter the formula. Next, you'll need to specify the table name since this formula is outside the table.
b) Type `Sa`.	Formula AutoComplete give you the name of the table to select.
c) Select **SalesProjections**, press **Tab**, then type `[`.	Now Formula AutoComplete shows you all the possible items for the table, both fields and special item specifiers. 
d) Select **Disc Amt**, press **Tab**, type `])`, then press **Enter**.	To complete and enter the formula, which calculates the correct maximum discount amount.
11. Update and then close the workbook.	

The completed My Structured References workbook



	C	D	E	F	G	H
8	Region	Discoun	Projectio	Disc Am		Max Disc
9	International	10%	$ 2,900	$ 290		$ 1,680
10	US	10%	$ 5,000	$ 500		
11	US	20%	$ 3,100	$ 620		
12	US	30%	$ 3,000	$ 900		
13	US	20%	$ 2,400	$ 480		

Assessment: Structured references

You can use structured reference on any Excel data that is arranged with headings. True or false?

- True
- **False**

Which of the following are valid special item identifiers for structured references? Choose all correct options.

- **#Data**
- **#Totals**
- #This Column
- **#This Row**

Module D: Validation

If others will be adding data to your workbooks, it's a good idea to use *validation* to ensure that they enter only appropriate data. For example, you can ensure that only whole numbers are entered in a particular column, or only values from a list that you define (such as a list of regions or departments).

You will learn how to:

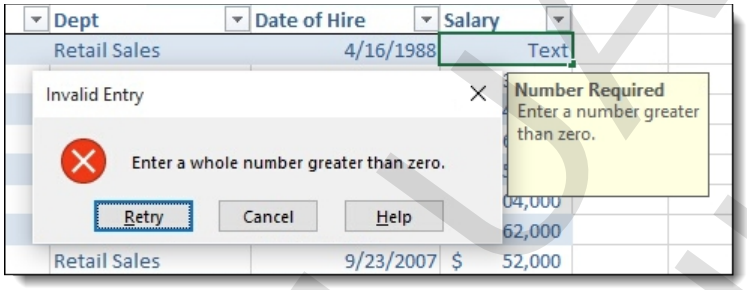
- Set up simple data validation rules
- Create a validation list

Validation

You use validation to ensure that the right data is entered into cells and ranges. When you're sharing a workbook, and especially when you allow others to enter data, this is very important.

You can, for example, restrict data to numbers. You can add input messages to guide users as they select cells that have validation applied, and you can add error messages to get them back on track when they attempt to enter invalid data.

Validation messages.



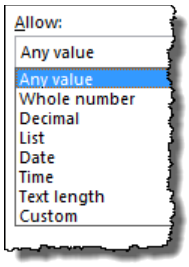
Validation is not, strictly speaking, a feature restricted to Excel tables. But it is particularly useful in tables in which you want the data's integrity to be very high.

Creating validation rules

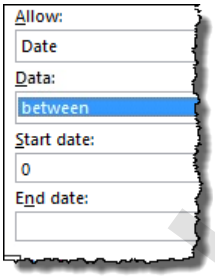
You set validation for a cell or range by using the Data Validation window to define a rule. You can also add input and error messages to the rule.

Exam Objective: MOS Excel Expert 2.1.3

1. Select the range for which you want to set the validation.
2. On the Data tab, in the Data Tools group, click **Data Validation**.
3. In the Allow list, click the type of data you want to allow.
   The selection you make here determines the other options that appear in the Data Validation window.



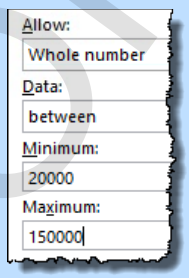
4. Select the options you want for the validation rule.
   - For most kinds of numeric validation, you can set minimum and maximum values (or length, in the case of text).

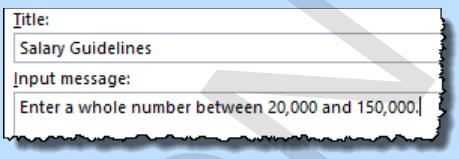
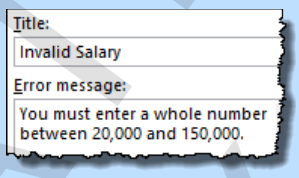
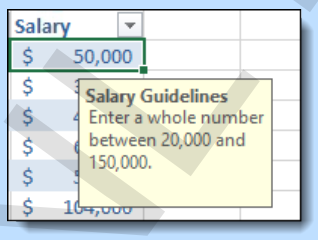
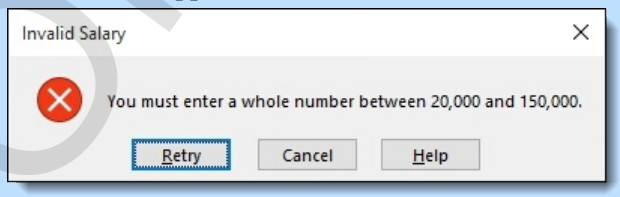


   - For lists and custom rules, the options are different.
5. Use the Input Message and Error Alert tabs to set up messages to guide users as they enter data.
6. Click **OK**.

Exercise: Creating a validation rule to specify positive numbers

Exam Objective: MOS Excel Expert 2.1.3

Do This	How & Why
1. Open `Validation`.	From the `Table` data folder. This is a workbook with employee information that has been formatted as a table.
2. Select the data in the Salary column.	
a) Right-click any cell in the Salary column.	To display the context menu.
b) Click **Select > Table Column Data**.	To select all the data in the column, but not the heading or totals formula. This is a nice shortcut feature when you're using tables.
3. On the Data tab, in the Data Tools group, click **Data Validation**.	You don't need to click its dropdown arrow, but if you do, click **Data Validation** in the menu. To display the Data Validation window.
4. Set up a validation rule that restricts input to whole numbers between 20000 and 150000.	
a) In the Allow list, click **Whole number**.	When you do, the options in the window change.
b) Verify that **Between** is selected in the Data list.	
c) In the Minimum box, type `20000`.	
d) In the Maximum box, type `150000`.	The window should look like this. 
e) Leave the window open.	You're going to create an input message and an error alert for the rule.
5. Create an input message for the validation rule.	
a) On the Input Message tab, in the Title box, type `Salary Guidelines`.	

Do This	How & Why
b) In the Input message box, type `Enter a whole number between 20,000 and 150,000.`	The window should look like this. Leave the window open so you can create an error alert. 
6. Create an error alert message for the validation rule.	
a) On the Error Alert tab, in the Title box, type `Invalid Salary`.	
b) In the Error message box, type `You must enter a whole number between 20,000 and 150,000.`	The window should look like this. 
c) Click **OK**.	To create the validation rule with its messages.
7. Select any cell in the Salary column.	The input message you created appears next to the cell. 
8. Attempt to enter `10000` in the selected cell.	An error alert appears. 
9. Click **Cancel**.	
10. Save the workbook as `My Validation`.	

Creating validation lists

You need one extra step to create a validation rule that restricts users to a particular list of input values.

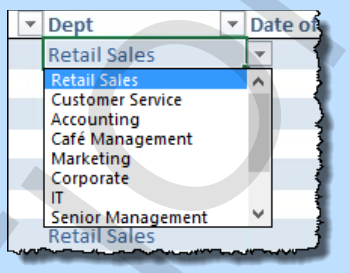
1. In the workbook, enter the list of values you want to use for the validation list.
   You should place this away from your other data, perhaps on another worksheet. You can also enter a list of items directly in the Data Validation window, but your lists will be easier to manage if you keep them on a worksheet.
2. Select the range for which you want to validate data.
3. Display the Data Validation window.
   Click the **Data Validation** button.
4. In the Allow list, click **List**.
5. In the source list, enter a reference to the range containing the valid list of entries that you created in the first step.
   You can click the **Collapse** button on the right of the box, and select the range using your mouse.
6. If you like, create an input message or an error alert.
7. Click **OK**.

Now, users can pick from a list to enter values in the range.

Exercise: Creating a department list validation rule

`My Validation` is open.

Do This	How & Why
1. Activate the **Departments** worksheet.	It contains a list of the departments at Java Tucana. You'll use this list for a validation rule for the Dept column of the Employees table.
2. On the Employees worksheet, select the Dept column data.	Right-click any cell in the column, then click **Select > Table Column Data**.
3. Display the Data Validation window.	Click the **Data Validation** button on the Data tab.
4. In the Allow list, click **List**.	The window now shows a Source box.
5. In the Source box, enter a reference to the departments list on the Departments worksheet.	
a) Click  .	The Collapse button is on the right of the Source box.
b) In the Departments worksheet, select A2:A12.	
c) Press **Enter**.	To return to the Data Validation window.

Do This	How & Why
6. Click **OK**.	To create the validation rule. If you wanted to, you could have created an input message or an error alert, but those aren't generally necessary with list validation.
7. Select any cell in the department column, then click its dropdown arrow.	A list of the departments appears, allowing a user to pick a valid department name. 
8. Press **Esc**.	To close the list.
9. Save and close the workbook.	

Assessment: Validation

Which of the following are types of validation you can apply to a cell or range without creating a custom formula? Choose all the correct answers.

- **Text of a particular length**
- **Whole numbers**
- **Lists of values**

You must create an input message and an error alert for all validation rules. True or false?

- True
- **False**

For list validation, you can enter a list of values directly in the Data Validation window. True or false?

- **True**
- False

Module E: Transposing data

Transposing allows you to switch rows and columns of a range of data.

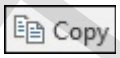
You will learn how to:

- Use a pasting option to transpose rows and columns in a range

Transposing rows and columns

You can *transpose* a row of data to make it go down a column instead, or a column to go across a row. This can be useful when you want to use a row or column of values as headings in the opposite orientation. You can also transpose an entire range. When you do so, Excel updates all the references in the transposed formulas.

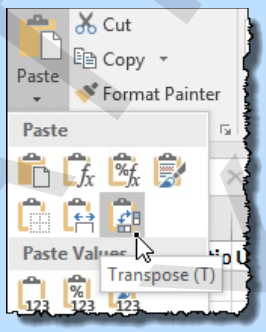
Exam Objective: MOS Excel Core 2.1.3

1. Select the range you want to transpose, then click 

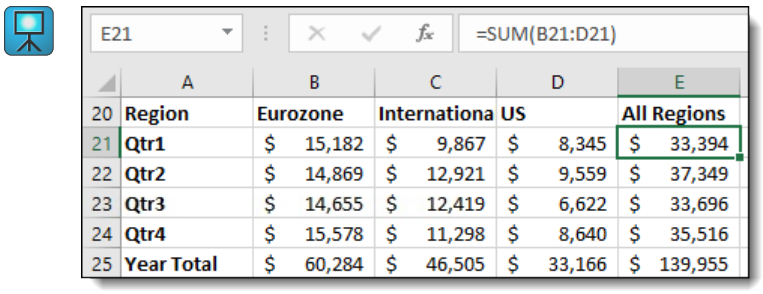
.
   You have to use **Copy**—*not* Cut—to transpose data.
2. Select the cell where you want the transposed data to begin. Be sure that when you paste the transposed data, it doesn't overwrite anything you need.
3. In the Paste gallery (in the Clipboard group on the Home tab), click  .

Exercise: Transposing rows and columns in a worksheet

Exam Objective: MOS Excel Core 2.1.3

Do This	How & Why
1. Open `Transposing`.	From the `Tables` data folder. The workbook contains sales data by region and quarter.
2. Use the region names as column headings on a new worksheet.	
a) Copy A9:A11.	Select the range, then click Copy.
b) Create a new worksheet.	Click (the New Sheet button, next to the sheet tabs).
c) Select A1, then, in the Paste Gallery, click the Transpose button.	
	The regions, which were in a column, now appear across the first row.
3. Transpose the entire sales table, so the Qtrs labels are in the first column.	
a) On the Sales Data worksheet, select A8:F12.	
b) Click Copy.	
c) Select A20.	
d) In the Paste gallery, click .	To transpose the data, exchanging its rows and columns.
4. Select E21.	Excel updates formula references when you transpose a range that contains formulas.
5. Save the workbook as `My Transposing`, then close it.	

The transposed data.



E21 =SUM(B21:D21)

	A	B	C	D	E
20	Region	Eurozone	Internationa	US	All Regions
21	Qtr1	$ 15,182	$ 9,867	$ 8,345	$ 33,394
22	Qtr2	$ 14,869	$ 12,921	$ 9,559	$ 37,349
23	Qtr3	$ 14,655	$ 12,419	$ 6,622	$ 33,696
24	Qtr4	$ 15,578	$ 11,298	$ 8,640	$ 35,516
25	Year Total	$ 60,284	$ 46,505	$ 33,166	$ 139,955

Assessment: Transposing data

You can use both the Copy and the Cut commands to transpose data. True or false?

- True
- **False**

Excel updates references in transposed formulas. True or false?

- **True**
- False

Summary: Tables

You should now know:

- How to sort data by text, number, date values, and by more than one column
- About Excel tables and how to create them, how to filter table data by various kinds of values, how to clear a filter, and how to use more complex criteria to show only what you want to see
- How to use structured references in formulas to make them more understandable and flexible
- How to use validation to ensure that the data entered in a worksheet is appropriate, and how to create list-based validation
- How to transpose rows and columns of data

Synthesis: Tables

In this synthesis exercise, you'll open a workbook containing invoice data, sort it in a couple of ways, turn it into a table, enter a calculated column that uses structured references, filter the table it to show only certain rows, and then add a validation rule.

1. Open `Tables Synthesis`.
   From the `Tables` data folder.
2. Sort the data by customer in ascending alphabetical order.
3. Sort the data by two columns: Region in alphabetical order, then Rep in alphabetical order.
4. Format the data as a table.
5. Filter the table to show invoices only for the International region.
6. Clear the filter from the Region column.
7. Filter the table to show only Vela Herbal invoices, for which there are 10 or more units.
8. Clear all filters.
9. Insert a new table column.
10. Label the column `Total Sale`.
11. In the Total Sale column, enter a calculated column formula using a structured reference. The formula should multiply units by cost.
12. Create list-based validation rules for the Rep, Region, and Item columns of data. Use the lists on the Lists worksheet.
13. Find the 4/30/2014 invoice for Sharp-End Tools, then change the rep to `Patterson`, and the region to `US`. (Hint: Filter for the customer to find the invoice.)
14. Save the workbook as `My Tables Synthesis`, and then close it.

    An example follows the exercise.

Editing an invoice using validation lists.

	A	B	C	D	E	F	G	H
10	Date	Customer	Rep	Region	Item	Unit	Cost	Total Sal
574	1/26/2014	Sharp-End Tools	Lloyd	International	Indus Tea	8	17.1	136.8
575	1/27/2014	Sharp-End Tools	Lloyd	International	Indus Tea	5	17.1	85.5
576	1/29/2014	Sharp-End Tools	Lloyd	International	Vela Herbal	8	17.1	136.8
577	2/10/2014	Sharp-End Tools	Lloyd	International	Phoenix Roast	13	17.1	222.3
578	2/11/2014	Sharp-End Tools	Lloyd	International	Tucana Roast	4	17.1	68.4
579	2/21/2014	Sharp-End Tools	Lloyd	International	Tucana Roast	16	17.1	273.6
580	3/11/2014	Sharp-End Tools	Lloyd	International	Phoenix Roast	7	17.1	119.7
581	4/2/2014	Sharp-End Tools	Lloyd	International	Vela Herbal	9	17.1	153.9
582	4/11/2014	Sharp-End Tools	Lloyd	International	Tucana Roast	13	17.1	222.3
583	4/25/2014	Sharp-End Tools	Lloyd	International	Indus Tea	10	17.1	171
584	4/30/2014	Sharp-End Tools	Patterson	US	cana Roast	2	17.1	34.2
585	5/4/2014	Sharp-End Tools	Lloyd	International	Phoenix Roast	6	17.1	102.6

Chapter 4: Summarizing data

You will learn how to:

- Consolidate similar data from multiple worksheets onto a single worksheet
- Use subtotals to summarize information based on values in columns

Learning time: 40 minutes

Module A: Consolidation

You can use consolidation to combine several ranges of similarly structured data into a single range.

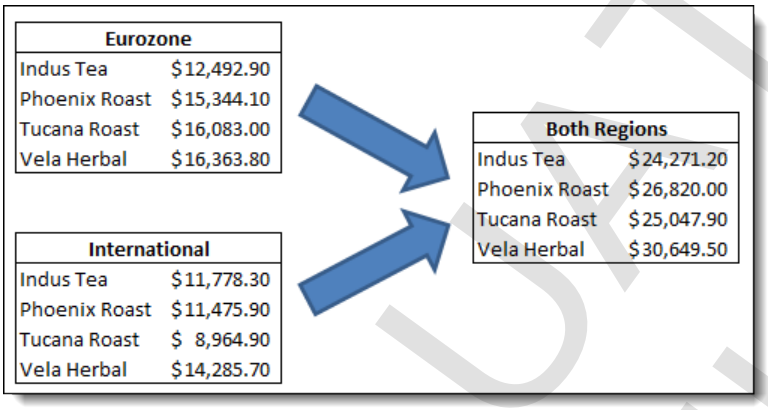
You will learn how to:

- Consolidate data from several ranges into a single list
- Consolidate with links back to the source data

Consolidation

You can use the **Consolidate** command to take similar data from more than one range and combine it into a single range. This is useful for consolidating budgets, for example, or perhaps sales figures from multiple regions.

Consolidated sales data



Eurozone	
Indus Tea	$12,492.90
Phoenix Roast	$15,344.10
Tucana Roast	$16,083.00
Vela Herbal	$16,363.80

International	
Indus Tea	$11,778.30
Phoenix Roast	$11,475.90
Tucana Roast	$ 8,964.90
Vela Herbal	$14,285.70

Both Regions	
Indus Tea	$24,271.20
Phoenix Roast	$26,820.00
Tucana Roast	$25,047.90
Vela Herbal	$30,649.50

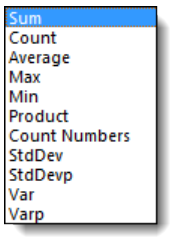
You can consolidate data by position when the source ranges are laid out in exactly the same way, as in this example. But you can also consolidate by category when there are different categories of information in the source data.

Consolidating data

To consolidate data from multiple ranges, those ranges need to be organized in similar, but not necessarily identical ways. If the ranges have identical row and column names, and there are the same numbers of them, you can consolidate by position of the data. Otherwise, you should use the labels in the top row or left column to consolidate by category.

Exam Objective: MOS Excel Expert 3.4.2

1. Select the cell where you want to put the consolidated data.
   It's a good idea to put consolidated data on its own worksheet.
2. On the Data tab, in the Data Tools group, click **Consolidate**.
   To display the Consolidate window.
3. Select a function to use for the consolidation.
   There are many you can choose from.



4. Add the ranges that you want to consolidate. For each range, you need to do the following.

   a) Click  .

   The Collapse button, to the right of the reference box. You can also enter a reference to an unopened workbook by clicking **Browse**.

   b) Select the range.

   c) Press **Enter** or click  again to return to the Consolidate window.

   d) Click **Add**.

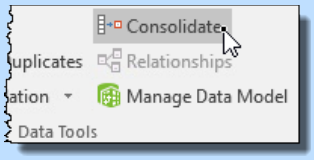
   The reference appears in the All References box. If you mistakenly enter a reference, select it, click **Delete**, and try again.

5. If you want to consolidate by category, click either **Top row** or **Left column**.
6. Click **OK**.

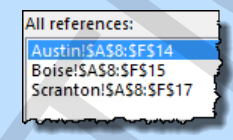
The consolidated data appears on the worksheet.

Exercise: Consolidating expense data

Exam Objective: MOS Excel Expert 3.4.2

Do This	How & Why
1. Open and examine the worksheets in `Consolidation`.	From the `Summarizing Data` data folder. The first three worksheets contain 2014 budgets for three different café locations. Notice that not all expense types appear in all the budgets. You will consolidate these three budgets by category on the Consolidated worksheet.
2. On the Consolidated worksheet, select A8.	
3. On the Data tab, in the Data Tools group, click **Consolidate**.	 To open the Consolidate window. Note that "Sum" is selected in the Function box. You'll add the values from the three budgets.

Continued...

Do This	How & Why
4. Add references to the three budgets to the Consolidate window.	
a) Click  .	
b) Activate the Scranton worksheet, and select A8:F17.	
c) Click  , then click **Add**.	To return to the window and add the reference to the All References box.
d) Repeat the process for the Boise and Austin worksheets.	The All References box should look like this. 
5. Consolidate the data by row and column categories.	
a) Under "Use labels in," click both **Top row** and **Left column**.	To select them, if necessary. Both should be checked.
b) Click **OK**.	To consolidate the data. The new range contains all the row categories from all three budgets, and totals all the values for each type of expense in each quarter. Creating this manually would have taken a great deal of time and effort.
6. Save the workbook as `My Consolidation`.	

The consolidated data

	A	B	C	D	E	F
8		Qtr1	Qtr2	Qtr3	Qtr4	Year Total
9	Rent	16800	16800	16800	16800	67200
10	Remodeling	10000	0	2000	0	12000
11	Legal	4500	0	500	0	5000
12	Equipment	9000	2200	0	0	11200
13	Supplies	9900	9900	9900	9900	39600
14	Advertising	4120	720	720	720	6280
15	Payroll	46000	46000	46000	46000	184000
16	Miscellaneous	6660	6660	6660	6660	26640
17	Totals:	106980	82280	82580	80080	351920

Consolidating with links

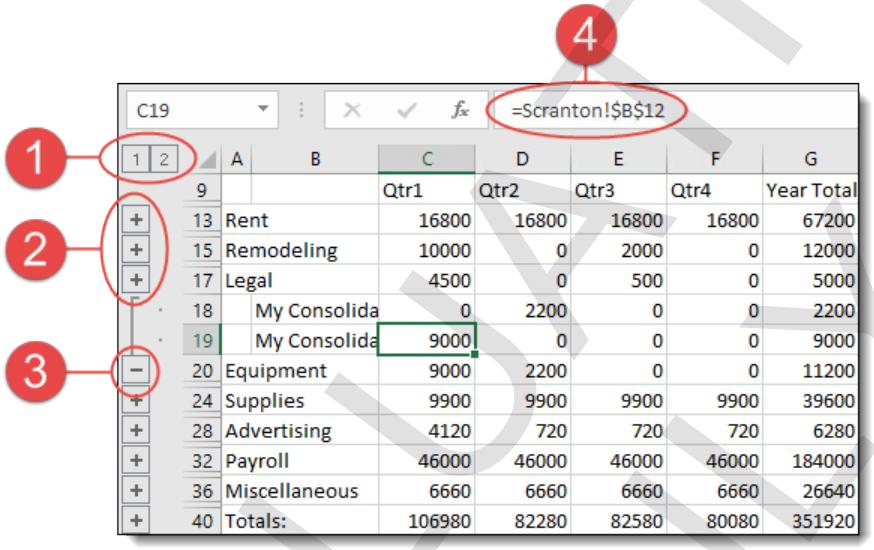
If you want to maintain a connection to the source ranges when you consolidate data, click **Create links to source data** in the Consolidate window. When you consolidate with links, Excel creates an outline structure in the consolidated range.

Outlining

You can create an outline structure on an Excel worksheet to be able to quickly see the data at a summary or detail level. Excel automatically creates an outline structure when you use various features, including consolidating data with links.

Exam Objective: MOS Excel Core 2.3.2

Outline features in consolidated data

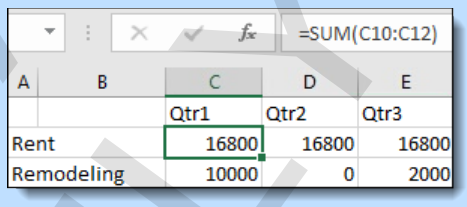
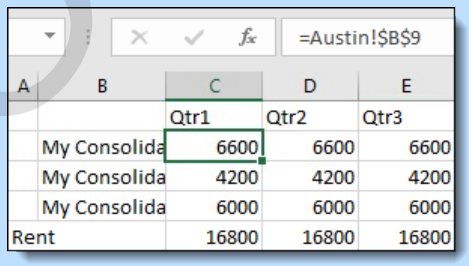


1. *Outline level buttons* show only a particular level of detail.
2. *Expand buttons* expand that part of the outlined data to show the underlying detail. Here, the Equipment category is expanded.
3. *Collapse buttons* collapse that part of the outline, showing less detail.
4. When you consolidate with links, the detail level of the outline data contains links like this one to the source data cells.

Exercise: Consolidating with links and examining outline features

`My Consolidation` is open.

Exam Objective: MOS Excel Core 2.3.2

Do This	How & Why
1. On the Consolidated worksheet, clear A8:F17.	You'll consolidate in a different way next.
2. Select A9, then click **Consolidate**.	On the Data tab, in the Data Tools group. The Consolidate window appears. All the settings you made before are still there.
3. Consolidate the data with links.	
a) Click **Create links to source data**.	
b) Click **OK**.	The consolidated data looks a bit different, and there are outlining symbols to the left of the row labels.
4. Select and observe C13.	Now, the consolidated category figures are being calculated by sum formulas.
	
5. Observe the linked data.	
a) Click + to expand the Rent category.	
b) Select C10.	The data is linked back to the Austin budget.
	
6. Try the outline level symbols.	
a) Click 2.	Above the expand and collapse symbols. You can now see all the detail.
b) Click 1.	To collapse all the detail.
7. Save the workbook and then close it.	

Assessment: Consolidation

To consolidate data, the source ranges must be structured identically. True or false?

- True
- **False**

Which of the following are functions that you can use when consolidating? Choose all that apply.

- **STDDEV**
- LOOKUP
- **SUM**
- MATCH
- **COUNT**

You must create an outline manually in Excel. True or false?

- True
- **False**

Module B: Subtotals

You can use subtotals to summarize data according to grouped values within a particular column. For example, you can insert subtotals for each sales rep in a list of invoices, or for each customer.

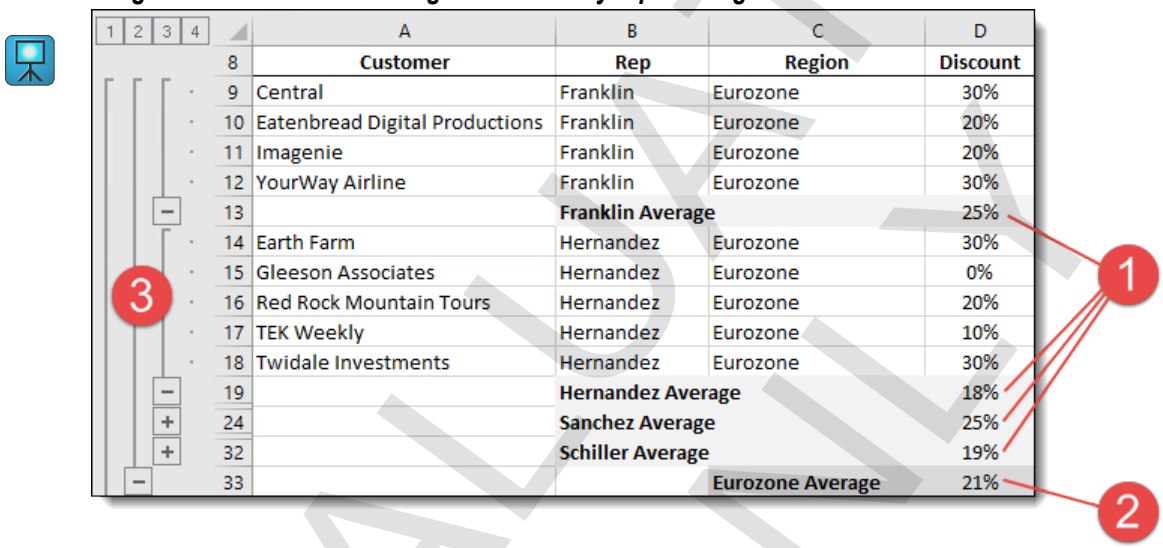
You will learn how to:

- Insert subtotals in a list of data
- Manage and copy subtotal data

About subtotals

You can insert *subtotals* within a list of data to summarize the data using groups of rows. To effectively use subtotals, you should first sort the list by the columns that you want to summarize. You can have subtotals for many levels, and using many different functions.

Using subtotals to show average discounts by rep and region



	A	B	C	D
8	**Customer**	**Rep**	**Region**	**Discount**
9	Central	Franklin	Eurozone	30%
10	Eatenbread Digital Productions	Franklin	Eurozone	20%
11	Imagenie	Franklin	Eurozone	20%
12	YourWay Airline	Franklin	Eurozone	30%
13		**Franklin Average**		25%
14	Earth Farm	Hernandez	Eurozone	30%
15	Gleeson Associates	Hernandez	Eurozone	0%
16	Red Rock Mountain Tours	Hernandez	Eurozone	20%
17	TEK Weekly	Hernandez	Eurozone	10%
18	Twidale Investments	Hernandez	Eurozone	30%
19		**Hernandez Average**		18%
24		**Sanchez Average**		25%
32		**Schiller Average**		19%
33			**Eurozone Average**	21%

1. These subtotals show the average discounts for each change in Rep in the data.
2. This subtotal shows the average discount for each change in Region in the data.
3. When you insert subtotals, Excel creates an outline structure, so you can view the data at different levels of detail. Here, the data is fully expanded for two of the sale reps (Franklin and Hernandez) but collapsed for Sanchez and Schiller.

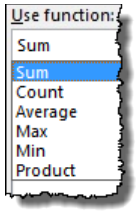
Inserting subtotals

You cannot insert subtotals on a range that has been formatted as an Excel table. To convert it to a range, select a cell in the table, then, on the Table Tools Design tab, click **Convert to Range** (in the Tools group).

You insert subtotals one level at a time, but you can insert many levels if you like. The process is always similar: specify what column to group by, then what column you want to subtotal, and what function you want to use.

Exam Objective: MOS Excel Core 2.3.3

1. First, sort the range by the columns that contain the data you want to group.
   For example, if you want subtotals for each region in the sales data, first sort by region.
2. Select a cell within the data, then, on the Data tab, click **Subtotal**.
   In the Outline group.
   The Subtotal window appears.
3. Insert the highest level of subtotal that you want to use.
   a) In the "At each change in" list, click the column containing the data by which you want to group.
   b) In the "Use function" box, click the function you want to use for the subtotals.
   There are 11 to choose from.

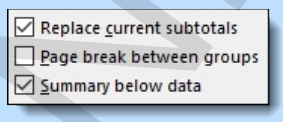
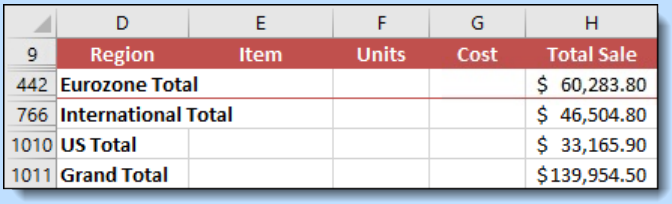


   c) In the "Add subtotal to" list, click all the columns for which you want to see subtotals.
4. Click any options you want.
   - Click **Replace current subtotals** if this is the first time you're inserting subtotals, or if you want to replace any existing subtotals.
   - Click **Page break between groups** to make it easy to print reports with one group per page.
   - Click **Summary below data** to show the subtotals after their group detail (or clear the option to show the subtotals above).
5. Click **OK**.

The subtotals appear as you specified, and an outline structure is added to the worksheet. Excel calculates the subtotals using the SUBTOTAL function. It's best not to try to use that function manually.

Exercise: Adding subtotals to an invoice list

Exam Objective: MOS Excel Core 2.3.3

Do This	How & Why
1. Open `Subtotals`.	From the `Summarizing Data` data folder. This workbook contains a large list of invoices. Note that the list is NOT formatted as a table. You cannot insert subtotals in an Excel table; you first need to convert it to a range.
2. Sort the invoice data by Region, then by Rep, in ascending alphabetical order.	Select the data, then click **Sort & Filter > Custom Sort** (in the Home tab's Editing group). Add two levels to the sort. You must sort a list by the data you want to group by before you insert subtotals.
3. Select any cell in the list; then, on the Data tab, click **Subtotal**.	In the Outline group. To display the Subtotal window.
4. In the "At each change in" list, click **Region**.	This means that you want to insert a subtotal each time there is a new region in the list. This is why you needed to sort the list before inserting subtotals.
5. Observe the "Use function" box.	The current selection is "Sum." You can use 11 different functions for your subtotals.
6. In the "Add subtotal for" list, verify that **Total Sale** is checked.	You'll insert subtotals that are sums of the total sales data for each region.
7. Observe the other options.	Currently, they're set to replace any existing subtotals and place the subtotals below their detail data. 
8. Click **OK**.	To insert the subtotals. There is now an outline structure for the data.
9. Click 2.	To view the outline at the second level of detail, only showing the regional subtotals. 
10. Expand the Eurozone detail.	Click the expand symbol. You can expand or collapse any of the levels.
11. Save the workbook as `My Subtotals`.	

	D	E	F	G	H
9	Region	Item	Units	Cost	Total Sale
442	Eurozone Total				$ 60,283.80
766	International Total				$ 46,504.80
1010	US Total				$ 33,165.90
1011	Grand Total				$139,954.50

Adding a level of subtotals

When you want to have more than one level of subtotals, start with the outer layer, and then work your way in, adding one at a time.

1. Sort the list first by the column for which you want the highest level of subtotal, then by the column for which you want the next layer.
2. Insert the highest level of subtotal.
3. Select a cell within the list, and begin to insert the next level of subtotal, choosing a column to group by, a function, and the columns for which you want subtotals.
4. Clear **Replace current subtotals** (click it to remove the check mark).
5. Click **OK**.

Exercise: Adding subtotals for a second column

`My Subtotals` is open.

Do This	How & Why
1. Click any cell in the list.	
2. Click 3.	To fully expand the detail on the list.
3. Click **Subtotal**.	On the Data tab, in the Outline group.
4. In the "At each change in" list, click **Rep**.	To add another level of subtotals by sales rep.
5. Clear **Replace current subtotals**.	Click it to remove the check mark. By clearing this option, the new subtotals will be added to the list, rather than replacing the current subtotals by region.
6. Click **OK**.	To insert subtotals by rep as well as by region.
7. Click 1.	The first level of the outline shows only the grand totals.
8. Click 2.	The second level shows the region subtotals.
9. Click 3.	The third level shows the subtotals by rep.
10. Expand the detail for one of the reps.	Click an expand symbol.
11. Show the third level of detail again.	See the example following the exercise.
12. Save the workbook.	

Showing two levels of subtotals

	Rep	Region	Item	Units	Cost	Total Sale
100	Franklin Total					$ 12,538.80
207	Hernandez Total					$ 15,599.70
296	Sanchez Total					$ 12,905.10
445	Schiller Total					$ 19,240.20
446		Eurozone Total				$ 60,283.80
468	Blackwell Total					$ 3,045.60
639	Lloyd Total					$ 23,391.90
772	McCanney Total					$ 20,067.30
773		International Total				$ 46,504.80
840	Daniels Total					$ 9,207.00
898	Patterson Total					$ 7,112.70
1019	Westlein Total					$ 16,846.20
1020		US Total				$ 33,165.90
1021		Grand Total				$139,954.50

Managing subtotals

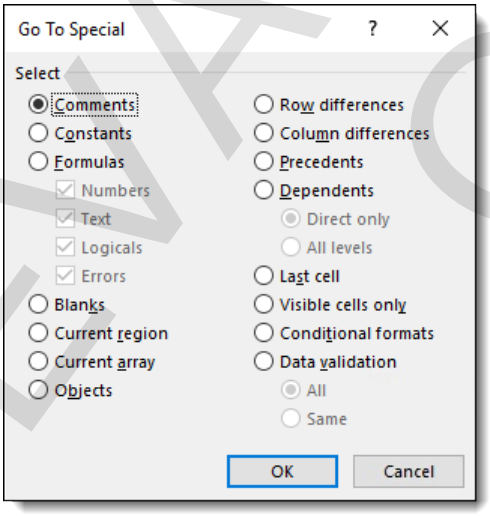
Subtotals can be a bit tricky to work with, because of the functions they use and because of the outline structure. You can copy subtotals to a report by selecting only the visible cells. If you no longer want to use subtotals, removing them is simple.

Selecting visible cells

If you try to select and copy a collapsed outline, you end up copying the collapsed detail rows as well as the visible levels. To avoid that, select the range, and then select only the visible cells.

1. Select the range for which you want to select only visible cells.
2. On the Home tab, in the Editing group, click **Find & Select > Go To Special**.

   The Go To Special window provides many ways to select cells using various criteria.



3. Click **Visible cells only**, then click **OK**.

Only the visible cells are selected. You can then copy them or perform other actions on them (such as formatting).

Removing subtotals

1. Select a cell within the list.
2. Display the Subtotals window.
3. Click **Remove All**.

Exercise: Copying subtotals to a report

`My Subtotals` is open.

Do This	How & Why
1. Click 3.	If necessary to display the rep and region subtotals level of detail. You'll copy this to a new worksheet for a report.
2. Select C9:H1021.	You have actually selected all the rows of data, not just what you're currently seeing. If you copy and paste this, it will come out in the destination with over a thousand rows of data.
3. Select only the visible cells in the range.	
a) On the Home tab, in the Editing group, click **Find & Select > Go To Special**.	To display the Go To Special window.
b) Click **Visible cells only**, then click **OK**.	To select only the visible cells.
4. Copy the selection to a new worksheet.	
a) Click Copy.	To copy the selected data. Notice that there are marquees (aka "marching ants") around each visible row, not just around the outside of the data.
b) Click the New Sheet button, then select A6 on the new worksheet.	
c) Click the **Paste** button.	
d) Widen column F to fit its data.	Now, you have a report of the subtotals.
5. Remove the subtotals on the Invoices worksheet.	
a) Activate the Invoices worksheet.	
b) Click in the list, then click **Subtotal**.	On the Data tab. To display the Subtotal window.
c) Click **Remove All**.	The subtotals and outline structure are removed from the list.
6. Save and close the workbook.	

The copied and pasted subtotal report.

	A	B	C	D	E	F
6	Rep	Region	Item	Units	Cost	Total Sale
7	Franklin Total					$ 12,538.80
8	Hernandez Total					$ 15,599.70
9	Sanchez Total					$ 12,905.10
10	Schiller Total					$ 19,240.20
11		Eurozone Total				$ 60,283.80
12	Blackwell Total					$ 3,045.60
13	Lloyd Total					$ 23,391.90
14	McCanney Total					$ 20,067.30
15		International Total				$ 46,504.80
16	Daniels Total					$ 9,207.00
17	Patterson Total					$ 7,112.70
18	Westlein Total					$ 16,846.20
19		US Total				$ 33,165.90
20		Grand Total				$139,954.50

Assessment: Subtotals

Subtotals are possible only in a range formatted as an Excel table. True or false?

- True
- **False**

How would you add two levels of subtotals to a list? Select the best answer.

- Insert both levels in a single step.
- Insert the lower level first, then insert the higher level.
- **Insert the higher level first, then insert the lower level.**

Which command do you use to select visible cells only? Choose the best response.

- Find
- Replace
- **Go To Special**
- Go To

Summary: Summarizing data

You should now know how to:

- Consolidate similar data from multiple worksheets onto a single worksheet, consolidate with links, and work with Excel's outline features to display various levels of detail
- Use subtotals to summarize information by the values in one column, add levels of subtotal detail, copy subtotal levels by using the select visible cells feature, and remove subtotals from a list

Synthesis: Summarizing data

In this synthesis exercise, you'll insert subtotals into an invoice list by customer, and then by product. You'll show the customer level of detail, and then copy that to a report worksheet. Then you'll remove the subtotals from the invoice list.

1. Open Summarizing Synthesis from the `Summarizing Data` data folder.
2. Sort the list so that you can add subtotals by customer, then by item.
3. Insert subtotals grouped by customer, showing the sum of Total Sale.
4. Insert a second level of subtotals by item, showing the sum of Total Sale.
5. Display the subtotals only for the customer level of detail, then copy only the visible cells to a new worksheet.
6. Delete all the columns except for Customer and Sales Total, and widen the columns as necessary to display their data.
7. Save the workbook as My Summarizing Synthesis, then close it.

The completed customer subtotal report.

	A	B
6	Customer	Total Sale
7	Accounts Now Total	$ 4,360.50
8	Award Sportswear Total	$ 2,509.20
9	Blastera Total	$ 4,033.80
10	BlazerFire Total	$ 2,413.80
11	Brocadero Total	$ 2,543.40
12	Callinsure Total	$ 2,948.40
13	Central Total	$ 3,249.00
14	Central-West Bank Total	$ 2,402.10
15	Chaplan Home Stores Total	$ 3,182.40
16	CrossCountry Airways Total	$ 3,304.80
17	Custom Boat Co. Total	$ 3,628.80
18	Diallonics Total	$ 2,555.10
19	Docu-sentry Ltd. Total	$ 2,559.60
20	Earth Farm Total	$ 3,466.80

Chapter 5: PivotTables

You will learn:

- About PivotTables and how to create and format them
- How to manipulate PivotTables to show exactly what you want
- How to create and manipulate PivotCharts

Learning time: 65 minutes

Module A: Creating and formatting PivotTables

PivotTables provide a powerful, simple, and intuitive way to summarize large sets of data. Don't be intimidated by them, because in many cases, PivotTables are exactly what you need to get the information you want.

You will learn how to:

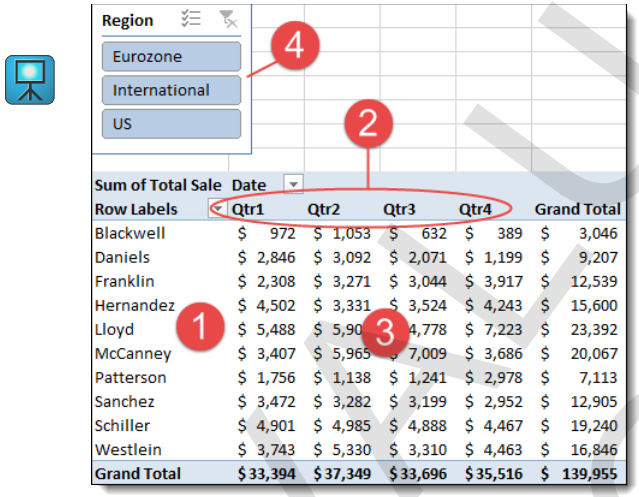
- Create a PivotTable and view its underlying data
- Control PivotTable options and value field formats
- Examine underlying PivotTable data

About PivotTables

A *PivotTable* is a table that summarizes the data in a list according to row and column headings that come from the values in the columns in the list. That sounds complicated, but it really isn't. In the figure here, the PivotTable you see is based on a list of invoice data, and can be created in less than a minute.

It helps in understanding PivotTables to know one term. When you're working with PivotTables, Excel refers to the columns in your source list as *fields*. This term comes from the database world.

PivotTable elements.



1. *Row field values* are data from a particular column (or "field") in the source list that define the rows of the PivotTable. Here, the PivotTable shows one row for each sales rep.
2. *Column field values* determine the columns in the PivotTable. Here, the column field values are *grouped* by quarter.
3. The *values* in a PivotTable also come from a particular field in the source list, and represent some calculation for all the values that match the row and column. So, for example, the sum of Total Sales for all of Franklin's sales in June.
4. A *slicer* is a very intuitive feature that allows you to see only certain subsets of the data. In this case, the slicer is based on the Region field, and allows you to see only one region, any two, or all of them.

Creating PivotTables

Creating basic PivotTables starts with having well-structured data. Your list shouldn't have blanks, and it should have column labels across the top row. The data in the columns should be of a consistent type.

Exam Objective: MOS Excel Expert 4.2.1, 4.2.2

If you have that part right, creating a PivotTable means selecting a field for the row labels, a field for the column headings, and a field for the values. There is so much more you can do, but this gets you started.

1. Select a cell in your list.
2. On the Insert tab, click **PivotTable**.

   To display the Create PivotTable window.

3. Select the options you want.
   - Excel guesses at the range you want to use. You also have the choice of selecting an external data source. If you selected a cell within a valid list (continuous data, a row of column headings), Excel almost always guesses correctly.
   - Place the PivotTable in a new or existing worksheet.
4. Click **OK**.

   To begin to create the PivotTable. Excel displays a box telling you to choose fields, as well as a field list (on the right).

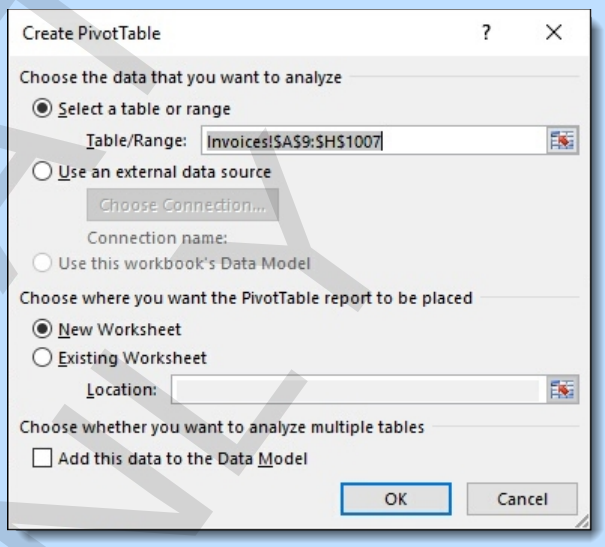
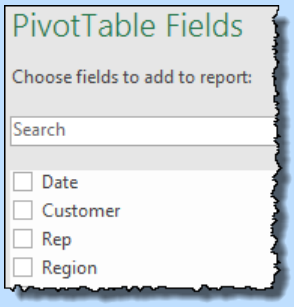
5. In the PivotTable Field List, drag fields (column names) from the "Choose fields to add to report" area to the boxes below that correspond to locations in the PivotTable.
   - *Row labels* appear down the left column of the PivotTable.
   - *Column labels* appear in the top row.
   - *Values* are totaled in the body of the report.

   As you add fields, the PivotTable is built dynamically.

After you've built the report, simply drag the fields to different boxes to rearrange it. The best way to learn about PivotTables it to drag fields around and see what happens.

Exercise: Creating a PivotTable sales report

Exam Objective: MOS Excel Expert 4.2.1, 4.2.2

Do This	How & Why
1. Open `PivotTables`.	From the `PivotTables` data folder. This workbook contains a list with 1000 invoices. You will use PivotTables to quickly create reports based on this list.
2. Select a cell in the invoice list.	If your data is well structured, you can select a single cell and Excel guesses correctly at the range you want to use for your source data.
3. On the Insert tab, click **PivotTable**.	To display the Create PivotTable window. Excel correctly guesses the range of the invoice list (including the headings row), and by default places the PivotTable in a new worksheet. 
4. Click **OK**.	To begin the process of creating a PivotTable. Excel creates a new worksheet, provides some instructions, and gives you a field list on the right in which you can specify what information should go where in the report.
5. Observe the field list.	Fields, which correspond to the columns in the source data, are the types of information you can use to build the PivotTable. 

Do This	How & Why
6. Observe the boxes below the field list.	You drag the fields into these boxes to create filters, rows, columns, and the values for the PivotTable.
7. Drag the **Item** field to the Rows box.	To begin to build the PivotTable. Row labels appear on the worksheet, one for each unique value in the Item column or, put simply, one row for each product.
8. Drag the **Rep** field to the Columns box.	To specify one column in the PivotTable for each sales rep. Where are the numbers? We need to add a value field.
9. Drag the **Total Sale** field to the Values box.	And now you have a report, showing total sales for each rep for each product.
10. Switch the row and column labels.	
a) Drag the **Rep** field from the Columns box to the Rows box.	
b) Drag the **Item** field from the Rows box to the Columns box.	Now there is a row for each sales rep and a column for each product. Rearranging PivotTables is just that simple.
11. Save the workbook as `My PivotTables`.	

Sales by rep and item.

Sum of Total Sale	Column Labels				
Row Labels	Indus Tea	Phoenix Roast	Tucana Roast	Vela Herbal	Grand Total
Blackwell	680.4	939.6	275.4	1150.2	3045.6
Daniels	2914.2	2163.6	1595.7	2533.5	9207
Franklin	2623.5	2770.2	3938.4	3206.7	12538.8
Hernandez	2852.1	3851.1	3324.6	5571.9	15599.7
Lloyd	6271.2	5890.5	5071.5	6158.7	23391.9
McCanney	4826.7	4645.8	3618	6976.8	20067.3
Patterson	1399.5	1585.8	1843.2	2284.2	7112.7
Sanchez	2261.7	3958.2	4054.5	2630.7	12905.1
Schiller	4755.6	4764.6	4765.5	4954.5	19240.2
Westlein	4164.3	3832.2	4488.3	4361.4	16846.2
Grand Total	**32749.2**	**34401.6**	**32975.1**	**39828.6**	**139954.5**

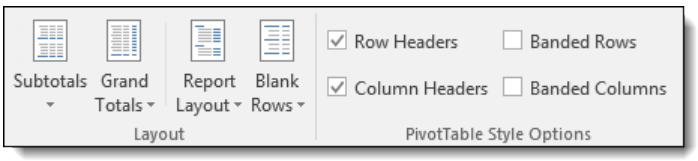
Formatting PivotTables

There are many ways to format PivotTables. You can use the PivotTable Tools ribbon tabs to show different parts in different ways, or to apply styles. You can use Field Settings commands to control how a particular field is formatted in the PivotTable.

Controlling PivotTable design options

After you create a PivotTable, two new toolbar tabs appear whenever the PivotTable is active. Here are some of the things you can control by using the PivotTable Tools Design tab.

Exam Objective: MOS Excel Expert 4.2.2



- **Subtotals**: When you have more than one field for row labels, you can control whether you want to display subtotals.
- **Grand Totals**: Control whether to display grand totals for rows, columns, or both.
- **Report Layout**: Use different layout forms when you have more than one field for row or column labels.
- **Style options**: Choose to show labels or bands, and apply table styles to the PivotTable as a whole.

Formatting value fields

You should never manually format the values in a PivotTable. If you do, that formatting applies to the cells themselves, and when you rearrange the PivotTable, you'll make a mess. Instead, you need to format the value field itself.

Exam Objective: MOS Excel Expert 4.2.7

1. Select a cell within the values.
2. On the PivotTable Tools Analyze tab, in the Active Field group, click **Field Settings**.
   Or, right-click a value, and then click **Value Field Settings**.

   To display the Value Field Settings window. Here, you can control how the field is calculated as well as how it appears.
3. Click **Number Format**.

   To display the Format Cells window, with which you should be familiar.
4. Format the values as you like, then click **OK**.

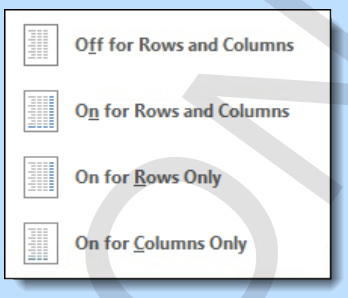
   To return to the Value Field Settings window.
5. Click **OK**.

Exercise: Changing PivotTable options and value field formatting

`My PivotTables` is open.

Exam Objective: MOS Excel Expert 4.2.2,4.2.7

Do This	How & Why
1. Click outside the PivotTable.	When you do, the PivotTable Tools tabs on the ribbon are no longer available. If you don't see those tabs, simply click in the PivotTable and you do.
2. Click in the PivotTable.	
3. Click the PivotTable Tools Design tab.	

Do This	How & Why
4. Click **Grand Totals**.	You can show Grand Totals for rows, columns, both, or neither. 
5. Click **Report Layout > Show in Tabular Form**.	The change is subtle in this PivotTable (the headings for the row and column labels now reflect the field names "Rep" and "Item"). But this format can be much better for some PivotTables. If you don't like how labels appear in your PivotTable, experiment first with the layout options.
6. In the PivotTable Style Options group, click **Banded Rows**.	Banded rows can make data easier to read.
7. Observe the PivotTable Styles gallery.	There are many PivotTable styles from which to choose. These work much like table styles, applying combinations of formatting to the headings and values in the PivotTable.
8. Observe the values.	They are currently in general format. You'll change that to currency.
9. Format the values as currency with two decimal places.	
a) Select any value cell.	
b) On the PivotTable Tools Analyze tab, in the Active Field group, click **Field Settings**.	To display the Value Field Settings window. Here, you can control how the values are calculated, shown, and formatted.
c) Click **Number Format**.	To display the Format Cells window. When you apply a format here, it applies to any value field cells in the PivotTable.
d) Click **Currency**, then click **OK**.	
e) Click **OK**.	To close the Value Field Settings window and return to the PivotTable. The value field cells are now formatted as currency.
10. Save the workbook.	

The formatted PivotTable.

Sum of Total Sale	Item				
Rep	Indus Tea	Phoenix Roast	Tucana Roast	Vela Herbal	Grand Total
Blackwell	$680.40	$939.60	$275.40	$1,150.20	$3,045.60
Daniels	$2,914.20	$2,163.60	$1,595.70	$2,533.50	$9,207.00
Franklin	$2,623.50	$2,770.20	$3,938.40	$3,206.70	$12,538.80
Hernandez	$2,852.10	$3,851.10	$3,324.60	$5,571.90	$15,599.70
Lloyd	$6,271.20	$5,890.50	$5,071.50	$6,158.70	$23,391.90
McCanney	$4,826.70	$4,645.80	$3,618.00	$6,976.80	$20,067.30
Patterson	$1,399.50	$1,585.80	$1,843.20	$2,284.20	$7,112.70
Sanchez	$2,261.70	$3,958.20	$4,054.50	$2,630.70	$12,905.10
Schiller	$4,755.60	$4,764.60	$4,765.50	$4,954.50	$19,240.20
Westlein	$4,164.30	$3,832.20	$4,488.30	$4,361.40	$16,846.20
Grand Total	**$32,749.20**	**$34,401.60**	**$32,975.10**	**$39,828.60**	**$139,954.50**

Showing underlying data

One of the interesting features of a PivotTable is the ability to see the data that underlies any value cell. There are a couple of ways to do this.

- Point to any value cell. A tip box appears describing the data in the cell.
- Double-click any value cell to create a new worksheet with a report showing all the rows in the source data underlying that value cell.

Exercise: Examining underlying PivotTable data

`My PivotTables` is open.

Do This	How & Why
1. Point to cell B6.	When you point to a value cell, a screen tip appears describing the data in the cell. This cell, for example, contains the sum of the Total Sales field for Daniels for Indus Tea. What if we want to see the detail underlying that cell? Excel has a great way to get that.
2. Double-click cell B6.	Excel inserts a new worksheet listing all the rows that underlie the data in the cell you double-clicked. That is, all invoices for which the rep was Daniels and the item was Indus Tea.
3. Widen any columns necessary.	Just like that, you have a detailed sales report for this rep and product.
4. Save and close the workbook.	

Invoices for Daniels and Indus Tea.

Date	Customer	Rep	Region	Item	Units	Cost	Total Sale
1/23/2014	CrossCountry Airways	Daniels	US	Indus Tea	11	16.2	178.2
7/20/2014	BlazerFire	Daniels	US	Indus Tea	13	16.2	210.6
4/8/2014	TTMWN	Daniels	US	Indus Tea	6	17.1	102.6
1/20/2014	TTMWN	Daniels	US	Indus Tea	16	17.1	273.6
8/16/2014	CrossCountry Airways	Daniels	US	Indus Tea	7	16.2	113.4
2/13/2014	TTMWN	Daniels	US	Indus Tea	6	17.1	102.6
5/13/2014	CrossCountry Airways	Daniels	US	Indus Tea	14	16.2	226.8
2/13/2014	BlazerFire	Daniels	US	Indus Tea	8	16.2	129.6
4/24/2014	TTMWN	Daniels	US	Indus Tea	15	17.1	256.5
2/21/2014	TTMWN	Daniels	US	Indus Tea	9	17.1	153.9
7/3/2014	BlazerFire	Daniels	US	Indus Tea	9	16.2	145.8
6/24/2014	CrossCountry Airways	Daniels	US	Indus Tea	5	16.2	81
9/8/2014	CrossCountry Airways	Daniels	US	Indus Tea	11	16.2	178.2
12/21/2014	CrossCountry Airways	Daniels	US	Indus Tea	14	16.2	226.8
5/6/2014	CrossCountry Airways	Daniels	US	Indus Tea	7	16.2	113.4
5/29/2014	BlazerFire	Daniels	US	Indus Tea	12	16.2	194.4
3/17/2014	BlazerFire	Daniels	US	Indus Tea	14	16.2	226.8

Assessment: Creating and formatting PivotTables

Which of the following are elements of a PivotTable? Choose all that apply.

- Category fields
- **Row labels**
- **Values**
- AutoFilter
- **Column labels**

Which of the following is the best way to format the values in PivotTable?

- Formatting tools on the Home tab of the ribbon
- **Value field settings**
- Format Painter

Module B: Manipulating PivotTables

Perhaps the best thing about PivotTables is all the ways you can manipulate them to show exactly what you want. Filtering and slicers help you see subsets of data, and field settings and grouping change which data appears and how it's combined.

You will learn how to:

- Filter and slice PivotTables to show subsets of their data
- Manipulate field setting to use different functions
- Group data within a field
- Use GETPIVOTDATA to return information from a PivotTable

Viewing subsets of PivotTable data

After you've created a PivotTable, there are many ways you can limit the data displayed.

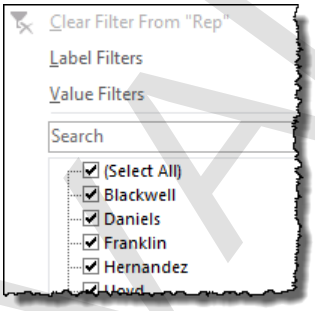
- Filtering row or column fields.
- Adding a *filter* field.
- Adding a *slicer*.

Filtering row and column fields

You can choose to view only some of the rows or columns in a PivotTable report by filtering the row or column labels.

1. Click the row or column label heading's filter arrow.

   To display sorting and filtering options for the rows or columns.



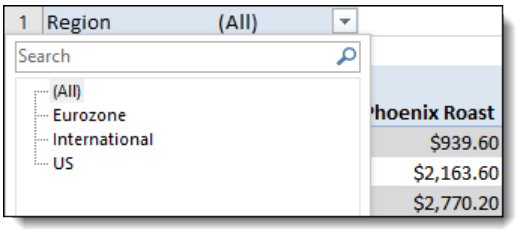
2. Click the options you want, then click **OK**.

Adding a filter

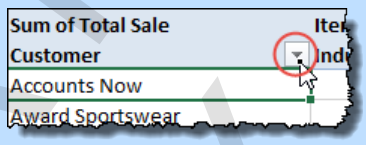
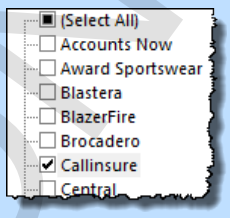
The fourth main field element available to you in a PivotTable is a *filter*. When you add a field to that box, you are then able to show data based on filtering that field. For example, in a PivotTable showing sales by customer and product, you might want to filter by region or sales rep.

1. Create a PivotTable.
2. Drag the field you want to use to the Filters box.

The report filter appears at the top of the PivotTable, and a filter arrow appears for the field you specified. Click that filter arrow to access the familiar Excel filtering features.

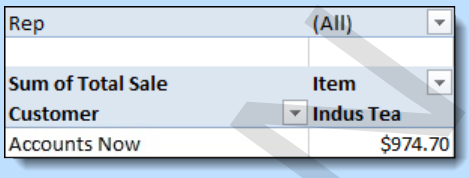


Exercise: Filtering a sales PivotTable

Do This	How & Why
1. Open `Manipulating PivotTables`.	From the `PivotTables` data folder. This workbook contains more invoice data, and has a PivotTable showing total sales (values) by customer (row labels) and item (column labels).
2. Click the Customer filter arrow.	 To display the filter features for the Customer field.
3. Filter the Customer field to show only rows for Callinsure.	
a) Click the box for Select All.	To deselect all the values.
b) Click the box for Callinsure.	The filter should look like this. 
c) Click **OK**.	The PivotTable shows only the one row for Callinsure.
4. Remove the filter from the Customer field.	
a) Click the Customer filter button.	
b) Click **Clear filter from "Customer"**.	You can filter on the row label fields in the same manner.

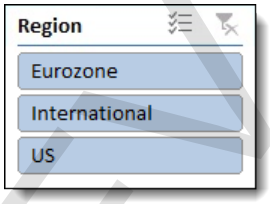
Continued...

Do This	How & Why
5. In the PivotTable field list, drag the **Rep** field to the Filters box.	The Rep filter appears at the top of the PivotTable.
6. Use the filter to show only those rows for Daniels and Franklin.	
a) Click the Rep filter arrow.	
b) Click **Select Multiple Items**.	
c) Click **All**.	To *deselect* all the values.
d) Click **Daniels** and **Franklin**.	
e) Click **OK**.	To show rows only for customers who have one of those two reps.
7. Show all the values for the Rep field.	Click the filter arrow, then click **All**.
8. Save the workbook as `My Manipulating PivotTables`.	



Slicers

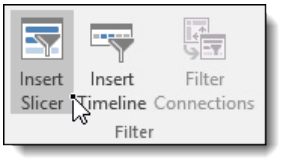
A slicer is an intuitive, graphical interface for filtering a PivotTable. Users simply click value buttons to apply filters. This is a slicer for a Region field.



Adding a slicer

Exam Objective: MOS Excel Expert 4.2.3

1. On the PivotTable Tools Analyze tab, click the **Insert Slicer** button.



To display the Insert Slicers window.

2. Click the field (or fields) for which you want to create a slicer (or slicers).

3. Click **OK**.
   The slicer appears on the worksheet.

Using slicers

Using slicers is very simple.

- To display data for a particular value in the slicer field, simply click that value in the slicer. To display results for more than one value, hold down **Ctrl** while clicking. Selected values are highlighted.
- To resize a slicer, drag one of its borders or corners.
- To move a slicer, drag it by the top.
- Use options on the Slicer Tools tab to control how the slicer looks and behaves.
- To remove a slicer, simply click its title once, then press **Delete**.

Exercise: Using a slicer with a sales PivotTable

`My Manipulating PivotTables` is open.

Exam Objective: MOS Excel Expert 4.2.3

Do This	How & Why
1. Remove the report filter from the PivotTable.	Simply drag the Rep field out of the Report Filter box and back to the field list. You will insert a slicer instead of a report filter.
2. On the PivotTable Tools Analyze tab, click **Insert Slicer**.	In the Filter group. The Insert Slicers window appears, giving you a choice of fields to use for slicers.
3. Click **Rep**, then click **OK**.	To create a slicer for the rep field. Now, a user can simply click value buttons to control which data appears in the PivotTable.
4. In the slicer, click **Blackwell**.	There is only one row of data for this rep.
5. Click **Daniels**.	To display Daniels's data. When you click a slicer button, any other buttons are deselected.
6. Hold down **Ctrl**, and click **Franklin**.	To show results for both Daniels and Franklin. Both buttons are highlighted. 

Continued...

Do This	How & Why
7. On the Slicer Tools Options tab, change the columns setting to 2.	The columns setting is in the Buttons group. When the slider field has many values, using more columns can make the slicer more compact.
8. Click **Slicer Settings**.	In the Slicer group. Here, you can control many aspects of how the slicer behaves.
9. Click **Cancel**.	To close the Slicer Settings window.
10. Save the workbook.	

Field settings

PivotTables can show data in almost any way you can imagine. When you drag a field into the Values box, the default is to calculate totals (using a SUM function) for rows in the source data with corresponding values in row and column fields. But you can calculate using other functions, and you can choose to show those values as percentages of a whole rather than as the values themselves.

Showing values as percentages of the grand total.

Sum of Total Sale	Item				
Region	Indus Tea	Phoenix Roast	Tucana Roast	Vela Herbal	Grand Total
Eurozone	8.93%	10.96%	11.49%	11.69%	43.07%
International	8.42%	8.20%	6.41%	10.21%	33.23%
US	6.06%	5.42%	5.66%	6.56%	23.70%
Grand Total	**23.40%**	**24.58%**	**23.56%**	**28.46%**	**100.00%**

Controlling field settings

You control the calculation and display for a field by using field settings.

Exam Objective: MOS Excel Expert 4.2.6

1. Click within the field in the PivotTable.
2. On the PivotTable Tools Analyze tab, in the Active Field group, click **Field Settings**.
3. Change any settings you want.
   - Type in the Custom Name box to change the name that appears for the field.
   - On the Summarize Values By tab, click the function you want to use to summarize the values from the field.
   - On the Show Values As tab, specify how you want the values to appear. They can be percentages of a row, column, or grand total; differences; running totals; ranked; or indexed.
4. Click **OK**.

Exercise: Changing value calculations and display in a PivotTable

`My Manipulating PivotTables` is open.

Exam Objective: MOS Excel Expert 4.2.6

Do This	How & Why
1. Activate the **Field Settings** tab.	It contains a simple PivotTable showing sales by rep and item.
2. Right-click any value cell, then click **Value Field Settings**.	You can instead click in the PivotTable, then, on the PivotTable Tools Analyze tab, click **Field Settings**. The Value Field Settings window appears, showing you that the function currently being used to calculate the field is Sum.
3. In the "Summarize value by" field list, click **Min**.	The PivotTable will show the minimum invoice for each rep and for each product.
4. Name the field `Minimum`, then click **OK**.	Type "Minimum" in the Custom Name box.
5. Add a second value field called `Maximum` for the maximum of the total sales.	
a) Drag the **Total Sales** field to the Values box.	There are now two columns for each product, one for Minimum, and one for Sum of Total Sales.
b) Display the Value Field Settings window for the Sum of Total Sales field.	Click a cell in one of the Sum of Total Sales field columns, then click `Field Settings`.
c) Change the function to `Max`.	
d) Change the name to `Maximum`.	
e) Format the field as currency.	Click **Number Format** to access the Format Cells window.
f) Click `OK` twice.	The PivotTable now shows the minimum and maximum invoice amounts for each rep and for each product.

	Indus Tea		Phoenix Roast	
Row Labels	Minimum	Maximum	Minimum	Maximum
Blackwell	$64.80	$178.20	$81.00	$259.20
Daniels	$81.00	$273.60	$16.20	$222.30
Franklin	$16.20	$256.50	$16.20	$273.60

6. Observe the Values box in the PivotTable field list.	It contains fields named Minimum and Maximum. When you customize field settings, those changes are reflected here.
7. Save the workbook.	
8. Remove the Maximum field from the Values box.	Drag it out of the box. Now, you'll change the field settings to show total sales again, but as a percentage of the grand total.

Continued...

Do This	How & Why
9. Display the Value Field Settings window for the Minimum field.	Right-click a value, then click **Value Field Settings**.
10. Change the summary function to `Sum`, and the name to `Percentage`.	
11. On the Show Values As tab, in the "Show values as" list, click **% of Grand Total**.	
12. Click **OK**.	You can now see the percentage of the grand total of sales for each rep and item.
13. Save the workbook.	

Grouping data

Grouping values in your rows or columns can be very useful, particularly with dates. Having a column for every day might be nearly impossible to make sense of, but by grouping by quarter, the meaning of the data becomes much clearer. You can group by any numeric field, and you can also create groups of text data.

Exam Objective: MOS Excel Expert 4.2.4

1. Right-click a row or column label, then click **Group**.
2. Enter starting and ending values.
3. Click or enter a By option. For dates, this means intervals, such as months, quarters, or years. For numbers, it's an interval.
4. Click **OK**.

Exercise: Grouping dates in a sales report

`My Manipulating PivotTables` is open.

Do This	How & Why
1. Activate the **Grouping** worksheet.	It contains a PivotTable showing total sales for each rep on every date. It's not terribly useful in this form.
2. Right-click a date heading, then click **Group**.	To display the Grouping window, which shows different options, depending on the type of data in the field.
3. Observe the "Starting at" and "Ending at" values.	By default, these contain the earliest and latest dates in the source data. But you can change that, if you want.
4. In the By list, click **Months**, then click **OK**.	To create a neat, monthly sales report. **Note:** This works nicely on this data, because it is for a single year. If you have data from more than one year, you should group by both year and month. Otherwise, data from the same month in different years will be grouped together.
5. Group the dates by quarter.	Right-click a month, click **Group**, click **Quarters**, click **Months** (to deselect it), and then click **OK**.
6. Save the workbook.	

Grouping a date field by quarters

Row Labels	Qtr1	Qtr2	Qtr3	Qtr4	Grand Total
Blackwell	$972.00	$1,053.00	$631.80	$388.80	$3,045.60
Daniels	$2,845.80	$3,091.50	$2,070.90	$1,198.80	$9,207.00
Franklin	$2,307.60	$3,270.60	$3,043.80	$3,916.80	$12,538.80
Hernandez	$4,501.80	$3,330.90	$3,524.40	$4,242.60	$15,599.70
Lloyd	$5,488.20	$5,903.10	$4,778.10	$7,222.50	$23,391.90
McCanney	$3,406.50	$5,965.20	$7,009.20	$3,686.40	$20,067.30
Patterson	$1,755.90	$1,137.60	$1,241.10	$2,978.10	$7,112.70
Sanchez	$3,472.20	$3,282.30	$3,198.60	$2,952.00	$12,905.10
Schiller	$4,900.50	$4,985.10	$4,887.90	$4,466.70	$19,240.20
Westlein	$3,743.10	$5,329.80	$3,310.20	$4,463.10	$16,846.20
Grand Total	**$33,393.60**	**$37,349.10**	**$33,696.00**	**$35,515.80**	**$139,954.50**

The GETPIVOTDATA function

You can use the GETPIVOTDATA function to retrieve data from a PivotTable, or to retrieve data based on a PivotTable. It's syntax is below.

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

You can explore the syntax in the help system, but the best way to enter a GETPIVOTDATA function is to refer to a cell in a PivotTable. When you click on a PivotTable cell while entering a formula, Excel enters a GETPIVOTDATA function rather than a cell reference. You can then edit the function to do exactly what you want.

Using GETPIVOTDATA

The simplest way to use GETPIVOTDATA is to start to enter a formula, then click a cell in a PivotTable.

Exam Objective: MOS Excel Expert 4.2.5

1. Select a cell in which you want to display PivotTable data.
2. Begin to enter a formula (type =), then click a cell in the PivotTable that contains the data you want to show.

   Or click a cell containing data that is something like what you want to show.

   The GETPIVOTDATA function appears in the formula instead of a cell reference.
3. Edit the GETPIVOTDATA function to suit your needs, then enter the formula.

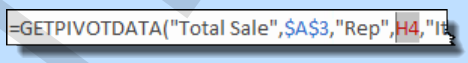
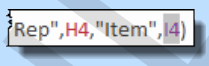
By using references to cells instead of explicit field values in the function, you can make GETPIVOTDATA look up information dynamically.

Exercise: Using GETPIVOTDATA to return sales for selected reps and items

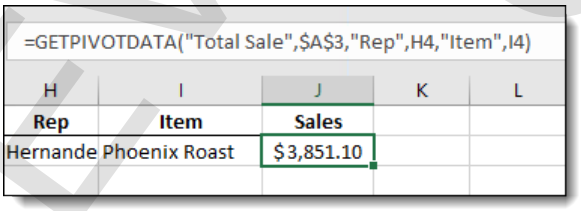
My Manipulating PivotTables should be open.

Exam Objective: MOS Excel Expert 4.2.5

Do This	How & Why
1. Activate the GETPIVOTDATA worksheet.	It contains a PivotTable, and a small table for looking up sales based on rep and item.
2. Enter a GETPIVOTDATA function in J4.	
a) Select J4.	
b) Type =, then select B5.	Instead of a cell reference, Excel enters a GETPIVOTDATA function. `=GETPIVOTDATA("Total Sale",$A$3,"Rep","Blackwell","Item","Indus Tea")`
c) Press **Enter**.	

Do This	How & Why
3. Observe the function.	Select J4, if necessary. The first argument, "Total Sale," is the filed value that the function will return. The next argument is the upper-left cell of the PivotTable, telling the function which PivotTable to use. After that, the arguments come in pair: a field name ("Rep") then a value in that field ("Blackwell").
4. Use the drop-down in H4 to select a different rep.	The function in J4 is not dynamically tied to these cells, so it's still showing the Indus Tea value for Blackwell.
5. Edit the GETPIVOTDATA function to use the field value in H4 for the Rep field value.	
a) Edit the function in J4.	
b) Change the fourth argument as shown.	
c) Enter the function.	Now the function shows the correct value based on the selected Rep.
6. Will the function work if you select a different item?	No, that reference in the GETPIVOTDATA function is still to the specific value of "Indus Tea" for item.
7. Edit the function so it refers to the item value in I4.	It should look like this. 
8. Test the function by selecting different reps and items.	The GETPIVOTDATA function is now dynamic.
9. Save and then close the workbook.	

Using a dynamic GETPIVOTDATA function



Assessment: Manipulating PivotTables

You can filter a PivotTable based on row and column label values. True or false?

- **True**
- False

Which of the following are ways to view subsets of data in a PivotTable? Choose all that apply.

- **Slicers**
- Subtotals
- **Report filters**
- AutoFilter

How do you control how values are being summarized in a PivotTable? Select the best answer.

- Grouping
- **The Summarize Values By tab of the Field Settings window**
- The Show Values As tab of the Field Settings window

You can show values as percentages only of the grand totals. True or false?

- True
- **False**

The only way to enter the GETPIVOTDATA function is by manually constructing it. True or false?

- True
- **False**

Module C: PivotCharts

PivotCharts are dynamic charts that are associated with PivotTables. You can manipulate them in all the ways you can manipulate PivotTables, and in most of the ways you can manipulate typical Excel charts.

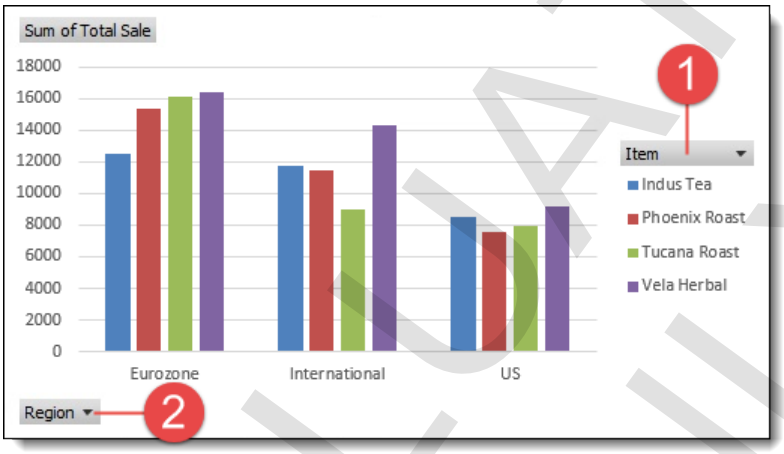
You will learn how to:

- Create PivotCharts
- Manipulate PivotCharts to analyze data

About PivotCharts

A PivotChart is a dynamic chart that is associated with a PivotTable. After you've created a PivotChart, you can filter or manipulate its fields and values settings much as would a PivotTable. You also have access to all the tools you know how to use with any Excel chart.

PivotChart elements



1. A *series filter* allows you to filter by a series in the chart.
2. A category filter allows you to filter by the categories in the chart.

You can also add report filters and slicers to PivotCharts.

Creating PivotCharts

You can create a PivotChart either directly from a list of data or from an existing PivotTable.

Exam Objective: MOS Excel Expert 4.3.1, 4.3.3

- From a list: On the Insert menu, in the Charts group, click **PivotChart**. Follow the steps you would to create a PivotTable, choosing fields for different parts from the Field List.
- From a PivotTable: On the PivotTable Tools Analyze tab, click **PivotChart** to display the Insert Chart window. The PivotChart button is in the Tools group. From there, follow the steps you would to create any chart.

The PivotChart appears as its own element in a worksheet with its associated PivotTable. If you created the PivotChart directly from a list, Excel creates both a PivotTable and a PivotChart. You can change the appearance and elements of a PivotChart by using the options on the PivotChart Tools Design tab (switching rows and columns, adding styles, applying quick layouts, and more).

Showing PivotChart detail

You can expand a PivotChart to show underlying detail for another field.

Exam Objective: MOS Excel Core 4.3.4

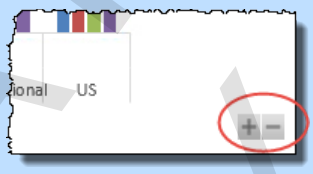
1. Right-click a series or data point, click **Expand/Collapse**, the click **Expand** or **Expand Entire Field**.
   A window appears giving you a choice of the fields for which to show detail.
2. Select a field and click **OK**.

You will now see data on the chart for the new field, broken down within the data for its parent field. There will be a filter arrow for the new field, along with expand and collapse symbols in the lower-right corner of the PivotChart.

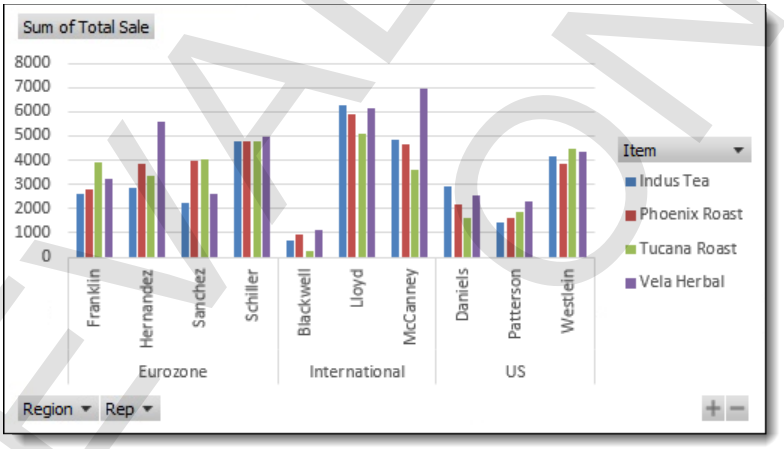
Exercise: Creating a PivotChart directly from a list

Exam Objective: MOS Excel Expert 4.3.1, 4.3.3, 4.3.4

Do This	How & Why
1. Open `PivotCharts`.	From the `PivotTables` data folder. This workbook contains invoice data, as well as a worksheet with a PivotTable. You'll first create a PivotChart directly from the invoice list.
2. Select any cell in the invoice list.	
3. Insert a new PivotChart on a new worksheet.	
a) On the Insert tab, click **PivotChart**.	In the Charts group. To display the Create PivotChart window. This is just like the Create PivotTable window.
b) Click **OK**.	To insert a new workbook with the beginnings of a new PivotTable and PivotChart.
4. Set the following fields. • Legend (Series): **Item** • Axis (Categories): **Region** • Values: **Total Sales**	As you add the fields, Excel builds a column chart.
5. Examine the PivotChart.	The columns correspond to the sales totals for the products, with the regions along the category axis. There are filter arrows available for both the legend (series) and the category axis.
6. Click the PivotChart Tools Design tab.	Here, you can add elements, apply a quick layout, apply styles, change chart type, and switch rows and columns as you would to any Excel chart.
7. Display only Eurozone information in the PivotChart.	
a) Click the Region filter arrow.	

Do This	How & Why
b) Click **Select All**, then click **Eurozone**.	
c) Click **OK**.	The chart shows the columns only for the Eurozone product sales.
8. Clear the Region filter.	In the Region filter menu, click **Clear filter form "Region"**.
9. Show the underlying detail for the Rep field.	
a) Right-click any series, then click **Expand/Collapse > Expand**.	To display the **Show Detail** window. Here, you can select a field for which to show further detail.
b) Click **Rep**, then click **OK**.	The PivotChart shows the Rep detail for the region you clicked. There are also Expand/Collapse symbols in the lower-right corner of the PivotChart. 
c) Click  .	To show Rep detail for all the regions on the chart.
10. Save the workbook as `My PivotCharts`.	

A PivotChart with expanded detail



Working with PivotCharts

You can use PivotCharts to analyze data visually. You can change fields, filter, and slice them just as you would PivotTables, but you can also format and add elements to them just as you would with normal Excel charts.

Filtering and slicing PivotCharts

You can filter on the categories and series in PivotCharts, or add report filter fields to them. You can also add slicers just as you would to a PivotTable.

Exam Objective: MOS Excel Expert 4.3.2

- To add a filter, drag a field to the Filters box.
- To add a slicer, click **Insert Slicer** on the PivotChart Tools Analyze tab.

Exercise: Manipulating a PivotChart to analyze data

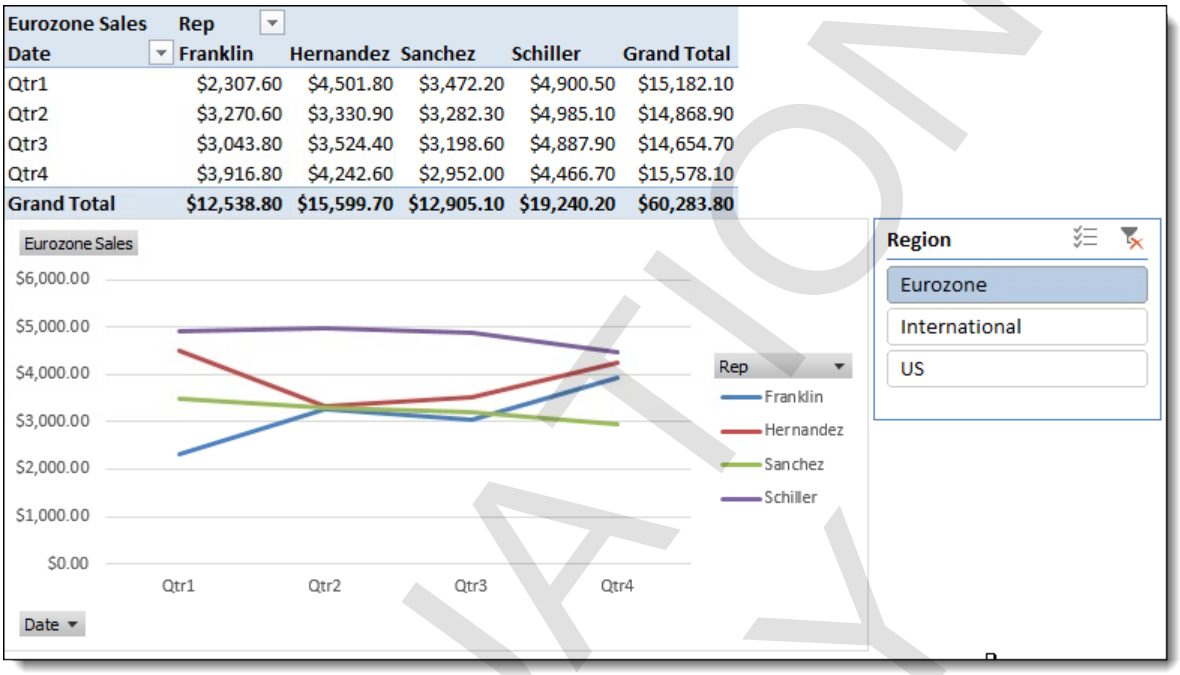
`My PivotCharts` is open.

Exam Objective: MOS Excel Expert 4.3.2

Do This	How & Why
1. Activate the **Reps by Qtr** worksheet.	It contains a PivotTable showing total sales by rep, grouped by quarters. You'll create a PivotChart from this PivotTable.
2. On the PivotTable Tools Analyze tab, click **PivotChart**.	In the Tools group. The familiar Insert Chart window appears.
3. Click the first Line option, then click **OK**.	To create a PivotChart showing quarter sales by rep. You want to flip the axes to show the rep's sales by quarter.
4. On the PivotChart Tools Design tab, click **Switch Row/Column**.	This, like most chart features, works exactly the same in a PivotChart as it does in any other chart. Notice, however, that the associated PivotTable also exchanged rows and columns.
5. Insert a Region slicer.	
a) On the PivotChart Tools Analyze tab, click the **Insert Slicer** button.	
b) Click **Region**, then click **OK**.	
6. Use the slicer to show only Eurozone reps.	Click the **Eurozone** button.
7. Drag the chart and the slicer to arrange them as you like.	
8. In A3, enter Eurozone Sales.	
9. Hide the worksheet gridlines.	On the View tab, click **Gridlines**. This is a nice presentation of the information.

Do This	How & Why
10. Save and close the workbook.	

PivotTable with PivotChart and slicer.



Eurozone Sales	Rep				
Date	Franklin	Hernandez	Sanchez	Schiller	Grand Total
Qtr1	$2,307.60	$4,501.80	$3,472.20	$4,900.50	$15,182.10
Qtr2	$3,270.60	$3,330.90	$3,282.30	$4,985.10	$14,868.90
Qtr3	$3,043.80	$3,524.40	$3,198.60	$4,887.90	$14,654.70
Qtr4	$3,916.80	$4,242.60	$2,952.00	$4,466.70	$15,578.10
Grand Total	**$12,538.80**	**$15,599.70**	**$12,905.10**	**$19,240.20**	**$60,283.80**

Assessment: PivotCharts

You can create a PivotChart without first creating a PivotTable. True or false?

- **True**
- False

Which of the following statements is most accurate?

- PivotCharts have the features of PivotTables, but not of normal Excel charts.
- PivotCharts have the features of normal Excel charts, but not of PivotTables.
- **PivotCharts have the features of both PivotTables and normal Excel charts.**

Summary: PivotTables

You should now know how to:

- Create and format PivotTables, view their underlying data, and create PivotTables based on external data
- Manipulate PivotTables to show exactly what you want by filtering or by using a slicer, change field settings for summary and display, and group a field to summarize dates by month or quarter
- Create PivotCharts either directly from a list or from an existing PivotTable, expand PivotChart detail, and manipulate PivotCharts to analyze data

Synthesis: PivotTables

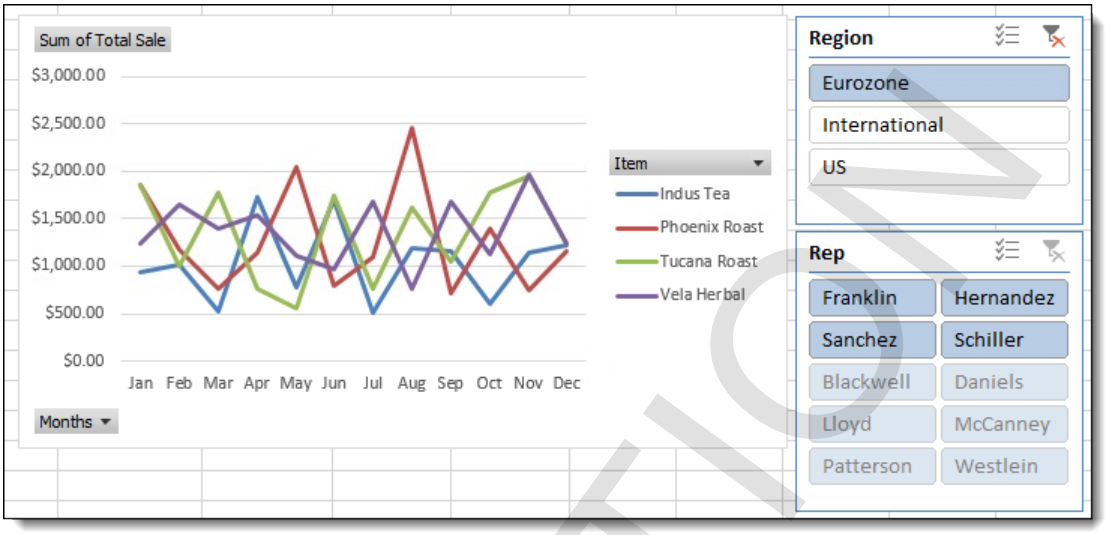
In this synthesis exercise, you will create a PivotTable to show minimum and maximum units for invoices by customer. Then, you'll create a monthly sales report by product, make a PivotChart from it, and add slicers to it.

1. Open `PivotTables Synthesis` from the `PivotTables` data folder.
2. Insert a PivotTable on a new worksheet based on the invoice list.
3. Use Customer as the row labels and Item as the column labels.
4. Use Units twice as value fields (you will change the calculation on each to make them different).
5. Make one of the value fields calculate the maximum units, and the other the minimum. Rename both appropriately.
6. Remove grand totals from both the rows and columns, and use banded rows.
7. Save the workbook as `My PivotTables Synthesis`.

Column Labels	Indus Tea		Phoenix Roast		Tucana Roast		Vela Herbal	
Row Labels	Max of Units	Min Units	Max of Units	Min Units	Max of Units	Min Units	Max of Units	Min Units
Accounts Now	13	2	15	1	15	3	16	1
Award Sportswear	12	2	15	2	16	7	12	5
Blastera	12	2	12	2	16	4	16	3
BlazerFire	14	8	13	1	15	5	9	1
Brocadero	9	2	16	2	12	1	15	6
Callinsure	16	3	15	2	13	6	15	3
Central	13	5	16	1	9	2	16	4
Central-West Bank	4	1	14	2	15	1	15	3
Chaplan Home Stores	16	3	16	6	11	4	15	2
CrossCountry Airways	14	5	9	1	15	9	16	1
Custom Boat Co.	16	3	16	8	15	15	16	2

8. Insert another PivotTable that shows Monthly sales for each item.
9. Format the values as currency.
10. Create a line-type PivotChart from the PivotTable.
11. If necessary, switch rows and columns so that the months are categories and the products are in the legend.
12. Insert Rep and Region slicers for the PivotChart.
13. Size and position the slicers any way you like.
14. Show only Eurozone reps in the PivotChart.
15. Save and close the workbook.

The Synthesis exercise PivotChart with slicers



Chapter 6: Presentation features

You will learn how to:

- Format cells and ranges based upon conditions you choose
- Create custom number formats
- Insert and manage various kinds of graphics

Learning time: 55 minutes

Module A: Conditional formats

You might want to format cells or ranges based on values they contain or on other conditions. This is called conditional formatting, and Excel has many features to make it simple.

You will learn how to:

- Use built-in rules to conditionally format cells and ranges
- Use data bars and icon sets to graphically represent conditional formatting
- Use the rule manager to create conditional formats
- Create conditional formatting based on formulas

Conditional formatting

Conditional formatting allows you to call attention to cells or ranges that meet conditions that you set. This can be very useful for calling users' attention to particular values. Here, for example, only Total Sales figures over $100 are highlighted.

Total Sale
$ 68.40
$ 226.80
$ 168.30
$ 145.80
$ 81.00
$ 17.10
$ 145.80
$ 210.60
$ 205.20

In this next example, entire rows are highlighted according to the value in the Region column.

Date	Customer	Rep	Region	Item
10/14/2014	Red Rock Mountain Tours	Hernandez	Eurozone	Tucana Roast
3/17/2014	BlazerFire	Daniels	US	Indus Tea
8/15/2014	Managec Group	Lloyd	International	Indus Tea
8/23/2014	CrossCountry Airways	Daniels	US	Tucana Roast
6/11/2014	The Grand	Blackwell	International	Phoenix Roast
12/18/2014	Vanessa's Deli	Schiller	Eurozone	Indus Tea
9/24/2014	CrossCountry Airways	Daniels	US	Phoenix Roast
1/1/2014	Imagenie	Franklin	Eurozone	Vela Herbal

Conditional formatting changes dynamically along with the values on which it depends, and that's the power of it. Excel has great built-in tools for various conditions such as largest and smallest values, top and bottom ranges, and relationships to averages.

You can also use *conditional format rules* to create conditional formats based on formulas. You can test any condition you can imagine, as long as you can come up with a formula to test it.

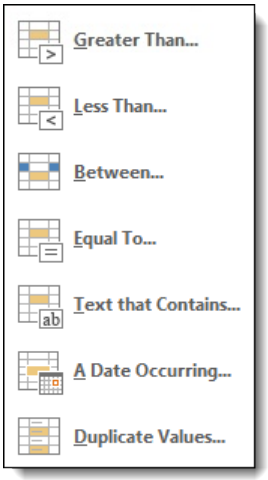
Using built-in rules for conditional formatting

The easiest way to apply conditional formatting is to use the simple, built-in rule types that Excel provides. You can highlight cells according to their values in various ways, such as values being greater or less than a number you specify, or being in a top or bottom range in a given list.

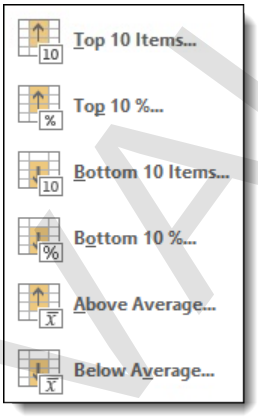
Exam Objective: MOS Excel Core 2.3.4

1. Select the range for which you want to apply the conditional format.
2. On the Home tab, in the Styles group, click **Conditional Formatting**.

   To display the Conditional Formatting menu, which gives you many intuitive ways to conditionally format a range.
3. Click a type of conditional formatting, and then a command.
   - *Highlight Cells Rules* provides commands for applying a highlight color when the cell's value is greater than, less than, between, or equal to a certain value. You can also highlight according to specific text, a date, or when a value is either a duplicate or unique.

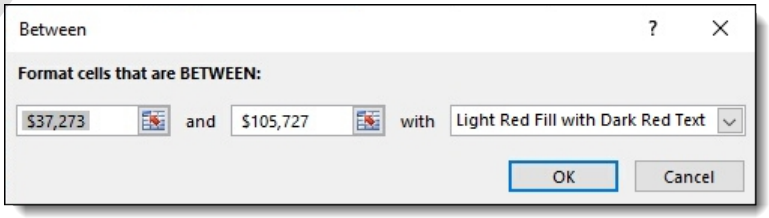


   - *Top/Bottom Rules* provides commands for applying formatting when a value falls in the top or bottom part of a list, or in a certain relation to the average of its values.



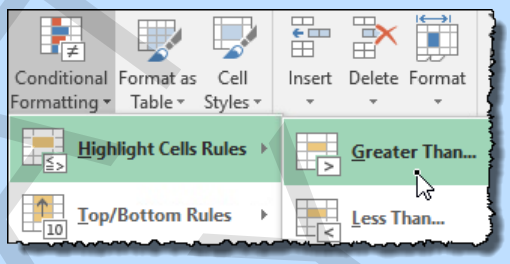
4. Choose your settings for the condition, and the type of formatting you want, then click **OK**.

   The settings are different, depending on the type of rule you choose. The figure here shows what the window for a "between" rule looks like.

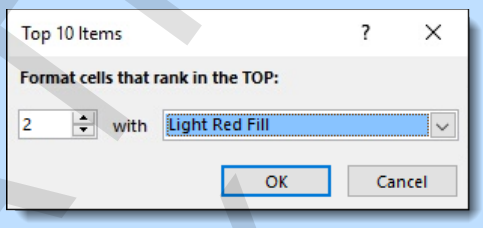


Exercise: Highlighting cells conditionally in a sales worksheet

Exam Objective: MOS Excel Core 2.3.4

Do This	How & Why
1. Open `Conditional Formats`.	From the `Presentation Features` data folder. This worksheet contains simple sales data showing sales by rep and product, with a totals row and column. There is also a dropdown list for selecting a region. You'll use this data to experiment with conditional formatting.
2. Apply a light blue highlight to the reps' grand totals if they're over $18,000.	
a) Select G9:G18.	
b) On the Home tab, click **Conditional Formatting > Highlight Cells Rules > Greater Than**.	 To display the Greater Than window.
c) In the Format cells that are GREATER THAN box, type `18000`.	
d) In the With list, click **Custom Format**.	To display the Format Cells window. The highlight rule windows provide a short list of quick formats, but you can use almost any kind for formatting.
e) On the Fill tab, select a light blue color, and click **OK** twice.	
f) Deselect the range.	The values above $18,000 are highlighted.
3. Save the workbook as `My Conditional Formats`.	

Grand Total
$ 3,046
$ 9,207
$ 12,539
$ 15,600
$ 23,392
$ 20,067
$ 7,113
$ 12,905
$ 19,240
$ 16,846
$ 139,955

Do This	How & Why
4. Apply a light red format to the reps' Tucana Roast values, if they are in the top two for that item.	
a) Select C9:C18.	
b) Click **Conditional Formatting > Top/Bottom Rules > Top 10 Items**.	The Top 10 Items window appears, and as you can see, you can control how many of the top items to highlight.
c) Change the number of items to highlight to `2`.	
d) In the With list, click **Light Red Fill**.	The window should look like this. 
e) Click **OK**, then deselect the range.	The top two Tucana Roast sales figures are highlighted.
5. Change the value in cell C17 to `4000`.	Because the value is no longer one of the top two, it's no longer highlighted (cell C18 is instead).
6. Save the workbook.	

Sales data with conditional formatting.

Sales Rep	Region	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	Grand Total
Blackwell	International	$ 275	$ 680	$ 940	$ 1,150	$ 3,046
Daniels	US	$ 1,596	$ 2,914	$ 2,164	$ 2,534	$ 9,207
Franklin	Eurozone	$ 3,938	$ 2,624	$ 2,770	$ 3,207	$ 12,539
Hernandez	Eurozone	$ 3,325	$ 2,852	$ 3,851	$ 5,572	$ 15,600
Lloyd	International	$ 5,072	$ 6,271	$ 5,891	$ 6,159	$ 23,392
McCanney	International	$ 3,618	$ 4,827	$ 4,646	$ 6,977	$ 20,067
Patterson	US	$ 1,843	$ 1,400	$ 1,586	$ 2,284	$ 7,113
Sanchez	Eurozone	$ 4,055	$ 2,262	$ 3,958	$ 2,631	$ 12,905
Schiller	Eurozone	$ 4,000	$ 4,756	$ 4,765	$ 4,955	$ 18,475
Westlein	US	$ 4,488	$ 4,164	$ 3,832	$ 4,361	$ 16,846
Grand Total		$ 32,210	$ 32,749	$ 34,402	$ 39,829	$ 139,189

Graphical conditional formatting

Excel provides graphical features of three types for indicating where values fall within a range.

- *Data bars* show bars in each cell, with the size of the bar indicating the size of the value relative to the other values in the range.

Customer	Grand Total
Accounts Now	$ 4,360.50
Award Sportswear	$ 2,509.20
Blastera	$ 4,033.80
BlazerFire	$ 2,413.80
Brocadero	$ 2,543.40
Callinsure	$ 2,948.40
Central	$ 3,249.00
Central-West Bank	$ 2,402.10

- *Icon sets* are collections of related icons that indicate where a number falls in a range (average, above average, or below average).

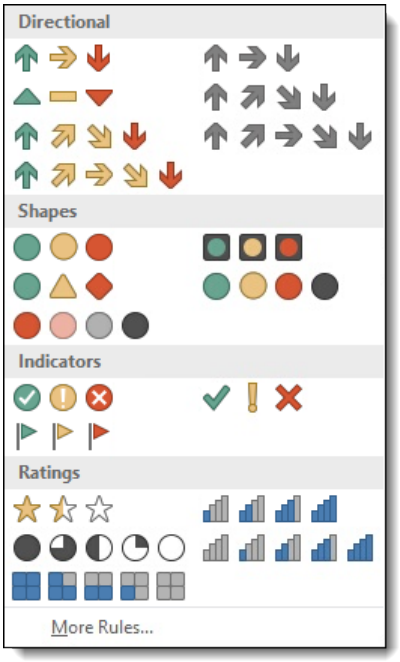
Customer	Grand Total
Accounts Now	▲ $4,360.50
Award Sportswear	▼ $2,509.20
Blastera	▲ $4,033.80
BlazerFire	▼ $2,413.80
Brocadero	▼ $2,543.40
Callinsure	▬ $2,948.40
Central	▬ $3,249.00
Central-West Bank	▼ $2,402.10

- *Color scales* have a limited number of colors that indicate where a value falls within a range.

Using data bars and icon sets

To apply data bars or icon sets to a range, simply click **Conditional Formatting**, click either **Data Bars** or **Icon Sets**, then click an option in the gallery that appears.

Exam Objective: MOS Excel Expert 2.2.1

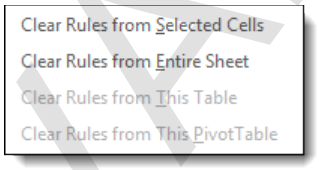


Clearing conditional formatting

You can clear conditional formatting quickly from selected cells, any entire worksheet, or from a table.

Exam Objective: MOS Excel Expert 2.2.3

1. Select the range from which you want to remove the conditional formatting.
   If you want to remove all the conditional formatting from a worksheet, this step isn't necessary.
2. Click **Conditional Formatting > Clear Rules**.
   To display a submenu of options.

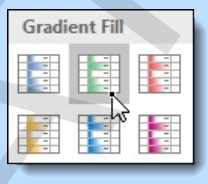
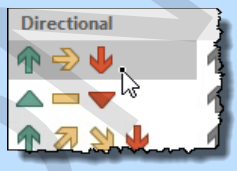


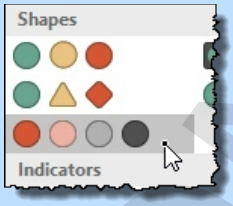
3. Click the command you want.
   - *Clear Rules from Selected Cells* clears the rules you've set only for the selection.
   - *Clear Rules from Entire Sheet* clears rules from the current worksheet.
   - If you select a cell in a table or PivotTable, those commands will be available as well.

Exercise: Using data bars and icon sets on sales data

`My Conditional Formats` is open.

Exam Objective: MOS Excel Expert 2.2.1;2.2.3

Do This	How & Why
1. Click **Conditional Formatting > Clear Rules > Clear Rules from Entire Sheet**.	To clear the conditional formatting that had been applied. You can also clear rules from only selected cells.
2. Apply green gradient data bars to reps' totals.	
a) Select G9:G18.	
b) Click **Conditional Formatting > Data Bars**.	To display the Data Bars gallery.
c) Click the Green Data Bars option.	
d) Deselect the range.	Data bars indicate the relative sizes of the values in the range.
3. Clear the rule from the range.	Select the range, then click **Conditional Formatting > Clear Rules > Clear Rules from Selected Cells**.
4. Apply the 3 Arrows (Colored) icon set to the sales totals.	Select the sales totals, click **Conditional Formatting > Icon Sets**, then click the 3 Arrows (Colored) option.  Icon sets divide the data into categories—such as small, medium, and large, or below average, average, and above average—then apply one icon to each category. Here, the green arrow pointing up represents larger values; the yellow one pointing right, more average ones; and the red one pointing down, below average ones.
5. Clear the rule from the range.	

Do This	How & Why
6. Apply the Red to Black icon set to the sales totals.	In the Shapes section of the gallery.  This set divides the data into four groups.
7. Save the workbook.	

Sales data with an icon set.

Sales Rep	Region	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	Grand Total
Blackwell	International	$ 275	$ 680	$ 940	$ 1,150	$ 3,046
Daniels	US	$ 1,596	$ 2,914	$ 2,164	$ 2,534	$ 9,207
Franklin	Eurozone	$ 3,938	$ 2,624	$ 2,770	$ 3,207	$ 12,539
Hernandez	Eurozone	$ 3,325	$ 2,852	$ 3,851	$ 5,572	$ 15,600
Lloyd	International	$ 5,072	$ 6,271	$ 5,891	$ 6,159	$ 23,392
McCanney	International	$ 3,618	$ 4,827	$ 4,646	$ 6,977	$ 20,067
Patterson	US	$ 1,843	$ 1,400	$ 1,586	$ 2,284	$ 7,113
Sanchez	Eurozone	$ 4,055	$ 2,262	$ 3,958	$ 2,631	$ 12,905
Schiller	Eurozone	$ 4,000	$ 4,756	$ 4,765	$ 4,955	$ 18,475
Westlein	US	$ 4,488	$ 4,164	$ 3,832	$ 4,361	$ 16,846
Grand Total		$ 32,210	$ 32,749	$ 34,402	$ 39,829	$ 139,189

Custom conditional formatting rules

If the conditional formatting rules you want aren't as simple as greater than, less than, top/bottom, you can create custom rules with the **New Rule** command. There are several types of rules you can create.

- Value-based
- Containing
- Ranked
- Top/bottom
- Above/below average
- Unique or duplicate
- Formula-based

Some of these correspond to the options available in the built-in rules, but in most cases, when you choose one of these rule types in the Create New Rule window, you have finer control over the rule you create.

Creating new rules

Use the New Formatting Rule window to apply more complex conditions.

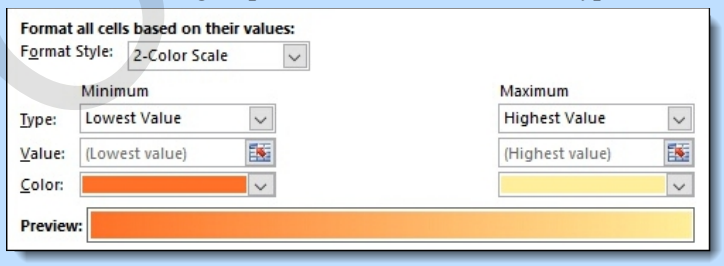
Exam Objective: MOS Excel Expert 2.2.2

1. Select the range to which you want to apply conditional formatting.
2. Click **Conditional Formatting > New Rule**.
   To display the New Formatting Rule window.
3. Click a rule type.
4. Edit the rule description.
   The options depend on the type of rule. These are similar to what you see in the built-in rules but give you more control over how the rules behave. You can experiment on your own with the various options to learn more about how they behave.
5. Specify the formatting you want to use if the condition is true.
6. Click **OK**.

Exercise: Creating a rule for standard deviation

`My Conditional Formats` is open.

Exam Objective: MOS Excel Expert 2.2.2

Do This	How & Why
1. Clear the conditional formatting from G9:G18.	
2. Select G9:G18, then click **Conditional Formatting > New Rule**.	To display the New Formatting Rule window. Here, you can do anything you can do with the built-in rules, but with much finer control over how the rules work.
3. Observe the Rule Description options for a rule based on values.	There are many options: 2-color scale, 3-color, icon sets, and data bars; minimum and maximum settings with their own colors for creating a spectrum; and various other types. 
4. Observe some of the options for rules based on cell data. a) Under Select a rule type, click **Format only cells that contain**.	

Do This	How & Why
b) Under "Format only cells with," click the first dropdown arrow.	You can format cells according to their value, specific text, dates, blanks, and errors. The option you choose here changes the other options as well.
c) Select different options, and observe the options for each.	
5. Create a rule to highlight totals more than one standard deviation above the mean.	
a) Under "Select a rule type," click **Format only values that are above or below average**.	
b) In the "Format values that are" list, click **1 std dev above**.	Standard deviation is a statistical measure of the degree to which values in a set vary from the mean.
c) Click **Format**.	
d) Click an orange fill, then click **OK** twice.	Only two values are more than one standard deviation above the mean.
6. Save the workbook.	

Rule formatting values one standard deviation above.

Sales Rep	Region	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	Grand Total
Blackwell	International	$ 275	$ 680	$ 940	$ 1,150	$ 3,046
Daniels	US	$ 1,596	$ 2,914	$ 2,164	$ 2,534	$ 9,207
Franklin	Eurozone	$ 3,938	$ 2,624	$ 2,770	$ 3,207	$ 12,539
Hernandez	Eurozone	$ 3,325	$ 2,852	$ 3,851	$ 5,572	$ 15,600
Lloyd	International	$ 5,072	$ 6,271	$ 5,891	$ 6,159	$ 23,392
McCanney	International	$ 3,618	$ 4,827	$ 4,646	$ 6,977	$ 20,067
Patterson	US	$ 1,843	$ 1,400	$ 1,586	$ 2,284	$ 7,113
Sanchez	Eurozone	$ 4,055	$ 2,262	$ 3,958	$ 2,631	$ 12,905
Schiller	Eurozone	$ 4,000	$ 4,756	$ 4,765	$ 4,955	$ 18,475
Westlein	US	$ 4,488	$ 4,164	$ 3,832	$ 4,361	$ 16,846
Grand Total		$ 32,210	$ 32,749	$ 34,402	$ 39,829	$ 139,189

Conditional formatting with formulas

The main idea with conditional formatting is that Excel checks whether a certain condition is true, and if it is, applies a format. For example, is it true that a certain value is greater than 10? If so, apply the format.

Some conditions require you to create formulas to test conditions. This is especially true when you want to test a value in one place on a worksheet, but format other places. The most common example of that is when you want to format an entire row or column of data according to a value in one cell. But there are other uses.

Here is a simple example of a formula that results in either TRUE or FALSE:

	A	B	C
1	Value	Formula	Result
2	3	=A2>5	FALSE
3	4	=A3>5	FALSE
4	5	=A4>5	FALSE
5	6	=A5>5	TRUE

The equals sign asks, "Is the following true?" Then, the rest of the formula is a condition: the cell is greater than 5. Only A6 contains a value greater than 5, so only that cell returns the value of FALSE.

These types of formulas are very useful in Excel, and you should become comfortable with creating them.

Creating conditional formatting rules based on formulas

You use the New Formatting Rule window to create a conditional formatting rule based on a formula. The procedure is similar to creating any formatting rule.

Exam Objective: MOS Excel Expert 2.2.2

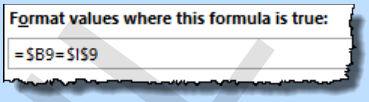
1. Select the range to which you want to apply the formatting.
2. Click **Conditional Formatting > New Rule**.
3. Click **Use a formula to determine which cells to format**.
4. In the "Format values where this formula is true" box, create a formula that results in a true value when you want the cell in question to be formatted.
   It is important to keep in mind where the active cell was in the range you selected in step 1. The formula you enter for the rule will adjust its relative references in relation to that active cell. Sometimes, you want that, but at other times, you need to lock the cell reference in the formula by using either an absolute reference or a mixed reference.
5. Click **Format**, set the formatting for the rule, then click **OK** to return to the New Formatting Rule window.
6. Click **OK**.

Exercise: Creating a rule to highlight rows by using a formula

`My Conditional Formats` is open.

Exam Objective: MOS Excel Expert 2.2.2

Do This	How & Why
1. Clear all conditional formatting from the worksheet.	Click **Conditional Formatting > Clear Rules > Clear Rules from Entire Sheet**.

Do This	How & Why
2. Select A9:G18, being sure that A9 is active.	You will create a rule to highlight all the cells in a row if that row is in the region that is selected in cell I9. To test the cells, you need to know where they are in relation to the active cell.
3. Click **Conditional Formatting > New Rule**.	
4. Click **Use a formula to determine which cells to format**.	
5. Construct a formula that results in TRUE if the current region for the cell's row value matches cell I9.	
a) In the "Format cells where this formula is true" box, type =, then click cell B9.	To enter a reference to the region cell for the active cell, A9. But this is an absolute reference, and you need the row to adjust as different cells are tested. You need to unlock the row reference by using a mixed reference here.
b) Press F4 twice.	The formulas should read `=$B9` so far.
c) Type =, then click cell I9.	To test whether the region is equal to the selection in cell I9. You want an absolute reference in this case, because the formulas should always compare the region to this specific cell.
	
6. Click **Format**, pick a light color fill, and click **OK**.	
7. Click **OK**, then deselect the range.	The rows in the International region are highlighted.
8. Select I9, then use its dropdown list to select a different region.	The formatting is dynamic and conditional.
9. Save and close the workbook.	

Formatting rows according to a selected region

Sales Rep	Region	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	Grand Total
Blackwell	International	$ 275	$ 680	$ 940	$ 1,150	$ 3,046
Daniels	US	$ 1,596	$ 2,914	$ 2,164	$ 2,534	$ 9,207
Franklin	Eurozone	$ 3,938	$ 2,624	$ 2,770	$ 3,207	$ 12,539
Hernandez	Eurozone	$ 3,325	$ 2,852	$ 3,851	$ 5,572	$ 15,600
Lloyd	International	$ 5,072	$ 6,271	$ 5,891	$ 6,159	$ 23,392
McCanney	International	$ 3,618	$ 4,827	$ 4,646	$ 6,977	$ 20,067
Patterson	US	$ 1,843	$ 1,400	$ 1,586	$ 2,284	$ 7,113
Sanchez	Eurozone	$ 4,055	$ 2,262	$ 3,958	$ 2,631	$ 12,905
Schiller	Eurozone	$ 4,000	$ 4,756	$ 4,765	$ 4,955	$ 18,475
Westlein	US	$ 4,488	$ 4,164	$ 3,832	$ 4,361	$ 16,846
Grand Total		$ 32,210	$ 32,749	$ 34,402	$ 39,829	$ 139,189

Assessment: Conditional formats

You can use conditional formatting on both numbers and text values. True or false?

- **True**
- False

You must always use formulas to apply conditional formatting. True or false?

- True
- **False**

When creating rules, you are limited by the options available in the built-in rule sets. True or false?

- True
- **False**

Which of the following statements is true of using formulas for conditional formatting? Choose the one correct answer.

- You can use any type of formula, regardless of its result.
- **Formulas must be in relation to the active cell of the range you selected to format.**
- If a formula results in a FALSE condition for a particular cell, that cell will be formatted.

Module B: Custom Formats

While Excel has a wide variety of built-in number formats, you can also create custom formats to serve your needs. For example, you can control exactly how zeros or negative numbers appear, or put specific characters in front of or after numbers, as in a product code.

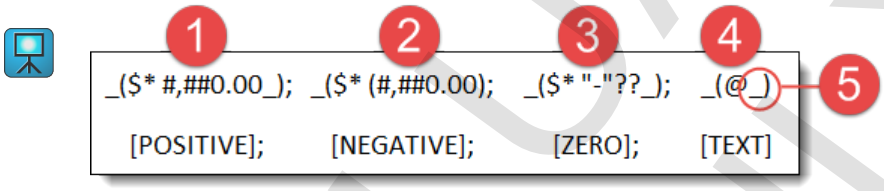
You will learn:

- How to customize number formats to control digits shown, decimal places, and how zeros and negative numbers appear
- How to customize date and time formats
- About symbols you can use in custom accounting formats

About custom number formatting

When you apply number formatting in Excel, you are actually apply formatting codes to the selected range. These codes control the display of the number in various ways. Is it a date? How many decimal places do you want? How many digits before the number is rounded? How do you want to handle commas, negative numbers, zeros, or text that appears in the cell?

There are potentially four parts to a number format code. There are many nuances to how the codes work, and the effects that various characters have. But you need to begin by understanding the structure of a number format.



1. The first part of the code controls how positive numbers appear. Most importantly, zeros (0) show that many digits, including zeros, if a number has fewer digits than are in the format. Number signs do the same, except they don't show unnecessary zeros. The positive number code in the pictured format rounds to two decimal places, and the number signs are there so that the code can have a comma as a thousands separator, if necessary.
2. After a semicolon (;), which separates the parts of a number format code, the second part of a code is for negative numbers. In this format, negative numbers are surrounded by parentheses. If you omit this section of the code, negative numbers appear just like positives.
3. The third part of the format specifies how zeros appear. The question mark (?) is a placeholder that helps to align numbers along the decimal point. If you omit this section, zeros appear like positives.
4. The last part of the code is for how text is handled. If you omit a section of the code, text simply appears in the cell. If you have this section, but don't include the at symbol (@), you don't see text entered in the cell.
5. An underscore in the code tells Excel to add the amount of space of the following character. In this case, adding the space for a parenthesis character ensures that the various codes will align on the right.

There is a great deal more to understanding Excel's number format codes. If you're interested, try the Help system to learn more.

Date format codes

Date format codes mostly use the "d," "m," and "y" characters. Different numbers of each letter represent different ways of presenting the day, month, and year, respectively.

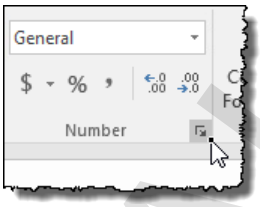
Date	Code	Result
10/4/2016	dddd, mmmm dd, yyyy	Tuesday, October 04, 2016
10/4/2016	d	4
10/4/2016	dd	04
10/4/2016	ddd	Tue
10/4/2016	dddd	Tuesday
10/4/2016	m	10
10/4/2016	mmm	Oct
10/4/2016	mmmm	October
10/4/2016	y	16
10/4/2016	yyy	2016

Customizing number formats

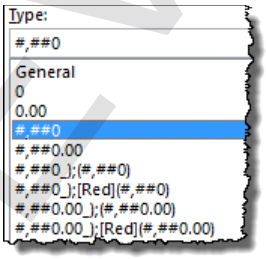
The best way to create a custom number format is to start from an existing format, and then change it.

Exam Objective: MOS Excel Expert 2.1.1

1. Select a cell or range containing numbers for which you want to create the custom format.
2. Display the Number tab of the Format Cells window.
   Click the Number Format button at the bottom right of the Number group on the Home tab.



3. Pick a category and a format to use as a starting point.
   Because format codes can be complex, starting from an existing one is usually best.
4. Under Category, click **Custom**.
   You see the format code for the current format in the Type box. The Sample box shows what the current format will look like when applied to the active cell.



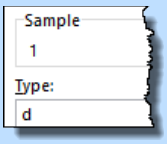
5. In the Type box, edit the code as you like.
   As you edit, the Sample box shows what your custom format will look like applied to the active cell.
6. Click **OK**.

Exercise: Experimenting with custom number formats

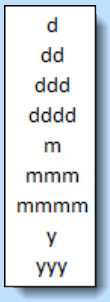
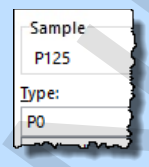
Exam Objective: MOS Excel Expert 2.1.1

Do This	How & Why
1. Open Custom Formats.	From the `Presentation Features` folder. This simple worksheet has some numbers and dates in column A, some formatting codes in column B, and the effect those codes would have on the numbers shown in column C.
2. Observe rows 2 and 3.	Zeros (0) and number signs (#) are the main digit placeholders in number format codes. Zeros always show that many digits. Number signs show the digits if the number has that many places, but not if not. Notice the comma in the code in row 3. The number signs enable you to place a thousands separator (the comma) in the code.
3. Observe row 4.	This is a more complex code. The part before the semicolon is the format for positive numbers, the part after the semicolon is for negative numbers.
4. Observe rows 5-7.	These rows contain dates. Notice that the codes are made up of the letters "d," "m," and "y," as well as separator characters (dashes, slashes, and spaces). A different number of the letters controls the way in which Excel shows the day, month, and year.
5. Experiment with custom date formats on cell C8.	
a) Select C8, then display the Number tab of the Format Cells window.	Click the Number Format button at the bottom right of the Number group on the Home tab. The current format is a date format.
b) Under Category, click **Custom**.	Now, you can see the format code in the Type box (m/d/yyyy).
c) In the type box, select the entire code, then type `d`.	The Sample box shows just the number 1. A single "d" gives the day as the numeric day of the month.

Number	Format	Result
-1234.5678	#,##0.0000;[Red]#,##0.0000	1,234.5678



Continued...

Do This	How & Why
d) Try some of shown formats to see their results.	 You can show the day as a one- or two-digit number, or as a short or full version of the day of the week. Month can be numeric, short, or full. And the year can be two digits or four.
e) Close the Format Cells window.	
6. In cell C9, apply a custom format that places the letter "P" in front of numbers.	This will be a product code.
a) Select C9, then display the Number tab of the **Format Cells** window.	
b) Format the cell as Number with zero decimal places.	Leave the window open.
c) Under Category, click **Custom**.	
d) Edit the type box as shown.	 You can show most characters simply by typing them in the code. Some of the characters used in the codes (such as the question mark) need to be placed within quotation marks.
e) Click **OK**.	The number appears with the letter "P" in front of it.
7. Apply the code `#,` to cell C10.	
a) Select C10, then display the Number tab of Format Cells window.	
b) Click Custom, then edit the Type box to read `#,`.	When you don't put a digit placeholder after the comma, Excel shows you the number in thousands.
c) Click **OK**.	35 shows in the cell because Excel is showing you the number in thousands. For some reports and charts, this can be very useful.
8. Experiment with other custom number formats.	If you have time and the interest. Use C11.

Do This	How & Why
9. Save the workbook as `My Custom Formats`, then close it.	

Custom number formats

Number	Format	Result
-1234.5678	#,##0.0000;[Red]#,##0.0000	1,234.5678
1/1/2016	dddd, mmmm dd, yyyy	Friday, January 01, 2016
1/1/2016	m/d/yy	1/1/16
1/1/2016	d-mmm-yyyy	1-Jan-2016
1/1/2016	Custom	1/1/2016
125	Custom	P125
34,500	Custom	35
4,340,000	Custom	4340

Assessment: Custom Formats

Which of the following types of number formats can be customized? Choose all that apply.

- **Number**
- **Currency**
- **Date**
- **Accounting**

In a number format code, there is no difference between the zero character (0) and the number sign #). True or false?

- True
- **False**

Which of the following is how the code, "m-dddd-yyyy", shows a date? Choose the one correct answer

- Jan-Monday-15
- 1-Mon-2015
- **1-Monday-2015**
- January-Monday-2015

Module C: Graphics

Although Excel is not a graphics program, it provides all sorts of features for adding pictures and illustrations to workbooks, and working with them after you've added them. You can insert graphics files directly, use clip art from within Excel, take screen shots of other programs, or create dynamic graphics called SmartArt. All of these can be sized, moved, rotated, and even edited from within Excel.

You will learn how to:

- Insert a picture, clip art, shape, or word art in a workbook
- Adjust graphic properties
- Move, size, or rotate graphics
- Use SmartArt to create functional, dynamic illustrations, such as organizational or process charts

Graphics in Excel

You can insert and work with many kinds of graphics in Excel.

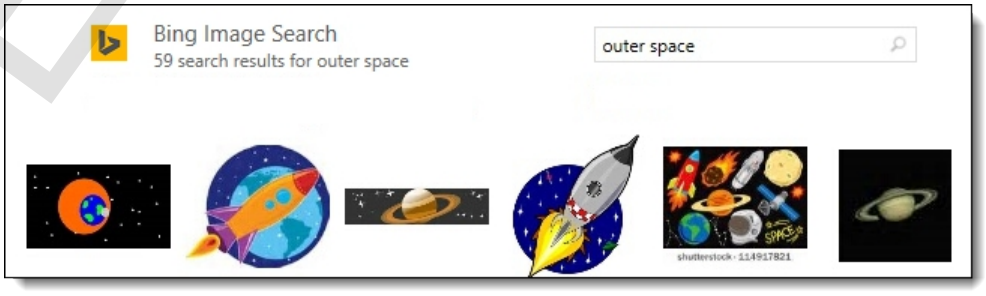
- *Pictures*: separate graphic files such as bitmap and jpg images.
- *Clip Art*: simple graphics and drawings that are available from a number of collections or online.
- *Shapes*: elements such as lines, arrows, polygons, and callout boxes.
- *SmartArt*: functional graphics for creating process, flow, and organizational charts.
- *Screenshots*: pictures of windows that are open on your computer screen.

Inserting pictures, online pictures, and shapes

For pictures, online pictures, and shapes, insertion works very similarly.

Exam Objective: MOS Excel Core 5.3.1, 5.3.2

1. Click where you want the graphic to appear.
2. On the Insert tab, in the Illustrations group, click either **Pictures**, **Online Pictures**, or  (the Shape button).
3. Select the picture, clip art, or shape you want.
   - For pictures, navigate to the folder containing the image, click the picture you want, and click **Insert**. The picture appears on the worksheet.
   - For online pictures, pick a source, perform a search, then insert the picture you want. It appears on the worksheet.



   - For shapes, click the shape you want from the Shapes gallery, then drag in the worksheet to create the shape.

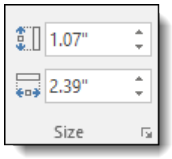
Changing graphic properties

You can move a graphic simply by dragging it.

There are at least three convenient ways to size graphics.

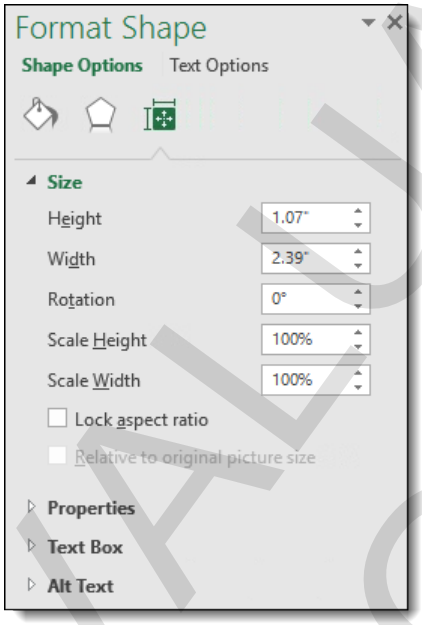
Exam Objective: MOS Excel Core 5.3.3

- Select it and then drag any of its sizing handles. To size the graphic proportionally, hold down **Shift** while you drag.
- Use the Height and Width controls. These are available on the Picture Tools Format tab.



- Right-click the graphic, then click **Size and Properties**.

  To display the Format Picture pane on the right side of the screen. Here, you have the most control and can reset the picture to its original size by clicking **Reset**. You can also control many other properties of the graphic all in one place.



Adding alternative text to graphics

Alternative text is text that is attached to an object that allows people with disabilities to better interact with your workbooks. It is important to add alternative text to any graphics that you might include in your workbooks.

Exam Objective: MOS Excel Core 5.3.4

1. Right-click a graphic and then click **Size and Properties**.

   To display the Size & Properties area of the graphic's properties pane.
2. Click **Alt Text** to expand that category of properties.
3. Enter a title and a description for the graphic.

   The title should be a very short identifier, while the description can more fully explain the graphic.

Changing the appearance of graphics

Excel's Picture Tools Format tab has many powerful features for changing the appearance of graphics in your workbooks. Select a graphic, then use a tool. The tools on the tab will be different for pictures and shapes.

Exam Objective: MOS Excel Core 5.3.3

- For pictures, in the Adjust group, click **Color**, then use one of the available tools to adjust the saturation, tone, or color of the graphic.

- Again for pictures, in the Adjust group, click **Artistic Effects** to select from a gallery of interesting flourishes.
- Use the Picture Styles or Shape Styles group tools to change style, borders, effects, or layout.

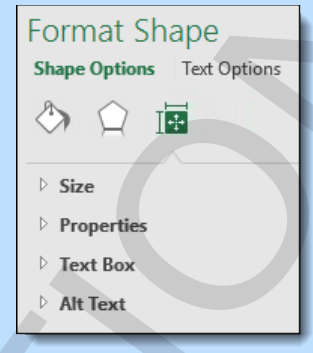
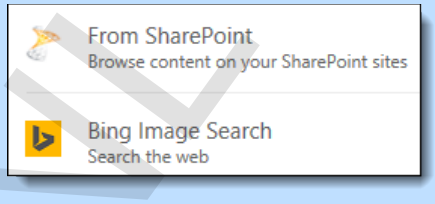
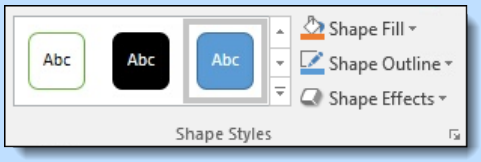
  The options are slightly different for pictures and for shapes. This is the Picture Styles group.

Exercise: Inserting and manipulating graphics in a worksheet

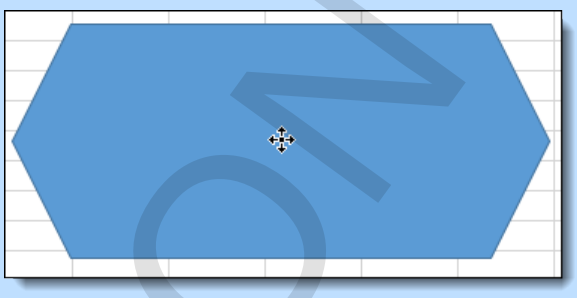
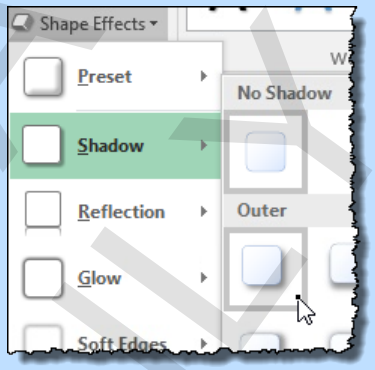
To perform the steps on inserting online pictures, you need an active internet connection. If you don't have one, you can skip that step or your instructor can demonstrate it for you.

Exam Objective: MOS Excel Core 5.3.1, 5.3.2, 5.3.3, 5.3.4

Do This	How & Why
1. Open a new, blank workbook.	You'll use it to experiment with graphics.
2. On the Insert tab, click **Pictures**.	In the Illustrations group. To open the Insert Picture window, which looks and functions very much like the Open and Save windows.
3. Navigate to the `Presentation Features` data folder, then double-click **JavaTucanaLogo**.	To insert the logo in the worksheet.
4. Add alternative text to the logo.	

Do This	How & Why
a) Right-click the logo, then click **Size and Properties**.	To display the Size & Properties area of the Format Shape pane. Here, you can control many aspects of the shape's properties. 
b) Expand the Alt Text category.	
c) In the Title box, type `Java Tucana logo`.	Without alternative text associated with your graphics, your workbooks will fail accessibility test.
d) Close the Format Shape pane.	
5. Click **Online Pictures**.	To display options for ways to search for online pictures. Here, you can search for images, then click to insert them in the worksheet. 
6. Close the Insert Picture window.	Click its Close button.
7. Insert a shape you like.	Click **Shape**, click a shape you like, then drag in the worksheet to create the shape.
8. Observe the Drawing Tools Format tab.	When you select a graphic, this tab appears. The Shape Styles group gives you lots of tools for controlling the appearance of a graphic. 

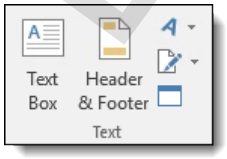
Continued...

Do This	How & Why
9. Move the shape you created.	Point to it anywhere other than a handle, and drag. As you do, you'll see an outline of the shape, showing where it will land. 
10. Make the shape wider.	Drag the middle-right handle. When you resize a graphic in this way, you change its proportions.
11. Make it proportionally smaller.	While holding down **Shift**, drag a handle.
12. Click **Shape Fill**.	You can use this gallery to change the shape's color.
13. Click Shape **Effect > Shadow**, then the first Outer option.	 To add a drop shadow effect to the shape.
14. Save the workbook as `My Graphics`.	In the `Presentation Features` data folder.

Inserting text graphics

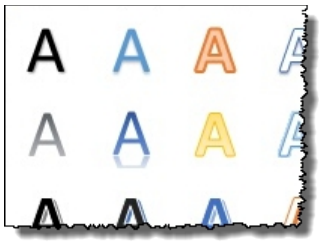
Click the Text button on the Insert tab to display a gallery of text-based options that you can insert, including text boxes and Word Art.

Exam Objective: MOS Excel Core 5.3.1



- Click **Text Box**, then drag to create a text box on the worksheet. You can then type text in the text box and format it as you would any shape.

- Click **WordArt**, then click a style from the gallery.



The WordArt appears on the worksheet. Simply select it and type. Again, you can format WordArt as a shape.

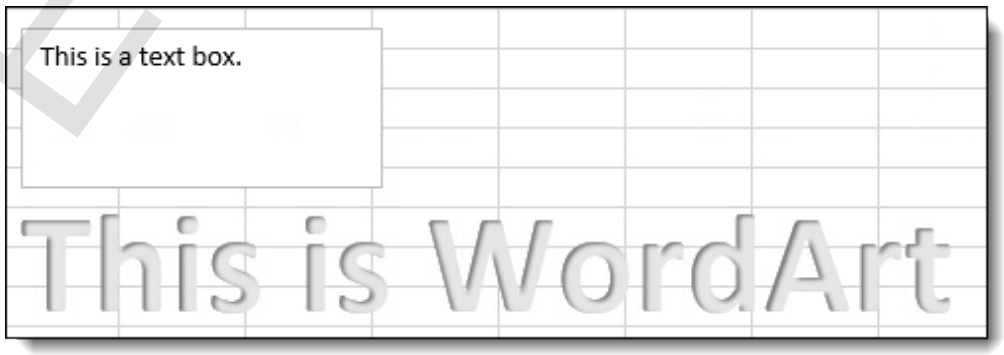
Exercise: Inserting WordArt and a text box

My Graphics is open.

Exam Objective: MOS Excel Core 5.3.1

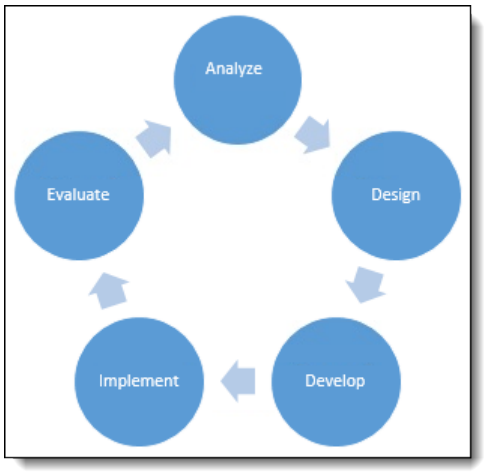
Do This	How & Why
1. On the Insert tab, click **Text > Text Box**.	
2. Drag on the worksheet to create a text box.	When you release the mouse, there is a box with a flashing insertion point.
3. Type some text, then click on the worksheet.	Text boxes can be useful for information you want users to see, perhaps explaining what is in a worksheet or chart.
4. Insert any style of WordArt.	On the Insert tab, in the text group, click  , then pick a style you like.
5. With the WordArt selected, type some text.	
6. Click the Drawing Tools Format tab.	You can modify and enhance WordArt and text boxes the same way you do any shapes.
7. Save the workbook.	

WordArt and a text box



SmartArt

SmartArt creates functional graphics for you, such as organizational charts or process diagrams. You pick a type, enter text for the pieces, control the relationships of those pieces, and Excel does the rest. Here, for example, is a cycle illustrated by SmartArt.

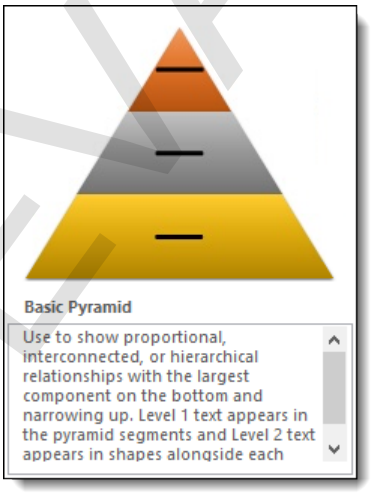


Creating this sort of thing takes less than a minute, and more importantly, adding steps or changing relationships is easy.

Creating SmartArt

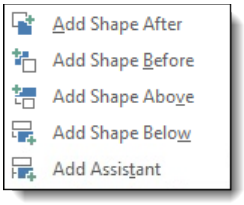
How you work with SmartArt depends on the type you select. But the basic process is usually somewhat similar.

1. On the Insert tab, in the Illustrations group, click  (the SmartArt button).
   To display the Choose a SmartArt Graphic window. You can create lists, processes, cycles, hierarchies, and more.
2. On the left, click a type of graphic.
3. In the middle, select the graphic you want.
   When you select a graphic, a preview appears on the right with a description of the SmartArt.

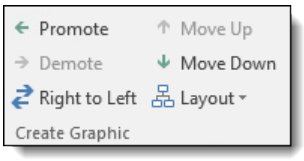


4. Click **OK**.
   The SmartArt appears as an object in the worksheet, along with two SmartArt Tools tabs on the ribbon.

5. Edit and format the SmartArt as you like.
   - To change text in a shape, click the shape and type.
   - To add a new shape, on the SmartArt Tools Design tab, click the **Add Shape** dropdown arrow, then click an option to determine where the shape goes.



   - To remove a shape, select it, and press **Delete**.
   - To move a shape within the structure of the SmartArt, use the buttons in the Create Graphic group of the SmartArt Tools Design tab.



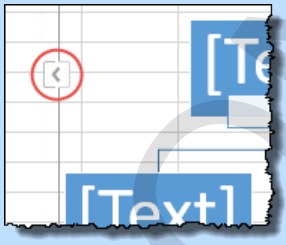
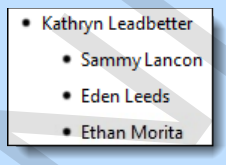
   - To change the overall layout of the SmartArt, use tools on the SmartArt Tools Design tab.
   - To change the style of the shapes, use the tools on the SmartArt Tools Format tab.

Exercise: Using SmartArt to create an organization chart

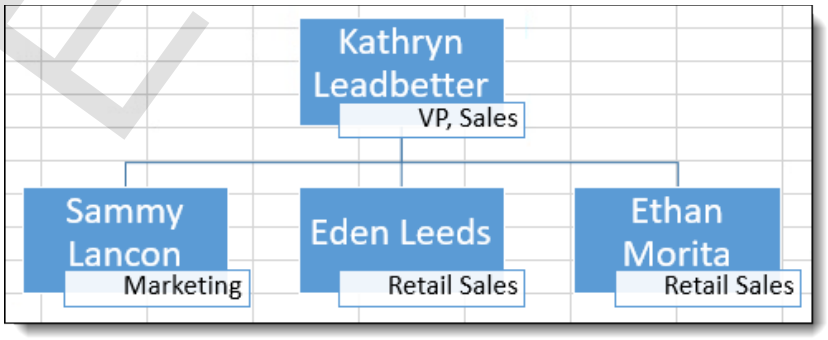
My Graphics is open.

Do This	How & Why
1. Add a new sheet to the workbook.	
2. On the Insert tab, click  .	The SmartArt button is in the Illustrations group. To display the Choose a Smart Art Graphic window. There are many categories from which to choose.
3. On the left, click **Process**, then click the first option.	This is the Basic Process SmartArt type. On the right, the window provides a preview and description of the selection.
4. Click **Hierarchy**, click the Organization Chart option, then click **OK**.	The Organization Chart is the first Hierarchy Option. A basic organization chart appears on the worksheet. There are also now SmartArt Tools tabs on the ribbon.
5. On the SmartArt Tools Design Tab, in the Layouts gallery, click the Name and Title Organization Chart layout.	It is the third one.  The org chart shapes now have a space for titles.

Continued...

Do This	How & Why
6. Observe the text pane.	You might have to click the Text Pane expand symbol if the text pane isn't showing.  The text pane allows you to type text for smart art into a text-based structure. This is often easier than typing text into the shapes themselves.
7. In the first text area, type `Kathryn Leadbetter`.	Kathryn is at the top of the org chart.
8. Click Kathryn Leadbetter's title box (the shape), then type `VP, Sales`.	
9. Delete the second shape on the chart.	Click the edge of the shape to select it. If you click the middle, you'll edit the shape. Then press **Delete**.
10. Use the text pane to enter employee names as shown.	Or you can enter any names you like. The specific names are not important. 
11. Enter the rest of the titles as shown.	For each employee, click the title box, then type the title. The titles are not SmartArt shapes, so you cannot edit them in the text pane. Again, you can enter any titles you like
12. Save and then close the workbook.	

The completed org chart using SmartArt



Assessment: Graphics

You cannot edit pictures from within Excel. True or false?

- True
- **False**

Which of the following can you accomplish by dragging a graphic's handles? Choose all the correct responses.

- Moving
- **Sizing**
- Changing color
- Changing contrast

Which of the following is a good use of SmartArt? Choose the best answer.

- **A process diagram.**
- A graphic of a person using a phone.
- A graphic of a window in another open program.

You can adjust picture contrast and brightness from within Excel. True or false?

- **True**
- False

Summary: Presentation features

You should now know how to:

- Format cells and ranges using built-in rules for conditional formatting, by using data bars and icon sets to graphically represent where values fall in a range, by creating new rules with more complex conditions, and by creating rules that use formulas to evaluate conditions
- Create custom number formats to show numbers and dates precisely how you want them to appear
- Insert, move, resize, and change properties for pictures, online pictures, and shapes; add alternative text to graphics; insert WordArt and text boxes; and use SmartArt to create functional graphics that illustrate relationships among shapes

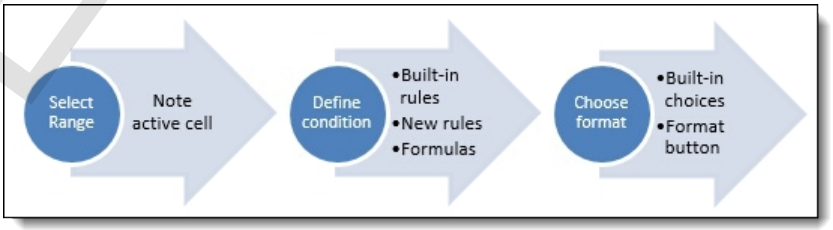
Synthesis: Presentation features

In this synthesis exercise, you will create a conditional formatting rule based on text, apply data bars based on the values in a range, and create a conditional format to highlight rows based on a numerical value users can select. Then, you'll create a simple process chart using SmartArt.

1. Open `Presentation Synthesis` from the `Presentation Features` data folder.
2. Create a new rule that applies a highlight color to all cells in columns A, B, and C that contain specific text beginning with the letter "m."
3. Clear the rule.
4. Create a conditional format to apply data bars to the Years column.
5. Create a conditional formatting rule that highlights an employee's entire row when her Years value is greater than the number selected under Service in I9. (Hint: When you select the range to which to apply the rule, be sure to make a cell in column E active before you create the rule.)
6. Select different Service values from the I9 dropdown list to verify that the rule is working.

First	Last	Dept	Date of Hire	Years	Service
Katrice	Abeita	Marketing	2/3/2001	14.9	15
Ezequiel	Abels	Customer Service	12/18/1984	31.0	
Amalia	Adcox	Customer Service	12/11/2013	2.0	
Irina	Alaimo	Marketing	8/5/2013	2.4	
Renetta	Albrecht	Retail Sales	9/25/1985	30.3	
Hai	Alder	Customer Service	2/9/2008	7.9	

7. Save the workbook as `My Presentation Synthesis`.
8. Activate **Sheet2**.
9. Create the Process Arrows SmartArt shown here, which illustrates the process of applying conditional formatting.



10. Save and close the workbook.

Chapter 7: Advanced charts

You will learn how to:

- Create charts that include trendlines and dual axes, and create and use a chart template
- Use and format sparklines, which show visual snapshots of data
- Use Quick Analysis features to conveniently analyze selected data

Learning time: 40 minutes

Module A: Special chart types

You can create many types of charts in Excel, from simple pie charts to charts that combine more than one type that contain two value axes. You can also create chart templates to quickly format charts in the ways you prefer.

You will learn how to:

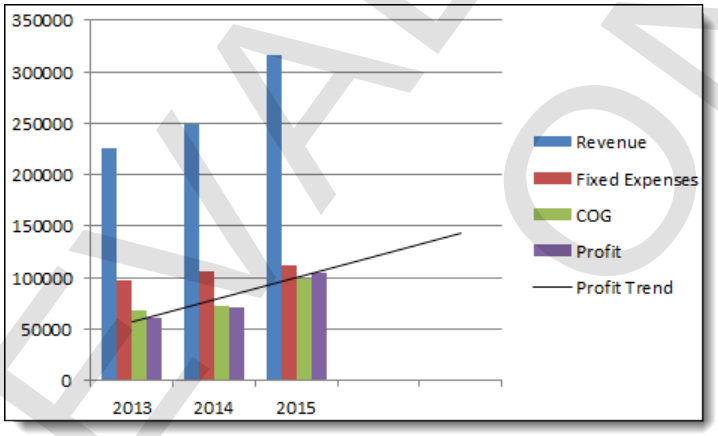
- Apply a trendline to a chart
- Combine two different sets of data in a single chart by using a trendline
- Create and use chart templates to quickly format charts

Trendlines

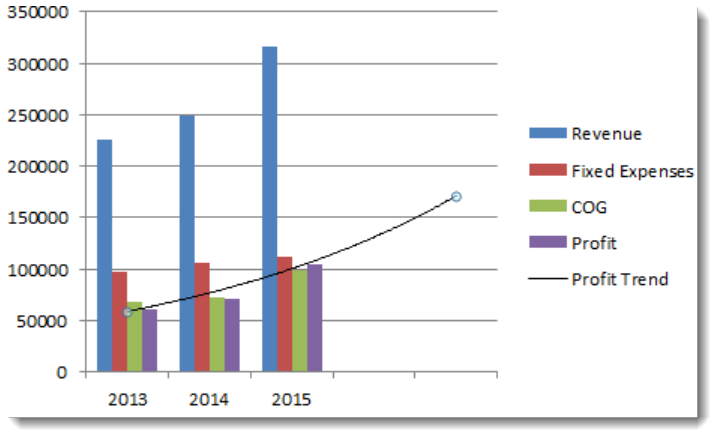
Trendlines allow you to quickly see if there is a trend in your data; you can also use them to project possible values into the future. When you add a trendline to a chart, Excel uses regression analysis to calculate the values for the line, and you can choose one of six methods by which Excel performs these calculations.

- *Exponential*, for data that increases or decreases at an increasing or decreasing rate.
- *Linear*, which is good for data that increases or decreases steadily.
- *Logarithmic*, good for when data increases quickly and then levels out.
- *Polynomial*, good for data that seems to have hills or valleys.
- *Power*, for data that increases or decreases at a constant rate.
- *Moving average*, for "smoothing out" fluctuating data so that a line can be approximated.

You could spend an entire course (or more) discussing regression analysis. But without going too far into it, the important thing is to pick a type that seems to fit what you want to convey. A linear trendline has been added to the profit data in this chart, and projected ahead two years.



But notice that in the third year of the actual data, the profit actually grows more quickly. What if the rate of that growth is actually increasing at an increasing rate (exponentially)? This exponential trendline seems to fit the data better (and gives a more optimistic view of future profit).



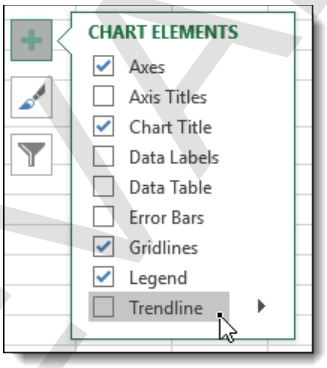
You should experiment with different types of trendlines to learn about which ones fit which types of data best.

Inserting trendlines on charts

There are a couple of methods for inserting a trendline on a chart.

Exam Objective: MOS Excel Expert 4.1.1

1. Select the series for which you want to insert a trendline.
   Click the series to select it, or use the dropdown list in the Current Selection group, on the Chart Tools Format tab.
2. Insert a trendline.
   - On the Chart Tools Design tab, click **Add Chart Element > Trendline**, and then click the type you want. This immediately inserts a trendline but doesn't give you options about how to control it.
   - Right-click the series, and then click **Add Trendline** to display the Format Trendline window.
   - Click the Chart Elements button, then click **Trendline**.

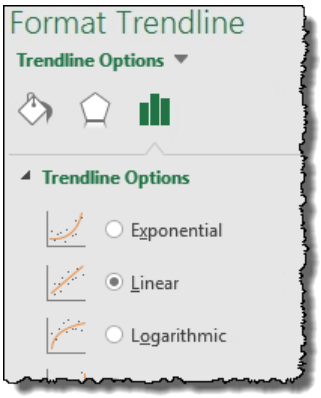


3. Add options to the trendline.
   - Choose a regression type.
   - Provide a name.
   - Forecast forward or backward.

- Show the trendline's equations or *R*-squared value.

Continued...

4. Format the trendline by displaying the Trendline Options pane (right-click and click **Format Trendline**), clicking a category of options at the top, and setting options.



5. When you're done with the Trendline Options pane, click its Close box.

R-squared values

A trendline's *R-squared value* is a statistical measure of how closely a trendline fits its data. The closer the value is to 1, the better the fit.

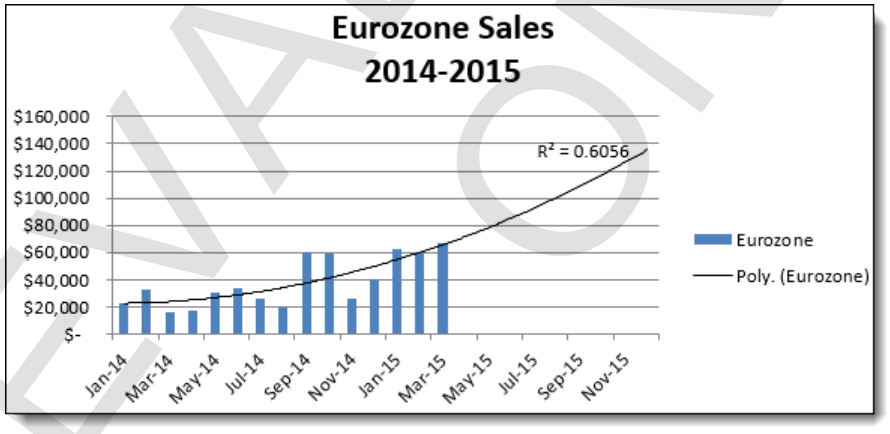
Exercise: Inserting a trendline on a sales chart

Exam Objective: MOS Excel Expert 4.1.1

Do This	How & Why
1. Open `Special Charts`.	From the `Advanced Charts` data folder. The first worksheet contains fifteen months of Eurozone sales data for Java Tucana and a column chart of this data.
2. Select the chart.	Click it.
3. On the Chart Tools Design tab, click **Add Chart Element > Trendline > Linear**.	A straight line appears over the data on the chart, showing the general trend. But the data points are mostly fairly far away from the line. How good an estimation of the trend is this line?
4. Add the *R*-squared value for the trendline.	
a) Right-click the trendline, then click **Format Trendline**.	To display the Format Trendline pane.

Do This	How & Why
b) Click **Display R-squared value on chart**.	This option is at the bottom of the Trendline Options. The *R*-squared value is 0.5697 (close to 1 is optimal).
5. Experiment with different regression types.	
a) Click **Exponential**.	In the Format Trendline window. If you closed it, open it again. To change the trendline to this type. The curved line seems a better fit visually, but the *R*-squared value is actually worse.
b) Click **Logarithmic**.	This isn't much better.
c) Click **Polynomial**.	The Polynomial regression type fits better, both visually and in terms of *R*-squared value.
6. Forecast the trend for the rest of 2015.	
a) In Forecast section, type `9` in the Forward box.	
b) Close the Trendline Options window.	Click its Close box. The trendline now goes out to the end of the year. Do you think this much growth is a rational expectation? Which regression type would you want to use if you were responsible for the forecast coming true?
7. Save the workbook as `My Special Charts`.	

Sales with polynomial trendline forecast.



Combination charts

If you have two kinds of data you want to show on a single chart, or if the scale of some series is very different, you can combine multiple chart types in a single chart. You do this by changing the chart type for each series you want to change.

After you create a combination chart, you can choose to have a secondary value axis to show the scale of the second type of chart differently.

Adding series to charts

To add a series to an existing chart, you edit the data from which the chart is made.

Exam Objective: MOS Excel Core 5.1.2

1. Select the chart.
2. On the Chart Tools Design tab, click **Select Data**.
   In the Data group.
   To display the Select Data Source window.
3. In the Chart data range box, enter a reference to the new range of data.
   You can type a reference, but it's far easier to select it. If you want to add a single series, click **Add**, enter reference for the series name and values, then click **OK**.
4. Click **OK**.

Changing series chart type

1. Right-click the series for which you want to change the type, then click Change Series Chart Type.
   The **Change Chart Type** window appears, with Combo as the selected category.
2. Click the Chart Type dropdown for the series you want to change, select a type, and click **OK**.

Adding secondary axes

You can add a second axis for some of the series in a chart when the units or scale of various series is different.

Exam Objective: MOS Excel Expert 4.1.2

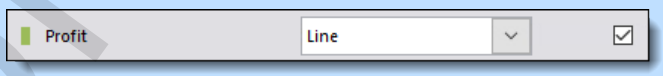
1. Right-click the series, then click **Format Data Series**.
   To display the Format Data Series window, in which you can control many aspects of how the series appears.
2. In the Series Options area, click **Secondary Axis**.
   This option is available only when you have more than one series in the chart.
3. Click **Close**.

Exercise: Creating a profit chart with two axes

`My Special Charts` is open.

Exam Objective: MOS Excel Core 4.1.2 and Expert 5.1.2

Do This	How & Why
1. Activate the **Cafe Profit** worksheet.	It contains simple revenue, expense, and profit information for a café for three years. There is a column chart of the expenses and revenues.

Do This	How & Why
2. Add the profit data to the chart.	
a) On the Chart Tools Design tab, click **Select Data**.	Select the chart to see the Chart Tools ribbon tabs. The Select Data Source window appears.
b) Under Legend Entries (Series), click **Add**.	To display the Edit Series window.
c) Click in the Series name box, click A13, and press **Enter**.	To specify the title of the series.
d) Select the contents of the Series values box, then select B13:D13.	
e) Click **OK** twice.	The Profit columns are small compared to the others, because they have the same type and scale. You'll call attention to that series by changing its type
3. Change the Profit series chart type to line.	
a) Right-click any column in the profit series, then click **Change Series Chart Type**.	The familiar Change Chart Type window appears, with the Combo category selected.
b) Change the chart type for the Profit series to the first line type.	Use the dropdown next to the series name at the bottom of the window.
c) The preview shows how the profit line will look with the expense and revenue columns.	
d) Next to the Profit series, click **Secondary Axis**.	The options look like this. 
e) Click **OK**.	To change the chart. The secondary axis makes the profit line much more prominent.
4. Save the workbook.	

Using a secondary axis

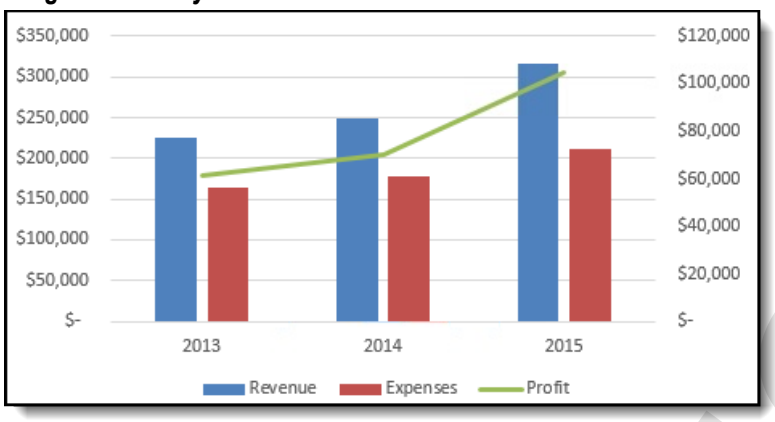


Chart templates

After you've created a specialized format for a chart, you can save it as a *chart template*. You can then apply the template to charts in the future, just as you would apply built-in chart types.

Creating chart templates

Exam Objective: MOS Excel Expert 4.1.3

1. Format a chart in a way that you want to be able to apply to future charts.
2. Right-click the chart, then click **Save As Template**.

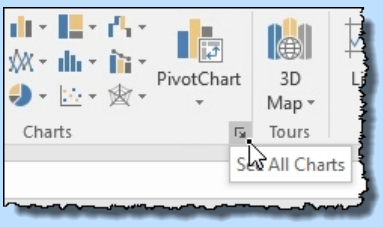
   The Save Chart Template window (which is just another Save window) appears. The Charts folder inside the Templates folder is active by default, and it's a good idea to save your chart templates here.
3. Enter a name for the template, then click **Save**.

You can now apply the template to other charts in the future. In the **Insert Chart** or Change Chart Type window, there is a Templates category, where your template will appear.

Exercise: Creating and applying a chart template

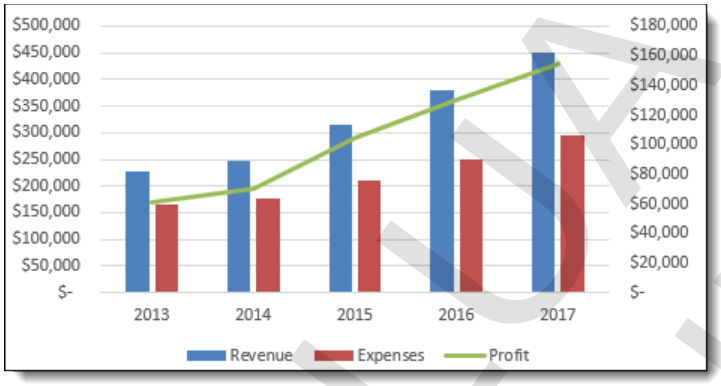
`My Special Charts` is open.

Exam Objective: MOS Excel Expert 4.1.3

Do This	How & Why
1. Select the combination Profit chart.	On the Cafe Profit worksheet. You'll create a chart template based on this chart.
2. Right-click the chart, then click **Save As Template**.	To display the Save Chart Template window. Notice that the `Templates/Charts` folder is selected. It's easiest to use templates when you save them to the default location.
3. Name the template `Profit Combo`, then click **Save**.	Nothing obvious happens, but you've saved the template.
4. Activate the Profit Projections worksheet.	This is similar data, but adds projections for 2016 and 2017.
5. Create a chart from the data based upon your template.	
a) Select A10:F13.	
b) On the Insert tab, click the See All Charts button.	At the lower-right of the Charts group.  To display the Insert Chart window.

Do This	How & Why
c) Click the All Charts tab, then click **Templates**.	On the left.
d) Click **OK**.	To create the combination chart with two column series, one line, and two axes, all in a single step.
6. Save and close the workbook.	

Applying a chart template.



Assessment: Special chart types

Which of the following are regression types for a trendline? Choose all that apply.

- **Linear**
- Curved
- **Exponential**
- **Polynomial**
- Static

An *R*-squared value of close to zero shows the best fit for a trendline. True or false?

- True
- **False**

You add a secondary axis to a chart by using the Format Axis command for the primary value axis. True or False?

- True
- **False**

You apply a chart template in the Change Chart Type window. True or false?

- **True**
- False

Module B: Sparklines

Sparklines are tiny, simple charts that appear in a single cell. They come in several types and are easy to apply and format.

You will learn how to:

- Insert and format a sparkline

About sparklines

A *sparkline* is a small chart that you can insert in a single cell. You can format sparklines in many ways, but by design, they're simple. There are three types.

- Line
- Column
- Win/loss

Here, column-type sparklines show the relative sales values for each product for each sales region.

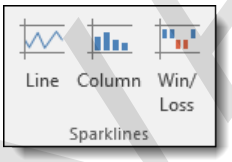
Region	Tucana Roast	Indus Tea	Phoenix Roast	Vela Herbal	T	I	P	V
Eurozone	$ 16,083	$ 12,493	$ 15,344	$ 16,364				
International	$ 8,965	$ 11,778	$ 11,476	$ 14,286				
US	$ 7,927	$ 8,478	$ 7,582	$ 9,179				

Inserting sparklines

To insert a sparkline, you need to specify its type, the data to base it on, and where to put it.

Exam Objective: MOS Excel Core 2.3.1

1. Select the data for which you want to create a sparkline.
   You do not actually have to do this first, because the Create Sparklines window allows you to specify both the source and the location. But selecting the source first is simpler.
2. On the Insert menu, in the Sparklines group, click a type.

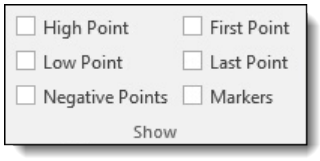


   The Create Sparklines window appears, with the range you selected shown in the Data Range box. You can create multiple sparklines at a time by selecting a range with several rows of data. But each sparkline can show only one series of data.
3. Click in the Location Range box, then click the cell where you want the sparkline to appear.
   If you are creating several at once, you can enter a range here. The number of cells must match the number of rows of data in the Data Range box.
4. Click **OK**.
   A sparkline of the type you chose appears in the cell you specified.

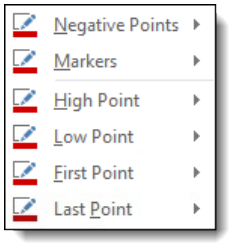
Formatting sparklines

The Sparkline Tools Design tab provides you with many ways to format sparklines.

- The Show group enables you to show markers for various points in the data.



- The Style group has a gallery of sparkline styles, and also provides fine control over the sparkline color and marker colors. The Marker Colors menu is shown here.



- Axis options can be useful when you have positive and negative values or want to show the data in a different order.

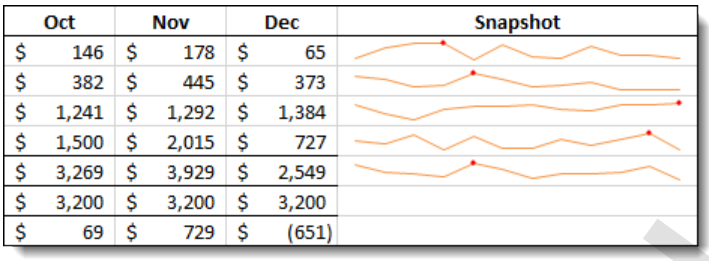
Exercise: Inserting and formatting sparklines for sales data

Exam Objective: MOS Excel Core 2.3.1

Do This	How & Why
1. Open `Sparklines`.	From the `Advanced Charts` data folder. This worksheet contains monthly sales data, along with totals, quotas, and difference information.
2. Insert sparklines for rep and total data in column N.	
a) Select B12:M16.	
b) On the Insert tab, in the Sparklines group, click **Line**.	Be sure to click this button, not the Line button in the Charts group.
	The Create Sparklines window appears, with the range you selected shown in the Data Range box.
c) Click in the Location Range box, then select N12:N16.	On the worksheet. This is the range where the sparklines will appear, one for each row of data.
d) Click **OK**.	Small line-chart sparklines appear in column N.
3. Widen column N.	To make the sparklines bigger. Sparklines are always in a single cell, but you can make cells bigger to enlarge sparklines.
4. Select any one of the sparkline cells.	Notice that a blue border encloses all the sparklines. Because you created all of them in a single step, they are considered to be "grouped." This means that you can apply formatting to all of them at the same time.
5. On the Sparkline Tools Design tab, try different styles.	This is a quick way to format sparklines.
6. In the Show group, click **High Point**.	To show markers (dots) on the sparklines where the highest data points are. You can also show negative points, low points, and highlight other features.
7. In the Marker Color list, click **High Point**, then click red.	The Marker Color list is to the right of the Style gallery. To make the high-point data markers red.

Do This	How & Why
8. Save the workbook as `My Sparklines`, then close it.	

Sparklines with high-point data markers.



Oct	Nov	Dec	Snapshot
$ 146	$ 178	$ 65	
$ 382	$ 445	$ 373	
$ 1,241	$ 1,292	$ 1,384	
$ 1,500	$ 2,015	$ 727	
$ 3,269	$ 3,929	$ 2,549	
$ 3,200	$ 3,200	$ 3,200	
$ 69	$ 729	$ (651)	

Assessment: Sparklines

You can create sparklines in all the same types as normal Excel charts. True or false?

- True
- **False**

Sparklines always reside in a single cell. True or false?

- **True**
- False

Module C: Quick Analysis

Quick Analysis is a gallery of analysis options that you access through a tag next to a selected range.

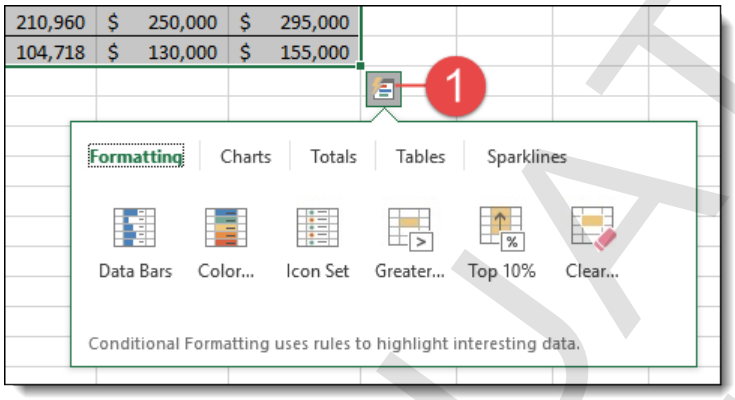
You will learn how to:

- Use Quick Analysis options to apply conditional formats, create charts, and analyze data in a selected range.

Quick Analysis options

Quick Analysis is a new feature in Excel 2013 that lets you do formatting and analysis very quickly, all from a single button next to a selected range.

Exam Objective: MOS Excel Core 5.1.4



The Quick Analysis button appears by the bottom-right corner of a selected range. Click it to see tabbed galleries of options for making quick work of the selection.

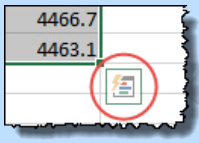
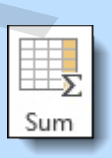
Click a tab in the Quick Analysis gallery to view the options available, then click the option you want to apply formatting or analyze the data.

- The *Formatting tab* gives access to the most common conditional formats.
- The *Charts tab* allows you to quickly apply recommended chart formats to the selected data.
- The *Totals tab* has options for quickly applying a totals row or column using different functions.
- The *Tables tab* allows you to apply a table format to the selection, or to create a PivotTable based upon the data.
- The *Sparklines tab* provides quick access to the Insert Sparklines buttons.

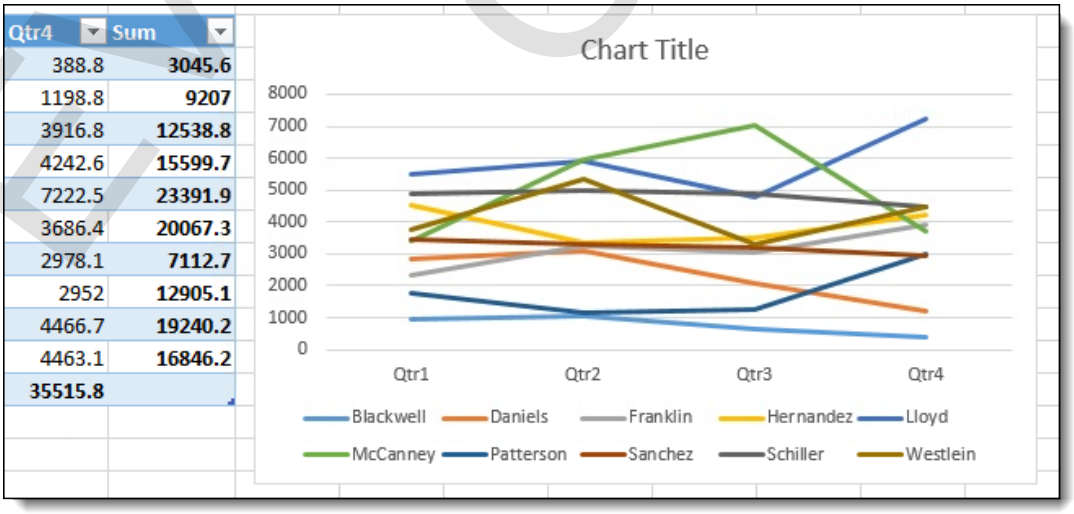
Exercise: Experimenting with Quick Analysis options

Exam Objective: MOS Excel Core 5.1.4

Do This	How & Why
1. Open Quick Analysis.	From the `Advanced Charts` folder. This worksheet has unformatted sales data for several sales reps, in columns by quarter.

Do This	How & Why
2. Select A4:E14.	Notice that a button, the Quick Analysis button, appears next to the lower-right corner of the selection. 
3. Click  .	To display the Quick Analysis options. You can use these to conveniently analyze and format the data in various ways.
4. Hover over various Formatting options.	These are actually conditional formatting options. As you hover over each, you see a preview of what your data will look like if you click the button.
5. Click the Totals tab, then click the first Sum option.	The data now has a totals row.
6. Add a totals column.	Click Totals, then click the second Sum option. It looks like this. 
7. Apply a table format to the data.	Select all the data including the totals, click the Table tab, then click **Table**. You can also create a PivotTable by using the other button on this tab.
8. Create a chart showing the reps' sales as lines, by quarter.	Do not include the totals. Click **Charts**, then **More Charts**; select the Line category, then the second option.
9. Save the workbook as `My Quick Analysis`, then close it.	

Data with Quick Analysis options



Qtr4	Sum
388.8	3045.6
1198.8	9207
3916.8	12538.8
4242.6	15599.7
7222.5	23391.9
3686.4	20067.3
2978.1	7112.7
2952	12905.1
4466.7	19240.2
4463.1	16846.2
35515.8	

Assessment: Quick Analysis

How do you access Quick Analysis features? Choose the one correct answer.

- The Data tab of the ribbon
- The Quick Analysis button on the Home tab
- **The Quick Analysis button for a selected range**

Which of the following is NOT a main Quick Analysis option? Choose the one correct answer.

- Conditional formatting
- **Number formatting**
- Tables
- Charts

Summary: Advanced charts

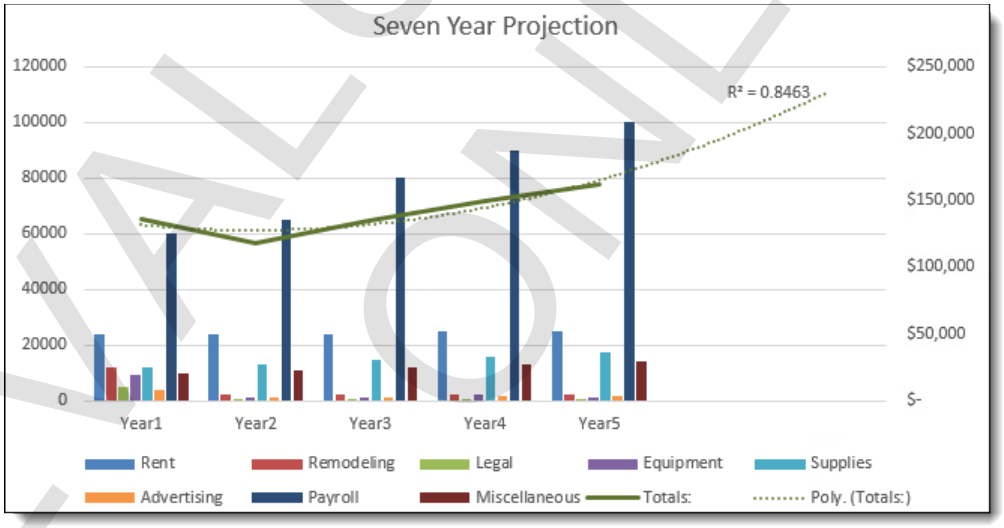
You should now know:

- About types of trendlines and how to insert them on charts; how to create combination charts and use a secondary axis; and how to create and then use chart templates to quickly format a chart
- About sparklines, how to insert them into cells to show snapshots of data, and how to format them
- How to access and use Quick Analysis features to apply conditional formatting and table formats, or to insert charts, totals, or sparklines

Synthesis: Advanced charts

In this synthesis exercise, you'll open a workbook with a sample, five-year café budget, create a chart of expenses, then make it a combination chart. Next, you'll add a trendline to project the future expenses. After that, you'll add sparklines for various types of data.

1. Open `Advanced Charts Synthesis` from the `Advanced Charts` data folder.
2. Use the Quick Analysis options to create a clustered column chart based on the expense data. Include all the line items and the totals row. Switch rows and columns to make the data series the expense types. Make the chart large enough to accommodate all the series.
3. Change the series data type for Totals to **Line**, and plot that series on a secondary axis.
4. Title the chart `Seven Year Projection`.
5. Add a linear trendline for the Totals series, projecting it two periods into the future.
6. Add the *R*-squared value for the trendline, and see if a different regression type has a better value.



7. Save the workbook as `My Advanced Charts Synthesis`.
8. Use a Quick Analysis option to insert line-type sparklines for the expenses in column G.
9. In cell G21, insert a win/loss sparkline for the profit/loss row.
10. Change styles and formatting for the sparklines any way you like.
11. Save and close the workbook.

Adding sparklines to the budget data.

Expense	Year1	Year2	Year3	Year4	Year5	
Rent	24000	24000	24000	25200	25200	
Remodeling	12000	2000	2000	2000	2000	
Legal	5000	500	500	500	500	
Equipment	9000	1000	1000	2000	1000	
Supplies	12000	13200	14500	16000	17600	
Advertising	4000	1000	1200	1400	1600	
Payroll	60000	65000	80000	90000	100000	
Miscellaneous	10000	11000	12000	13000	14000	
Totals:	$136,000	$117,700	$135,200	$150,100	$161,900	
	Year1	**Year2**	**Year3**	**Year4**	**Year5**	
Revenue	$ 95,000	$115,000	$145,000	$185,000	$235,000	
Profit/Loss	$ (41,000)	$ (2,700)	$ 9,800	$ 34,900	$ 73,100	

Chapter 8: Collaboration

You will learn:

- About permissions, and how to use them to restrict access to a workbook or to protect certain parts of it from being changed
- How to share workbooks, track changes to them, merge multiple versions into one, and mark a workbook as final

Learning time: 60 minutes

Module A: Permissions

Permissions

You will learn how to:

- Protect a workbook so only those users with a password can open it
- Lock cells in a workbook and then protect it to prevent certain cells and ranges from being edited
- Protect the structure of a workbook

About permissions

Permissions enable you to control access to a workbook. You set permissions by using the Info tab of Backstage view, and you can control permissions at various levels.

- Workbook access
- Worksheet data and elements
- Workbook structure

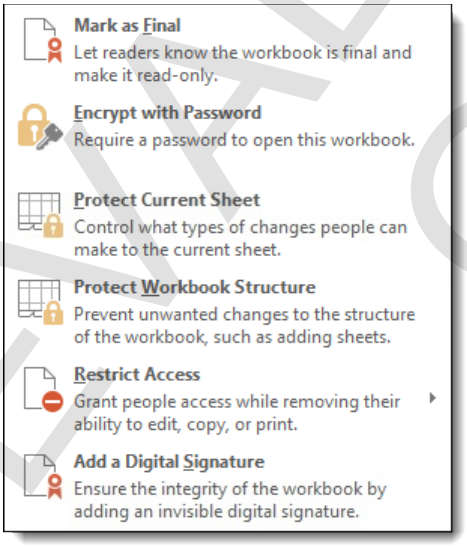
Controlling access to a workbook

If you want only certain users to be able to open a workbook, you can *encrypt* the workbook with a *password*.

Exam Objective: MOS Excel Expert 1.2.6

1. With the workbook open, click **File** to display Backstage view.
2. If necessary, click **Info** on the left.
3. Click **Protect Workbook**.

   You can protect a workbook in many ways, and at various levels.



4. Click **Encrypt with Password**.

   Excel prompts you to enter a password.
5. Type a password, then click **OK**.

   Excel displays a window asking you to reenter the password. Be sure you can remember the password, or you might be permanently locked out of the workbook.

6. Reenter the password, then click **OK**.
7. Save the workbook.

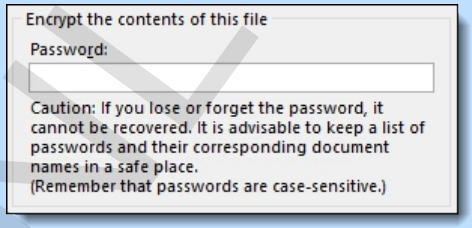
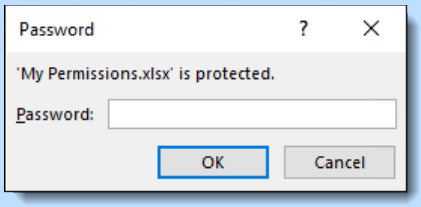
The next time anyone tries to the open the workbook, Excel prompts them for the password before opening.

Restricting access

If you want to control permissions at a user level, determining what a particular person may or may not do, you can use Microsoft's Information Rights Management (IRM) service. It's free, but you need to sign up for it using a Microsoft ID. After signing in, click **Protect Workbook > Restrict Access**, and then click a command.

Exercise: Encrypting an employee information workbook

Exam Objective: MOS Excel Expert 1.2.6

Do This	How & Why
1. Open `Permissions`.	From the `Collaboration` data folder. This workbook contains employee information, which could be private or sensitive. You will encrypt the workbook so that only users with the password can open it.
2. Display Backstage view.	Click **File**. The Info area should be active.
3. Click **Protect Workbook > Encrypt with Password**.	To display the Encrypt Document window, which warns you about the importance of being able to remember a password. 
4. Type a simple password, then click **OK**.	Excel prompts you to reenter the password.
5. Reenter the password, then click **OK**.	Notice that the Permissions heading is now red. This means that you've applied permissions to the workbook.
6. Save the workbook as `My Permissions`, then close it.	
7. Open `My Permissions`.	Excel prompts you to enter a password. 
8. Enter your password, and click **OK**.	The workbook opens.

Protection

Protection is different from encryption of an entire workbook. You protect certain parts of a workbook, particular cells and ranges, certain features, or its structure. Depending on what you're protecting, the process works differently. And you can choose whether you want to add a password to your protection.

Protecting worksheets

The **Protect Current Sheet** command gives you control over protection of various kinds of interaction with a worksheet.

Exam Objective: MOS Excel Expert 1.2.1, 1.2.2

1. If you want users to be able to edit some, but not all cells, you need to unlock some of the cells in the worksheet before you can apply protection.
   a) Select the cells you want to unlock.
      Note that, by default, all cells on a worksheet are locked. So you always need to unlock cells that you want to be able to edit, before protecting the worksheet.
   b) On the Home tab, in the Cells group, click **Format > Lock Cell**.
      To toggle the locking status of the selected cells from locked to unlocked.
2. In Backstage view, click **Protect Workbook > Protect Current Sheet**.
   To display the Protect Sheet window. Here, you can specify exactly which aspects of user interaction you want to prevent.
3. Click the options you want to allow.
   - Selection of locked or unlocked cells
   - Formatting of cells, columns, or rows
   - Insertion of rows, columns, or hyperlinks
   - Deletion of rows or columns
   - Sorting, AutoFiltering, and PivotTable use
   - Editing objects or scenarios
4. If you like, add a password for the protection.
5. Click **OK**.

Exercise: Unlocking cells and protecting a worksheet

`My Permissions` is open.

Exam Objective: MOS Excel Expert 1.2.1, 1.2.2

Do This	How & Why
1. Observe the data in each column.	Columns A:C contain text, while column D contains dates. That is information users should be able to edit. But column E contains formulas, which you don't want people to edit, and you don't want people to be able to change anything else here.
2. Unlock A9:D508.	
a) Select A9:D508.	Use the keyboard. Select A9, hold **Shift** and press the Right Arrow key three times, then hold both **Ctrl** and **Shift** and press the Down Arrow key.
b) On the Home tab, in the Cells group, click **Format > Lock Cell**.	To unlock those cells, so that when you protect the worksheet, users can edit only these cells and not any others. The Lock Cell command works as a toggle, turning locking on or off for the selection.
3. In Backstage view, click **Protect Workbook > Protect Current Sheet**.	To display the Protect Sheet window. By default, protection keeps users from doing anything other than selecting cells. But you can grant users other permissions here by clicking the various options. You can also add a password.
4. Click **OK**.	To protect the sheet with the default settings but without a password.
5. Attempt to change the Dept heading.	You get a message stating that the cell is protected.
6. Click **OK**.	
7. Change Katrice Abeita's department to `Retail Sales`.	Because you unlocked these cells before protecting the worksheet, you can change department values.
8. Attempt to edit a formula in the Years column.	Again, you can't, because these cells are protected.
9. Click **OK**.	
10. Save the workbook.	

Protecting workbook structure

The **Protect Current Sheet** command gives you control of interaction with elements of a particular worksheet. If you want to protect whether users can add, delete, and move worksheets, you use a different command, **Protect Workbook Structure**.

Exam Objective: MOS Excel Expert 1.2.4

1. In Backstage view, click **Protect Workbook > Protect Workbook Structure**.
   To display the Protect Structure and Windows window.
2. Click the options you want.
   - *Structure* protects against adding, deleting, or moving worksheets.
   - *Windows*, if available, protects against changes to the size or position of the workbook's windows.
3. If you want, add a password.
4. Click **OK**.

Exercise: Protecting against worksheet deletion in a workbook

`My Permissions` is open, and the first worksheet is currently protected.

Exam Objective: MOS Excel Expert 1.2.4

Do This	How & Why
1. Attempt to delete the first worksheet, but don't follow through.	
a) Right-click the Sheet1 tab, then click **Delete**.	Excel displays a warning but would let a user delete the worksheet.
b) Click **Cancel**.	If you accidentally clicked Delete, close the workbook without saving, then reopen it.
2. In Backstage view, click **Protect Workbook > Protect Workbook Structure**.	To display the Protect Structure and Windows window.
3. Click **OK**.	To protect the structure of the workbook from unwanted changes. You are still allowing users to resize and move the workbook's windows.
4. Right-click the Sheet1 tab.	The Delete command is not available, because the workbook's structure is protected.
5. Save and close the workbook.	

Assessment: Permissions

Which of the following are types of protection in Excel? Choose all that apply.

- Cell protection
- **Workbook encryption**
- **Sheet protection**
- **Workbook structure**
- Ribbon protection

When you protect a worksheet, you can control which cells are editable. True or false?

- **True**
- False

Protecting workbook structure always includes preventing changes to windows. True or false?

- True
- **False**

Module B: Shared workbooks

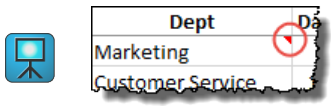
Excel has many features to help you when sharing workbooks with others. You can add comments to cells to explain what you're thinking. You can also track your changes to a workbook so that others can see what you've done.

You will learn how to:

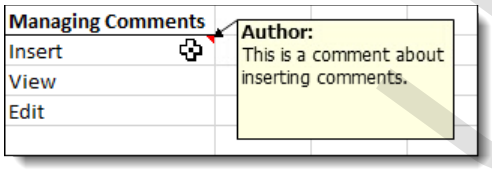
- Insert, view, edit, and delete comments in a workbook
- Restrict who can edit a workbook and what they can edit
- Turn on the track changes feature to see how a particular user has changed a workbook
- Merge shared workbooks

Comments

Comments allow you to elaborate on data that a cell contains or to make suggestions to other users of a workbook. When a cell has a comment attached, it displays a comment indicator.



When you point to a cell with a comment, the comment box appears, like this.



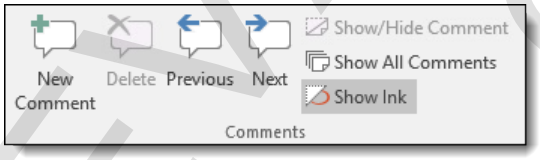
Notice that the comment contains the name of the user who wrote the comment.

You can cycle through all the comments in a workbook by clicking **Previous** and **Next** in the Comments group of the Review tab.

Inserting comments

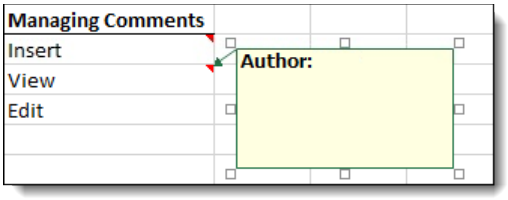
Use the Review tab to create new comments.

Comments group on the Review tab.



1. Select the cell to which you want to add a comment.
2. On the Review tab, in the Comments group, click **New Comment**.

   A comment box showing your name appears, ready for you to type.



3. Type the comment.

4. If you like, format the comment.
   You can use the text formatting tools on the Home tab.
5. Click outside the comment when you're finished.

The comment indicator appears in the upper-right corner of the cell, and you see the comment if you point to the cell.

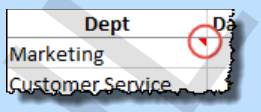
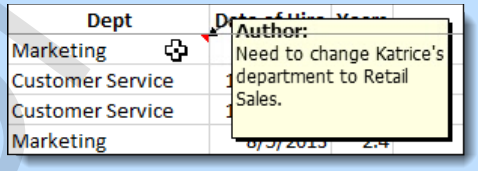
Editing comments

To edit a comment, select the cell containing the comment, then click **Edit Comment** (on the Review tab). You can also right-click the cell and click **Edit Comment**.

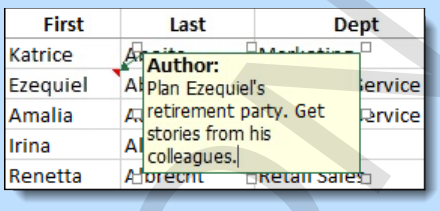
Deleting comments

To delete a comment, select the cell containing the comment, then click **Delete Comment** (on the Review tab). You can also right-click the cell and click **Delete Comment**.

Exercise: Managing comments in a workbook

Do This	How & Why
1. Open `Sharing`.	From the `Collaboration` data folder. This workbook contains employee information.
2. Observe the comment indicator on cell C9.	The small triangle in the upper-right corner of the cell means that this cell currently has a comment. 
3. Point to cell C9.	To view the note. 
4. Insert a note for Ezequiel Abels about planning a retirement party.	
a) Select cell A10.	
b) On the Review tab, click **New Comment**.	In the Comments group. A new comment appears, ready for you to edit.
c) Type `Plan Ezequiel's retirement party.`	
d) Click outside the note.	

Continued...

Do This	How & Why
5. Observe the comment indicator and the new note.	
6. Edit the note in cell A10 as shown. a) Select the cell. b) On the review tab, click **Edit Comment**. c) Add the text, then click outside the note.	
7. Select cell A10, and observe the Comments group.	On the Review tab. When a cell has a comment, the Delete button becomes available. Simply click it to delete a comment.
8. Save the workbook as `My Sharing`.	

Tracking changes

When you want to work on workbooks with other users, you can each record and highlight your changes by using the *Track Changes* feature. When you do, any changes you make are highlighted by a comment in the workbook. You can also control who can edit the workbook, and what they can edit.

Highlighting changes

You can highlight workbook changes in a number of ways.

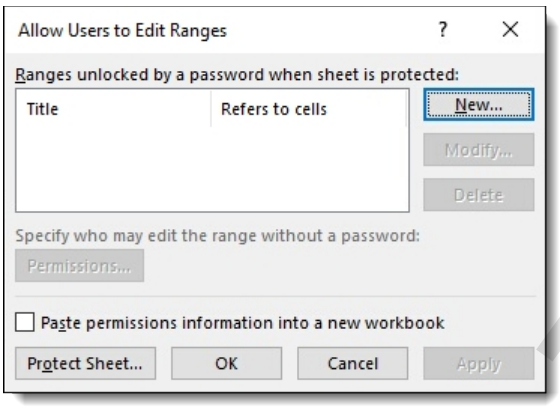
1. On the Review tab, in the Changes group, click **Track Changes > Highlight Changes**.
   To display the Highlight Changes window.
2. Click **Track changes while editing**.
   Note that this selection automatically makes the workbook a shared workbook. This is important if you later want to compare and merge versions of the workbook.
3. Set any options you want.
   - *When* determines the times when you want changes to be tracked.
   - *Who* determines whether you want all or only some users' changes to be tracked.
   - *Where* specifies a particular area on the worksheet for which you want to track changes.
   - *Highlight changes on screen* sets whether you can see changes at a glance.
4. Click **OK**.
   Excel prompts you to save the workbook.
5. Click **OK**.
   Notice that "[Shared]" now appears at the end of the file name (on the title bar).

Now, any changes you make are tracked by a note on the workbook.

Limiting editors

To restrict who may edit what ranges on a particular worksheet, click **Allow Users to Edit Ranges** (in the Changes Group of the Review tab). This displays a window allowing you fine control over who may edit protected ranges. You can also protect a worksheet directly from here, and create a new workbook with permissions information pasted into it.

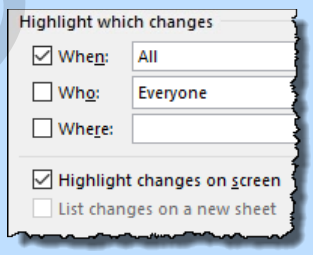
Exam Objective: MOS Excel Expert 1.2.1



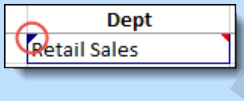
Exercise: Tracking workbook changes

`My Sharing` is open.

Exam Objective: MOS Excel Expert 1.2.1

Do This	How & Why
1. On the Review tab, in the Changes group, click **Track Changes > Highlight Changes**.	To display the Highlight Changes window.
2. Click **Track changes while editing**.	
3. Observe the options.	You can control when changes are tracked, whose changes are tracked, and where (a range) you want changes to be tracked. Also note that the option to highlight changes on screen is checked. 
4. Click **OK**.	Excel prompts you to save the workbook.
5. Click **OK**.	Notice that the title bar now shows "[Shared]" along with the file name.
6. Select C9 and observe its note.	This department name needs to be changed.

Continued...

Do This	How & Why
7. In C9, enter `Retail Sales`.	Notice that the cell now has a marker in the upper-left corner, indicating a change. 
8. Select C9, and observe the change comment.	Change comments include the user who made the change, the date and time the change was made, and a description of the change.
9. Delete the cell comment on cell C9.	Select the cell, then, in the Comments group, click **Delete**. Because you've made the department name change, you don't need the comment anymore.
10. Save the workbook as `My Sharing Edited`.	To create another copy of the shared workbook. There are now two copies that are slightly different. If other users work on shared workbooks, they should all save their changes in copies with different names but in the same folder.

Merging shared workbooks

Use the **Compare and Merge Workbooks** command to merge two or more versions of the same shared workbook.

1. To use the **Compare and Merge Workbooks** command, you need to add it to the Quick Access toolbar.
   a) Click the Customize Quick Access Toolbar arrow, then click **More Commands**.
   b) In the Commands Not in the Ribbon category, select **Compare and Merge Workbooks**, then click **Add**.
   c) Click **OK**.
2. Open the version of the shared workbook *into which* you want to merge changes from another.
3. Click **Compare and Merge Workbooks**.
   When prompted to save the workbook, do so. The Select Files to Merge Into Current Workbook window appears.
4. Select the version(s) of the workbook from which you want to merge changes.
   To select multiple files, hold down **Ctrl** or **Shift**.
5. Click **Open**.
   The changes in the selected workbook now appear in the open one.

Marking a workbook as final

When you are through making changes to a workbook, and want other users to know that they should not change it, you can mark it as the final version.

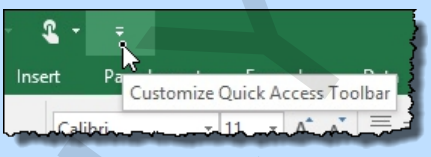
1. If the workbook is shared (that is, if you are tracking changes), turn off change tracking. You cannot mark a shared workbook as final.
2. In Backstage view, on the Info screen, click **Protect Workbook > Mark as Final**.
   Excel prompts you that the workbook will be marked as the final version and then saved.

3. Click **OK**.

A workbook that is marked as final is not, technically, "protected." A user could simply remove the final marking and then edit it. But it does create at least one hurdle to unwanted changes.

Exercise: Merging two versions of the employee workbook

`My Sharing Edited` is open. It is very important that the last exercise, **Tracking workbook changes**, was performed precisely in sequence for this exercise to work.

Do This	How & Why
1. Close My Sharing Edited.	You'll open the earlier version of this shared workbook and then merge changes from the edited version into that one. If you're prompted to save changes when closing, do so.
2. Open `My Sharing`.	This is the earlier version of the shared workbook. Notice that the department for Katrice Abels is still Marketing, and the note on cell C9 is still there, suggesting a change.
3. Add the Compare and Merge Workbooks button to the Quick Access toolbar. a) Click the Customize Quick Access Toolbar arrow, then click **More Commands**. b) In the Commands Not in the Ribbon category, select **Compare and Merge Workbooks**, then click **Add**. c) Click **OK**.	
4. Click the **Compare and Merge Workbooks** button.	Excel prompts you to save the workbook.
5. Click **OK**.	
6. Select the **My Sharing Edited** workbook, then click **OK**.	
7. Observe Katrice Abels's department.	The changes from the edited workbook are merged into the current one. The department is there, and the note is gone.
8. Save the workbook.	
9. In Backstage view, observe the Protect Workbook options.	Most are not available in a shared workbook. We want to mark this as the final version of the workbook, but we'll need to turn off the tracking of changes first.

Continued...

Do This	How & Why
10. Turn off change tracking.	On the Review tab, click Track **Changes > Highlight Changes**; clear **Track changes while editing**, then click **OK**. Excel displays a warning that this will make the workbook no longer shared.
11. Click **OK**.	The word "[Shared]" no longer appears on the title bar.
12. In Backstage view, click **Protect Workbook > Mark as Final**.	Excel tells you the workbook will be marked as final and saved.
13. Click **OK**.	Excel explains what being marked as final means.
14. Click **OK**, then observe the Marked as Final icon.	On the Status bar. There is also a message below the menus, and most of the commands are unavailable.
15. Close the workbook.	

Assessment: Shared workbooks

You use the Insert tab to insert and manage comments in a workbook. True or false?

- True
- **False**

You can highlight tracked changes only in shared workbooks. True or false?

- **True**
- False

Which of the following statements is true? Choose the one correct answer.

- You can merge any two workbooks.
- **You can merge only shared versions of the same workbook.**
- You cannot merge more than two versions of a shared workbook at a time.

You can mark a shared workbook as final. True or false?

- True
- **False**

Summary: Collaboration

You should now know:

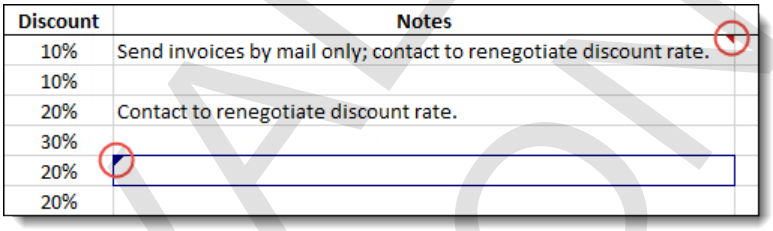
- About permissions, and how to use them to encrypt a workbook with a password, control access to data and various workbook features, and protect a workbook's structure or windows from being changed
- How to insert, modify, and delete comments; about shared workbooks; how to use Track Changes to mark changes by multiple users; how to compare and merge multiple versions of the same shared workbook; and how to mark a workbook as final

Synthesis: Collaboration

In this synthesis exercise, you'll set permissions for a customer information workbook, insert a comment, and then share and track changes on the workbook.

1. Open `Collaboration Synthesis` from the `Collaboration` data folder.
2. Save the workbook as `My Collaboration Synthesis`, then encrypt the workbook with a password.
3. Protect the structure of the workbook from being changed.
4. Insert a comment on E9 to contact the customer by the end of the week.
5. Make the workbook a shared workbook.
6. Delete the text in E13, then observe the change marker on the cell.
7. Save and then close the workbook.

Viewing note and change markers



Discount	Notes
10%	Send invoices by mail only; contact to renegotiate discount rate.
10%	
20%	Contact to renegotiate discount rate.
30%	
20%	
20%	

Alphabetical Index