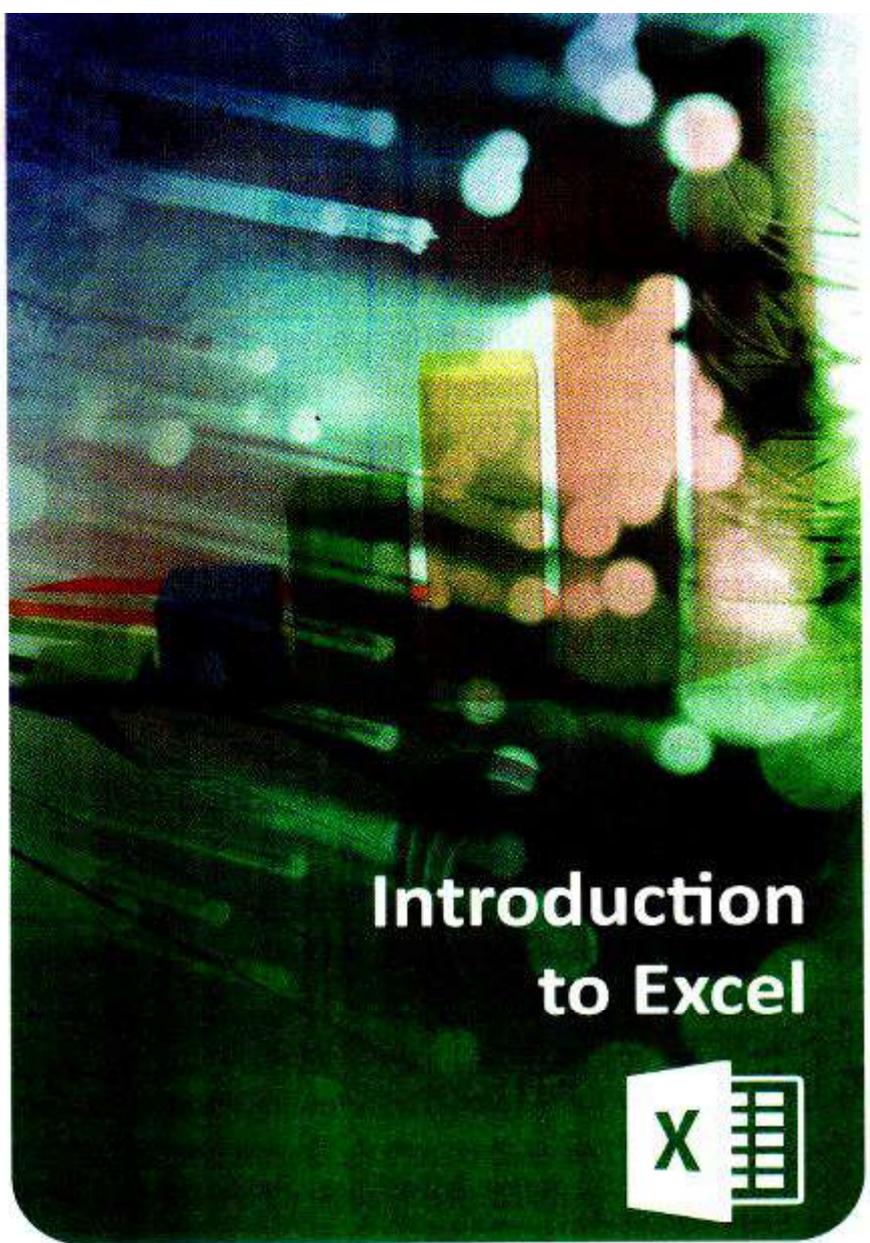# Introduction to Excel

Excel is a powerful spreadsheet application that is perfect for maintaining long lists of data, budgets, sales figures and other data.

Excel is, in its most basic form, a very fancy calculator. The information given in this book is meant to give a working knowledge of how to use Excel. There are usually several different ways to perform the same function in Excel, this book will give the most commonly used way. If you need more information on how to use Excel, accessing the HELP menu from within the program can also be useful!

In this section of the book, you'll learn how to create tables, move information around with ease, and use formulas that can calculate the totals of everything from a monthly budget to a loan payment. Excel 2013 has been redesigned and several common functions are now much easier to use.

About Excel

Much of the appeal of Excel is due to the fact that it's so versatile. Excel's forte, of course, is performing numerical calculations, but Excel is also very useful for non-numeric applications. Here are just a few of the uses for Excel:

- **Number crunching:** Create budgets, tabulate expenses, analyze survey results, and perform just about any type of financial analysis you can think of.

- **Creating charts:** Create a wide variety of highly customizable charts.

- **Organizing lists:** Use the row-and-column layout to store lists efficiently.

- **Text manipulation:** Clean up and standardize text-based data.

- **Accessing other data:** Import data from a wide variety of sources.

- **Creating graphical dashboards:** Summarize a large amount of business information in a concise format.

- **Creating graphics and diagrams:** Use Shapes and SmartArt to create professional looking diagrams.

- **Automating complex tasks:** Perform a tedious task with a single mouse click with Excel's macro capabilities.

Understanding Workbooks and Worksheets

The work you do in Excel is performed in a workbook file. You can have as many workbooks open as you need, and each one appears in its own window. By default, Excel workbooks use an .xlsx file extension.

> **Note**
>
> In previous versions of Excel, users could work with multiple workbooks in a single window. That is no longer an option in Excel 2013. Every workbook that you open has its own window.

Each workbook contains one or more worksheets, and each worksheet is made up of individual cells. Each cell can contain a value, a formula, or text. A worksheet also has an invisible draw layer, which holds charts, images, and diagrams. Each worksheet in a workbook is accessible by clicking the tab at the bottom of the workbook window. In addition, a workbook can store chart sheets; a chart sheet displays a single chart and is also accessible by clicking a tab.

Below image shows you the more important bits and pieces of Excel. As you look at the figure, refer to below Table for a brief explanation of the items.
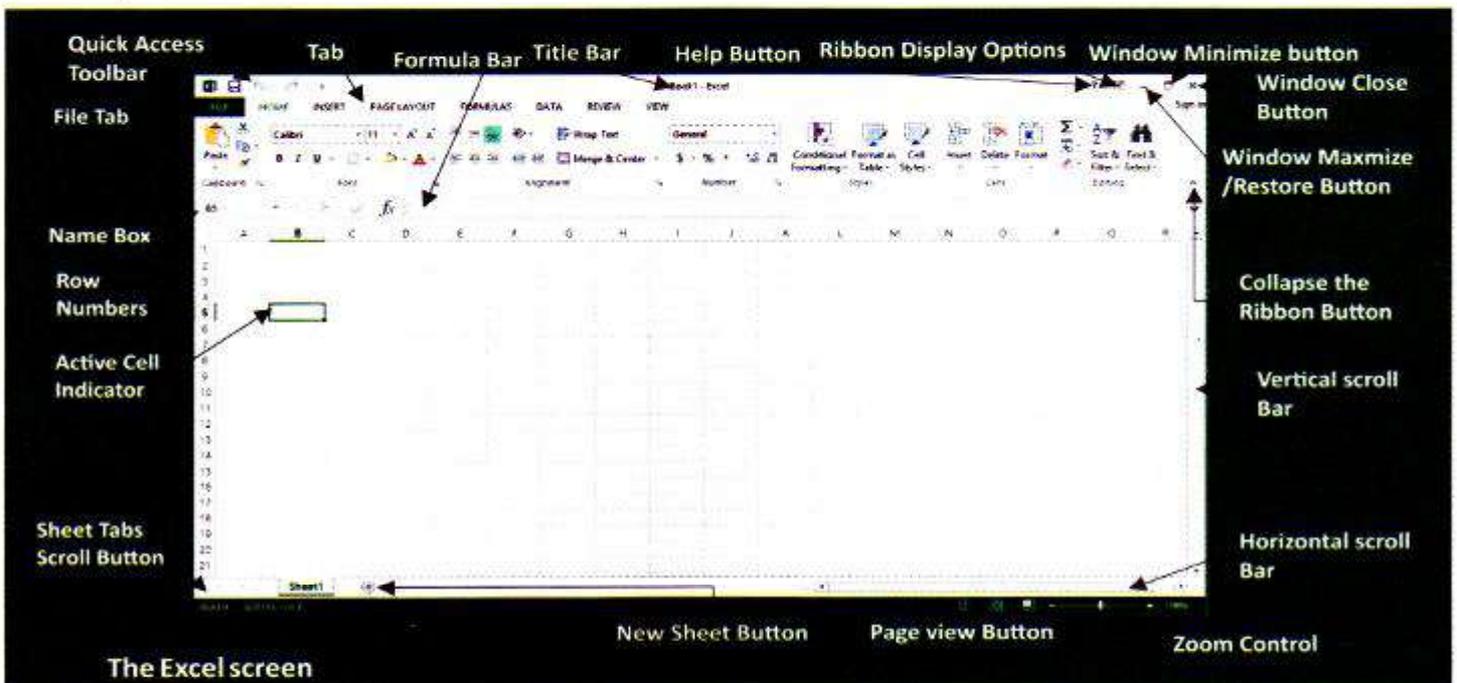

The Excel screen

Table Parts of the Excel Screen That You Need to Know

| Name	Description
Active cell indicator	This dark outline indicates the currently active cell (one of the 17,179,869,184 cells on each worksheet).
Collapse the Ribbon	Click this button to temporarily hide the Ribbon. Click it again to make the Ribbon button remain visible.
Column letters	Letters range from A to XFD — one for each of the 16,384 columns in the worksheet. You can click a column heading to select an entire column of cells or drag a column border to change its width.
File tab	Click this button to open Backstage view, which contains many options for working with your document (including printing) and setting Excel options.
Formula bar	When you enter information or formulas into a cell, it appears in this bar.
Help button	Click this button to display the Excel Help system window.
Horizontal scroll bar	Use this tool to scroll the sheet horizontally.
Macro recorder indicator	Click to start recording a VBA macro. The icon changes while your actions are being recorded. Click again to stop recording.
Name box	This box displays the active cell address or the name of the selected cell, range, or object.
New sheet button	Add a new worksheet by clicking the New sheet button (which is displayed after the last sheet tab).
Page View buttons	Click these buttons to change the way the worksheet is displayed.
Quick Access Toolbar	This customizable toolbar holds commonly used commands. The Quick Access Toolbar is always visible, regardless of which tab is selected.
Ribbon	This is the main location for Excel commands. Clicking an item in the tab list changes the Ribbon that is displayed.
Ribbon Display	A drop-down control that offers three options related to displaying the Ribbon. Options
Row numbers	Numbers range from 1 to 1,048,576 — one for each row in the worksheet. You can click a row number to select an entire row of cells.
Sheet tabs	Each of these notebook-like tabs represents a different sheet in the workbook. A workbook can have any number of sheets, and each sheet has its name displayed in a sheet tab.
Sheet tab scroll	Use these buttons to scroll the sheet tabs to display tabs that aren't visible. You can also right-buttons click to get a list of sheets.
Status bar	This bar displays various messages, as well as the status of the Num Lock, Caps Lock, and Scroll Lock keys on your keyboard. It also shows summary information about the range of cells selected. Right-click the status bar to change the information displayed.
Tabs	Click these tabs to display different Ribbon commands, similar to a menu.
Title bar	This displays the name of the program and the name of the current workbook. It also by default holds the Quick Access Toolbar (on the left) and some control buttons that you can use to modify the window (on the right).

Vertical scroll bar	Use this to scroll the sheet vertically.
Window Close button	Click this button to close the active workbook window.
Window Maximize/ button	Click this button to increase the workbook window's size to fill the entire screen. If Restore the window is already maximized, clicking this button returns Excel's window to its prior size so that it no longer fills the entire screen.
Window Minimize	Click this button to minimize the workbook window. The window displays as an icon button in the Windows taskbar.
Zoom control	Use this to zoom your worksheet in and out.

A Worksheet

Every worksheet consists of rows (numbered 1 through 1,048,576) and columns (labeled A through XFD). Column labeling works like this: After column Z comes column AA, which is followed by AB, AC, and so on. After column AZ comes BA, BB, and so on. After column ZZ is AAA, AAB, and so on.

The intersection of a row and a column is a single cell, and each cell has a unique address made up of its column letter and row number. For example, the address of the upper-left cell is A1. The address of the cell at the lower right of a worksheet is XFD1048576.

At any given time, one cell is the active cell. The active cell is the cell that accepts keyboard input, and its contents can be edited. You can identify the active cell by its darker border. Its address appears in the Name box. Depending on the technique that you use to navigate through a workbook, you may or may not change the active cell when you navigate.

The active cell is the cell with the dark border — in this case, cell **C8**
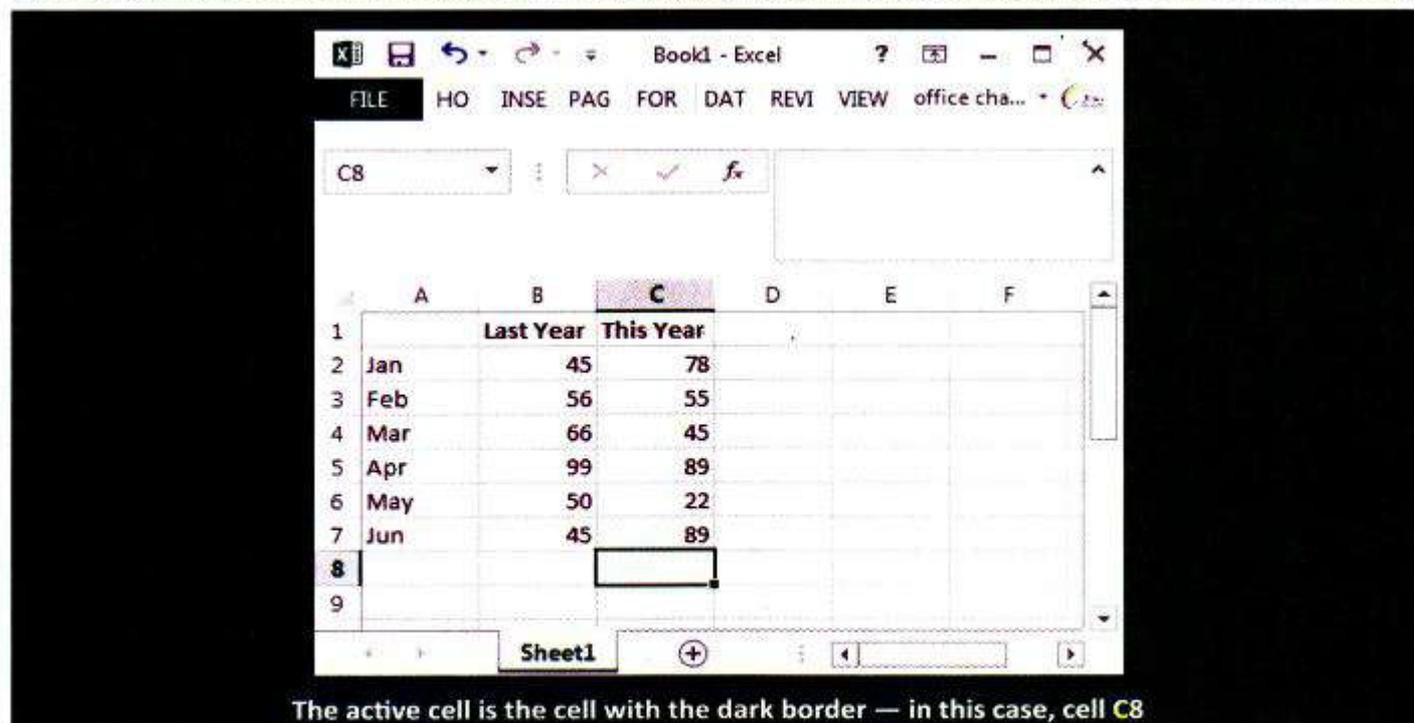
Notice that the row and column headings of the active cell appear in a different color to make it easier to identify the row and column of the active cell.

Navigating with your keyboard

You can use the standard navigational keys on your keyboard to move around a worksheet. These keys work just as you'd expect: The down arrow moves the active cell down one row, the right arrow moves it one column to the right, and so on. Page Up and Page Down move the active cell up or down one full window.

The Num Lock key on your keyboard controls how the keys on the numeric keypad behave. When Num Lock is on, the keys on your numeric keypad generate numbers. Many keyboards have a separate set of navigation (arrow) keys located to the left of the numeric keypad. The state of the Num Lock key doesn't affect these keys.

Below table summarizes all the worksheet movement keys available in Excel.

Table Excel Worksheet Movement Keys

Key	Action
Up Arrow	Moves the active cell up one row
Down Arrow	Moves the active cell down one row
Left Arrow or Shift+Tab	Moves the active cell one column to the left
Right Arrow or Tab	Moves the active cell one column to the right
Page Up	Moves the active cell up one screen
Page Down	Moves the active cell down one screen
Alt+Page Down	Moves the active cell right one screen
Alt+Page Up	Moves the active cell left one screen
Ctrl+Backspace	Scrolls the screen so that the active cell is visible
Ctrl+End	Moves the active cell to the intersection of the row with the lowermost entry (highest row number) on the worksheet and the column with the rightmost entry (highest column letter) on the worksheet
Up Arrow	Scrolls the screen up one row (active cell does not change)
Down Arrow	Scrolls the screen down one row (active cell does not change)
Left Arrow	Scrolls the screen left one column (active cell does not change)
Right Arrow	Scrolls the screen right one column (active cell does not change)

* With Scroll Lock on

Navigating with your mouse

To change the active cell by using the mouse, just click another cell, and it becomes the active cell. If the cell that you want to activate isn't visible in the workbook window, you can use the scrollbars to scroll the window in any direction. To scroll one cell, click either of the arrows on the scroll bar. To scroll by a complete screen, click either side of the scrollbar's scroll box. You can also drag the scroll box for faster scrolling.

Press Ctrl while you use the mouse wheel to zoom the worksheet. If you prefer to use the mouse wheel to zoom the worksheet without pressing Ctrl, choose File ⇨ Options and select the Advanced section. Under Editing options, click the Zoom on roll with IntelliMouse check box to check it.

Using the scroll bars or scrolling with your mouse doesn't change the active cell. It simply scrolls the worksheet. To change the active cell, you must click a new cell after scrolling.

Excel's Ribbon Tabs

The Ribbon can either be hidden or visible (it's your choice). To toggle the Ribbon's visibility, press Ctrl+F1 (or double-click a tab at the top). If the Ribbon is hidden, it temporarily appears when you click a tab and hides itself when you click in the worksheet. The title bar has a control named Ribbon Display Options (next to the Help button). Click the control and choose one of three Ribbon options: Auto-hide Ribbon, Show Tabs, or Show Tabs and Commands.

Ribbon tabs

The commands available in the Ribbon vary, depending upon which tab is selected. The Ribbon is arranged into groups of related commands. Here's a quick overview of Excel's tabs:

- **Home:** This tab contains the basic Clipboard commands, formatting commands, style commands, commands to insert and delete rows or columns, plus an assortment of worksheet editing commands.

- **Insert:** Select this tab when you need to insert something in a worksheet — a table, a diagram, a chart, a symbol, and so on.

- **Page Layout:** This tab contains commands that affect the overall appearance of your worksheet, including some settings that deal with printing.

- **Formulas:** Use this tab to insert a formula, name a cell or a range, access the formula auditing tools, or control how Excel performs calculations.

- **Data:** Excel's data-related commands are on this tab, including data validation commands.

- **Review:** This tab contains tools to check spelling, translate words, add comments, or protect sheets.

- **View:** The View tab contains commands that control various aspects of how a sheet is viewed. Some commands on this tab are also available in the status bar.

- **Developer:** This tab isn't visible by default. It contains commands that are useful for programmers. To display the Developer tab, choose File ➪ Options and then select Customize Ribbon. In the Customize the Ribbon section on the right, make sure Main Tabs is selected in the drop-down control, and place a check mark next to Developer.

- **Add-Ins:** This tab is visible only if you loaded an older workbook or add-in that customizes the menu or toolbars. Because menus and toolbars are no longer available in Excel 2013, these user interface customizations appear on the Add-Ins tab.

The preceding list contains the standard Ribbon tabs. Excel may display additional Ribbon tabs, resulting from add-ins or macros.

The appearance of the commands on the Ribbon varies, depending on the width of the Excel window. When the Excel window is too narrow to display everything, the commands adapt; some of them might seem to be missing, but the commands are still available. Below image shows the Home tab of the Ribbon with all controls fully visible. When you make the Excel window narrower or reduce your screen resolution, some groups display as a single button; however, if you click the button, all the group commands are available to you.
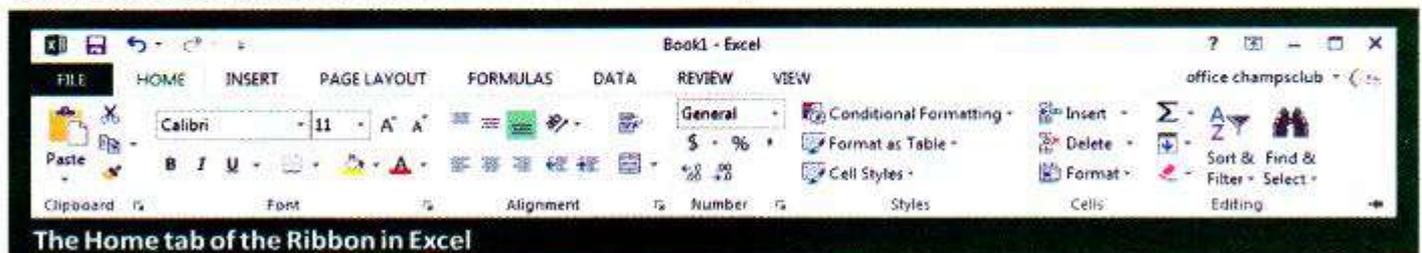
The Home tab of the Ribbon in Excel

Contextual tabs

Excel also includes contextual tabs. Whenever an object (such as a chart, a table, or a SmartArt diagram) is selected, specific tools for working with that object are made available in the Ribbon.

Below image shows the contextual tabs that appear when a chart is selected. In this case, it has two contextual tabs: Chart Tools ➪ Design and Chart Tools ➪ Format. When contextual tabs appear, you can, of course, continue to use all the other tabs.

Contextual tabs contain tools for working with that object

Creating Your First Excel Workbook

In this example, you create a simple monthly sales projection table along with a chart.

Getting started on your worksheet

To create a new, blank workbook when Excel is already open, press Ctrl+N (the shortcut key for File ⇨ New ⇨ Blank Workbook).

The sales projection will consist of two columns of information. Column A will contain the month names, and column B will store the projected sales numbers. You start by entering some descriptive titles into the worksheet. Here's how to begin:

1. **Move the cell pointer to cell A1 (the upper-left cell in the worksheet) if needed by using the navigation (arrow) keys.** The Name box displays the cell's address.

2. **Type Month into cell A1 and press Enter.** Depending on your setup, either Excel moves the cell pointer to a different cell or the pointer remains in cell A1.

3. **Move the cell pointer to B1, type Projected Sales, and press Enter.** The text extends beyond the cell width, but don't worry about that for now.

Filling in the month names

In this step, you enter the month names in column A.

1. **Move the cell pointer to A2 and type Jan (an abbreviation for January).** At this point, you can enter the other month name abbreviations manually or you can let Excel do some of the work by taking advantage of the AutoFill feature.

2. **Make sure that cell A2 is selected.** Notice that the active cell is displayed with a heavy outline. At the bottom-right corner of the outline, you'll see a small square known as the fi ll handle. Move your mouse pointer over the fill handle, click, and drag down until you've highlighted from cell A2 down to cell A13.

3. **Release the mouse button, and Excel automatically fills in the month names.**

	A	B	C	D	E	F
1	Month	Projected Sales				
2	Jan					
3	Feb					
4	Mar					
5	Apr					
6	May					
7	Jun					
8	Jul					
9	Aug					
10	Sep					
11	Oct					
12	Nov					
13	Dec					
14						

Sheet2   Sheet3   ⊕

Worksheet, after entering the column headings and month names

Entering the sales data

Next, you provide the sales projection numbers in column B. Assume that January's sales are projected to be 50,000, and that sales will increase by 3.5 percent in each subsequent month.

1. **Move the cell pointer to B2 and type 50000, the projected sales for January.**

2. **To enter a formula to calculate the projected sales for February, move to cell·B3 and type the following:** =B2*103.5%. When you press Enter, the cell displays 51750. The formula returns the contents of cell B2, multiplied by 103.5%. In other words, February sales are projected to be 103.5% of the January sales — a 3.5% increase.

3. **The projected sales for subsequent months use a similar formula, but rather than retype the formula for each cell in column B, take advantage of the Autofill feature.** Make sure that cell B3 is selected. Click the cell's fill handle, drag down to cell B13, and release the mouse button.

	A	B	C	D	E	F
1	Month	Projected Sales				
2	Jan	50000				
3	Feb	51750				
4	Mar	53561.25				
5	Apr	55435.89				
6	May	57376.15				
7	Jun	59384.32				
8	Jul	61462.77				
9	Aug	63613.96				
10	Sep	65840.45				
11	Oct	68144.87				
12	Nov	70529.94				
13	Dec	72998.49				
14						
15						

Sheet2   Sheet3   ⊕

Worksheet after creating the formulas

At this point, your worksheet should resemble the one shown in Keep in mind that, except for cell B2, the values in column B are calculated with formulas. To demonstrate, try changing the projected sales value for the initial month, January (in cell B2). You'll find that the formulas recalculate and return different values. These formulas all depend on the initial value in cell B2, though.

Formatting the numbers

The values in the worksheet are difficult to read because they aren't formatted. In this step, you apply a number format to make the numbers easier to read and more consistent in appearance:

Excel Worksheet and Workbooks

1. **Select the numbers by dragging from cell B2 down to cell B13.** Don't drag the fill handle this time, though, because you're selecting cells, not filling a range.

2. **On the Ribbon, click Home. In the Number group, click the drop-down Number Format control (it initially displays General), and select Currency from the list.** The numbers now display with a currency symbol and two decimal places. Much better, but the decimal places aren't necessary for this type of projection.

3. **Make sure the range B2:B13 is selected, choose Home ➪ Number, and click the Decrease Decimal button.** One of the decimal places disappears. Click that button a second time, and the values are displayed with no decimal places.

Making your worksheet look a bit fancier

At this point, you have a functional worksheet, but it could use some help in the appearance department. Converting this range to an "official" (and attractive) Excel table is a snap:

1. **Activate any cell within the range A1:B13.**

2. **Choose Insert ➪ Tables ➪ Table.** Excel displays the Create Table dialog box to make sure that it guessed the range properly:

3. **Click OK to close the Create Table dialog box.** Excel applies its default table formatting and displays its Table Tools ➪ Design contextual tab.

If you don't like the default table style, just select another one from the Table Tools ➪ Design ➪ Table Styles group. Notice that you can get a preview of different table styles by moving your mouse over the Ribbon. When you find one you like, click it, and the style will be applied to your table.

	A	B	C	D
1	**Month** ▼	**Projected Sales** ▼		
2	Jan	50000		
3	Feb	51750		
4	Mar	53561.25		
5	Apr	55435.89375		
6	May	57376.15003		
7	Jun	59384.31528		
8	Jul	61462.76632		
9	Aug	63613.96314		
10	Sep	65840.45185		
11	Oct	68144.86766		
12	Nov	70529.93803		
13	Dec	72998.48586		
14				
15				
16				

Sheet2   Sheet3   ⊕

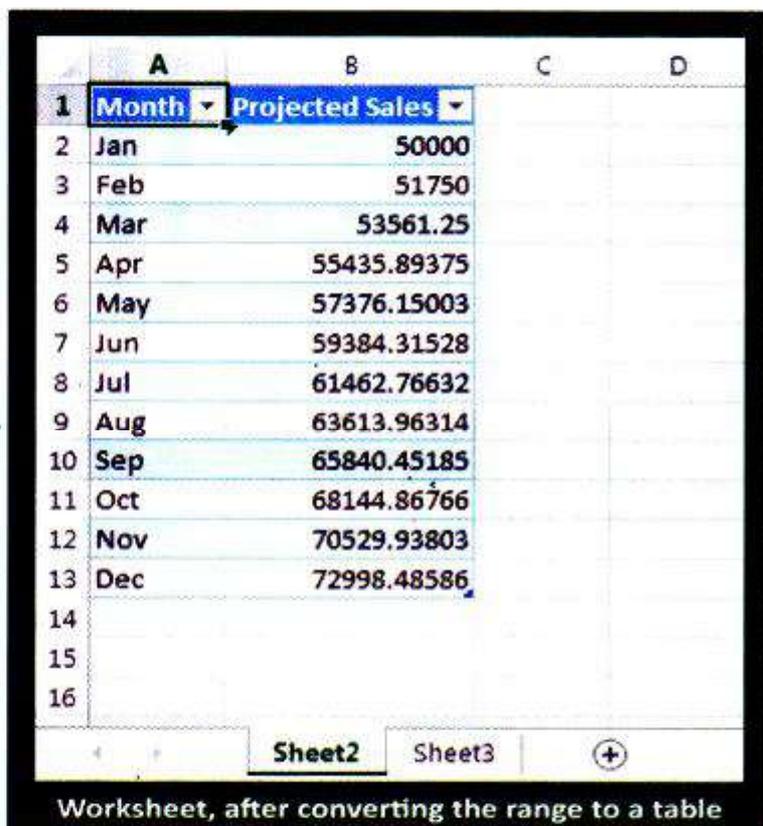**Worksheet, after converting the range to a table**

Summing the values

The worksheet displays the monthly projected sales, but what about the total projected sales for the year? Because this range is a table, it's simple:

1. **Activate any cell in the table.**

2. **Choose Table Tools ➪ Design ➪ Table Style Options ➪ Total Row.** Excel automatically adds a new row to the bottom of your table, including a formula that calculates the total of the Projected Sales column.

3. **If you'd prefer to see a different summary formula (for example, average), click cell B14 and choose a different summary formula from the drop-down list.**

Creating a chart

How about a chart that shows the projected sales for each month?

1. **Activate any cell in the table.**

2. **Choose Insert ➪ Charts ➪ Recommended Charts.** Excel displays some suggested chart type options.

3. **In the Insert Chart dialog box, click the second recommended chart (a column chart), and click OK.** Excel inserts the chart in the center of the window. To move the chart to another location, click its border and drag it.
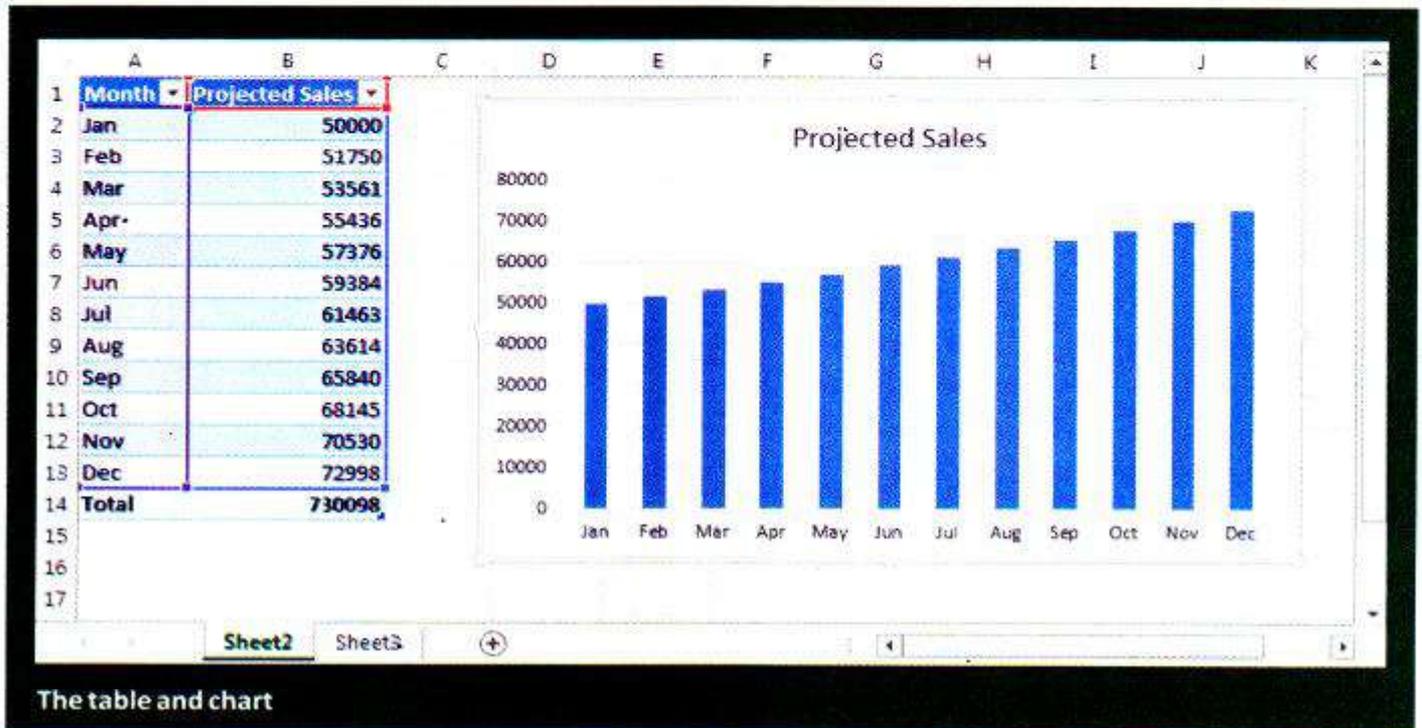
4. **Click the chart and choose a style using the Chart Tools ⇨ Design ⇨ Chart Styles options.**

Below image shows the worksheet with a column chart. Your chart may look different, depending on the chart style you selected.
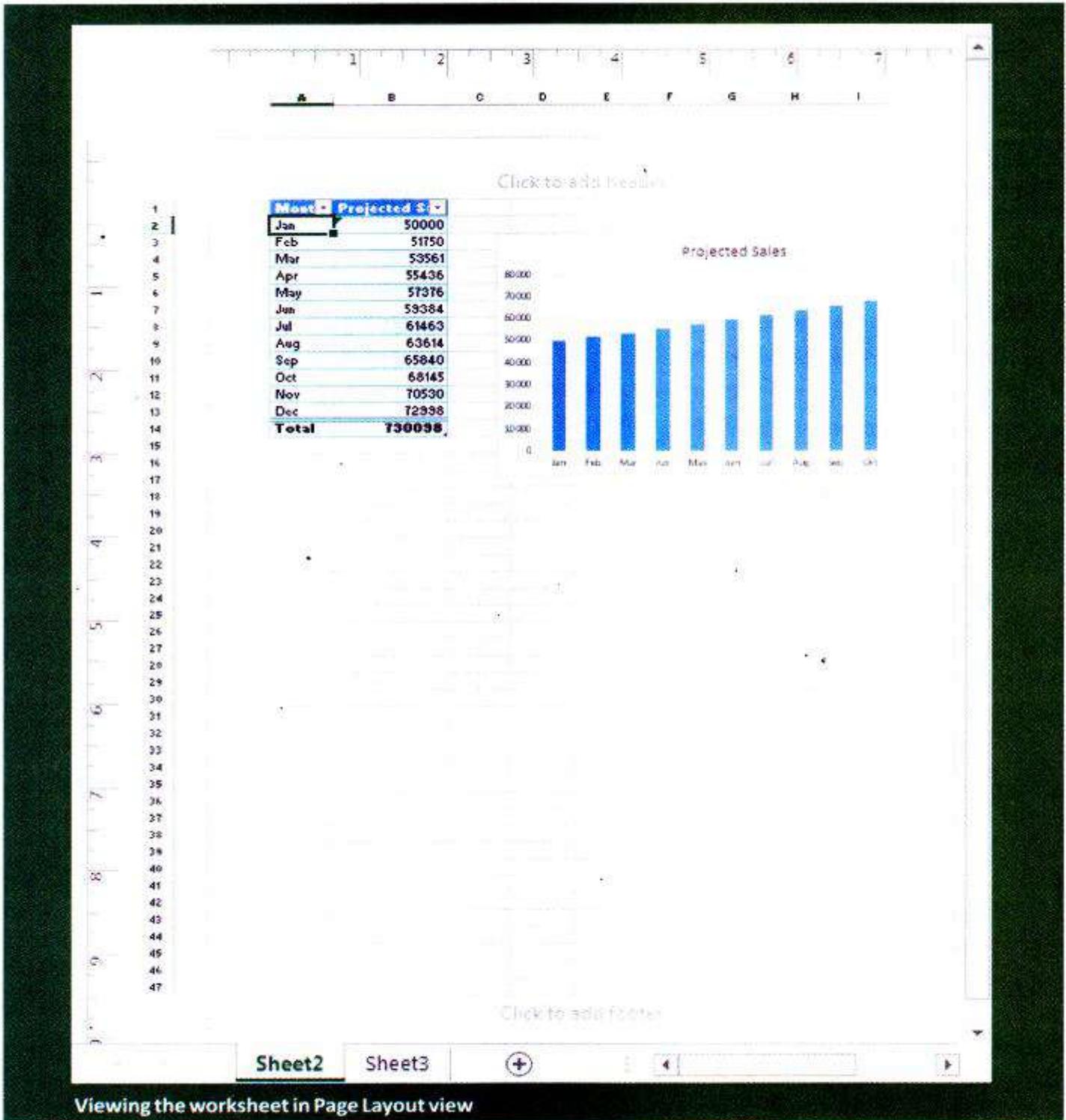

The table and chart

Printing your worksheet

Printing your worksheet is very easy (assuming that you have a printer attached and that it works properly).

1. **Make sure that the chart isn't selected.** If a chart is selected, the chart will print on a page by itself. To deselect the chart, just press Esc or click any cell.

2. **To make use of Excel's handy Page Layout view, click the Page Layout button on the right side of the status bar.** Excel displays the worksheet page-by-page so that you can easily see how your printed output will look. Below image shows the worksheet zoomed out to show a complete page. In Page Layout view, you can tell immediately whether the chart is too wide to fit on one page. If the chart is too wide, drag a corner of the chart to resize it or just move the chart below the table of numbers.

Month	Projected S
Jan	50000
Feb	51750
Mar	53561
Apr	55436
May	57376
Jun	59384
Jul	61463
Aug	63614
Sep	65840
Oct	68145
Nov	70530
Dec	72998
Total	730098

Viewing the worksheet in Page Layout view

3. **When you're ready to print, choose File ➪ Print.** At this point, you can change some print settings. For example, you can choose to print in landscape rather than portrait orientation. Make the change, and you see the result in the preview window.

4. **When you're satisfied, click the Print button in the upper-left corner.** The page is printed, and you're returned to your workbook.

Saving your workbook

Until now, everything that you've done has occurred in your computer's memory. If the power should fail, all may be lost — unless Excel's AutoRecover feature happened to kick in. It's time to save your work to a file on your hard drive.

1. **Click the Save button on the Quick Access Toolbar.** Because the workbook hasn't been saved yet and still has its default name, Excel responds with a Backstage screen that lets you choose the location for the workbook file. The Backstage screen lets you save the file to an online location or to your local computer.

2. **Select Computer, and then click Browse.** Excel displays the Save As dialog box.

3. **In the File name text box, enter a name (such as Monthly Sales Projection), and then click Save or press Enter.** Excel saves the workbook as a file. The workbook remains open so that you can work with it some more.

Note

By default, Excel saves a backup copy of your work automatically every ten minutes. To adjust the AutoRecover setting (or turn it off), choose File ⇨ Options, click the Save tab, and check or clear Save AutoRecover information every X minutes as needed. Click OK to apply your change. However, you should never rely on Excel's AutoRecover feature. Saving your work frequently is a good idea.

- Move around a worksheet with the mouse or keyboard.

- Work with the Ribbon.

- Create and save an example workbook file.

Data Types

An Excel workbook file can hold any number of worksheets, and each worksheet is made up of more than 17 billion cells. A cell can hold any of three basic types of data:

- A numeric value
- Text
- A formula

A worksheet can also hold charts, diagrams, pictures, buttons, and other objects. These objects aren't contained in cells. Instead, they reside on the worksheet's draw layer, which is an invisible layer on top of each worksheet.

Numeric values

Numeric values represent a quantity of some type: sales amounts, number of employees, atomic weights, test scores, and so on. Values also can be dates (such as Jun-27-2015) or times (such as 10:15 a.m.).

Numeric Limitations

Excel's numbers are precise up to 15 digits. For example, if you enter a large value, such as 123,456,789,123,456,789 (18 digits), Excel actually stores it with only 15 digits of precision. This 18-digit number displays as 123,456,789,123,456,000. This precision may seem quite limiting, but in practice, it rarely causes any problems.

One situation in which the 15-digit accuracy can cause a problem is when entering credit card numbers. Most credit card numbers are 16 digits, but Excel can handle only 15 digits, so it substitutes a zero for the last credit card digit. Even worse, you may not even realize that Excel made the card number invalid. The solution? Enter the credit card numbers as text. The easiest way is to pre format the cell as Text (choose Home ⇨ Number and choose Text from the Number Format drop-down list). Or you can precede the credit card number with an apostrophe. Either method prevents Excel from interpreting the entry as a number.

Text entries

Most worksheets also include text in some of the cells. Text can serve as data (for example, a list of employee names), labels for values, headings for columns, or instructions about the worksheet. Text is often used to clarify what the values in a worksheet mean or where the numbers came from.

Text that begins with a number is still considered text. For example, if you type 12 **Students** into a cell, Excel considers the entry to be text rather than a numeric value. Consequently, you can't use this cell for numeric calculations. If you need to indicate that the number 12 refers to employees, enter 12 into a cell and then type **Students** into the cell to the right.

Understanding formulas

Formulas are what make a spreadsheet a spreadsheet. Excel enables you to enter flexible formulas that use the values (or even text) in cells to calculate a result. When you enter a formula into a cell, the formula's result appears in the cell. If you change any of the cells used by a formula, the formula re calculates and shows the new result.

Formulas can be simple mathematical expressions, or they can use some of the powerful functions that are built into Excel. Below image shows an Excel worksheet set up to calculate a monthly loan payment. The worksheet contains values, text, and formulas. The cells in column A contain text. Column B contains four values and two formulas. The formulas are in cells B5 and B9. Column D, for reference, shows the actual contents of the cells in column B.

	A	B	C	D	E	F
1	Loan Payment Calculator					
2					Column B Contents	
3	Purchase Amount:	475,000			475,000	
4	Down Payment Pct:	20%			0.2	
5	Loan Payment:	380,000			=B4*(1-B5)	
6	Team (Month):	360			360	
7	Interest Rate (APR):	6.25%			0.0625	
8						
9	Monthly Payment:	2,339.73			PMT=E13(B8/12,B7, A14- B6)	
10						
11						

You can use values, text, and formulas to create useful Excel worksheets

Entering Text and Values

Entering text into a cell is just as easy as entering a value: Activate the cell, type the text, and then press Enter or a navigation key. A cell can contain a maximum of about 32,000 characters — more than enough to hold a typical chapter in this book. Even though a cell can hold a huge number of characters, you'll find that it's not possible to actually display all these characters.
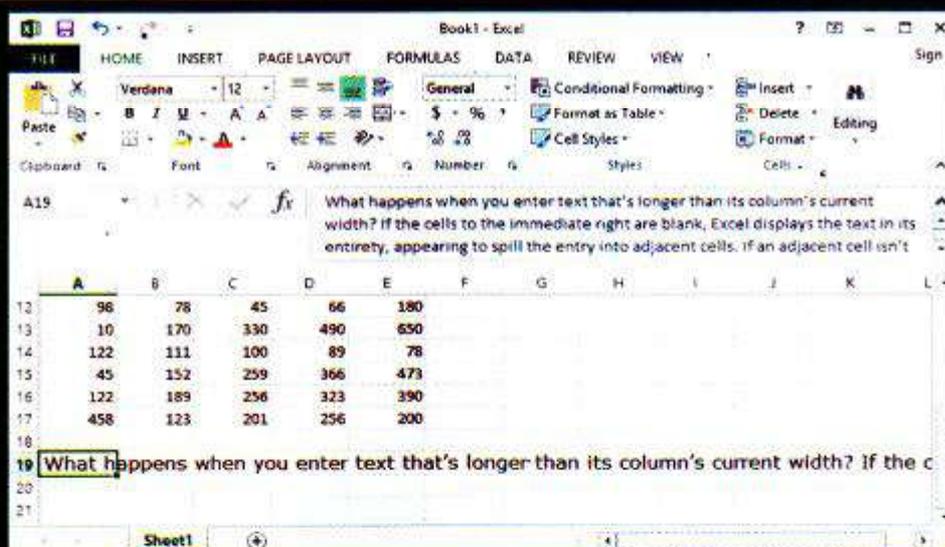
The Formula bar, expanded in height to show more information in the cell

What happens when you enter text that's longer than its column's current width? If the cells to the immediate right are blank, Excel displays the text in its entirety, appearing to spill the entry into adjacent cells. If an adjacent cell isn't blank, Excel displays as much of the text as possible. (The full text is contained in the cell; it's just not displayed.) If you need to display a long text string in a cell that's adjacent to a non blank cell, you have a few choices:

● Edit your text to make it shorter.

● Increase the width of the column (drag the border in the column letter display).

● Use a smaller font.

● Wrap the text within the cell so that it occupies more than one line. Choose Home ➪ Alignment ➪ Wrap Text to toggle wrapping on and off for the selected cell or range.

Modifying Cell Contents

After you enter a value or text into a cell, you can modify it in several ways:

- Delete the cell's contents.
- Replace the cell's contents with something else.
- Edit the cell's contents.

Deleting the contents of a cell

To delete the contents of a cell, just click the cell and press the Delete key. To delete more than one cell, select all the cells that you want to delete and then press Delete. Pressing Delete removes the cell's contents but doesn't remove any formatting (such as bold, italic, or a different number format) that you may have applied to the cell.

For more control over what gets deleted, you can choose Home ⇨ Editing ⇨ Clear. This command's drop-down list has five choices:

- **Clear All:** Clears everything from the cell — its contents, its formatting, and its cell comment (if it has one)
- **Clear Formats:** Clears only the formatting and leaves the value, text, or formula
- **Clear Contents:** Clears only the cell's contents and leaves the formatting
- **Clear Comments:** Clears the comment (if one exists) attached to the cell
- **Clear Hyperlinks:** Removes hyperlinks contained in the selected cells. The text remains, but the cell no longer functions as a clickable hyperlink.

NOTE

Clearing formats doesn't clear the background colors in a range that has been designated as a table unless you've replaced the table style background colors manually.

Replacing the contents of a cell

To replace the contents of a cell with something else, just activate the cell and type your new entry, which replaces the previous contents. Any formatting applied to the cell remains in place and is applied to the new content.

You can also replace cell contents by dragging and dropping or by pasting data from the Clipboard. In both cases, the cell formatting will be replaced by the format of the new data. To avoid pasting formatting, choose Home ⇨ Clipboard ⇨ Paste ⇨ Values (V), or Home ⇨ Clipboard ⇨ Paste ⇨ Formulas (F).

Editing the contents of a cell

If the cell contains only a few characters, replacing its contents by typing new data usually is easiest. However, if the cell contains lengthy text or a complex formula and you need to make only a slight modification, you probably want to edit the cell rather than re-enter information.

When you want to edit the contents of a cell, you can use one of the following ways to enter cell-edit mode:

- Double-click the cell to edit the cell contents directly in the cell.
- Select the cell and press F2 to edit the cell contents directly in the cell.
- Select the cell that you want to edit and then click inside the Formula bar to edit the cell contents in the Formula bar.

You can use whichever method you prefer. Some people find editing directly in the cell easier; others prefer to use the Formula bar to edit a cell.

NOTE

The Advanced tab of the Excel Options dialog box contains a section called Editing options. These settings affect how editing works. (To access this dialog box, choose File ⇨ Options.) If the Allow editing directly in cells option isn't enabled, you can't edit a cell by double-clicking. In addition, pressing F2 allows you to edit the cell in the Formula bar (not directly in the cell).

All these methods cause Excel to go into edit mode. (The word Edit appears at the left side of the status bar at the bottom of the screen.) When Excel is in edit mode, the Formula bar enables two icons: Cancel (the X) and Enter (the check mark). Below image shows these two icons. Clicking the Cancel icon cancels editing without changing the cell's contents. (Pressing Esc has the same effect.) Clicking the Enter icon completes the editing and enters the modified contents into the cell. (Pressing Enter has the same effect.) The Advanced tab of the Excel Options dialog box contains a section called Editing options. These settings affect how editing works. (To access this dialog box, choose File ⇨ Options.) If the Allow editing directly in cells option isn't enabled, you can't edit a cell by double-clicking. In addition, pressing F2 allows you to edit the cell in the Formula bar (not directly in the cell).

While editing a cell, the Formula bar enables two new icons: Cancel (X) and Enter (check mark)
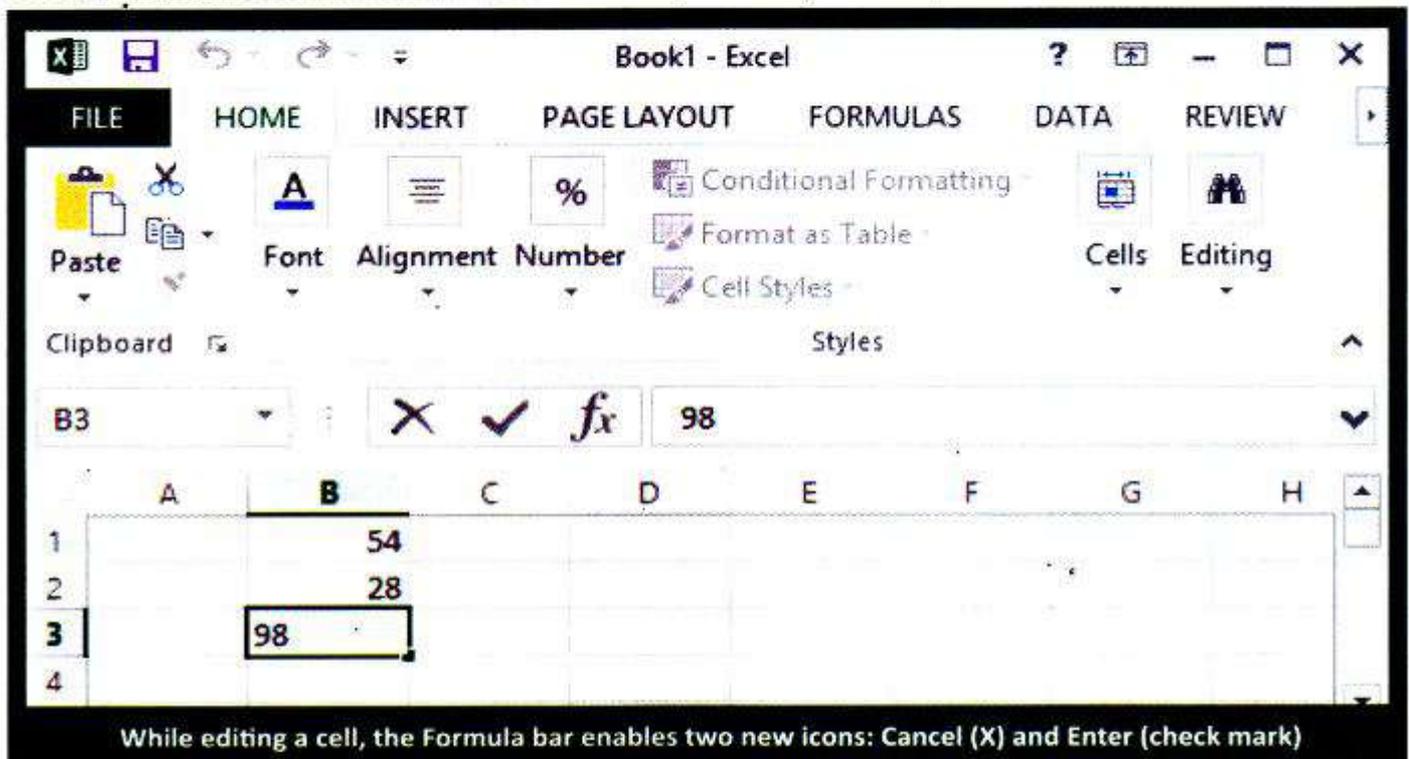
When you begin editing a cell, the insertion point appears as a vertical bar, and you can perform the following tasks:

- Add new characters at the location of the insertion point. Move the insertion point by:
- Using the navigation keys to move within the cell
- Pressing Home to move the insertion point to the beginning of the cell
- Pressing End to move the insertion point to the end of the cell
- Select multiple characters. Press Shift while you use the navigation keys.
- Select characters while you're editing a cell. Use the mouse. Just click and drag the mouse pointer over the characters that you want to select.

Learning data-entry techniques

You can simplify the process of entering information into your Excel worksheets and make your work go quite a bit faster by using a number of useful tricks, described in the following sections.

Automatically moving the cell pointer after entering data

By default, Excel automatically moves the cell pointer to the next cell down when you press the Enter key after entering data into a cell. (The exception is if you have previously used Tab to make entries across a row; when you press Enter in that case, the cell pointer moves to the next row, in the first column where you entered data in the row above.) To change this setting, choose File ⇨ Options and click the Advanced tab. The check box that controls this behavior is labeled After pressing Enter, move selection. If you enable this option, you can choose the direction in

which the cell pointer moves (down, left, up, or right).

Using navigation keys instead of pressing Enter

Instead of pressing the Enter key when you're finished making a cell entry, you also can use any of the navigation keys to complete the entry. Not surprisingly, these navigation keys send you in the direction that you indicate. For example, if you're entering data in a row, press the right-arrow (⇨) key rather than Enter. The other arrow keys work as expected, and you can even use Page Up and Page Down.

Selecting a range of input cells before entering data

When a range of cells is selected, Excel automatically moves the cell pointer to the next cell in the range when you press Enter. If the selection consists of

You can use the Advanced tab in Excel Options to select a number of helpful input option settings

multiple rows, Excel moves down the column; when it reaches the end of the selection in the column, it moves to the first selected cell in the next column.

To skip a cell, just press Enter without entering anything. To go backward, press Shift+Enter. If you prefer to enter the data by rows rather than by columns, press Tab rather than Enter. Excel continues to cycle through the selected range until you select a cell outside of the range.
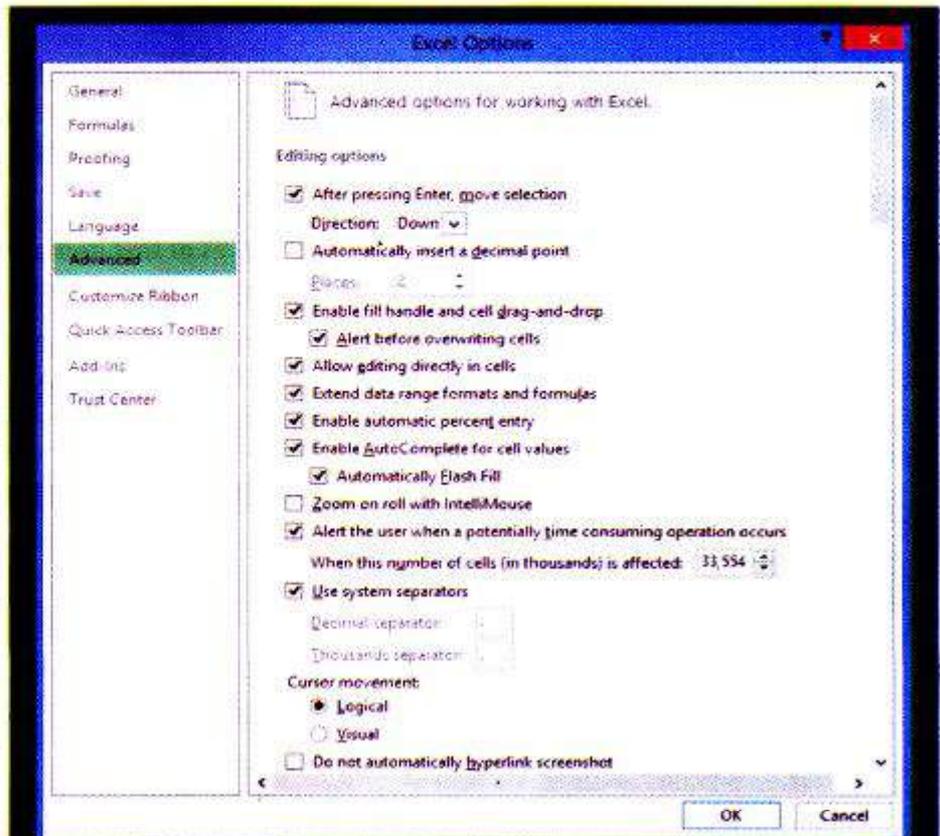
Using Ctrl+Enter to place information into multiple cells simultaneously

If you need to enter the same data into multiple cells, Excel offers a handy shortcut. Select all the cells that you want to contain the data, enter the value, text, or formula, and then press Ctrl+Enter. The same information is inserted into each cell in the selection.

Entering decimal points automatically

If you need to enter lots of numbers with a fixed number of decimal places, Excel has a useful tool that works like some old adding machines. Access the Excel Options dialog box and click the Advanced tab. Select the Automatically Insert a Decimal Point check box and make sure that the Places box is set for the correct number of decimal places for the data you need to enter.

When this option is set, Excel supplies the decimal points for you automatically. For example, if you specify two decimal places, entering 12345 into a cell is interpreted as 123.45. To restore things to normal, just clear the Automatically Insert a Decimal Point check box in the Excel Options dialog box. Changing this setting doesn't affect any values that you

CAUTION

The fixed decimal places option is a global setting and applies to all workbooks (not just the active workbook). If you forget that this option is turned on, you can easily end up entering incorrect values — or cause some major confusion if someone else uses your computer.

Using AutoFill to enter a series of values

The Excel Auto Fill feature makes inserting a series of values or text items in a range of cells easy. It uses the AutoFill handle (the small box at the lower right of the active cell). You can drag the Auto Fill handle to copy the cell or automatically complete a series.

Below image shows an example. We entered 1 into cell A1 and 3 into cell A2. Then we selected both cells and dragged down the fill handle to create a linear series of odd numbers. The image also shows an icon that, when clicked, displays some additional Auto Fill options.

This series was created by using **Auto Fill**
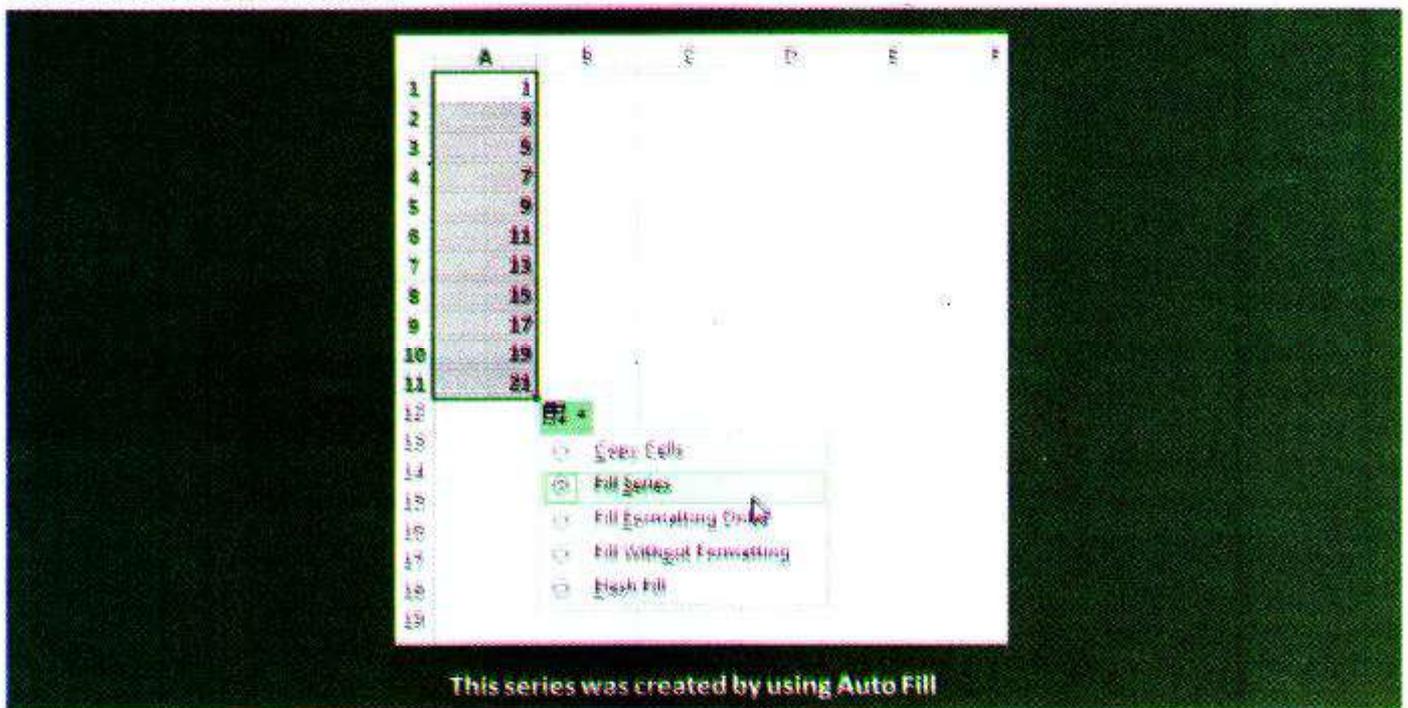
TIP

If you drag the AutoFill handle while you press and hold the right mouse button, Excel displays a shortcut menu with additional fill options.

Using AutoComplete to automate data entry

The Excel AutoComplete feature makes entering the same text into multiple cells easy. With AutoComplete, you type the first few letters of a text entry into a cell, and Excel automatically completes the entry based on other entries that you already made in the column. Besides reducing typing, this feature also ensures that your entries are spelled correctly and are consistent.

Here's how it works: Suppose that you're entering product information in a column. One of your products is named **Widgets.** The first time that you enter Widgets into a cell, Excel remembers it. Later, when you start typing **Widgets** in that same column, Excel recognizes it by the first few letters and finishes typing it for you. Just press Enter, and you're done. To override the suggestion, just keep typing.

AutoComplete also changes the case of letters for you automatically. If you start entering widgets (with a lowercase w) in the second entry, Excel makes the w uppercase to be consistent with the previous entry in the column.

TIP

You also can access a mouse-oriented version of AutoComplete by right-clicking the cell and choosing Pick from Drop-down List from the shortcut menu. Excel then displays a drop-down box that has all the text entries in the current column, and you just click the one that you want.

AutoComplete works only within a contiguous column of cells. If you have a blank row, for example, AutoComplete identifies only the cell contents below the blank row.

If you find the AutoComplete feature distracting, you can turn it off by using the Advanced tab of the Excel Options dialog box. Remove the checkmark from the checkbox labeled Enable AutoComplete for cell values.

Forcing text to appear on a new line within a cell

If you have lengthy text in a cell, you can force Excel to display it in multiple lines within the cell: Press Alt+Enter to start a new line in a cell.

When you add a line break, Excel automatically changes the cell's format to Wrap Text. But unlike normal text wrap, your manual line break forces Excel to break the text at a specific place within the text, which gives you more precise control over the appearance of the text than if you rely on automatic text wrapping.

TIP

To remove a manual line break, edit the cell and press Delete when the insertion point is located at the end of the line that contains the manual line break. You won't see any symbol to indicate the position of the manual line break, but the text that follows it will move up when the line break is deleted.

Using AutoCorrect for shorthand data entry

You can use the AutoCorrect feature to create shortcuts for commonly used words or phrases. For example, if you work for a company named Consolidated Data Processing Corporation, you can create an AutoCorrect entry for an abbreviation, such as cdp. Then, whenever you type cdp, Excel automatically changes it to Consolidated Data Processing Corporation.

Excel includes quite a few built-in AutoCorrect terms (mostly to correct common misspellings), and you can add your own. To set up your custom AutoCorrect entries, access the Excel Options dialog box (choose File ⇨ Options) and click the Proofing tab. Then click the AutoCorrect Options button to display the AutoCorrect dialog box. In the dialog box, click the AutoCorrect tab, check the option labeled Replace Text as You Type, and then enter your custom entries. You can set up as many custom entries as you like. Just be careful not to use an abbreviation that might appear normally in your text.
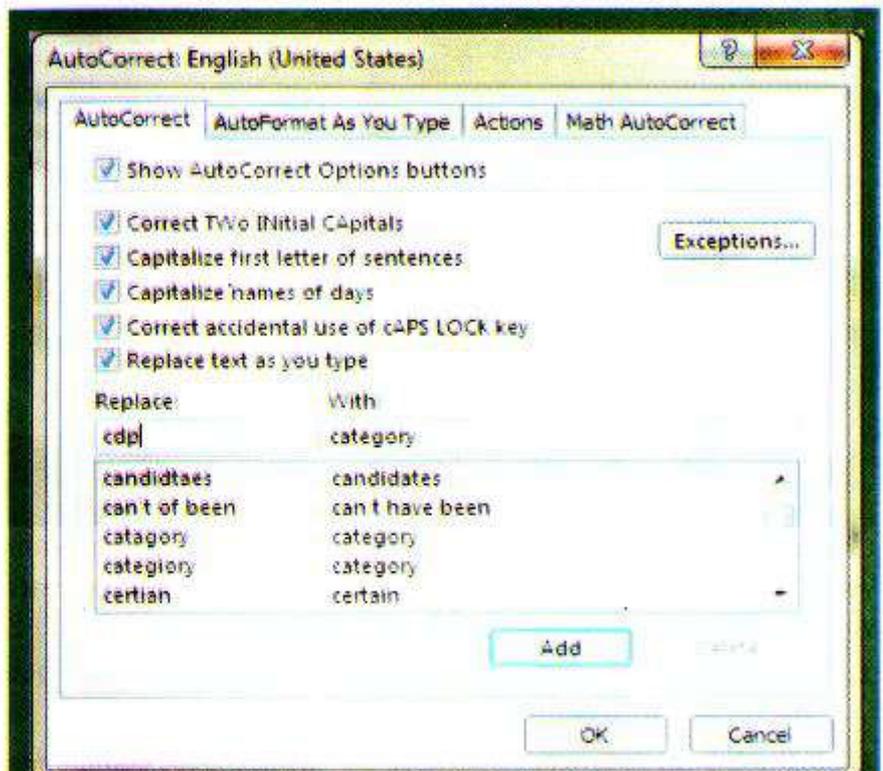
AutoCorrect allows you to create shorthand abbreviations for text you enter often

TIP

Excel shares your AutoCorrect list with other Microsoft Office applications. For example, any AutoCorrect entries you created in Word also work in Excel.

Entering numbers with fractions

To enter a fractional value into a cell, leave a space between the whole number and the fraction. For example, to enter 6 7/8, enter 6 7/8 and then press Enter. When you select the cell, 6.875 appears in the Formula bar, and the cell entry appears as a fraction. If you have a fraction only (for example, 1/8), you must enter a zero first, like this — 0 1/8 — or Excel will likely assume that you're entering a date. When you select the cell and look at the Formula bar, you see 0.125. In the cell, you see 1/8.

Using a form for data entry

Many people use Excel to manage lists in which the information is arranged in rows. Excel offers a simple way to work with this type of data through the use of a data entry form that Excel can create automatically. This data form works with either a normal range of data, or with a range that has been designated as a table (choose Insert ⇨ Tables ⇨ Table).
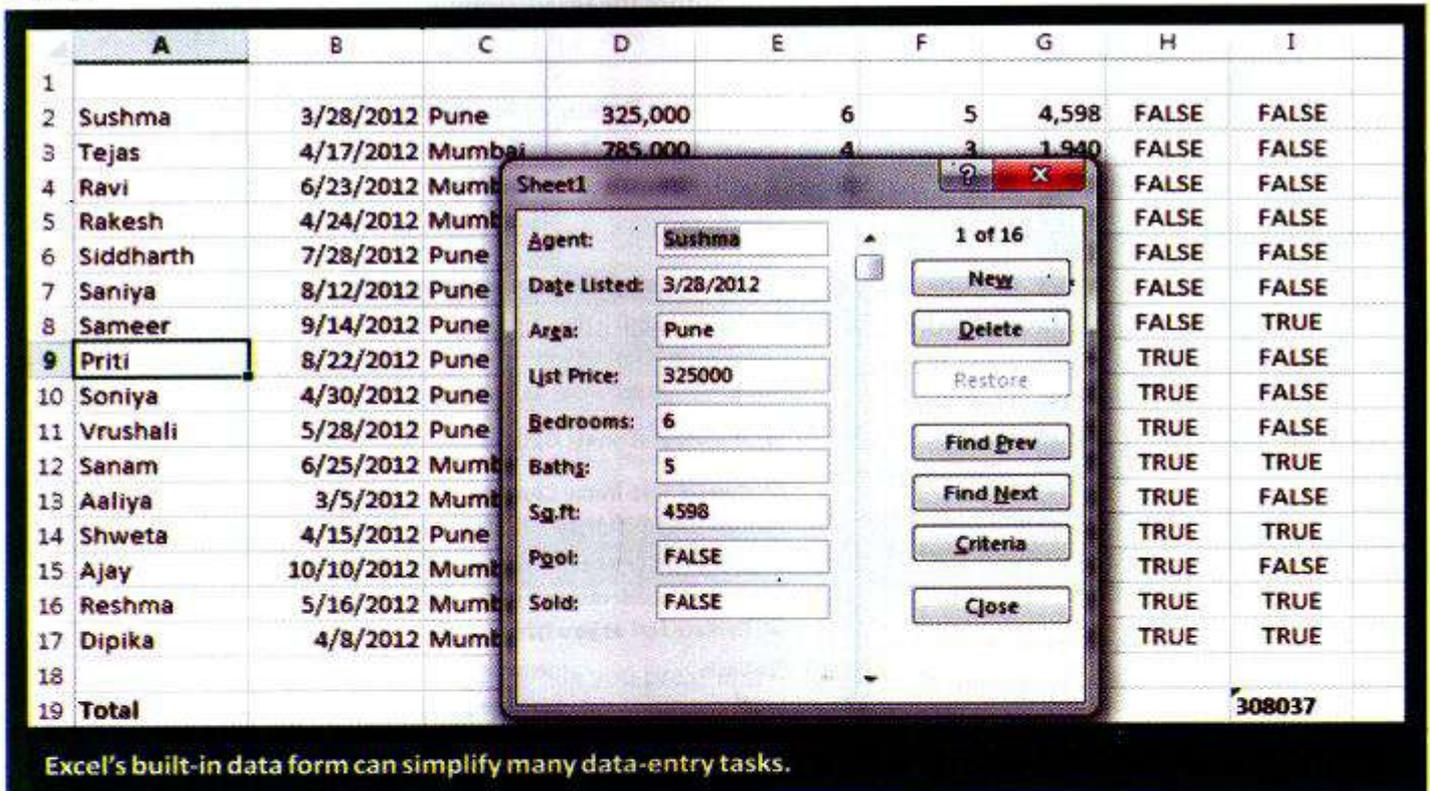
	A	B	C	D	E	F	G	H	I
1									
2	Sushma	3/28/2012	Pune	325,000	6	5	4,598	FALSE	FALSE
3	Tejas	4/17/2012	Mumbai	785,000	4	3	1,940	FALSE	FALSE
4	Ravi	6/23/2012	Mumb					FALSE	FALSE
5	Rakesh	4/24/2012	Mumb					FALSE	FALSE
6	Siddharth	7/28/2012	Pune					FALSE	FALSE
7	Saniya	8/12/2012	Pune					FALSE	FALSE
8	Sameer	9/14/2012	Pune					FALSE	TRUE
9	Priti	8/22/2012	Pune					TRUE	FALSE
10	Soniya	4/30/2012	Pune					TRUE	FALSE
11	Vrushali	5/28/2012	Pune					TRUE	FALSE
12	Sanam	6/25/2012	Mumb					TRUE	TRUE
13	Aaliya	3/5/2012	Mumb					TRUE	FALSE
14	Shweta	4/15/2012	Pune					TRUE	TRUE
15	Ajay	10/10/2012	Mumb					TRUE	FALSE
16	Reshma	5/16/2012	Mumb					TRUE	TRUE
17	Dipika	4/8/2012	Mumb					TRUE	TRUE
18									
19	Total								308037

Data form dialog (Sheet1):
- Agent: Sushma
- Date Listed: 3/28/2012
- Area: Pune
- List Price: 325000
- Bedrooms: 6
- Baths: 5
- Sq.ft: 4598
- Pool: FALSE
- Sold: FALSE
- 1 of 16
- Buttons: New, Delete, Restore, Find Prev, Find Next, Criteria, Close

Excel's built-in data form can simplify many data-entry tasks.

Unfortunately, the command to access the data form is not on the Ribbon. To use the data form, you must add it to your Quick Access Toolbar or add it to the Ribbon. The following instructions describe how to add this command to your Quick Access Toolbar:

1. **Right-click the Quick Access Toolbar and choose Customize Quick Access Toolbar.** The Quick Access Toolbar panel of the Excel Options dialog box appears.

2. **In the Choose commands from drop-down list, choose Commands Not in the Ribbon.**

3. **In the list box on the left, select Form.**

4. **Click the Add button to add the selected command to your Quick Access Toolbar.**

5. **Click OK to close the Excel Options dialog box.**

After performing these steps, a new icon appears on your Quick Access Toolbar.

To use a data entry form, follow these steps:

1. **Arrange your data so that Excel can recognize it as a table by entering headings for the columns in the first row of your data entry range.**

2. **Select any cell in the table and click the Form button on your Quick Access Toolbar.** Excel displays a dialog box customized to your data.

3. **Fill in the information.** Press Tab to move between the text boxes. If a cell contains a formula, the formula result appears as text (not as an edit box). In other words, you can't modify formulas using the data entry form.

4. **When you complete the data form, click the New button.** Excel enters the data into a row in the worksheet and clears the dialog box for the next row of data.

You can also use the form to edit existing data.

Entering the current date or time into a cell

If you need to date-stamp or time-stamp your worksheet, Excel provides two shortcut keys that do this task for you:

- **Current date:** Ctrl+; (semicolon)
- **Current time:** Ctrl+Shift+; (semicolon)

The date and time are from the system time in your computer. If the date or time isn't correct in Excel, use the Windows Control Panel to make the adjustment.

NOTE

When you use either of these shortcuts to enter a date or time into your worksheet, Excel enters a static value into the worksheet. In other words, the date or time entered doesn't change when the worksheet is recalculated. In most cases, this setup is probably what you want, but you should be aware of this limitation. If you want the date or time display to update, use one of these formulas:

   =TODAY()

    =NOW()

Flash Fill

Flash Fill is a new feature in Excel 2013. Flash Fill uses pattern recognition to extract data (and also concatenate data). Just enter a few examples in a column that's adjacent to the data, and choose Data ➪ Data Tools ➪ Flash Fill (or press Ctrl+E). Excel analyzes the examples and attempts to fill in the remaining cells. If Excel didn't recognize the pattern you had in mind, press Ctrl+Z, add another example or two, and try again.

Below image shows a worksheet with some text in a single column. The goal is to extract the number from each cell and put it into a separate cell. The Text to Columns Wizard can't do it because the space delimiters aren't consistent. It might be possible to write an array formula, but it would be very complicated. Case, the Flash Fill feature might

	A	B	C
1	The box weighed 20 pounds		
2	Bob is 6 feet tall		
3	She drove for 9.5 hours straight.		
4	Pi is 3.41549		
5	He drank 5 cups of coffee.		
6	The sales tax was 3.12		
7	15 people showed up for jury duty		
8	He was in7th heaven		
9			
10			
11			
12			

The goal is to extract the numbers in column A

save the day. But keep in mind that Flash Fill works successfully only when the data is very consistent.

To try using Flash Fill, activate cell B1 and type the first number (20). Move to B2, and type the second number (6). Can Flash Fill identify the remaining numbers and fill them in? Choose Data ⇨ Data Tools ⇨ Flash Fill or Home ⇨ Editing ⇨ Fill ⇨ Flash Fill (or press Ctrl+E) and Excel fills in the remaining cells in a flash.
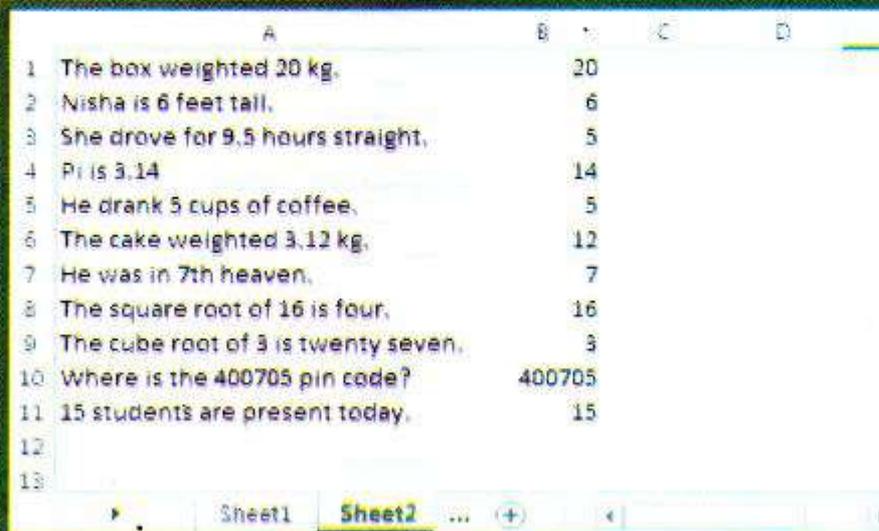
	A	B	C	D
1	The box weighted 20 kg.	20		
2	Nisha is 6 feet tall.	6		
3	She drove for 9.5 hours straight.	5		
4	Pi is 3.14	14		
5	He drank 5 cups of coffee.	5		
6	The cake weighted 3.12 kg.	12		
7	He was in 7th heaven.	7		
8	The square root of 16 is four.	16		
9	The cube root of 3 is twenty seven.	3		
10	Where is the 400705 pin code?	400705		
11	15 students are present today.	15		
12				
13				

Sheet1 **Sheet2** ... (+)

Using manually entered examples in B1 and B2, Excel makes some incorrect guesses

As you see, Excel identified most of the values. Accuracy increases if you provide more examples. For example, provide an example of a decimal number. Delete the suggested values, enter 3.12 in cell B6, and press Ctrl+E. This time, Excel gets them all correct.
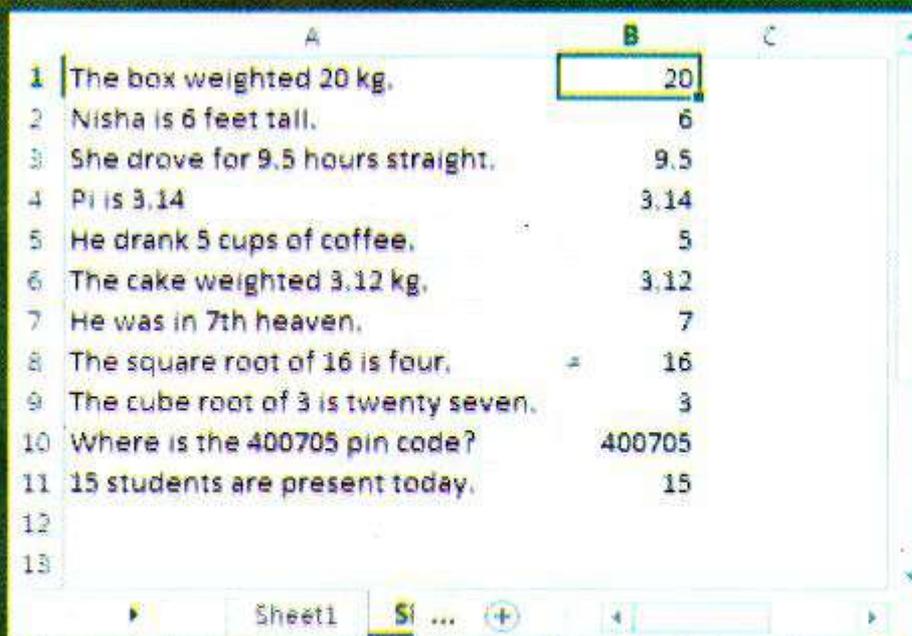
	A	B	C
1	The box weighted 20 kg.	20	
2	Nisha is 6 feet tall.	6	
3	She drove for 9.5 hours straight.	9.5	
4	Pi is 3.14	3.14	
5	He drank 5 cups of coffee.	5	
6	The cake weighted 3.12 kg.	3.12	
7	He was in 7th heaven.	7	
8	The square root of 16 is four.	16	
9	The cube root of 3 is twenty seven.	3	
10	Where is the 400705 pin code?	400705	
11	15 students are present today.	15	
12			
13			

Sheet1 S! ... (+)

After you enter an example of a decimal number, Excel gets them all correct

This simple example demonstrates two important points:

- **You must examine your data very carefully after using Flash Fill.** Just because the first few rows are correct, you can't assume that Flash Fill worked correctly for all rows.
- **Flash Fill increases accuracy when you provide more examples.**

Below image shows another example, names in column A. The goal is to extract the first, last, and middle name (if it

has one). In column B Excel successfully gets all the first names using only two examples (Sushma and Tejas). Plus, it successfully extracted all the last names (column C), using Dange and Chawan. Extracting the middle names or initials (column D) eluded me until I provided examples that included a space on either side of the middle name).

	A	B	C	D	E
1	Sushma Dange	Sushma	Dange		
2	Tejas Chavan	Tejas	Chavan		
3	Ravi Pawar	Ravi	Pawar		
4	Rakesh Raj	Rakesh	Raj		
5	Siddharth Roy	Siddharth	Roy		
6	Saniya Khan	Saniya	Khan		
7	Sameer Agrawal	Sameer	Agrawal		
8	Priti Chaudhari	Priti	Chaudhari		
9	Soniya G. Manik	Soniya	Manik	G.	
10	Vrushali T. Pate	Vrushali	Pate	T.	
11	Sonam E. Sharma	Sonam	Sharma	E.	
12	Aaliya J. Bhat	Aaliya	Bhat	J.	
13	Shweta Tiwari	Shweta	Tiwari		
14	Ajay M. Devruskar	Ajay	Devruskar	M.	
15	Reshma A. Rane	Reshma	Rane	A.	
16	Dipika R. Wagh	Dipika	Wagh	R.	
17					
18					
19					

Sheet1   Sheet2   **Sheet3**
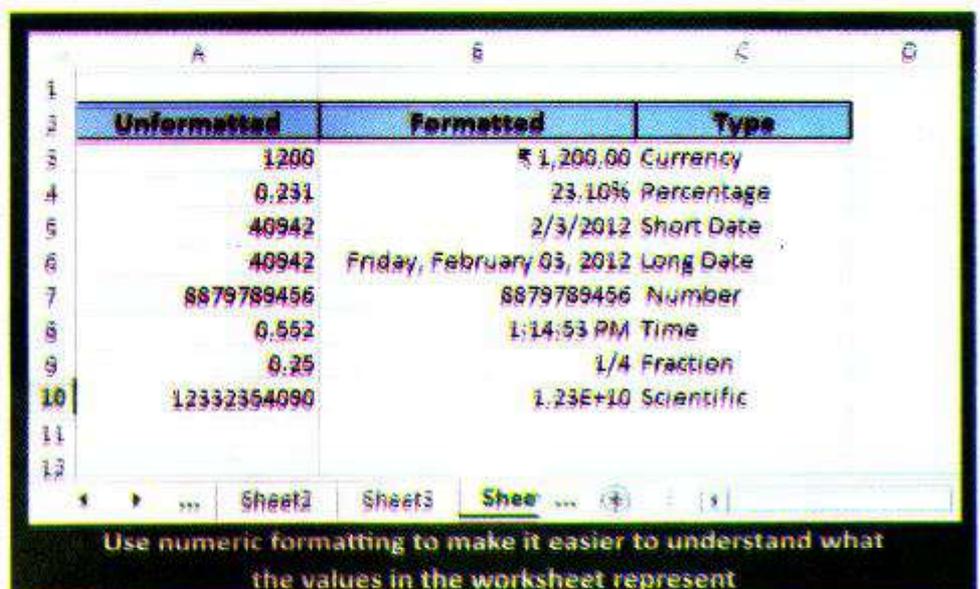
Using Flash Fill to split names

To summarize, Excel's new Flash Fill is an interesting idea, but it seems to work reliably only if the data is very consistent. Even when you think it worked correctly, make sure you examine the results carefully. And think twice before trusting it with important data. There's no way to document how the data was extracted. But the main limitation is that (unlike formulas) Flash Fill is not a dynamic technique. If your data changes, the flash filled column does not update.

Applying Number Formatting

Number formatting refers to the process of changing the appearance of values contained in cells. Excel provides a wide variety of number formatting options.

Values that you enter into cells normally are unformatted. They simply consist of a string of numerals. Typically, you want to format the numbers so that they're easier to read or are more consistent in terms of the number of decimal places shown.

Below image shows a worksheet that has two columns of values. The first column consists of unformatted values. The cells in the second column are formatted to make the values easier to read. The third column describes the type of formatting applied.

	A	B	C	D
1				
2	**Unformatted**	**Formatted**	**Type**	
3	1200	₹ 1,200.00	Currency	
4	0.231	23.10%	Percentage	
5	40942	2/3/2012	Short Date	
6	40942	Friday, February 03, 2012	Long Date	
7	8879789456	8879789456	Number	
8	0.552	1:14:53 PM	Time	
9	0.25	1/4	Fraction	
10	12332354090	1.23E+10	Scientific	
11				
12				

Sheet2   Sheet3   **Shee** ...

Use numeric formatting to make it easier to understand what the values in the worksheet represent

Using automatic number formatting

Excel is smart enough to perform some formatting for you automatically. For example, if you enter 12.2% into a cell, Excel knows that you want to use a percentage format and applies it for you automatically. If you use commas to separate thousands (such as 123,456), Excel applies comma formatting for you.

Formatting numbers by using the Ribbon

The Home ⇨ Number group in the Ribbon contains controls that let you quickly apply common number formats.

You can find number formatting commands in the Number group of the Home tab.
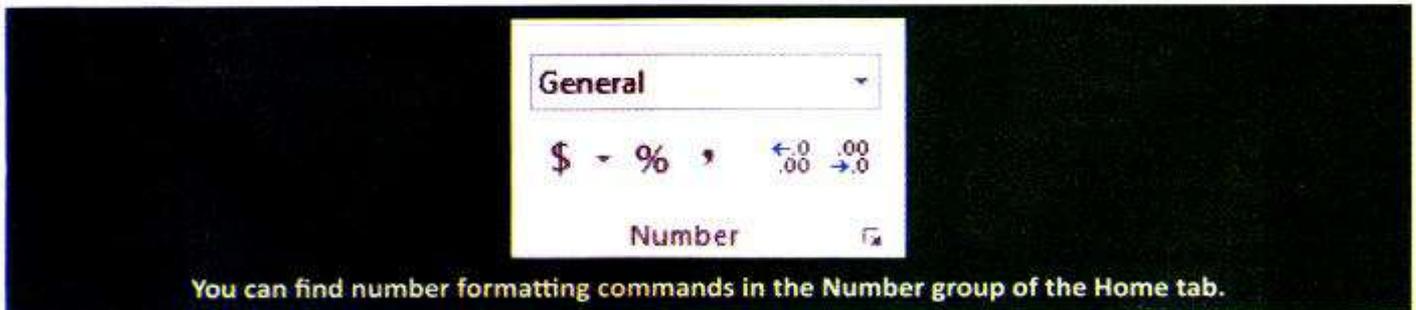
The Number Format drop-down list contains several common number formats. Additional options include an Accounting Number Format drop-down list (to select a currency format), a Percent Style button, and a Comma Style button. The group also contains a button to increase the number of decimal places, and another to decrease the number of decimal places.

When you select one of these controls, the active cell takes on the specified number format. You also can select a range of cells (or even an entire row or column) before clicking these buttons. If you select more than one cell, Excel applies the number format to all the selected cells.

Using keyboard shortcuts to format numbers

Another way to apply number formatting is to use keyboard shortcuts. Below Table summarizes the keyboard shortcut combinations that you can use to apply common number formatting to the selected cells or range. Notice that these Ctrl+Shift characters are all located together, in the upper left of your keyboard.

Table Number Formatting Keyboard Shortcuts

Key Combination	Formatting Applied
Ctrl+Shift+~	General number format (that is, unformatted values)
Ctrl+Shift+$	Currency format with two decimal places (negative numbers appear in parentheses)
Ctrl+Shift+%	Percentage format, with no decimal places
Ctrl+Shift+^	Scientific notation number format, with two decimal places
Ctrl+Shift+#	Date format with the day, month, and year
Ctrl+Shift+@	Time format with the hour, minute, and AM or PM
Ctrl+Shift+!	Two decimal places, thousands separator, and a hyphen for negative values

Formatting numbers using the Format Cells dialog box

In most cases, the number formats that are accessible from the Number group on the Home tab are just fine. Sometimes, however, you want more control over how your values appear. Excel offers a great deal of control over number formats through the use of the Format Cells dialog box. For formatting numbers, you need to use the Number tab.
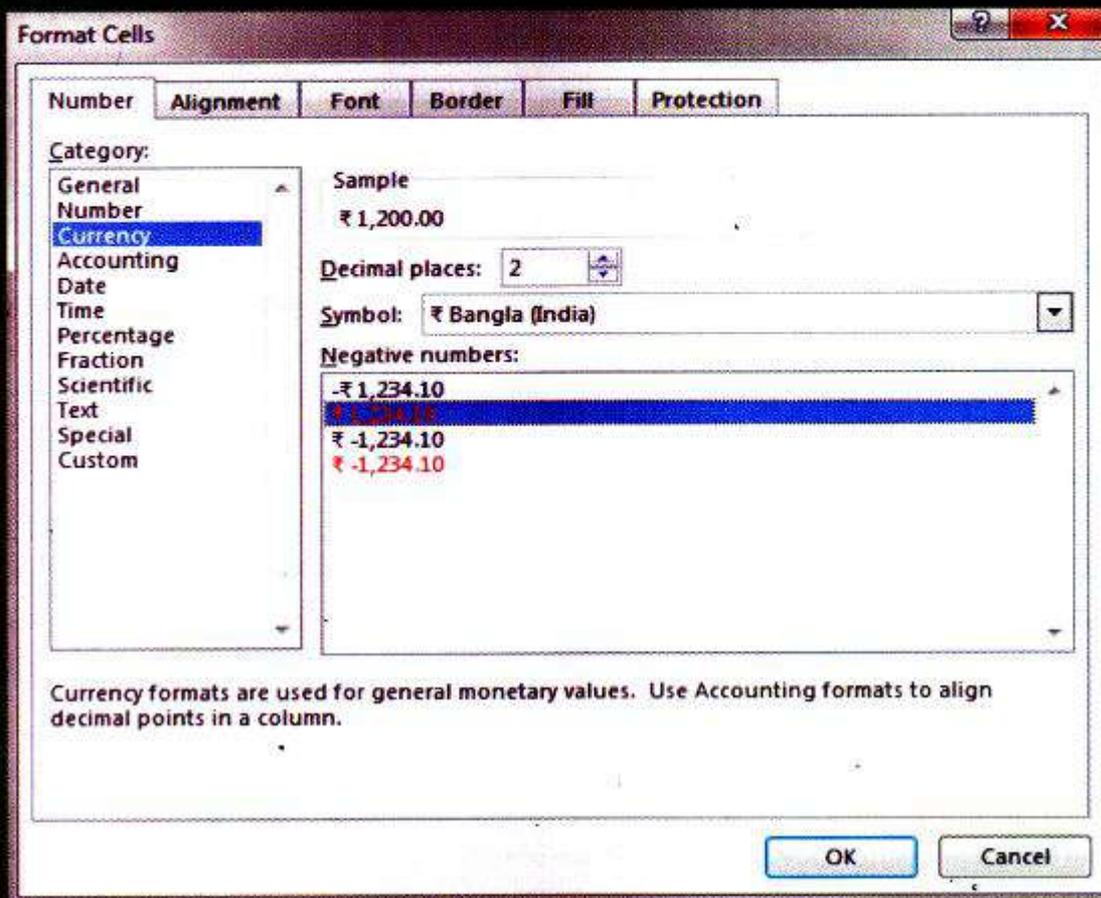
Format Cells dialog box

You can bring up the Format Cells dialog box in several ways. Start by selecting the cell or cells that you want to format and then do one of the following:

- Choose Home and click the dialog box launcher in the lower-right corner of the Number group.
- Choose Home ⬥ Number, click the Number Format drop-down list, and choose More Number Formats from the drop-down list.
- Right-click the cell and choose Format Cells from the shortcut menu.
- Press Ctrl+1.

The Number tab of the Format Cells dialog box displays 12 categories of number formats. When you select a category from the list box, the right side of the tab changes to display options appropriate to that category.

The Number category has three options that you can control: the number of decimal places displayed, whether to use a thousands separator, and how you want negative numbers displayed. Notice that the Negative Numbers list box has four choices (two of which display negative values in red), and the choices change depending on the number of decimal places and whether you choose to separate thousands.

The top of the tab displays a sample of how the active cell will appear with the selected number format (visible only if a cell with a value is selected). After you make your choices, click OK to apply the number format to all the selected cells.

When Numbers Appear to Add Incorrectly

Applying a number format to a cell doesn't change the value — it only changes how the value appears in the worksheet. For example, if a cell contains 0.874543, you may format it to appear as 87%. If that cell is used in a formula, the formula uses the full value (0.874543), not the displayed value (87%).

In some situations, formatting may cause Excel to display calculation results that appear incorrect, such as when totaling numbers with decimal places. For example, if values are formatted to display two decimal places, you may not see the actual numbers used in the calculations. But because Excel uses the full precision of the values in its formula, the sum of the two values may appear to be incorrect.

Several solutions to this problem are available. You can format the cells to display more decimal places. You can use the ROUND function on individual numbers and specify the number of decimal places Excel should round to. Or you can instruct Excel to change the worksheet values to match their displayed format. To do so, access the Excel Options dialog box and click the Advanced tab. Check the Set precision as displayed check box (located in the When calculating this workbook section).

The following are the number format categories, along with some general comments:

- **General:** The default format; it displays numbers as integers, as decimals, or in scientific notation if the value is too wide to fit in the cell.

- **Number:** Enables you to specify the number of decimal places, whether to use a comma to separate thousands, and how to display negative numbers (with a minus sign, in red, in parentheses, or in red and in parentheses).

- **Currency:** Enables you to specify the number of decimal places, choose a currency symbol, and how to display negative numbers (with a minus sign, in red, in parentheses, or in red and in parentheses). This format always uses a comma to separate thousands.

- **Accounting:** Differs from the Currency format in that the currency symbols always align vertically.

- **Date:** Enables you to choose from several different date formats.

- **Time:** Enables you to choose from several different time formats.

- **Percentage:** Enables you to choose the number of decimal places and always displays a percent sign.

- **Fraction:** Enables you to choose from among nine fraction formats.

- **Scientific:** Displays numbers in exponential notation (with an E): 2.00E+05 = 200,000; 2.05E+05 = 205,000. You can choose the number of decimal places to display to the left of E. The second example can be read as "2.05 times 10 to the fifth."

- **Text:** When applied to a value, causes Excel to treat the value as text (even if it looks like a number). This feature is useful for such items as part numbers and credit card numbers.

- **Special:** Contains additional number formats. In the U.S. version of Excel, the additional number formats are Zip Code, Zip Code +4, Phone Number, and Social Security Number.

- **Custom:** Enables you to define custom number formats that aren't included in any other category.

TIP

If a cell displays a series of hash marks (such as #########), it usually means that the column isn't wide enough to display the value in the number format that you selected. Either make the column wider or change the number format.

3. Worksheet and Cell Range Operations

Learning the Fundamentals of Excel Worksheets

In Excel, each file is called a workbook, and each workbook can contain one or more worksheets. You may find it helpful to think of an Excel workbook as a notebook and worksheets as pages in the notebook. As with a notebook, you can view a particular sheet, add new sheets, remove sheets, rearrange sheets, and copy sheets. The following sections describe the operations that you can perform with worksheets.

Working with Excel windows

Each Excel workbook file that you open is displayed in a window. A workbook can hold any number of sheets, and these sheets can be either worksheets (sheets consisting of rows and columns) or chart sheets (sheets that hold a single chart). A worksheet is what people usually think of when they think of a spreadsheet. You can open as many Excel workbooks as necessary at the same time.

Each Excel window has five buttons (which appear as icons) at the right side of its title bar. From left to right, they are Help, Full Screen Mode (or Exit Full Screen Mode), Minimize, Maximize (or Restore Down), and Close.

An Excel window can be in one of the following states:

- **Maximized:** Fills the entire screen. To maximize a window, click its Maximize button.

- **Minimized:** Hidden, but still open. To minimize a window, click its Minimize button.

- **Restored:** A non maximized size. To restore a maximized window, click its Restore Down button. To restore a minimized window, click its icon in the Windows taskbar. A window in this state can be resized and moved.

If you work with more than one workbook simultaneously, you need to know how to move, resize, and switch among the workbook windows.

Moving and resizing windows

To move or resize a window, make sure that it's not maximized (click the Restore Down button). Then drag its title bar with your mouse.

To resize a window, drag any of its borders until it's the size that you want it to be. When you position the mouse pointer on a window's border, the mouse pointer changes to a double-headed arrow, which lets you know that you can now drag to resize the window. To resize a window horizontally and vertically at the same time, drag any of its corners.

If you want all your workbook windows to be visible (that is, not obscured by another window), you can move and resize the windows manually, or you can let Excel do it for you. Choosing View ⟺ Window ⟺ Arrange All displays the Arrange Windows dialog box. This dialog box has four window arrangement options. Just select the one that you want and click OK. Windows that are minimized aren't affected by this command.
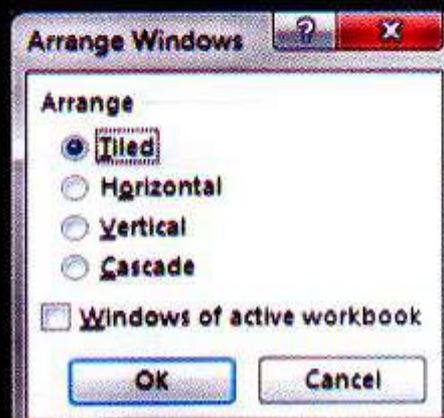
Use the Arrange Windows dialog box to quickly arrange all open non minimized workbook windows

Switching among windows

At any given time, one (and only one) workbook window is the active window. The active window accepts your input and is the window on which your commands work. The active window appears at the top of the stack of windows. To work in a workbook in a different window, you need to make that window active. You can make a different window the active window in several ways:

- **Click another window, if it's visible.** The window you click moves to the top and becomes the active window. This method isn't possible if the current window is maximized.

- **Press Ctrl+F6 to cycle through all open windows until the window that you want to work with appears on top as the active window.** Pressing Shift+Ctrl+F6 cycles through the windows in the opposite direction.

- **Choose View ⇨ Window ⇨ Switch Windows and select the window that you want from the drop-down list (the active window has a check mark next to it).** This menu can display as many as nine windows. If you have more than nine workbook windows open, choose More Windows (which appears below the nine window names).

- **Click the Excel icon in the Windows taskbar.** You can then choose the window by clicking its thumbnail or clicking it in the pop-up list.

Most people prefer to do most of their work with maximized workbook windows, which enables you to see more cells and eliminates the distraction of other workbook windows getting in the way. At times, however, viewing multiple windows is preferred. For example, displaying two windows is more efficient if you need to compare information in two workbooks or if you need to copy data from one workbook to another.

Closing windows

If you have multiple windows open, you may want to close those windows that you no longer need. Excel offers several ways to close the active window:

- Choose File ⇨ Close.

- Click the Close button (the X icon) on the workbook window's title bar.

- Press Alt+F4.

- Press Ctrl+W.

Activating a worksheet

At any given time, one workbook is the active workbook, and one sheet is the active sheet in the active workbook. To activate a different sheet, just click its sheet tab, located at the bottom of the workbook window. You also can use the following shortcut keys to activate a different sheet:

- **Ctrl+PageUp:** Activates the previous sheet, if one exists

- **Ctrl+PageDown:** Activates the next sheet, if one exists

If your workbook has many sheets, all its tabs may not be visible. Use the tab scrolling controls to scroll the sheet tabs. The sheet tabs share space with the worksheet's horizontal scrollbar. You also can drag the tab split control (to the left of the horizontal scrollbar) to display more or fewer tabs. Dragging the tab split control simultaneously changes the number of tabs and the size of the horizontal scrollbar.
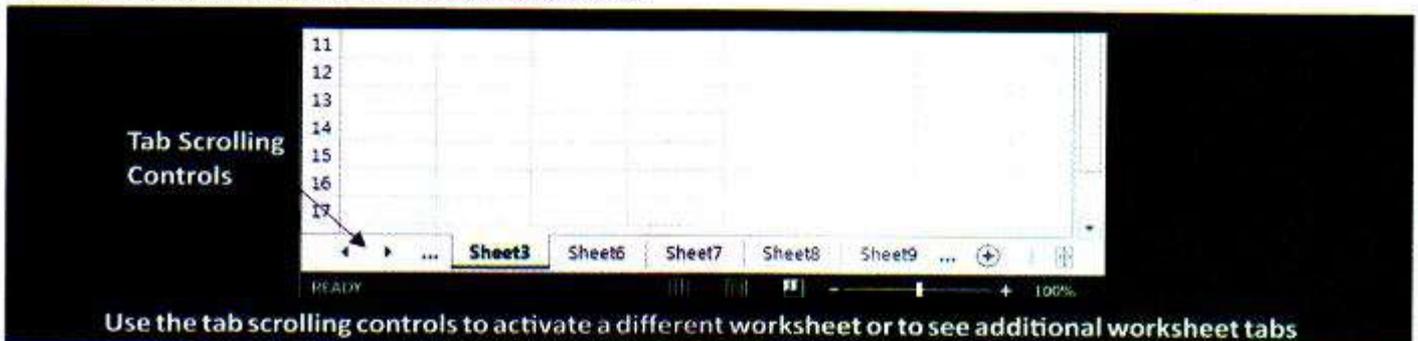
Use the tab scrolling controls to activate a different worksheet or to see additional worksheet tabs

Adding a new worksheet to your workbook

Worksheets can be an excellent organizational tool. Instead of placing everything on a single worksheet, you can use additional worksheets in a workbook to separate various workbook elements logically. For example, if you have several products whose sales you track individually, you may want to assign each product to its own worksheet and then use another worksheet to consolidate your results.
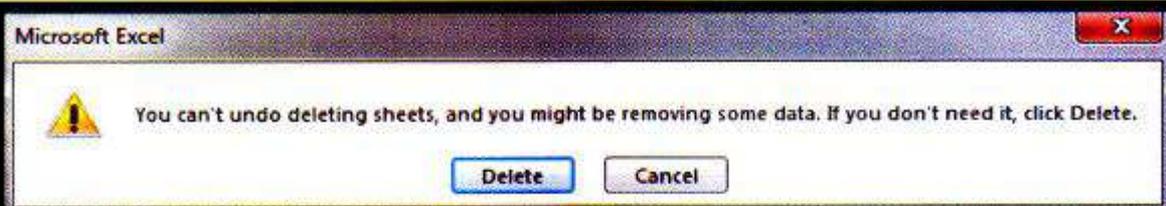
Here are three ways to add a new worksheet to a workbook:

- **Click the New Sheet button, which is the plus sign icon located to the right of the last sheet tab.** A new sheet is added after the active sheet.

- **Press Shift+F11.** A new sheet is added before the active sheet.

- **Right-click a sheet tab, choose Insert from the shortcut menu, and select the General tab of the Insert dialog box that appears.** Then select the Worksheet icon and click OK. A new sheet is added before the active sheet.

Deleting a worksheet you no longer need

If you no longer need a worksheet, or if you want to get rid of an empty worksheet in a workbook, you can delete it in either of two ways:

- **Right-click its sheet tab and choose Delete from the shortcut menu.**

- **Activate the unwanted worksheet and choose Home ⇨ Cells ⇨ Delete ⇨ Delete Sheet.**

Microsoft Excel

⚠ You can't undo deleting sheets, and you might be removing some data. If you don't need it, click Delete.

[Delete] [Cancel]

Excel's gentle warning that you might be losing some data

Changing the name of a worksheet

The default names that Excel uses for worksheets — Sheet1, Sheet2, and so on — are generic and non descriptive. To make it easier to locate data in a multi sheet workbook, you'll want to make the sheet names more descriptive.

To change a sheet's name, double-click the sheet tab. Excel highlights the name on the sheet tab so that you can edit the name or replace it with a new name.

Sheet names can contain as many as 31 characters, and spaces are allowed. However, you can't use the following characters in sheet names:

:	colon
/	slash
\	backslash
[]	square brackets
?	question mark
*	asterisk

Changing a sheet tab color

Excel allows you to change the background color of your worksheet tabs. For example, you may prefer to color-code the sheet tabs to make identifying the worksheet's contents easier.

To change the color of a sheet tab, right-click the tab and choose Tab Color from the shortcut menu. Then select the color from the color gallery or palette. You can't change the text color, but Excel will choose a contrasting color to make the text visible. For example, if you make a sheet tab black, Excel will display white text.

Rearranging your worksheets

You may want to rearrange the order of worksheets in a workbook. If you have a separate worksheet for each sales region, for example, arranging the worksheets in alphabetical order might be helpful. You can also move a worksheet from one workbook to another and create copies of worksheets, either in the same workbook or in a different workbook.

You can move or copy a worksheet in the following ways:

- **Right-click the sheet tab and choose Move or Copy to display the Move or Copy dialog box.** Use this dialog box to specify the operation and the location for the sheet.
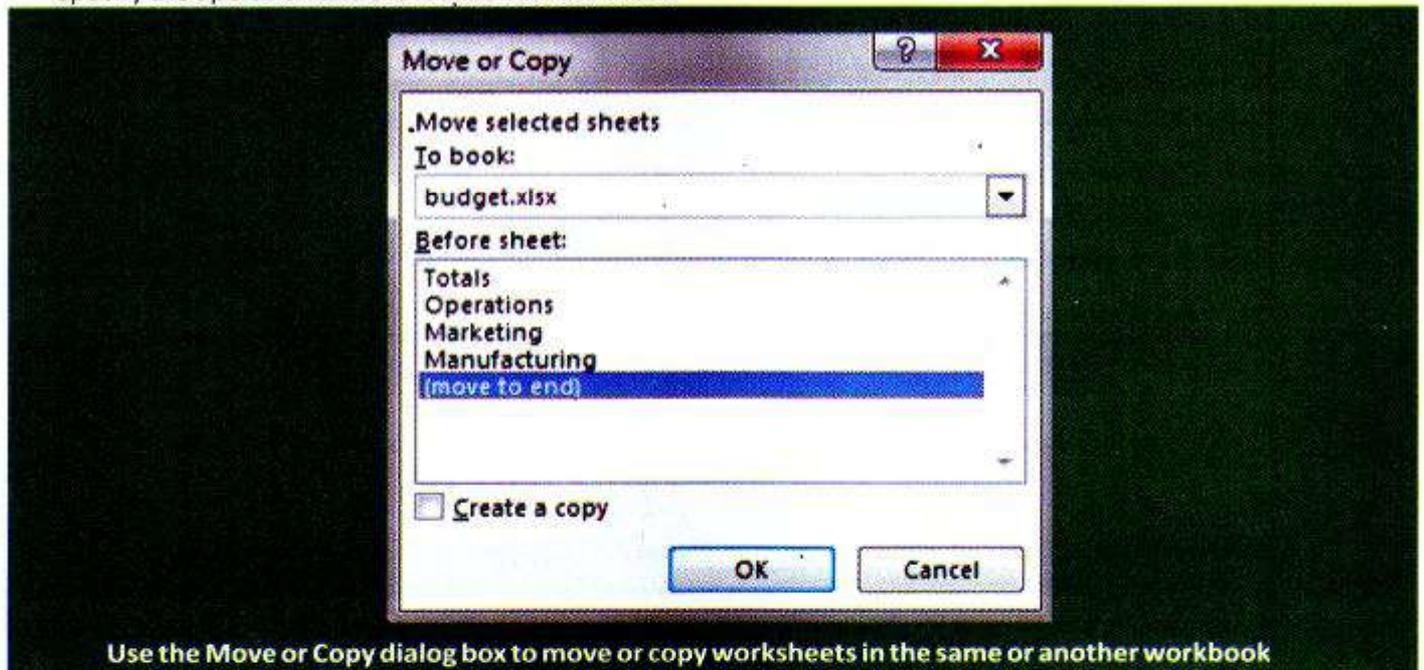
Use the Move or Copy dialog box to move or copy worksheets in the same or another workbook

- **To move a worksheet, drag the worksheet tab to the desired location.** When you drag, the mouse pointer changes to a small sheet, and a small arrow guides you. To move a worksheet to a different workbook, the second workbook must be open and not maximized.

- **To copy a worksheet, click the worksheet tab, and press Ctrl while dragging the tab to its desired location.** When you drag, the mouse pointer changes to a small sheet with a plus sign on it. To copy a worksheet to a different workbook, the second workbook must be open and not maximized.

Hiding and unhiding a worksheet

To hide a worksheet, right-click its sheet tab and choose Hide Sheet. The active worksheet (or selected worksheets) will be hidden from view.

To unhide a hidden worksheet, right-click any sheet tab and choose Unhide Sheet. Excel opens the Unhide dialog box, which lists all hidden sheets. Choose the sheet that you want to redisplay, and click OK. You can't select multiple sheets from this dialog box, so you need to repeat the command for each sheet that you want to unhide. When you unhide a sheet, it appears in its previous position among the sheet tabs.

Preventing Sheet Actions

To prevent others from unhiding hidden sheets, inserting new sheets, renaming sheets, copying sheets, or deleting sheets, protect the workbook's structure:

1. Choose Review ⇨ Changes ⇨ Protect Workbook.

2. In the Protect Workbook dialog box, select the Structure option.

3. Provide a password (optional).

4. Click OK.

Controlling the Worksheet View

As you add more information to a worksheet, you may find that navigating and locating what you want gets more difficult. Excel includes a few options that enable you to view your sheet, and sometimes multiple sheets, more efficiently.

Zooming in or out for a better view

Normally, everything you see on-screen is displayed at 100%. You can change the zoom percentage from 10% (very tiny) to 400% (huge). Using a small zoom percentage can help you to get a bird's-eye view of your worksheet to see how it's laid out. Zooming in is useful if you have trouble deciphering tiny type. Zooming doesn't change the font size specified for the cells, so it has no effect on printed output.

Tip

Excel contains separate options for changing the size of your printed output. (Use the controls in the Page Layout ⇨ Scale to Fit group.)
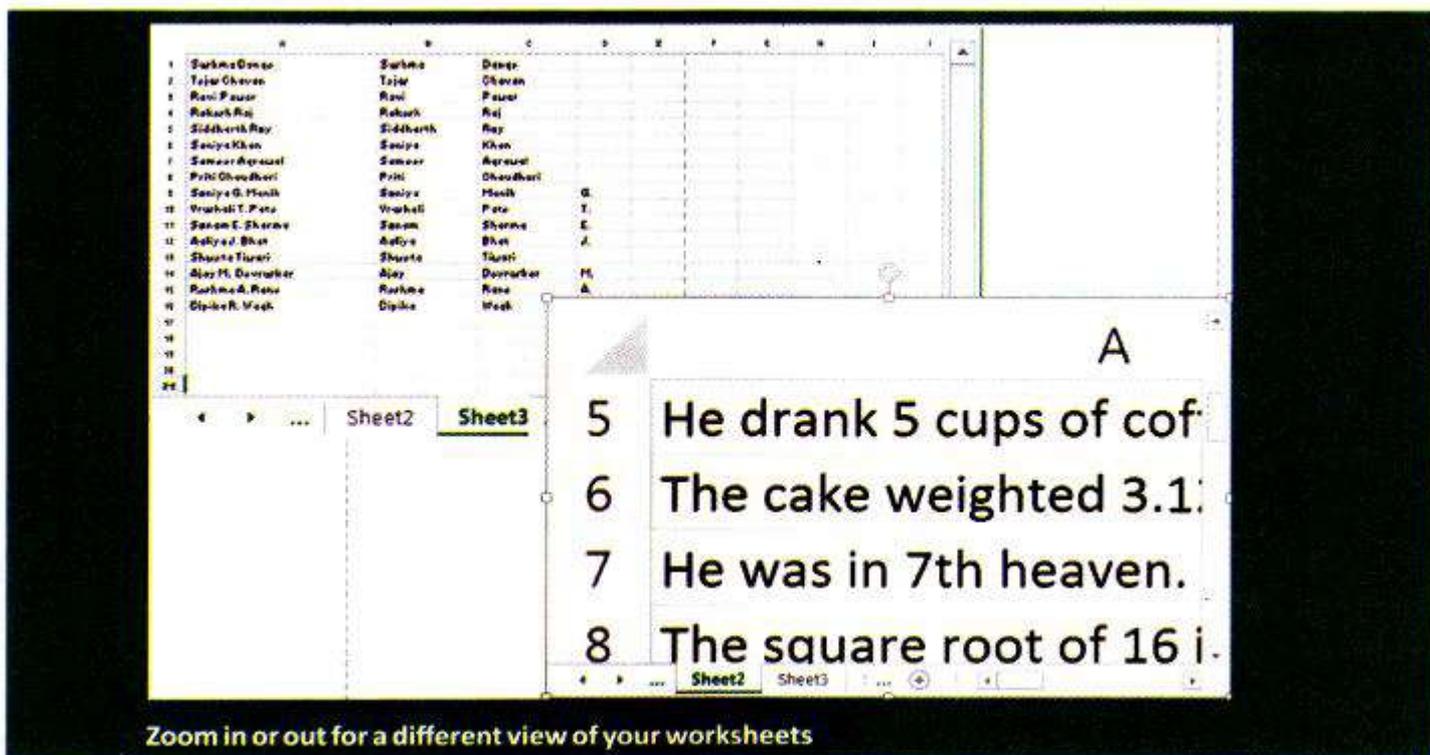
Zoom in or out for a different view of your worksheets

You can change the zoom factor of the active worksheet window by using any of three methods:

- **Use the Zoom slider located on the right side of the status bar.** Drag the slider, and your screen transforms instantly.

- **Press Ctrl and use the wheel button on your mouse to zoom in or out.**

- Choose View ⇨ Zoom ⇨ Zoom, which displays a dialog box with some zoom options.
- **Select a range of cells, and choose View ⇨ Zoom ⇨ Zoom to Selection.** The selected range will be enlarged so it fills the entire window.

Viewing a worksheet in multiple windows

You may want to view two different parts of a worksheet simultaneously — perhaps to make referencing a distant cell in a formula easier. Or you may want to examine more than one sheet in the same workbook simultaneously. You can accomplish either of these actions by opening a new view to the workbook, using one or more additional windows.

To create and display a new view of the active workbook, choose View ⇨ Window ⇨ New Window.

Excel displays a new window for the active workbook, similar to the one shown in below image. In this case, each window shows a different worksheet in the workbook. Notice the text in the windows' title bars: Regional sales1 and Regional sales2. To help you keep track of the windows, Excel appends a colon and a number to each window.
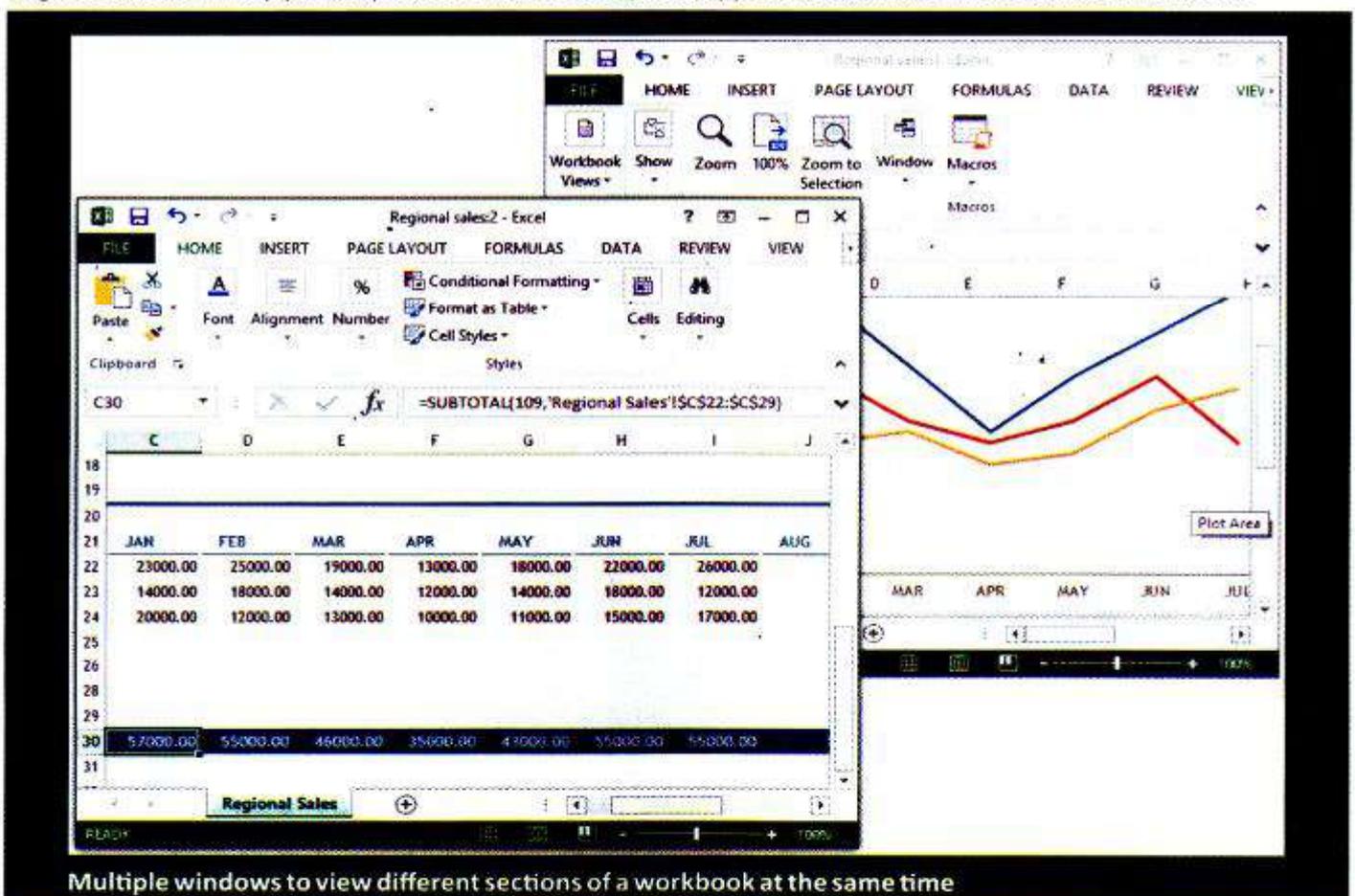
Multiple windows to view different sections of a workbook at the same time

A single workbook can have as many views (that is, separate windows) as you want. Each window is independent. In other words, scrolling to a new location in one window doesn't cause scrolling in the other window(s). However, if you make changes to the worksheet shown in a particular window, those changes are also made in all views of that worksheet.

You can close these additional windows when you no longer need them. For example, clicking the Close button on the active window's title bar closes the active window but doesn't close the other windows for the workbook.

Tip

Multiple windows make copying or moving information from one worksheet to another easier. You can use Excel's drag-and-drop procedures to copy or move ranges.
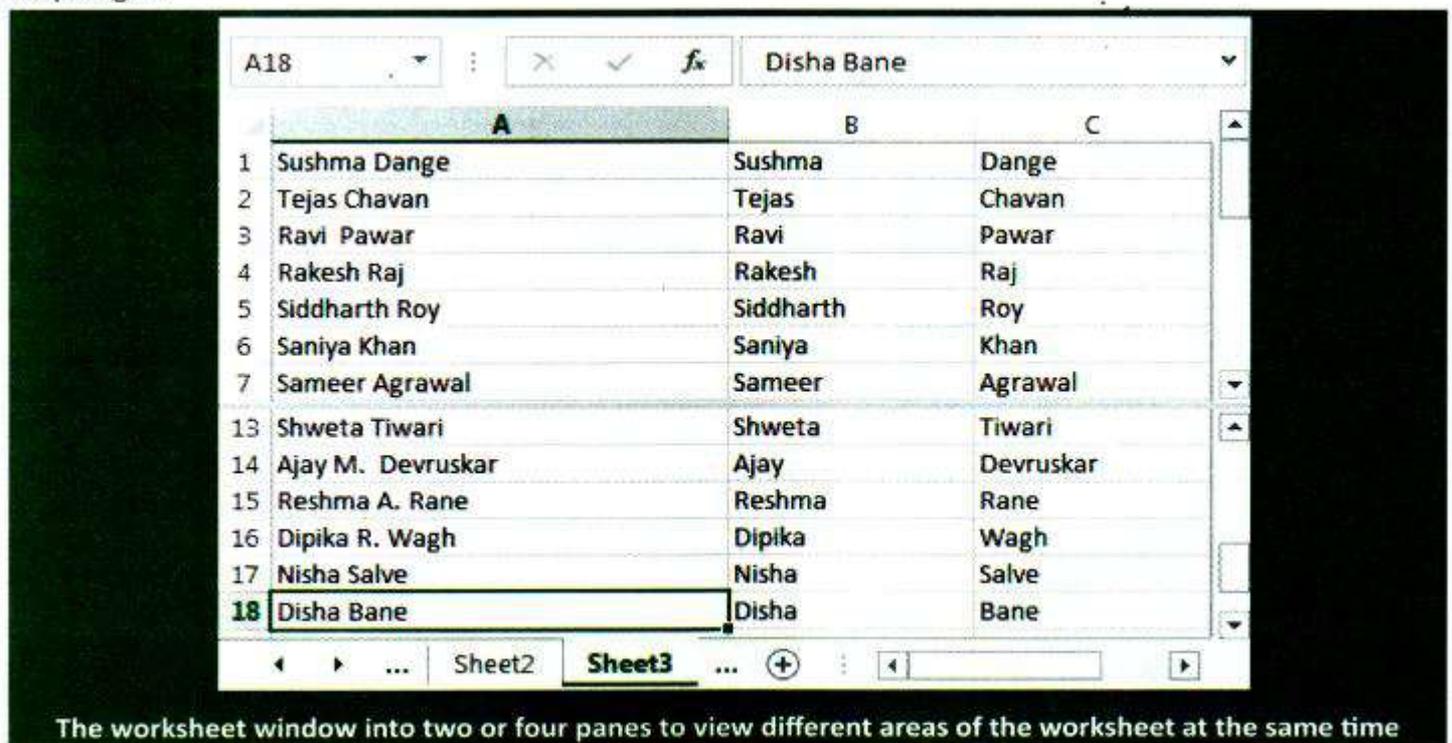
Comparing sheets side by side

First, make sure that the two sheets are displayed in separate windows. (The sheets can be in the same workbook or in different workbooks.) If you want to compare two sheets in the same workbook, choose View ⇨ Window ⇨ New Window to create a new window for the active workbook. Activate the first window; then choose View ⇨ Window ⇨ View Side by Side. If more than two windows are open, you see a dialog box that lets you select the window for the comparison. The two windows are tiled to fill the entire screen.

When using the Compare Side by Side feature, scrolling in one of the windows also scrolls the other window. If you don't want·this simultaneous scrolling, choose View ⇨ Window ⇨ Synchronous Scrolling (which is a toggle). If you have rearranged or moved the windows, choose View ⇨ Window ⇨ Reset Window Position to restore the windows to the initial side-by-side arrangement. To turn off the side-by-side viewing, choose View ⇨ Window ⇨ View Side by Side again.

Splitting the worksheet window into panes

If you prefer not to clutter your screen with additional windows, Excel provides another option for viewing multiple parts of the same worksheet. Choosing View ⇨ Window ⇨ Split splits the active worksheet into two or four separate panes. The split occurs at the location of the cell pointer. If the cell pointer is in row 1 or column A, this command results in a two-pane split; otherwise, it gives you four panes. You can use the mouse to drag the individual panes to resize them.

Below image shows a worksheet split into two panes. Notice that row numbers aren't continuous. The top pane shows rows 1 through 7, and the bottom pane shows rows 13 through 18. In other words, splitting panes enables you to display in a single window widely separated areas of a worksheet. To remove the split panes, choose View ⇨ Window ⇨ Split again.

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	A	B	C	
1	Sushma Dange	Sushma	Dange	
2	Tejas Chavan	Tejas	Chavan	
3	Ravi Pawar	Ravi	Pawar	
4	Rakesh Raj	Rakesh	Raj	
5	Siddharth Roy	Siddharth	Roy	
6	Saniya Khan	Saniya	Khan	
7	Sameer Agrawal	Sameer	Agrawal	▼
13	Shweta Tiwari	Shweta	Tiwari	▲
14	Ajay M. Devruskar	Ajay	Devruskar	
15	Reshma A. Rane	Reshma	Rane	
16	Dipika R. Wagh	Dipika	Wagh	
17	Nisha Salve	Nisha	Salve	
18	Disha Bane	Disha	Bane	▼

◄ ► ... | Sheet2 | **Sheet3** | ... ⊕ ⋮ ◄ ►

The worksheet window into two or four panes to view different areas of the worksheet at the same time

Keeping the titles in view by freezing panes

If you set up a worksheet with column headings or descriptive text in the first column, this identifying information won't be visible when you scroll down or to the right. Excel provides a handy solution to this problem: freezing panes. Freezing panes keeps the column or row headings visible while you're scrolling through the worksheet.

To freeze panes, start by moving the cell pointer to the cell below the row that you want to remain visible while you

scroll vertically, and to the right of the column that you want to remain visible while you scroll horizontally. Then choose View ➪ Window ➪ Freeze Panes and select the Freeze Panes option from the drop-down list. Excel inserts dark lines to indicate the frozen rows and columns. The frozen row and column remain visible while you scroll throughout the worksheet. To remove the frozen panes, choose View ➪ Window ➪ Freeze Panes, and select the Unfreeze Panes option from the drop-down list.

Below image shows a worksheet with frozen panes. In this case, column A is frozen in place. This technique allows you to scroll down and to the right to locate some information while keeping the column titles and the column A entries visible.

G8		f_x				
	A		**B**	**C**	**D**	
1	Name		First Name	Last Name	Middle Name	
11	Vrushali T. Pate		Vrushali	Pate	T.	
12	Sonam E. Sharma		Sonam	Sharma	E.	
13	Aaliya J. Bhat		Aaliya	Bhat	J.	
14	Shweta Tiwari		Shweta	Tiwari		
15	Ajay M. Devruskar		Ajay	Devruskar	M.	
16	Reshma A. Rane		Reshma	Rane	A.	
17	Dipika R. Wagh		Dipika	Wagh	R.	
18	Nisha Salve		Nisha	Salve		
19	Disha Bane		Disha	Bane		
20	Shreya Kale		Shreya	Kale		
21	Saniya Khan		Saniya	Khan		
22						

... | Sheet2 | **Sheet3** | Sheet4 ... | ⊕

Freeze certain columns and rows to make them remain visible while you scroll the worksheet

Most of the time, you'll want to freeze either the first row or the first column. The View ➪ Window ➪ Freeze Panes drop-down list has two additional options: Freeze Top Row and Freeze First Column. Using these commands eliminates the need to position the cell pointer before freezing panes.

Monitoring cells with a Watch Window

In some situations, you may want to monitor the value in a particular cell as you work. As you scroll throughout the worksheet, that cell may disappear from view. A feature known as Watch Window can help. A Watch Window displays the value of any number of cells in a handy window that's always visible.

To display the Watch Window, choose Formulas ➪ Formula Auditing ➪ Watch Window. The Watch Window is actually a task pane, and you can dock it to the side of the window or drag it and make it float over the worksheet.

To add a cell to watch, click Add Watch and specify the cell that you want to watch. The Watch Window displays the value in that cell. You can add any number of cells to the Watch Window.
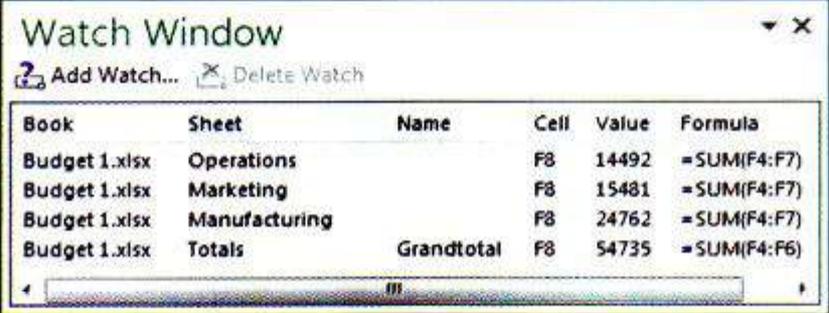
Watch Window
🔲 Add Watch... ✖ Delete Watch

Book	Sheet	Name	Cell	Value	Formula
Budget 1.xlsx	Operations		F8	14492	=SUM(F4:F7)
Budget 1.xlsx	Marketing		F8	15481	=SUM(F4:F7)
Budget 1.xlsx	Manufacturing		F8	24762	=SUM(F4:F7)
Budget 1.xlsx	Totals	Grandtotal	F8	54735	=SUM(F4:F6)

The Watch Window

> **Tip**
>
> Double-click a cell in the Watch Window to immediately select that cell.

Working with Rows and Columns

Every worksheet has exactly 1,048,576 rows and 16,384 columns, and these values can't be changed.

Inserting rows and columns

Although the number of rows and columns in a worksheet is fixed, you can still insert and delete rows and columns if you need to make room for additional information. These operations don't change the number of rows or columns. Instead, inserting a new row moves down the other rows to accommodate the new row. The last row is simply removed from the worksheet if it's empty. Inserting a new column shifts the columns to the right, and the last column is removed if it's empty.
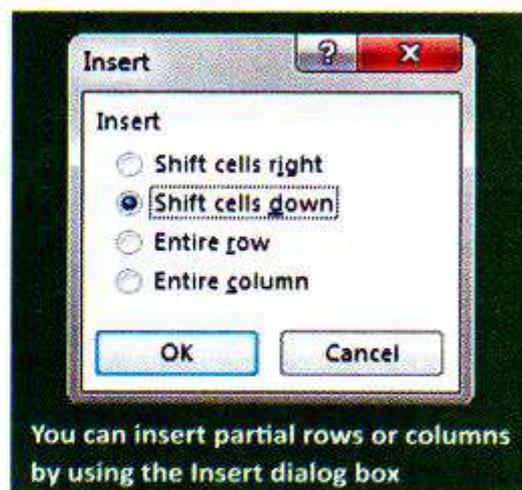
To insert a new row or rows, use either of these methods:

- **Select an entire row or multiple rows by clicking the row numbers in the worksheet border.** Right-click and choose Insert from the shortcut menu.

- **Move the cell pointer to the row that you want to insert, and then choose Home ⇨ Cells ⇨ Insert ⇨ Insert Sheet Rows.** If you select multiple cells in the column, Excel inserts additional rows that correspond to the number of cells selected in the column and moves the rows below the insertion down.

To insert a new column or columns, use either of these methods:

- **Select an entire column by clicking its column letter in the worksheet border, also known as the column header.** (Ctrl+click to select multiple adjacent columns.) Right-click and choose Insert from the shortcut menu.

- **Move the cell pointer to the column that you want to insert, and then choose Home ⇨ Cells ⇨ Insert ⇨ Insert Sheet Columns.** If you select multiple cells in the row, Excel inserts additional columns that correspond to the number of cells selected in the row.

You can also insert cells, rather than just rows or columns. Select the range into which you want to add new cells and then choose Home ⇨ Cells ⇨ Insert Insert Cells (or right-click the selection and choose Insert). To insert cells, the existing cells must be shifted to the right or shifted down. Therefore, Excel displays the Insert dialog box shown in below image so that you can specify the direction in which you want to shift the cells. Notice that this dialog box also enables you to insert entire rows or columns.

You can insert partial rows or columns by using the Insert dialog box

Deleting rows and columns

You may also want to delete rows or columns in a worksheet. For example, your sheet may contain old data that is no longer needed, or you may want to remove empty rows or columns.

To delete a row or rows, use either of these methods:

- **Select an entire row or multiple rows by clicking or Ctrl+clicking the row numbers in the worksheet border (row header).** Right-click and choose Delete from the shortcut menu.

- **Move the cell pointer to the row that you want to delete, and then choose Home ⇨ Cells ⇨ Delete Sheet Rows.** If you select multiple cells in the column, Excel deletes all rows in the selection.

Deleting columns works in a similar way. If you discover that you accidentally deleted a row or column, select Undo from the Quick Access Toolbar (or press Ctrl+Z) to undo the action.

Hiding rows and columns

In some cases, you may want to hide particular rows or columns. Hiding rows and columns may be useful if you don't want users to see particular information, or if you need to print a report that summarizes the information in the worksheet without showing all the details.

To hide rows in your worksheet, select the row or rows that you want to hide by clicking in the row header on the left. Then right-click and choose Hide from the shortcut menu. Or you can use the commands on the Home ⇨ Cells ⇨ Format ⇨ Hide & Unhide drop-down list.

To hide columns, use the same technique, but start by selecting columns rather than rows.

Excel displays a very narrow column heading for hidden columns and a very narrow row heading for hidden rows. You can drag the column heading to make the column wider — and make it visible again. For a hidden row, drag the small row heading to make the column visible.

Another way to unhide a row or column is to choose Home ⇨ Editing ⇨ Find & Select ⇨ Go To (or its F5 equivalent) to select a cell in a hidden row or column. For example, if column A is hidden, you can press F5 and specify cell A1 (or any other cell in column A) to move the cell pointer to the hidden column. Then you can choose Home ⇨ Cells ⇨ Format ⇨ Hide & Unhide ⇨ Unhide Columns.

Changing column widths and row heights

Often, you'll want to change the width of a column or the height of a row. For example, you can make columns narrower to show more information on a printed page. Or you may want to increase row height to create a "double-spaced" effect. Excel provides several different ways to change the widths of columns and the height of rows.

Changing column widths

Column width is measured in terms of the number of characters of a monospaced font that will fit into the cell's width. By default, each column's width is 8.43 units, which equates to 64 pixels (px).

Tip

If hash symbol (#) fill a cell that contains a numerical value, the column isn't wide enough to accommodate the information in the cell. Widen the column to solve the problem.

Before you change the column width, you can select multiple columns so that the width will be the same for all selected columns. To select multiple columns, either drag over the column letter in the column header or Ctrl+click to select individual columns. To select all columns, click the button where the row and column headers intersect. You can change columns widths by using any of the following techniques:

- Drag the right column border with the mouse until the column is the desired width.
- Choose Home ⇨ Cells ⇨ Format ⇨ Column Width and enter a value in the Column Width dialog box.
- Choose Home ⇨ Cells ⇨ Format ⇨ AutoFit Column Width to adjust the width of the selected column so that the widest entry in the column fits. Instead of selecting an entire column, you can just select cells in the column, and the column is adjusted based on the widest entry in your selection.
- Double-click the right border of a column header to set the column width automatically to the widest entry in the column.

Tip

To change the default width of all columns, choose Home ⇨ Cells ⇨ Format ⇨ Default Width. This command displays a dialog box into which you enter the new default column width. All columns that haven't been previously adjusted take on the new column width.

Changing row heights

Row height is measured in points (pt; a standard unit of measurement in the printing trade — 72 pt is equal to 1 inch). The default row height using the default font is 15 pt, or 20 px.

The default row height can vary, depending on the font defined in the Normal style. In addition, Excel automatically adjusts row heights to accommodate the tallest font in the row. So, if you change the font size of a cell to 20 pt, for example, Excel makes the row taller so that the entire text is visible.

You can set the row height manually, however, by using any of the following techniques. As with columns, you can select multiple rows.

- **Drag the lower row border with the mouse until the row is the desired height.**

- **Choose Home ⇨ Cells ⇨ Format ⇨ Row Height and enter a value (in points) in the Row Height dialog box.**

- **Double-click the bottom border of a row to set the row height automatically to the tallest entry in the row.** You can also choose Home ⇨ Cells ⇨ Format ⇨ Autofit Row Height for this task.

Changing the row height is useful for spacing out rows and is almost always preferable to inserting empty rows between lines of data.

Understanding Cells and Ranges

A cell is a single element in a worksheet that can hold a value, some text, or a formula. A cell is identified by its address, which consists of its column letter and row number. For example, cell D9 is the cell in the fourth column and the ninth row.

A group of cells is called a range. You designate a range address by specifying its upper-left cell address and its lower-right cell address, separated by a colon.

Here are some examples of range addresses:

C24	A range that consists of a single cell.
A1:B1	Two cells that occupy one row and two columns.
A1:A100	100 cells in column A.
A1:D4	16 cells (four rows by four columns).
C1:C1048576	An entire column of cells; this range also can be expressed as C:C.
A6:XFD6	An entire row of cells; this range also can be expressed as 6:6.
A1:XFD1048576	All cells in a worksheet. This range also can be expressed as either A:XFD or 1:1048576.

Selecting ranges

To perform an operation on a range of cells in a worksheet, you must first select the range. For example, if you want to make the text bold for a range of cells, you must select the range and then choose Home ⇨ Font ⇨ Bold (or press Ctrl+B).

When you select a range, the cells appear highlighted. The exception is the active cell, which remains its normal color. Below image shows an example of a selected range (B5:C8) in a worksheet. Cell B5, the active cell, is selected but not highlighted.

	A	B	C	D	E
1					
2	Sushma Dange	Sushma	Dange		
3	Tejas Chavan	Tejas	Chavan		
4	Ravi Pawar	Ravi	Pawar		
5	Rakesh Raj	Rakesh	Raj		
6	Siddharth Roy	Siddharth	Roy		
7	Saniya Khan	Saniya	Khan		
8	Sameer Agrawal	Sameer	Agrawal		
9	Priti Chaudhari	Priti	Chaudhari		
10	Soniya G. Manik	Soniya	Manik	G.	
11	Vrushali T. Pate	Vrushali	Pate	T.	
12	Sonam E. Sharma	Sonam	Sharma	E.	
13	Aaliya J. Bhat	Aaliya	Bhat	J.	
14	Shweta Tiwari	Shweta	Tiwari		
15	Ajay M. Devruskar	Ajay	Devruskar	M.	
16	Reshma A. Rane	Reshma	Rane	A.	
17	Dipika R. Wagh	Dipika	Wagh	R.	
18	Nisha Salve	Nisha	Salve		

Sheet2 Sheet5 **Sheet3** Shee ... (+)

When you select a range, it appears highlighted, but the active cell within the range is not highlighted

You can select a range in several ways:

- **Press the left mouse button and drag, highlighting the range. Then release the mouse button.** If you drag to the end of the window, the worksheet will scroll.
- **Press the Shift key while you use the arrow keys to select a range.**
- **Press F8 and then move the cell pointer with the arrow keys to highlight the range.** Press F8 again to return the navigation keys to normal movement.
- **Type the cell or range address into the Name box (located to the left of the Formula bar) and press Enter.** Excel selects the cell or range that you specified.
- **Choose Home ⇨ Editing ⇨ Find & Select ⇨ Go To (or press F5) and enter a range's address manually in the Go To dialog box.** When you click OK, Excel selects the cells in the range that you specified.
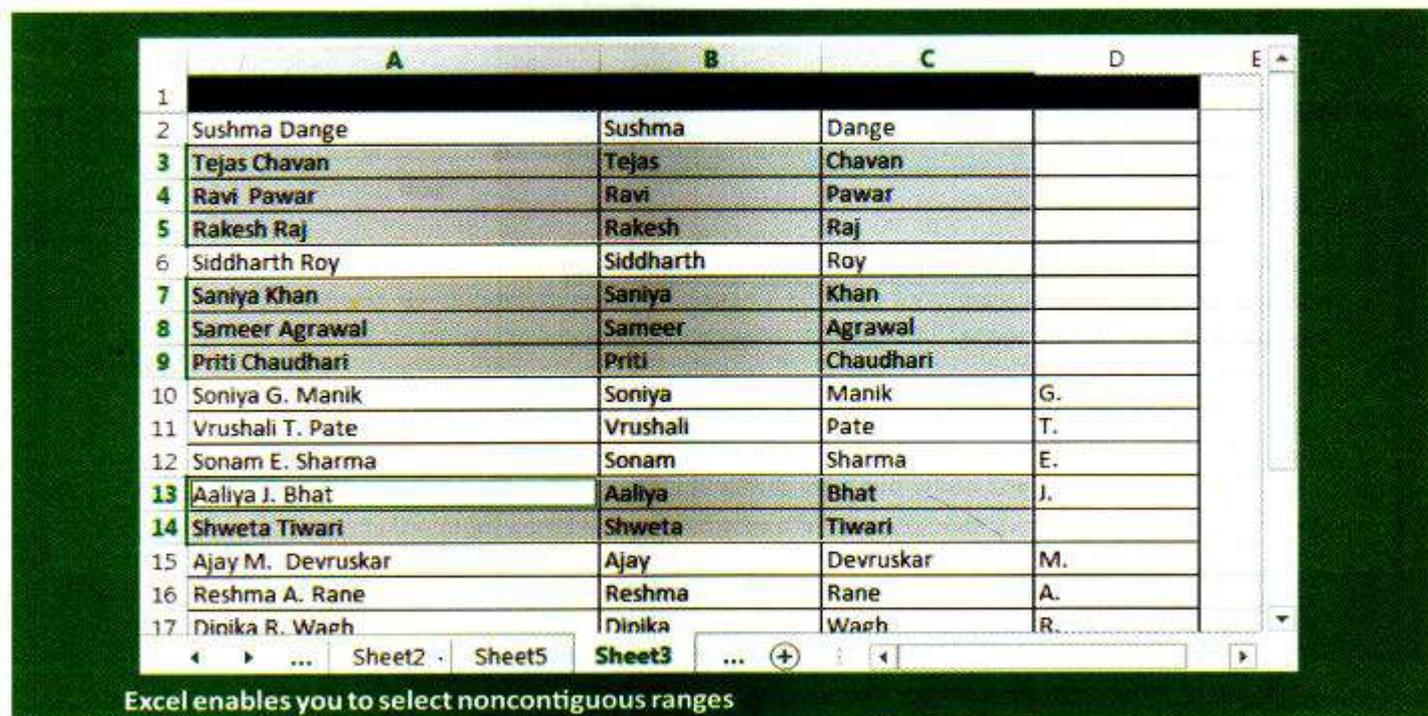
Selecting complete rows and columns

Select entire rows and columns in much the same manner as you select ranges:

- **Click the row or column header to select a single row or column.**
- **To select multiple adjacent rows or columns, drag over the row or column header.**
- **To select multiple (nonadjacent) rows or columns, press Ctrl while you click the row or column headers that you want.**
- **Press Ctrl+Spacebar to select a column.** The column of the active cell (or columns of the selected cells) is highlighted.
- **Press Shift+Spacebar to select a row.** The row of the active cell (or rows of the selected cells) is highlighted.

Selecting non contiguous ranges

Excel also enables you to work with noncontiguous ranges, which consist of two or more ranges (or single cells) that aren't next to each other. Selecting non contiguous ranges is also known as a **multiple selection.** If you want to apply the same formatting to cells in different areas of your worksheet, one approach is to make a multiple selection. When the appropriate cells or ranges are selected, the formatting that you select is applied to them all. Below image shows a noncontiguous range selected in a worksheet. Three ranges are selected: A3:C5, A7:C9, and A13:C14.

	A	B	C	D	E
1					
2	Sushma Dange	Sushma	Dange		
3	Tejas Chavan	Tejas	Chavan		
4	Ravi Pawar	Ravi	Pawar		
5	Rakesh Raj	Rakesh	Raj		
6	Siddharth Roy	Siddharth	Roy		
7	Saniya Khan	Saniya	Khan		
8	Sameer Agrawal	Sameer	Agrawal		
9	Priti Chaudhari	Priti	Chaudhari		
10	Soniya G. Manik	Soniya	Manik	G.	
11	Vrushali T. Pate	Vrushali	Pate	T.	
12	Sonam E. Sharma	Sonam	Sharma	E.	
13	Aaliya J. Bhat	Aaliya	Bhat	J.	
14	Shweta Tiwari	Shweta	Tiwari		
15	Ajay M. Devruskar	Ajay	Devruskar	M.	
16	Reshma A. Rane	Reshma	Rane	A.	
17	Dinika R. Wagh	Dinika	Wagh	R.	

Sheet2 · Sheet5 **Sheet3** ...

Excel enables you to select noncontiguous ranges

You can select a noncontiguous range in several ways:

- **Select the first range (or cell).** Then press and hold Ctrl as you drag the mouse to highlight additional cells or ranges.

- **From the keyboard, select a range as described previously (using F8 or the Shift key).** Then press Shift+F8 to select another range without canceling the previous range selections.

- **Enter the range (or cell) address in the Name box and press Enter.** Separate each range address with a comma.

- **Choose Home ⇨ Editing ⇨ Find & Select ⇨ Go To (or press F5) to display the Go To dialog box.** Enter the range (or cell) address in the Reference box, and separate each range address with a comma. Click OK, and Excel selects the ranges.

Selecting multi sheet ranges

In addition to two-dimensional ranges on a single worksheet, ranges can extend across multiple worksheets to be three-dimensional ranges.

Suppose that you have a workbook set up to track budgets. A common approach is to use a separate worksheet for each department, making it easy to organize the data. You can click a sheet tab to view the information for a particular department.

Say you have a workbook with four sheets: Totals, Operations, Marketing, and Manufacturing. The sheets are laid out identically. The only difference is the values. The Totals sheet contains formulas that compute the sum of the corresponding items in the three departmental worksheets.

Assume that you want to apply formatting to the sheets — for example, make the column headings bold with background shading. One (albeit not-so-efficient) approach is to format the cells in each worksheet separately. A better technique is to select a multisheet range and format the cells in all the sheets simultaneously. The following is a step-by-step example of multi sheet formatting, using the workbook shown in below image.

1. Activate the Totals worksheet by clicking its tab.

2. Select the range B3:F3.

3. Press Shift and click the Manufacturing sheet tab. This step selects all worksheets between the active worksheet

(Totals) and the sheet tab that you click — in essence, a three-dimensional range of cells. The workbook window's title bar displays [Group] to remind you that you've selected a group of sheets and that you're in Group mode.
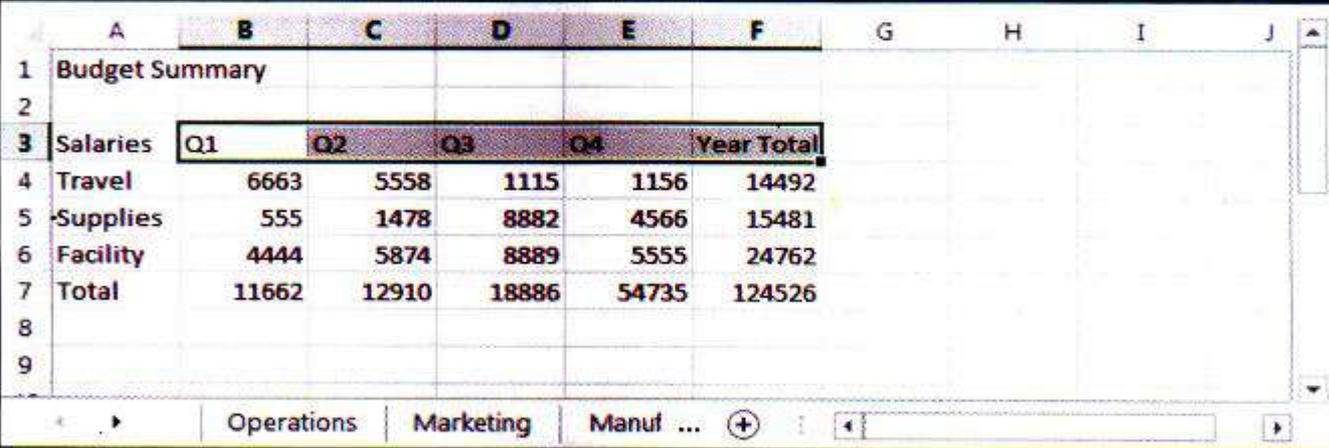
	A	B	C	D	E	F	G	H	I	J
1	Budget Summary									
2										
3	Salaries	Q1	Q2	Q3	Q4	Year Total				
4	Travel	6663	5558	1115	1156	14492				
5	Supplies	555	1478	8882	4566	15481				
6	Facility	4444	5874	8889	5555	24762				
7	Total	11662	12910	18886	54735	124526				
8										
9										

Operations | Marketing | Manuf ...

In Group mode, you can work with a three-dimensional range of cells that extend across multiple worksheets

4. **Choose Home ➪ Font ➪ Bold and then choose Home ➪ Font ➪ Fill Color to apply a colored background.** Excel applies the formatting to the selected range across the selected sheets.

5. **Click one of the other sheet tabs.** This step selects the sheet and also cancels Group mode; [Group] is no longer displayed in the title bar.

Selecting special types of cells

As you use Excel, you may need to locate specific types of cells in your worksheets. For example, wouldn't it be handy to be able to locate every cell that contains a formula — or perhaps all the formula cells that depend on the active cell? Excel provides an easy way to locate these and many other special types of cells: Select a range, and choose Home ➪ Editing ➪ Find & Select ➪ Go to Special to display the Go to Special dialog box.

Use the Go to Special dialog box to select specific types of cells

After you make your choice in the dialog box, Excel selects the qualifying subset of cells in the current selection. Often, this subset of cells is a multiple selection. If no cells qualify, Excel lets you know with the message No cells were found.

Below Table offers a description of the options available in the Go to Special dialog box. Some of the options are very useful.

Table Go to Special Options

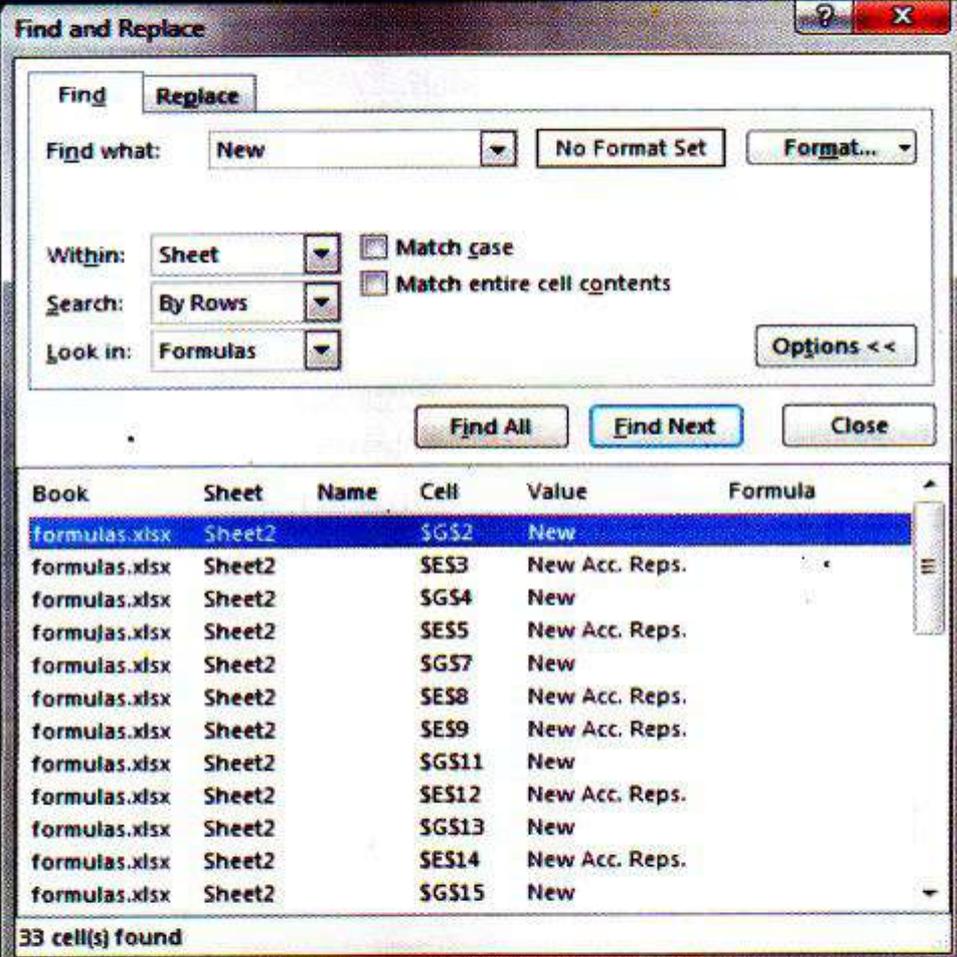| Option	What it does
Comments	Selects the cells that contain a cell comment.
Constants	Selects all nonempty cells that don't contain formulas. Use the check boxes under the Formulas option to choose which types of non formula cells to include.
Formulas	Selects cells that contain formulas. Qualify this by selecting the type of result: numbers, text, logical values (TRUE or FALSE), or errors.
Blanks	Selects all empty cells. If a single cell is selected when the dialog box displays, this option selects the empty cells in the used area of the worksheet.
Current region	Selects a rectangular range of cells around the active cell. This range is determined by surrounding blank rows and columns. You can also press Ctrl+Shift+8 (Ctrl+*).
Current array	Selects the entire array.
Objects	Selects all embedded objects on the worksheet, including charts and graphics.
Row differences	Analyzes the selection and selects cells that are different from other cells in each row.
Column differences	Analyzes the selection and selects the cells that are different from other cells in each column.
Precedents	Selects cells that are referred to in the formulas in the active cell or selection (limited to the active sheet). You can select either direct precedents or precedents at any level.
Dependents	Selects cells with formulas that refer to the active cell or selection (limited to the active sheet). You can select either direct dependents or dependents at any level.
Last cell	Selects the bottom-right cell in the worksheet that contains data or formatting. For this option, the entire worksheet is examined, even if a range is selected when the dialog box displays.
Visible cells only or table.	Selects only visible cells in the selection. This option is useful when dealing with a filtered list
Conditional formats	Selects cells that have a conditional format applied (by choosing Home ⇨ Styles ⇨ Conditional Formatting). The All option selects all such cells. The Same option selects only the cells that have the same conditional formatting as the active cell.
Data validation	Selects cells that are set up for data entry validation (by choosing Data ⇨ Data Tools ⇨ Data Validation). The All option selects all such cells. The Same option selects only the cells that have the same validation rules as the active cell.

Tip

When you select an option in the Go to Special dialog box, be sure to note which suboptions become available. The placement of these suboptions can be misleading. For example, when you select Constants, the suboptions under Formulas become available to help you further refine the results. Likewise, the suboptions under Dependents also apply to Precedents, and those under Data validation also apply to Conditional Formats.

Selecting cells by searching

Another way to select cells is to choose Home ⇨ Editing ⇨ Find & Select ⇨ Find (or press Ctrl+F), which allows you to select cells by their contents. Click the Options button to display additional choices for refining the search.

Enter the text that you're looking for; then click Find All. The dialog box expands to display all the cells that match your search criteria. For example, below image shows the dialog box after Excel has located all cells that contain the text New. You can click an item in the list, and the screen will scroll so that you can view the cell in context. To select all the cells in the list, first select any single item in the list. Then press Ctrl+A to select them all.

The Find and Replace dialog box, with its results listed

Note

The Find and Replace dialog box is non modal, so it allows you to return to the worksheet without dismissing the dialog box.

The Find and Replace dialog box supports two wildcard characters:

?	Matches any single character
*	Matches any number of characters

Wildcard characters also work with values when the Match Entire Cell Contents option is selected. For example, searching for 3* locates all cells that contain a value that begins with 3. Searching for 1?9 locates all three-digit entries that begin with 1 and end with 9. Searching for *00 locates values that end with two zeros.

Tip

To search for a question mark or an asterisk, precede the character with a tilde (~). For example, the following search string finds the text *NONE*:

~*NONE~*

If you need to search for the tilde character, use two tildes.

If your searches don't seem to be working correctly, double-check these three options (which sometimes have a way of changing on their own):

- **Match case:** If this check box is selected, the case of the text must match exactly. For example, searching for smith does not locate Smith.

- **Match entire cell contents:** If this check box is selected, a match occurs if the cell contains only the search string (and nothing else). For example, searching for Excel doesn't locate a cell that contains Microsoft Excel. When using wildcard characters, an exact match is not required.

- **Look in:** This drop-down list has three options: Values, Formulas, and Comments. If, for example, Values is selected, searching for 900 doesn't find a cell that contains 900 if that value is generated by a formula (unless the formula itself contains 900).

Copying or Moving Ranges

As you create a worksheet, you may find it necessary to copy or move information from one location to another. Excel makes copying or moving ranges of cells easy. Here are some common things you might do:

- **Copy a cell to another location.**

- **Copy a cell to a range of cells.** The source cell is copied to every cell in the destination range.

- **Copy a range to another range.** Both ranges must be the same size.

- **Move a range of cells to another location.**

The primary difference between copying and moving a range is the effect of the operation on the source range. When you copy a range, the source range is unaffected. When you move a range, the contents are removed from the source range.

Copying or moving consists of two steps:

1. **Select the cell or range to copy (the source range), and copy it to the Clipboard.** To move the range instead of copying it, cut the range instead of copying it.

2. **Move the cell pointer to the range that will hold the copy (the destination range), and paste the Clipboard contents.**

Caution

When you paste information, Excel overwrites any cells that get in the way without warning you. If you find that pasting overwrote some essential cells, choose Undo from the Quick Access Toolbar (or press Ctrl+Z).

Copying by using Ribbon commands

Choosing Home ⇨ Clipboard ⇨ Copy transfers a copy of the selected cell or range to the Windows Clipboard and the Office Clipboard. After performing the copy part of this operation, select the cell that will hold the copy and choose Home ⇨ Clipboard ⇨ Paste.

Instead of choosing Home ⇨ Clipboard ⇨ Paste, you can just activate the destination cell and press Enter. If you use this technique, Excel removes the copied information from the Clipboard so that it can't be pasted again.

About the Office Clipboard

Office has its own Office Clipboard. To view or hide the Office Clipboard, click the dialog box launcher in the bottom-right corner of the Home ⇨ Clipboard group.

Whenever you cut or copy information in an Office program, such as Excel or Word, the program places the information on both the Windows Clipboard and the Office Clipboard. However, the program treats information on the Office Clipboard differently from how it treats information on the Windows Clipboard. Instead of replacing information on the Office Clipboard, the program appends the information to the Office Clipboard when it's active. With multiple items stored on the Clipboard, you can then paste the items either individually or as a group.

Copying by using shortcut menu commands and keyboard shortcuts

If you prefer, you can use the following shortcut menu commands for copying and pasting:

- **Right-click the range and choose Copy (or Cut) from the shortcut menu to copy the selected cells to the Clipboard.**

- **Right-click and choose Paste from the shortcut menu that appears to paste the Clipboard contents to the selected cell or range.**
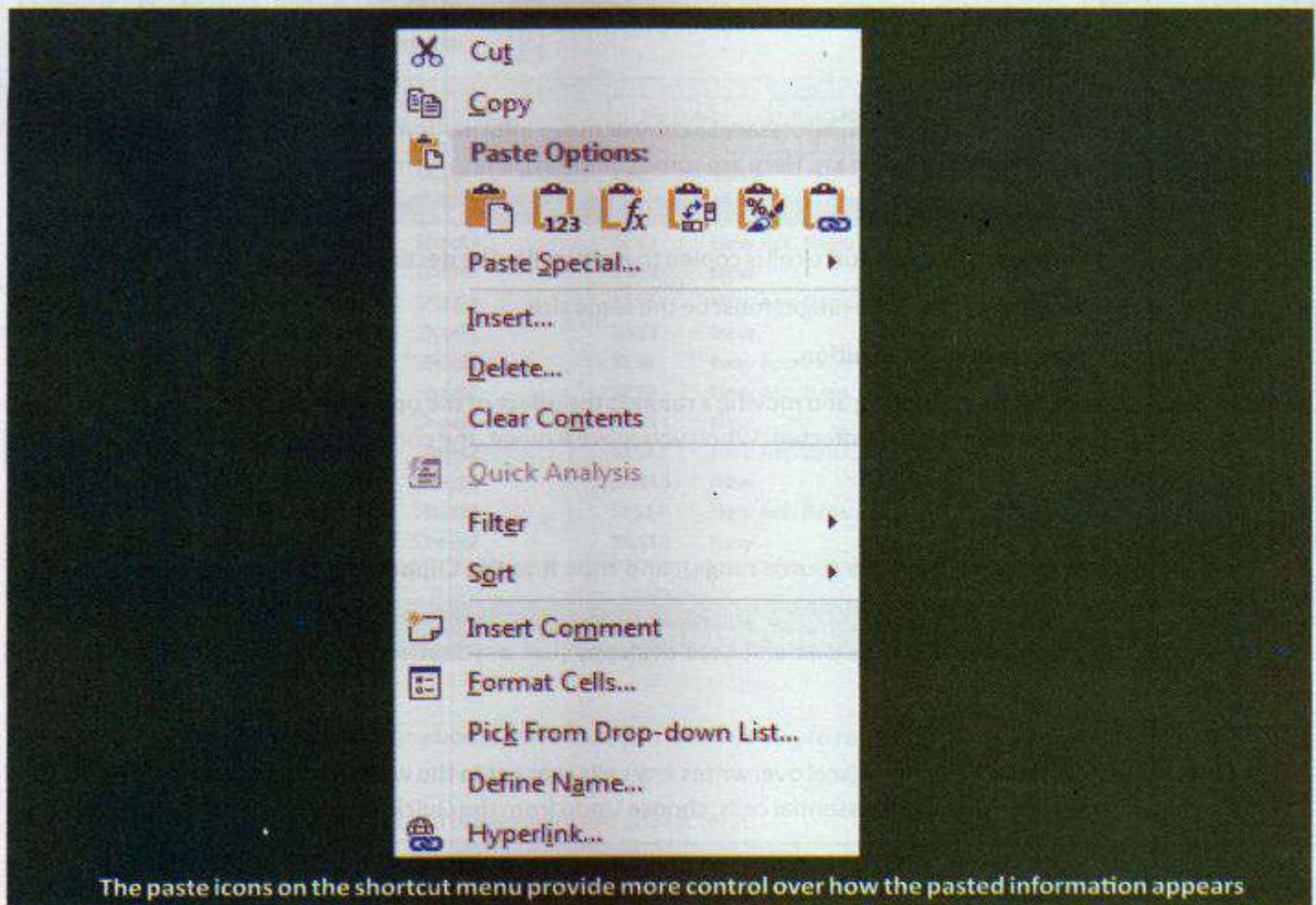
The paste icons on the shortcut menu provide more control over how the pasted information appears

Instead of using Paste, you can just activate the destination cell and press Enter. If you use this technique, Excel removes the copied information from the Clipboard so that it can't be pasted again.

The copy and paste operations also have keyboard shortcuts (these are the same as those available in other applications):

- **Ctrl+C copies the selected cells to both the Windows Clipboard and the Office Clipboard.**

- Ctrl+X cuts the selected cells to both the Windows Clipboard and the Office Clipboard.
- Ctrl+V pastes the Windows Clipboard contents to the selected cell or range.

Copying or moving by using drag-and-drop

Excel also enables you to copy or move a cell or range by dragging. Unlike other methods of copying and moving, dragging and dropping does not place any information on either the Windows Clipboard or the Office Clipboard.

To copy using drag-and-drop, select the cell or range that you want to copy and then press Ctrl and move the mouse to one of the selection's borders (the mouse pointer is augmented with a small plus sign). Then, drag the selection to its new location while you continue to press the Ctrl key. The original selection remains behind, and Excel makes a new copy when you release the mouse button.

To move a range using drag-and-drop, don't press Ctrl while dragging the border.

Tip

If the mouse pointer doesn't turn into an arrow when you point to the border of a cell or range, you need to make a change to your settings. Choose File ⇨ Options to display the Excel Options dialog box, select the Advanced tab, and place a checkmark on the option labeled Enable fill handle and cell drag-and-drop.

Copying to adjacent cells

Often, you need to copy a cell to an adjacent cell or range. This type of copying is quite common when working with formulas. For example, if you're working on a budget, you might create a formula to add the values in column B. You can use the same formula to add the values in the other columns. Rather than re-enter the formula, you can copy it to the adjacent cells.

Excel provides additional options for copying to adjacent cells. To use these commands, activate the cell that you're copying and extend the cell selection to include the cells that you're copying to. Then issue the appropriate command from the following list for one-step copying:

- Home ⇨ Editing ⇨ Fill ⇨ Down (or Ctrl+D) copies the cell to the selected range below.
- Home ⇨ Editing ⇨ Fill ⇨ Right (or Ctrl+R) copies the cell to the selected range to the right.
- Home ⇨ Editing ⇨ Fill ⇨ Up copies the cell to the selected range above.
- Home ⇨ Editing ⇨ Fill ⇨ Left copies the cell to the selected range to the left.

None of these commands places information on either the Windows Clipboard or the Office Clipboard.

Tip

You also can use Autofill to copy to adjacent cells by dragging the selection's fill handle (the small square in the bottom-right corner of the selected cell or range). Excel copies the original selection to the cells that you highlight while dragging. For more control over the Auto Fill operation, drag the fill handle with the right mouse button, and you'll get a shortcut menu with additional options.

Copying a range to other sheets

You can use the copy procedures described previously to copy a cell or range to another worksheet, even if the worksheet is in a different workbook. You must, of course, activate the other worksheet before you select the location to which you want to copy.

Excel offers a quicker way to copy a cell or range and paste it to other worksheets in the same workbook.

1. Select the range to copy.

2. Press Ctrl and click the sheet tabs for the worksheets to which you want to copy the information. Excel displays [Group] in the workbook's title bar.

3. **Choose Home ⇨ Editing ⇨ Fill ⇨ Across Worksheets.** A dialog box appears to ask you what you want to copy (All, Contents, or Formats).

4. **Make your choice and then click OK.** Excel copies the selected range to the selected worksheets; the new copy occupies the same cells in the selected worksheets as the original occupies in the initial worksheet.

Using the Office Clipboard to paste

Whenever you cut or copy information in an Office program, such as Excel, you can place the data on both the Windows Clipboard and the Office Clipboard. When you copy information to the Office Clipboard, you append the information to the Office Clipboard instead of replacing what is already there. With multiple items stored on the Office Clipboard, you can then paste the items either individually or as a group.

To use the Office Clipboard, you first need to open it. Click the dialog box launcher on the bottom right of the Home ⇨ Clipboard group to toggle the Clipboard pane on and off.

Tip

To make the Clipboard task pane open automatically, click the Options button near the bottom of the task pane and choose the Show Office Clipboard Automatically option.

After you open the Clipboard task pane, select the first cell or range that you want to copy to the Office Clipboard and copy it by using any of the preceding techniques. Repeat this process, selecting the next cell or range that you want to copy. As soon as you copy the information, the Clipboard pane shows you the number of items that you've copied and a brief description (it will hold up to 24 items). Below image shows the Office Clipboard with four copied items.

When you're ready to paste information, select the cell into which you want to paste information. To paste an individual item, click it in the Clipboard pane. To paste all the items that you've copied, click the Paste All button (which is at the top of the Clipboard pane). The items are pasted, one after the other. The Paste All button is probably more useful in Word, for situations in which you copy text from various sources and then paste it all at once.

You can clear the contents of the Office Clipboard by clicking the Clear All button.

The following items about the Office Clipboard and how it functions are worth noting:

Use the Clipboard pane to copy and paste multiple items

- **Excel pastes the contents of the Windows Clipboard (the last item you copied to the Office Clipboard) when you paste by choosing Home ⇨ Clipboard ⇨ Paste, by pressing Ctrl+V, or by right-clicking and choosing Paste from the shortcut menu.**
- **The last item that you cut or copied appears on both the Office Clipboard and the Windows Clipboard.**
- **Pasting from the Office Clipboard also places that item on the Windows Clipboard.** If you choose Paste All from the Office Clipboard toolbar, you paste all items stored on the Office Clipboard onto the Windows Clipboard as a single item.
- **Clearing the Office Clipboard also clears the Windows Clipboard.**

Pasting in special ways

You may not always want to copy everything from the source range to the destination range. For example, you may want to copy only the formula results rather than the formulas themselves. Or you may want to copy the number formats from one range to another without overwriting any existing data or formulas.

To control what is copied into the destination range, choose Home ➪ Clipboard ➪ Paste and use the drop-down menu. When you hover your mouse pointer over an icon, you'll see a preview of the pasted information in the destination range. Click the icon to use the selected paste option.
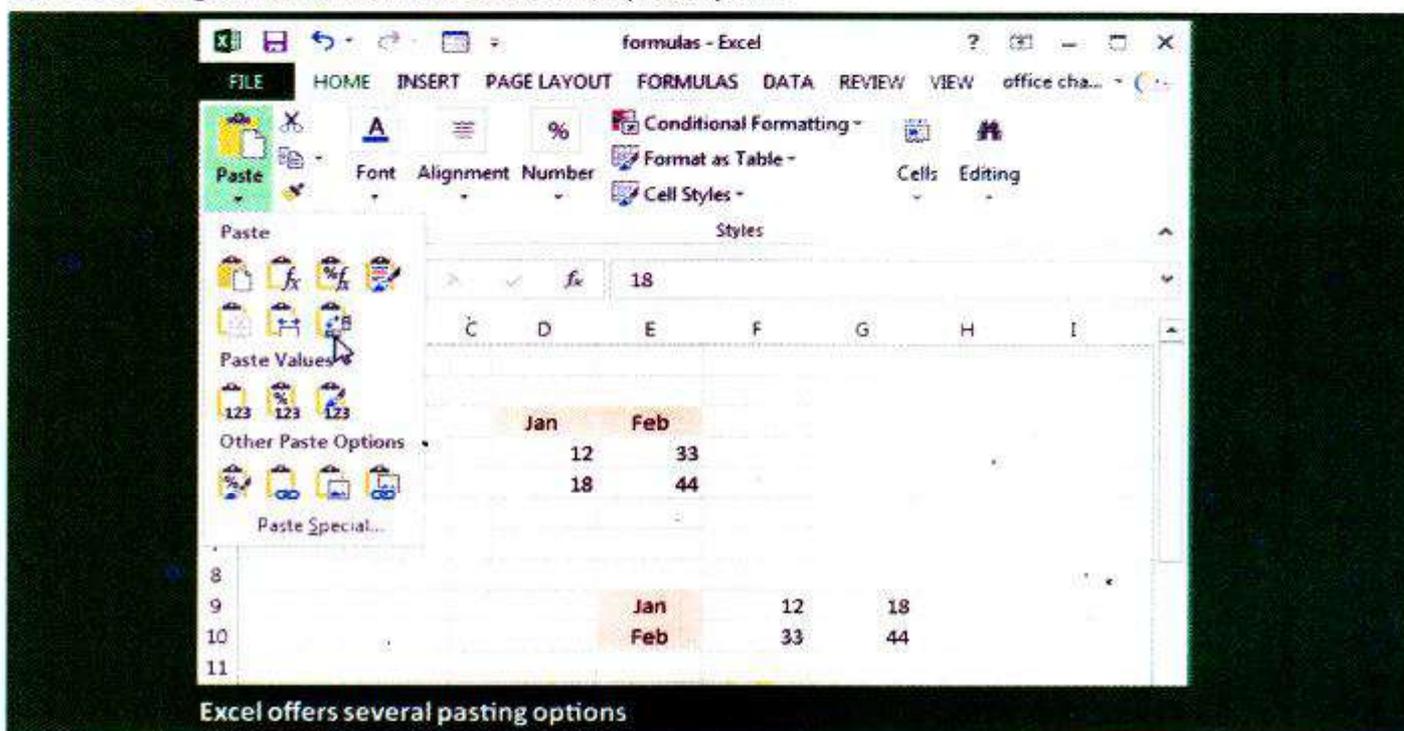
Excel offers several pasting options

The paste options are:

- **Paste (P):** Pastes the cell's contents, formats, and data validation from the Windows Clipboard.

- **Formulas (F):** Pastes formulas but not formatting.

- **Formulas & Number Formatting (O):** Pastes formulas and number formatting only.

- **Keep Source Formatting (K):** Pastes formulas and all formatting.

- **No Borders (B):** Pastes everything except borders that appear in the source range.

- **Keep Source Column Width (W):** Pastes formulas and duplicates the column width of the copied cells.

- **Transpose (T):** Changes the orientation of the copied range. Rows become columns, and columns become rows. Any formulas in the copied range are adjusted so that they work properly when transposed.

- **Merge Conditional Formatting (G):** This icon is displayed only when the copied cells contain conditional formatting. When clicked, it merges the copied conditional formatting with any conditional formatting in the destination range.

- **Values (V):** Pastes the results of formulas. The destination for the copy can be a new range or the original range. In the latter case, Excel replaces the original formulas with their current values.

- **Values & Number Formatting (A):** Pastes the results of formulas plus the number formatting.

- **Values & Source Formatting (E):** Pastes the results of formulas plus all formatting.

- **Formatting ®:** Pastes only the formatting of the source range.

- **Paste Link (N):** Creates formulas in the destination range that refer to the cells in the copied range.

- **Picture (U):** Pastes the copied information as a picture.

- **Linked Picture (I):** Pastes the copied information as a "live" picture that is updated if the source range is changed.

- **Paste Special:** Displays the Paste Special dialog box (described in the next section).

Note

After you paste, you're offered another chance to change your mind. A Paste Options button appears at the lower right of the pasted range. Click it (or press Ctrl), and you see the paste option icons again.

Using the Paste Special dialog box

For yet another pasting method, choose Home ➪ Clipboard ➪ Paste ➪ Paste Special to display the Paste Special dialog box. You can also right-click and choose Paste Special from the shortcut menu to display this dialog box. This dialog box has several options, explained next.
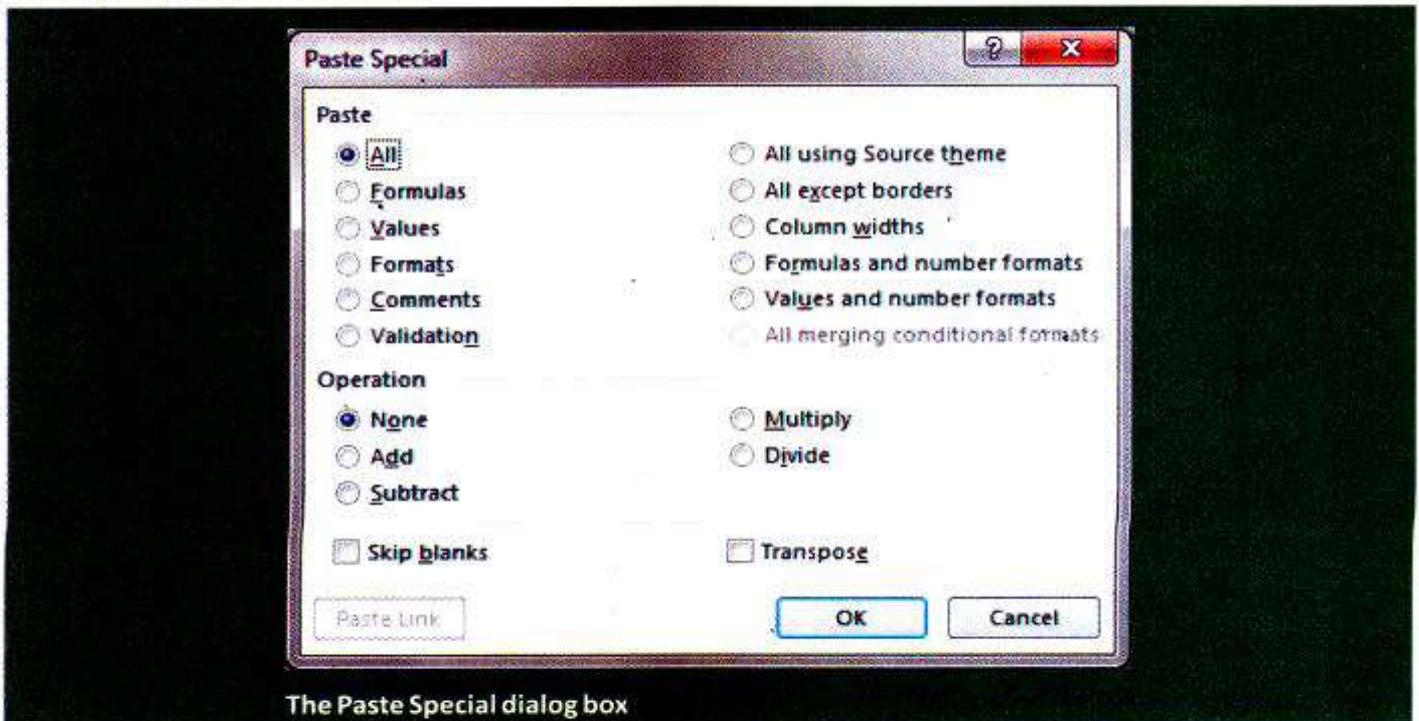
The Paste Special dialog box

Note

Excel actually has several different Paste Special dialog boxes, each with different options. The one displayed depends on what's copied. This section describes the Paste Special dialog box that appears when a range or cell has been copied.

- **All:** Pastes the cell's contents, formats, and data validation from the Windows Clipboard

- **Formulas:** Pastes values and formulas, with no formatting

- **Values:** Pastes values and the results of formulas (no formatting). The destination for the copy can be a new range or the original range. In the latter case, Excel replaces the original formulas with their current values.

- **Formats:** Copies only the formatting

- **Comments:** Copies only the cell comments from a cell or range. This option doesn't copy cell contents or formatting.

- **Validation:** Copies the validation criteria so the same data validation will apply. Data validation is applied by choosing Data ➪ Data Tools ➪ Data Validation.

- **All Using Source Theme:** Pastes everything, but uses the formatting from the document theme of the source. This option is relevant only if you're pasting information from a different workbook, and the workbook uses a different document theme than the active workbook.

- **All Except Borders:** Pastes everything except borders that appear in the source range

- **Column Widths:** Pastes only column width information

- **Formulas and Number Formats:** Pastes all values, formulas, and number formats (but no other formatting)

- **Values and Number Formats:** Pastes all values and numeric formats but not the formulas themselves

- **All merging conditional formats:** Merges the copied conditional formatting with any conditional formatting in the destination range. This option is enabled only when you're copying a range that contains conditional formatting.

In addition, the Paste Special dialog box enables you to perform other operations, described in the following sections.

Performing mathematical operations without formulas

The option buttons in the Operation section of the Paste Special dialog box let you perform an arithmetic operation on values and formulas in the destination range. For example, you can copy a range to another range and select the Multiply operation. Excel multiplies the corresponding values in the source range and the destination range and replaces the destination range with the new values.

This feature also works with a single copied cell, pasted to a multi-cell range. Assume that you have a range of values, and you want to increase each value by 5 percent. Enter 105% into any blank cell and copy that cell to the Clipboard. Then select the range of values and bring up the Paste Special dialog box. Select the Multiply option, and each value in the range is multiplied by 105%.

Skipping blanks when pasting

The Skip Blanks option in the Paste Special dialog box prevents Excel from overwriting cell contents in your paste area with blank cells from the copied range. This option is useful if you're copying a range to another area but don't want the blank cells in the copied range to overwrite existing data.

Transposing a range

The Transpose option in the Paste Special dialog box changes the orientation of the copied range. Rows become columns, and columns become rows. Any formulas in the copied range are adjusted so that they work properly when transposed. Note that you can use this check box with the other options in the Paste Special dialog box.

Using Names to Work with Ranges

Excel allows you to assign descriptive names to cells and ranges. For example, you can give a cell a name such as Interest_Rate, or you can name a range July Sales. Working with these names (rather than cell or range addresses) has several advantages:

- A meaningful range name (such as Total_Income) is much easier to remember than a cell address (such as AC21).

- Entering a name is less error prone than entering a cell or range address, and if you type a name incorrectly in a formula, Excel will display a #NAME? error.

- You can quickly move to areas of your worksheet either by using the Name box, located at the left side of the Formula bar (click the arrow to drop down a list of defined names) or by choosing Home ⇨ Editing ⇨ Find & Select ⇨ Go To (or pressing F5) and specifying the range name.

- Creating formulas is easier. You can paste a cell or range name into a formula by using Formula AutoComplete, another feature covered in Chapter 15.

- Names make your formulas more understandable and easier to use. A formula such as =Income—Taxes is more intuitive than =D20—D40.

Creating range names in your workbooks

Excel provides several different methods that you can use to create range names. Before you begin, however, you should be aware of a few rules:

- **Names can't contain any spaces.** You may want to use an underscore character to simulate a space (such as Annual_Total).

- **You can use any combination of letters and numbers, but the name must begin with a letter, underscore, or backslash.** A name can't begin with a number (such as 3rd Quarter) or look like a cell address (such as QTR3). If these are desirable names, though, you can precede the name with an underscore or a backslash: for example, _3rd Quarter and \QTR3.

- **Symbols — except for underscores, backslashes, and periods — aren't allowed.**

- **Names are limited to 255 characters, but it's a good practice to keep names as short as possible, but still meaningful.**

Using the Name box

The fastest way to create a name is to use the Name box (to the left of the Formula bar). Select the cell or range to name, click the Name box, and type the name. Press Enter to create the name. (You must press Enter to actually record the name; if you type a name and then click in the worksheet, Excel doesn't create the name.)

If you type an invalid name (such as May 21, which is a cell address), Excel activates that address (and doesn't warn you that the name is not valid). If the name you type includes an invalid character, Excel displays an error message. If a name already exists, you can't use the Name box to change the range to which that name refers. Attempting to do so simply selects the range.

The Name box is a drop-down list and shows all names in the workbook. To choose a named cell or range, click the Name box and choose the name. The name appears in the Name box, and Excel selects the named cell or range in the worksheet.

Using the New Name dialog box

For more control over naming cells and ranges, use the New Name dialog box. Start by selecting the cell or range that you want to name. Then choose Formulas ➪ Defined Names ➪ Define Name. Excel displays the New Name dialog box. Note that this is a resizable dialog box. Drag a border to change the dimensions.
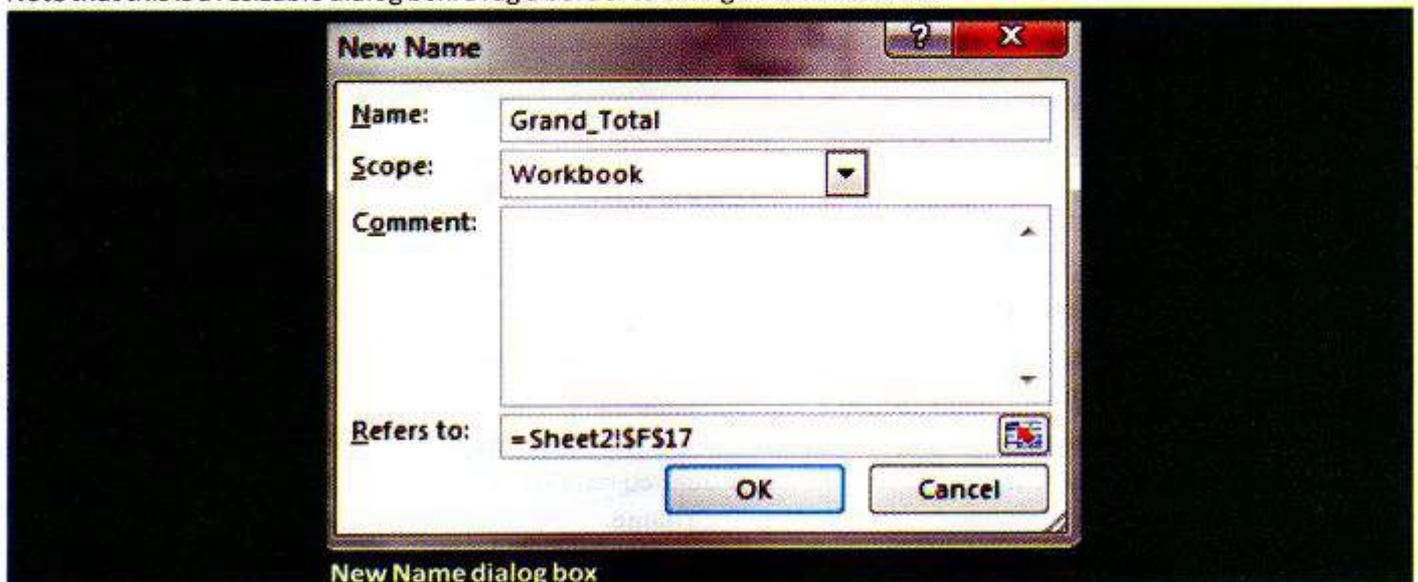
New Name dialog box

Type a name in the Name text field (or use the name that Excel proposes, if any). The selected cell or range address appears in the Refers To text field. Use the Scope drop-down list to indicate the scope for the name. The scope

indicates where the name will be valid, and it's either the entire workbook or a particular sheet. If you like, you can add a comment that describes the named range or cell. Click OK to add the name to your workbook and close the dialog box.

Using the Create Names from Selection dialog box

You may have a worksheet that contains text that you want to use for names for adjacent cells or ranges. For example, you may want to use the text in column A to create names for the corresponding values in column B. Excel makes this task easy.

To create names by using adjacent text, start by selecting the name text and the cells that you want to name. (These items can be individual cells or ranges of cells.) The names must be adjacent to the cells that you're naming. (A multiple selection is allowed.) Then choose Formulas ⇨ Defined Names ⇨ Create from Selection. Excel displays the Create Names from Selection dialog box.

The check marks in the Create Names from Selection dialog box are based on Excel's analysis of the selected range. For example, if Excel finds text in the fi rst row of the selection, it proposes that you create names based on the top row. If Excel didn't guess correctly, you can change the check boxes. Click OK, and Excel creates the names. Using the data in below image, Excel creates six names: January for cell B1, February for cell B2, and so on.

Use the Create Names from Selection dialog box to name cells using labels that appear in the worksheet

Note

If the text contained in a cell would result in an invalid name, Excel modifies the name to make it valid. For example, if a cell contains the text Net Income (which is invalid for a name because it contains a space), Excel converts the space to an underscore character. If Excel encounters a value or a numeric formula where text should be, however, it doesn't convert it to a valid name. It simply doesn't create a name — and does not inform you of that fact.

Managing names

A workbook can have any number of named cells and ranges. If you have many names, you should know about the Name Manager.
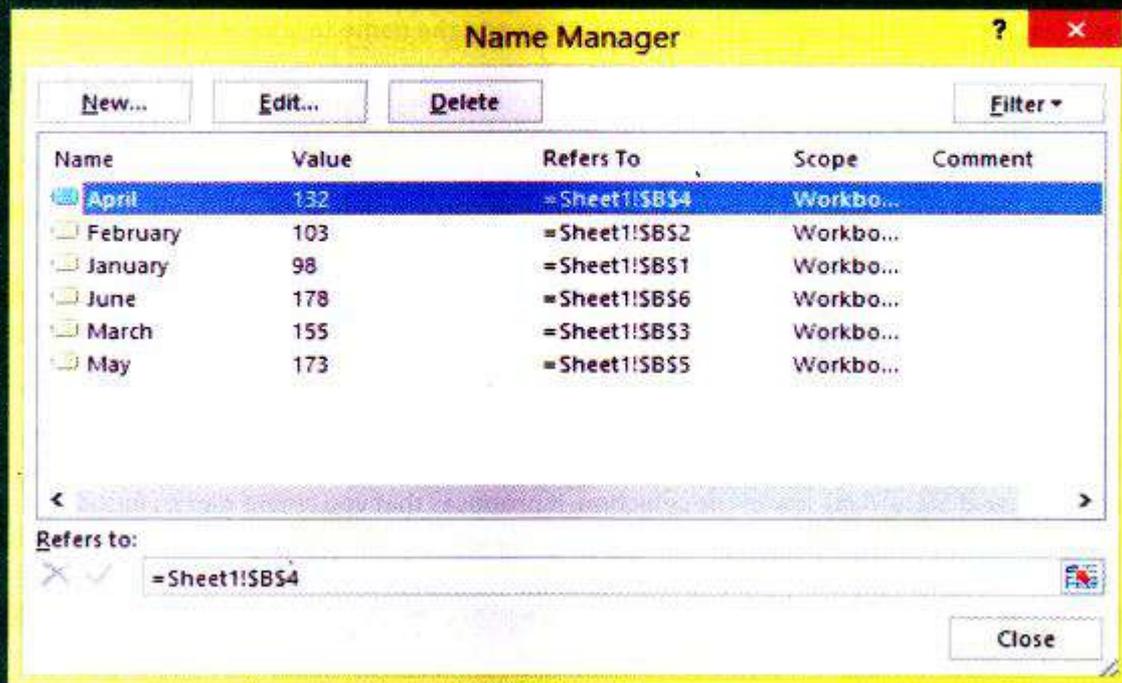
Use the Name Manager to work with range names

The Name Manager appears when you choose Formulas ➪ Defined Names ➪ Name Manager (or press Ctrl+F3). The Name Manager has the following features:

- **Displays information about each name in the workbook:** You can resize the Name Manager dialog box, widen the columns to show more information, and even rearrange the order of the columns. You can also click a column heading to sort the information by the column.

- **Allows you to filter the displayed names:** Clicking the Filter button lets you show only those names that meet a certain criteria. For example, you can view only the worksheet-level names.

- **Provides quick access to the New Name dialog box:** Click the New button to create a new name without closing the Name Manager.

- **Lets you edit names:** To edit a name, select it in the list and then click the Edit button. You can change the name itself, modify the Refers to range, or edit the comment.

- **Lets you quickly delete unneeded names:** To delete a name, select it in the list and click Delete.

If you delete the rows or columns that contain named cells or ranges, the names contain an invalid reference. For example, if cell A1 on Sheet1 is named Interest and you delete row 1 or column A, the name Interest then refers to =Sheet1!#REF! (that is, to an erroneous reference). If you use Interest in a formula, the formula displays #REF.

Adding Comments to Cells

Documentation that explains certain elements in the worksheet can often be helpful. One way to document your work is to add comments to cells. This feature is useful when you need to describe a particular value or explain how a formula works.

To add a comment to a cell, select the cell and use any of these actions:

- **Choose Review ➪ Comments ➪ New Comment.**

- **Right-click the cell and choose Insert Comment from the shortcut menu.**

- **Press Shift+F2.**

Excel inserts a comment that points to the **active cell**. Initially, the comment consists of your name, as specified in the General tab of the Excel Options dialog box (choose File ⇨ Options to display this dialog box). You can delete your name from the comment, if you like. Enter the text for the cell comment and then click anywhere in the worksheet to hide the comment. You can change the size of the comment by clicking and dragging any of its borders.

	A	B	C	D	E	F
1		**Sales**	**Expenses**			
2	Jan	3092	1983			
3	Feb	3293	2203			
4	Mar	3183	2391			
5	Apr	4088	1998			
6	May	3265				
7	Jun	4255	**Snehal:**			
8			**Is the June number Accurate?**			
9						
10						
11						

◀ ▶ ... FILE NAMES Sheet1 Fig. ... ◀ ▶

You can add comments to cells to help point out specific items in your worksheets
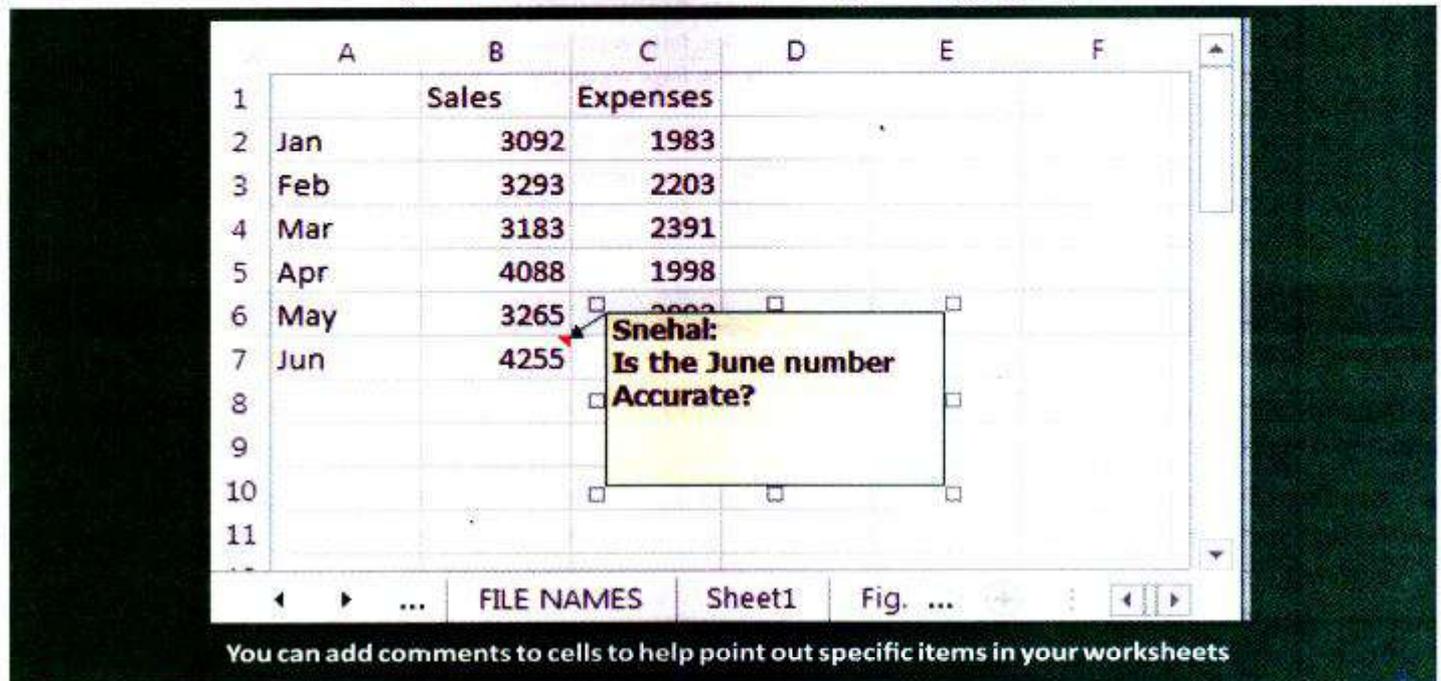
Cells that have a comment display a small red triangle in the upper-right corner. When you move the mouse pointer over a cell that contains a comment (or activate the cell), the comment becomes visible.

You can force a comment to be displayed even when its cell is not activated. Right-click the cell and choose Show/Hide Comments. Although this command refers to "comments" (plural), it affects only the comment in the active cell. To return to normal (make the comment appear only when its cell is activated or the mouse point hovers over it), right-click the cell and choose Hide Comment.

Tip

You can control how comments are displayed. Choose File ⇨ Options and then select the Advanced tab of the Excel Options dialog box. In the Display section, select the No comments or indicators option under For cells with comments, show.

Formatting comments

If you don't like the default look of cell comments, you can make some changes. Right-click the cell and choose Edit Comment. Select the text in the comment and use the commands of the Font and the Alignment groups (on the Home tab) to make changes to the comment's appearance.

For even more formatting options, right-click the comment's border and choose Format Comment from the shortcut menu. Excel responds by displaying the Format Comment dialog box, which allows you to change many aspects of its appearance, including color, border, and margins.

You can also display an image inside a comment. Right-click the cell and choose Edit Comment. Then right-click the comment's border and choose Format Comment. Select the Colors and Lines tab in the Format Comment dialog box. Click the Color drop-down list and select Fill Effects. In the Fill Effects dialog box, click the Picture tab and then click the Select Picture button to specify a graphics file.

	A	B	C	D	E	F	G	H	I	J
1	Date	Weekday	Amount	Account type	Opened By	Branch	Customer			
2	1/2/2012	Monday	45000	Checking	New Acc. Rep:	Central	Existing			
3	1/7/2012	Saturday	10000	Checking	New Acc. Rep:	Westside	New			
4	1/2/2012	Monday	368333.33	Checking	New Acc. Rep:	Westside	New			
5	1/2/2012	Monday	228333.33	Checking	New Acc. Rep:	Westside	Existing			
6	1/2/2012	Monday	508333.33	Checking	Teller	Central	New			
7	1/2/2012	Monday	588333.33	Checking	Teller	North	New			
8	1/2/2012	Monday	528333.33	Checking	Teller	North	Existing			
9	1/2/2012	Monday	88333.333	Checking	Teller	Westside	New			
10	1/2/2012	Monday	208333.33	Checking	Teller	Westside	New			
11										

comment containing a graphics image

Working further with comments

Comments are there to present information, and you need to know how to read and display comments. Here are additional key actions you'll perform with comments:

- **Reading comments:** To read all comments in a workbook, choose Review ⟹ Comments ⟹ Next. Keep clicking Next to cycle through all the comments in a workbook. Choose Review ⟹ Comments ⟹ Previous to view the comments in reverse order.

Note

You can also access the Page Setup box from the Print panel of Backstage view.

- **Hiding and showing comments:** If you want all cell comments to be visible (regardless of the location of the cell pointer), choose Review ⟹ Comments ⟹ Show All Comments. This command is a toggle; select it again to hide all cell comments. To toggle the display of an individual comment, select its cell, and then choose Review ⟹ Comments ⟹ Show/Hide Comment.

- **Selecting comments:** To quickly select all cells in a worksheet that contain a comment, choose Home ⟹ Editing ⟹ Find & Select ⟹ Go to Special. Then choose the Comments option and click OK.

- **Editing comments:** To edit a comment, activate the cell, right-click, and then choose Edit Comment from the shortcut menu. Or select the cell and press Shift+F2. After you make your changes, click any cell.

- **Deleting comments:** To delete a cell comment, activate the cell that contains the comment and then choose Review ⟹ Comments ⟹ Delete. Or right-click and then choose Delete Comment from the shortcut menu.

- **Printing comments:** Comments do not print by default. Click the dialog box launcher in the Page Layout ⟹ Page Setup group. In the Page Setup dialog box, click the Sheet tab. Make your choice from the Comments drop-down control: At End of Sheet or As Displayed on Sheet. Click OK to close the Page Setup dialog box or click the Print button to print the worksheet.

Understanding Formula Basics

A formula consists of special code entered into a cell. It performs a calculation of some type and returns a result, which is displayed in the cell. Formulas use a variety of operators and worksheet functions to work with values and text. The values and text used in formulas can be located in other cells, which makes changing data easy and gives worksheets their dynamic nature. For example, you can see multiple scenarios quickly by changing the data in a worksheet and letting your formulas do the work.

A formula can consist of any of these elements:

- Mathematical operators, such as + (for addition) and * (for multiplication)
- Cell references (including named cells and ranges)
- Values or text
- Worksheet functions (such as SUM or AVERAGE)

After you enter a formula, the cell displays the calculated result of the formula. The formula itself appears in the Formula bar when you select the cell, however.

Here are a few examples of formulas:

=150*.05	Multiplies 150 times 0.05. This formula uses only values, and it always returns the same result. You could just enter the value 7.5 into the cell.
=A3	Returns the value in cell A3. No calculation is performed.
=A1+A2	Adds the values in cells A1 and A2.
=Income−Expenses	Subtracts the value in the cell named Expenses from the value in the cell named Income
=SUM(A1:A12)	Adds the values in the range A1:A12, using the SUM function.
=A1=C12	Compares cell A1 with cell C12. If the cells are identical, the formula returns TRUE; otherwise, it returns FALSE.

Note that every formula begins with an equal sign (=). The initial equal sign allows Excel to distinguish a formula from plain text.

Using operators in formulas

Excel formulas support a variety of operators. Operators are symbols that indicate what mathematical operation you want the formula to perform. Below Table lists the operators that Excel recognizes. In addition to these, Excel has many built-in functions that enable you to perform additional calculations.

Operators Used in Formulas

Operator	Name
+	Addition
−	Subtraction
*	Multiplication
/	Division
^	Exponentiation
&	Concatenation
=	Logical comparison (equal to)

>	Logical comparison (greater than)
<	Logical comparison (less than)
>=	Logical comparison (greater than or equal to)
<=	Logical comparison (less than or equal to)
<>	Logical comparison (not equal to)

You can, of course, use as many operators as you need to perform the desired calculation.

Here are some examples of formulas that use various operators.

Formula	What it does
="Part-"&"23A"	Joins (concatenates) the two text strings to produce Part-23A.
=A1&A2	Concatenates the contents of cell A1 with cell A2. Concatenation works with values as well as text. If cell A1 contains 123 and cell A2 contains 456, this formula would return the text 123456.
=6^3	Raises 6 to the third power (216).
=216^(1/3)	Raises 216 to the 1/3 power. This is mathematically equivalent to calculating the cube root of 216, which is 6.
=A1<A2	Returns TRUE if the value in cell A1 is less than the value in cell A2. Otherwise, it returns FALSE. Logical comparison operators also work with text. If A1 contains Bill and A2 contains Julia, the formula would return TRUE because Bill comes before Julia in alphabetical order.
=A1<=A2	Returns TRUE if the value in cell A1 is less than or equal to the value in cell A2. Otherwise, it returns FALSE.
=A1<>A2	Returns TRUE if the value in cell A1 isn't equal to the value in cell A2. Otherwise, it returns FALSE.

Understanding operator precedence in formulas

When Excel calculates the value of a formula, it uses certain rules to determine the order in which the various parts of the formula are calculated. You need to understand these rules so your formulas produce accurate results.

Below Table lists the Excel operator precedence. This table shows that exponentiation has the highest precedence (performed first) and logical comparisons have the lowest precedence (performed last).

Table Operator Precedence in Excel Formulas

Symbol	Operator	Precedence
^	Exponentiation	1
*	Multiplication	2
/	Division	2
+	Addition	3
–	Subtraction	3
&	Concatenation	4
=	Equal to	5

<	Less than	5
>	Greater than	5

You can use parentheses to override Excel's built-in order of precedence. Expressions within parentheses are always evaluated first. For example, the following formula uses parentheses to control the order in which the calculations occur. In this case, cell B3 is subtracted from cell B2, and the result is multiplied by cell B4:

=(B2-B3)*B4

If you enter the formula without the parentheses, Excel computes a different answer. Because multiplication has a higher precedence, cell B3 is multiplied by cell B4. Then this result is subtracted from cell B2, which isn't what was intended.

The formula without parentheses looks like this:

=B2-B3*B4

It's a good idea to use parentheses even when they aren't strictly necessary. Doing so helps to clarify what the formula is intended to do. For example, the following formula makes it perfectly clear that B3 should be multiplied by B4, and the result subtracted from cell B2. Without the parentheses, you would need to remember Excel's order of precedence.

=B2-(B3*B4)

You can also nest parentheses within formulas — that is, put them inside other parentheses. If you do so, Excel evaluates the most deeply nested expressions first — and then works its way out. Here's an example of a formula that uses nested parentheses:

=((B2*C2)+(B3*C3)+(B4*C4))*B6

This formula has four sets of parentheses — three sets are nested inside the fourth set. Excel evaluates each nested set of parentheses and then sums the three results. This result is then multiplied by the value in cell B6.

Although the preceding formula uses four sets of parentheses, only the outer set is really necessary. If you understand operator precedence, it should be clear that you can rewrite this formula as:

=(B2*C2+B3*C3+B4*C4)*B6

But most would agree that using the extra parentheses makes the calculation much clearer.

Every left parenthesis, of course, must have a matching right parenthesis. If you have many levels of nested parentheses, keeping them straight can sometimes be difficult. If the parentheses don't match, Excel displays a message explaining the problem — and won't let you enter the formula.

In some cases, if your formula contains mismatched parentheses, Excel may propose a correction to your formula. Below image shows an example of a proposed correction. You may be tempted simply to accept Excel's suggestion, but be careful — in many cases, the proposed formula, although syntactically correct, isn't the formula you intended and it will produce an incorrect result.
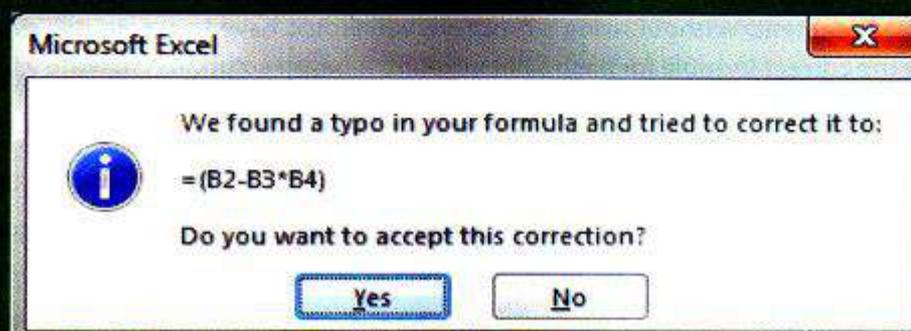
Excel sometimes suggests a syntactically correct formula, but not the formula you had in mind

Tip

When you're editing a formula, Excel lends a hand in helping you match parentheses by displaying matching parentheses in the same color.

Using functions in your formulas

Many formulas you create use worksheet functions. These functions enable you to greatly enhance the power of your formulas and perform calculations that are difficult (or even impossible) if you use only the operators discussed previously. For example, you can use the TAN function to calculate the tangent of an angle. You can't do this complicated calculation by using the mathematical operators alone.

Examples of formulas that use functions

A worksheet function can simplify a formula significantly.

Here's an example. To calculate the average of the values in ten cells (A1:A10) without using a function, you'd have to construct a formula like this:

    =(A1+A2+A3+A4+A5+A6+A7+A8+A9+A10)/10

You would need to edit this formula if you added another cell to the range. Fortunately, you can replace this formula with a much simpler one that uses one of Excel's built-in worksheet functions, AVERAGE:

    =AVERAGE(A1:A10)

The following formula demonstrates how using a function can enable you to perform calculations that are not otherwise possible. Say you need to determine the largest value in a range. A formula can't tell you the answer without using a function. Here's a formula that uses the MAX function to return the largest value in the range A1:D100:

    =MAX(A1:D100)

Functions also can sometimes eliminate manual editing. Assume that you have a worksheet that contains 1,000 names in cells A1:A1000, and the names appear in all-capital letters. Your boss sees the listing and informs you that the names will be mail-merged with a form letter. All-uppercase letters is not acceptable; for example, JINESH M. SHAH must now appear as Jinesh M. Shah You could spend the next several hours re-entering the list, or you could use a formula, such as the following, which uses the PROPER function to convert the text in cell A1 to the proper case:

    =PROPER(A1)

Enter this formula once in cell B1 and then copy it down to the next 999 rows. Then select B1:B1000 and choose Home ⇨ Clipboard ⇨ Copy to copy the range. Next, with B1:B1000 still selected, choose Home ⇨ Clipboard ⇨ Paste arrow ⇨ Paste Values (V) to convert the formulas to values. Delete the original column, and you've just accomplished several hours of work in less than a minute.

One last example should convince you of the power of functions. Suppose you have a worksheet that calculates sales commissions. If the salesperson sold more than 100,000 of product, the commission rate is 7.5 percent; otherwise, the commission rate is 5.0 percent. Without using a function, you would have to create two different formulas and make sure that you use the correct formula for each sales amount. A better solution is to write a formula that uses the IF function to ensure that you calculate the correct commission, regardless of sales amount:

    =IF(A1<100000,A1*5%,A1*7.5%)

This formula performs some simple decision making. The formula checks the value of cell A1. If this value is less than 100,000, the formula returns cell A1 multiplied by 5 percent. Otherwise, it returns what's in cell A1 multiplied by 7.5 percent. This example uses three arguments, separated by commas. I discuss this in the upcoming section, "Function arguments."

New Functions in Excel 2013

Excel 2013 includes more than 50 new worksheet functions.

Nearly all the new functions are highly specialized functions that will appeal to those in engineering or math-related fields.

But there are some new functions that might appeal to a more general audience:

- ISFORMULA: Returns TRUE if the referenced cell contains a formula
- FORMULATEXT: Returns the formula in the referenced cell, as text
- SHEET: Returns the sheet number of the referenced sheet. For example, =SHEET("Sheet3") returns the sheet number for Sheet3.
- SHEETS: Returns the number of sheets in a workbook. For example, =SHEETS() returns the number of sheets in the workbook.
- IFNA: If a reference contains a #NA error, returns other text you specify

Keep in mind that these functions are not backward compatible. If you use any of these new functions, they won't work if the file is opened with an earlier version of Excel.

Function arguments

In the preceding examples, you may have noticed that all the functions used parentheses. The information inside the parentheses is the list of arguments.

Functions vary in how they use arguments. Depending on what it has to do, a function may use:

- No arguments
- One argument
- A fixed number of arguments
- An indeterminate number of arguments
- Optional arguments

An example of a function that doesn't use an argument is the NOW function, which returns the current date and time. Even if a function doesn't use an argument, you must still provide a set of empty parentheses, like this:

    =NOW()

If a function uses more than one argument, you must separate each argument with a comma. The examples at the beginning of the chapter used cell references for arguments. Excel is quite flexible when it comes to function arguments, however. An argument can consist of a cell reference, literal values, literal text strings, expressions, and even other functions. Here are some examples of functions that use various types of arguments:

- **Cell reference:** =SUM(A1:A24)
- **Literal value:** =SQRT(121)
- **Literal text string:** =PROPER("jinesh shah")
- **Expression:** =SQRT(183+12)
- **Other functions:** =SQRT(SUM(A1:A24))

More about functions

All told, Excel includes more than 450 functions. And if that's not enough, you can download or purchase additional specialized functions from third-party suppliers — and even create your own custom functions (by using VBA) if you're so inclined.

Some users feel a bit overwhelmed by the sheer number of functions, but you'll probably find that you use only a dozen or so on a regular basis. And as you'll see, the Excel Insert Function dialog box makes it easy to locate and insert a function, even if it's not one that you use frequently.

Entering Formulas into Your Worksheets

Every formula must begin with an equal sign to inform Excel that the cell contains a formula rather than text. Excel provides two ways to enter a formula into a cell: manually, or by pointing to cell references. The following sections discuss each way in detail.

Excel provides additional assistance when you create formulas by displaying a drop-down list that contains function names and range names. The items displayed in the list are determined by what you've already typed. For example, if you're entering a formula and then type the letters SU, you'll see the drop-down list shown in below image. If you type an additional letter, the list is shortened to show only the matching functions. To have Excel AutoComplete an entry in that list, use the navigation keys to highlight the entry, and then press Tab. Notice that highlighting a function in the list also displays a brief description of the function. See the sidebar "Using Formula AutoComplete" for an example of how this feature works.

Excel displays a drop-down list when you enter a formula
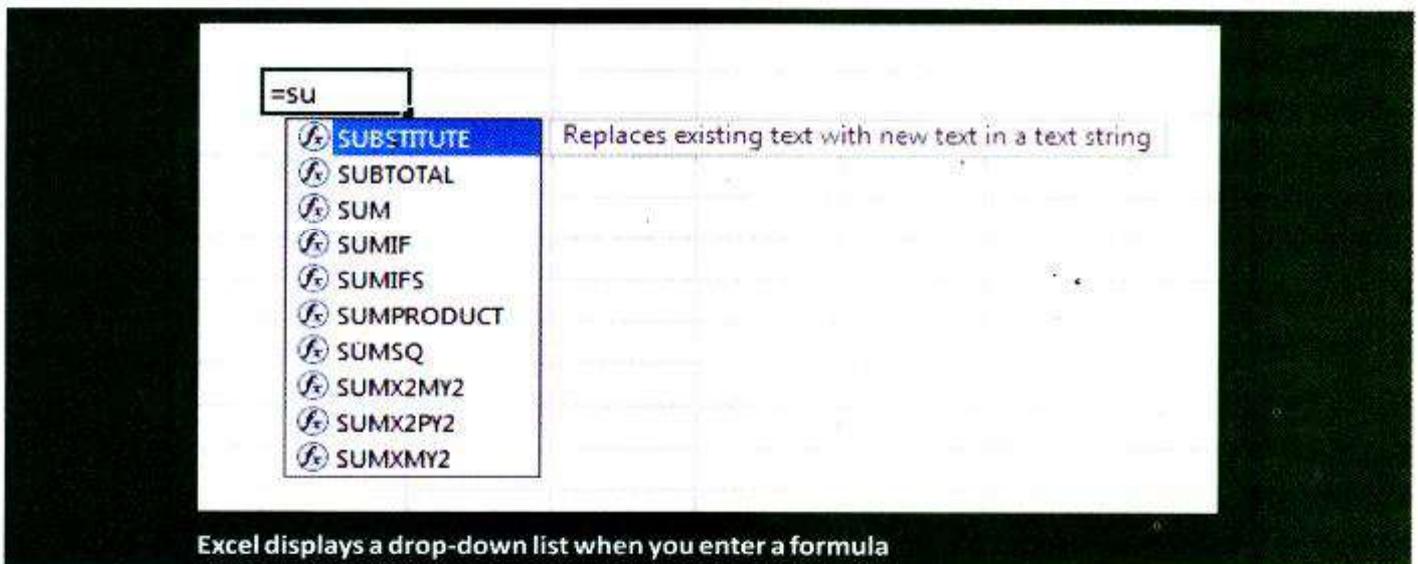
Using Formula AutoComplete

The Formula AutoComplete feature makes entering formulas easier than ever. Here's a quick walkthrough that demonstrates how it works. The goal is to create a formula that uses the AGGREGATE function to calculate the average value in a range that I named TestScores. The AVERAGE function will not work in this situation because the range contains an error value.

1. **Select the cell that will hold the formula, and type an equal sign (=) to signal the start of a formula.**

2. **Type the letter A.** You get a list of functions and names that begin with A. This feature is not case sensitive, so you can use either uppercase or lowercase characters.

3. **Scroll through the list, or type G to narrow down the choices.**

4. **When AGGREGATE is highlighted, press Tab to select it.** Excel adds the opening parenthesis and displays another list that contains options for the first argument for AGGREGATE.

5. **Select 1 - AVERAGE and then press Tab.** Excel inserts 1, which is the code for calculating the average.

6. **Type a comma to separate the next argument.**

7. When Excel displays a list of items for the AGGREGATE function's second argument, select 2 - Ignore Error Values and then press Tab.

8. Type a comma to separate the third argument (the range of test scores).

9. Type a T to get a list of functions and names that begin with T; you're looking for Test Scores, so narrow it down a bit by typing the second character, E.

10. Highlight Test Scores, and then press Tab.

11. Type a closing parenthesis and then press Enter.

The completed formula is

    =AGGREGATE(1,2,TestScores)

Formula AutoComplete includes the following items (and each type is identified by a separate icon):

- Excel built-in functions

- User-defined functions (functions defined by the user through VBA or other methods)

- Defined names (cells or range named using the Formulas ⇨ Defined Names ⇨ Define Name command)

- Enumerated arguments that use a value to represent an option (only a few functions use such arguments, and AGGREGATE is one of them)

- Table structure references (used to identify portions of a table)

Entering formulas manually

Entering a formula manually involves, well, entering a formula manually. In a selected cell, you simply type an equal sign (=) followed by the formula. As you type, the characters appear in the cell and in the Formula bar. You can, of course, use all the normal editing keys when entering a formula.

Entering formulas by pointing

Even though you can enter formulas by typing in the entire formula, Excel provides another method of entering formulas that is generally easier, faster, and less error prone. This method still involves some manual typing, but you can simply point to the cell references instead of typing their values manually. For example, to enter the formula =A1+A2 into cell A3, follow these steps:

1. Move the cell pointer to cell A3.

2. Type an equal sign (=) to begin the formula. Notice that Excel displays Enter in the status bar (lower left of your screen).

3. Press the up arrow twice. As you press this key, Excel displays a moving border around cell A1, and the cell reference appears in cell A3 and in the Formula bar. In addition, Excel displays Point in the status bar.

4. Type a plus sign (+). A solid color border replaces the faint border, and Enter reappears in the status bar.

5. Press the up arrow again. The moving border encompasses cell A2 and adds that cell address to the formula.

6. Press Enter to end the formula.

Tip

Excel color-codes the range addresses and ranges when you're entering or editing a formula. This helps you quickly spot the cells that are used in a formula.

Tip

When creating a formula by pointing, you can also point to the data cells by using your mouse.

Pasting range names into formulas

If your formula uses named cells or ranges, you can either type the name in place of the address, or choose the name from a list and have Excel insert the name for you automatically. Two ways to insert a name into a formula are available:

- Select the name from the drop-down list. To use this method, you must know at least the first character of the name. When you're entering the formula, type the first character and then select the name from the drop-down list.

- Press F3. The Paste Name dialog box appears. Select the name from the list and then click OK (or just double-click the name). Excel enters the name into your formula. If no names are defined, pressing F3 has no effect.

Below image shows an example. The worksheet contains two defined names: Expenses and Sales. The Paste Name dialog box is being used to insert a name (Sales) into the formula being entered in cell B9.
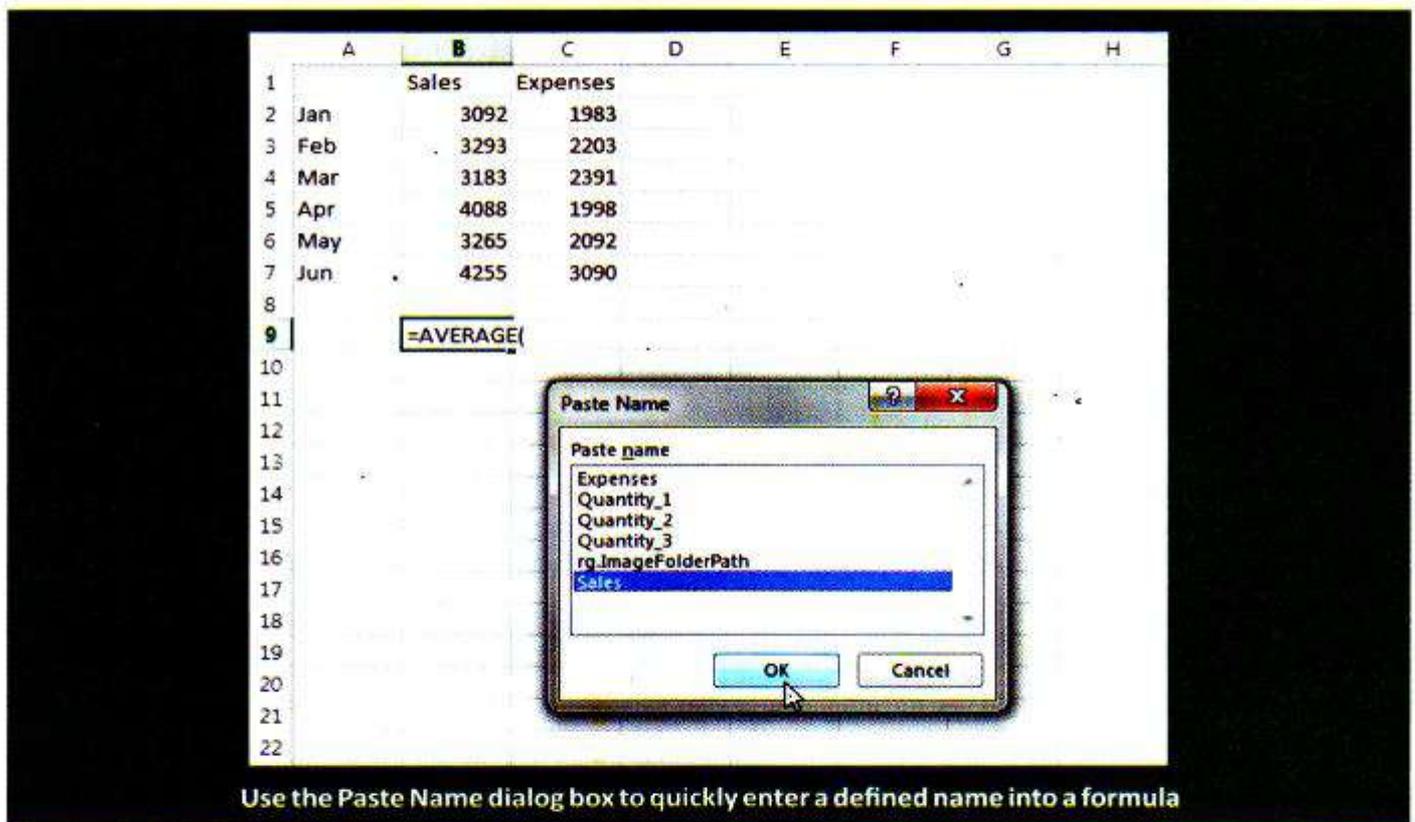
Use the Paste Name dialog box to quickly enter a defined name into a formula

Inserting functions into formulas

The easiest way to enter a function into a formula is to use Formula AutoComplete (the drop-down list that Excel displays while you type a formula). To use this method, however, you must know at least the first character of the function's name.

Another way to insert a function is to use tools in the Function Library group on the Formulas tab on the Ribbon. This method is especially useful if you can't remember which function you need. When entering a formula, click the function category (Financial, Logical, Text, and so on) to get a list of the functions in that category. Click the function you want, and Excel displays its Function Arguments dialog box. This is where you enter the function's arguments. In addition, you can click the Help on This Function link to learn more about the selected function.

Introducing Formulas and Functions

You can insert a function by selecting it from one of the function categories

Yet another way to insert a function into a formula is to use the Insert Function dialog box. You can access this dialog box in several ways:
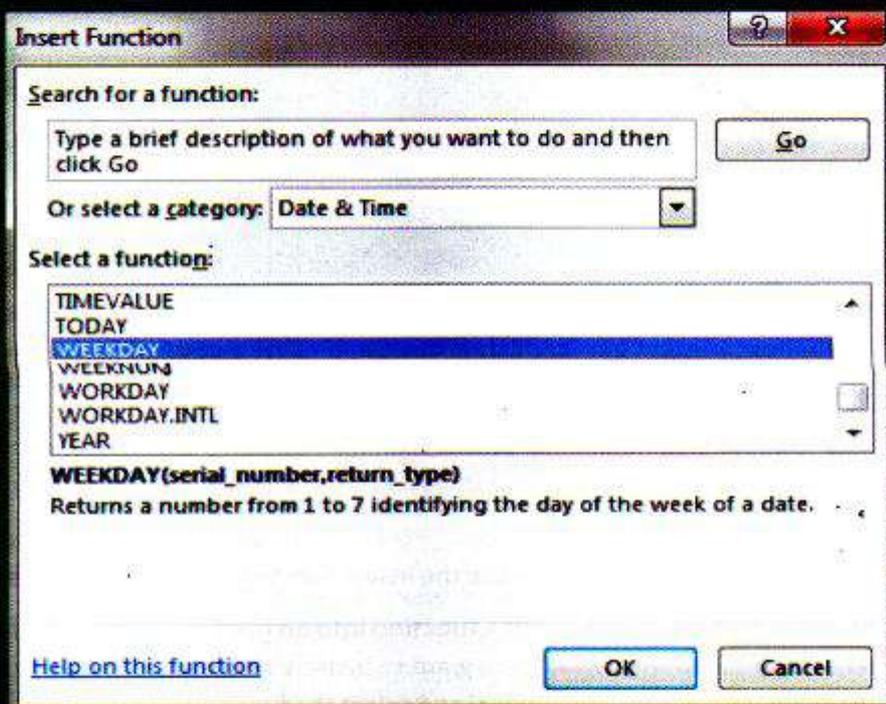
The Insert Function dialog box

- Choose Formulas ⇨ Function Library ⇨ Insert Function.

- Use the Insert Function command, which appears at the bottom of each dropdown list in the Formulas ⇨ Function Library group.

- Click the Insert Function button, which is directly to the left of the Formula bar. This button displays fx.

- Press Shift+F3.

The Insert Function dialog box shows a drop-down list of function categories. Select a category and the functions in that category are displayed in the list box. To access a function that you recently used, select Most Recently Used from the drop-down list.

If you're not sure which function you need, you can search for the appropriate function by using the Search for a Function field at the top of the dialog box.

1. **Enter your search terms and click Go.** You get a list of relevant functions. When you select a function from the Select a Function list, Excel displays the function (and its argument names) in the dialog box along with a brief description of what the function does.

2. **When you locate the function you want to use, highlight it and click OK.** Excel then displays its Function Arguments dialog box.
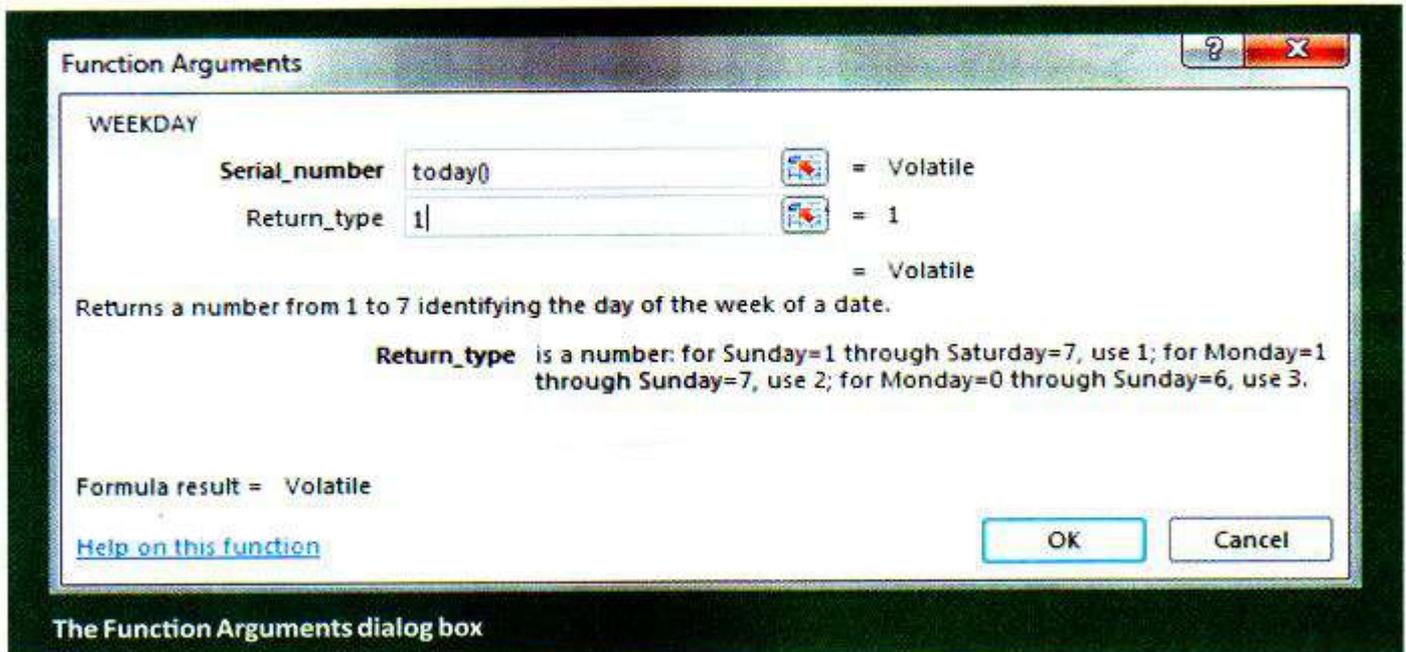
The Function Arguments dialog box

3. **Specify the arguments for the function.** The Function Arguments dialog box will vary, depending on the function you're inserting, and it will show one text box for each of the function's arguments. To use a cell or range reference as an argument, you can enter the address manually or click inside the argument box and then select (that is, point to) the cell or range in the sheet.

4. **After you specify all the function arguments, click OK.**

Function entry tips

Here are some additional tips to keep in mind when you use the Insert Function dialog box to enter functions:

- **You can use the Insert Function dialog box to insert a function into an existing formula.** Just edit the formula and move the insertion point to the location at which you want to insert the function. Then open the Insert Function dialog box (using any of the methods described earlier) and select the function.

- **You can also use the Function Arguments dialog box to modify the arguments for a function in an existing formula.** Click the function in the Formula bar and then click the Insert Function button (the fx button, to the left of the Formula bar).

- **If you change your mind about entering a function, click the Cancel button.**

- **The number of boxes you see in the Function Arguments dialog box depends on the number of arguments used in the function you selected.** If a function uses no arguments, you won't see any boxes. If the function uses a variable number of arguments (such as the AVERAGE function), Excel adds a new box every time you enter an optional argument.

- **As you provide arguments in the Function Arguments dialog box, the value of each argument is displayed to the right of each box.**

- **A few functions, such as INDEX, have more than one form.** If you choose such a function, Excel displays another dialog box that lets you choose which form you want to use.

- **As you become familiar with the functions, you can bypass the Insert Function dialog box and type the function name directly.** Excel prompts you with argument names as you enter the function.

Editing Formulas

After you enter a formula, you can (of course) edit that formula. You may need to edit a formula if you make some

changes to your worksheet and then have to adjust the formula to accommodate the changes. Or the formula may return an error value, in which case you need to edit the formula to correct the error.

Here are some of the ways to get into cell edit mode:

- **Double-click the cell, which enables you to edit the cell contents directly in the cell.**

- **Press F2, which enables you to edit the cell contents directly in the cell.**

- **Select the cell that you want to edit, and then click in the Formula bar.** This enables you to edit the cell contents in the Formula bar.

- **If the cell contains a formula that returns an error, Excel will display a small triangle in the upper-left corner of the cell.** Click the cell, and you'll see an error button appear. Click the button, and you can choose one of the options for correcting the error. (The options will vary according to the type of error in the cell.)

> **Tip**
>
> You can control whether Excel displays these formula error buttons in the Formulas tab of the Excel Options dialog box. To find this setting, choose File ⇨ Options ⇨ Formulas. If you remove the checkmark from Enable background error checking under Error Checking, Excel no longer displays these buttons.

While you're editing a formula, you can select multiple characters either by dragging over them or by pressing Shift while you use the navigation keys.

> **Tip**
>
> If you have a formula that you can't seem to edit correctly, you can convert the formula to text and tackle it again later. To convert a formula to text, just remove the initial equal sign (=). When you're ready to try again, type the initial equal sign to convert the cell contents back to a formula.

Using Cell References in Formulas

Most formulas you create include references to cells or ranges. These references enable your formulas to work dynamically with the data contained in those cells or ranges. For example, if your formula refers to cell A1 and you change the value contained in A1, the formula result changes to reflect the new value. If you didn't use references in your formulas, you would need to edit the formulas themselves in order to change the values used in the formulas.

Using relative, absolute, and mixed references

When you use a cell (or range) reference in a formula, you can use three types of references:

- **Relative:** The row and column references can change when you copy the formula to another cell because the references are actually offsets from the current row and column. By default, Excel creates relative cell references in formulas.

- **Absolute:** The row and column references don't change when you copy the formula because the reference is to an actual cell address. An absolute reference uses two dollar signs in its address: one for the column letter and one for the row number (for example, $A$5).

- **Mixed:** Either the row or column reference is relative, and the other is absolute. Only one of the address parts is absolute (for example, $A4 or A$4).

The type of cell reference is important only if you plan to copy the formula to other cells. The following examples illustrate this point.

Below image shows a simple worksheet. The formula in cell D2, which multiplies the quantity by the price, is =B2*C2

Copying a formula that contains relative references

This formula uses relative cell references. Therefore, when the formula is copied to the cells below it, the references adjust in a relative manner. For example, the formula in cell D3 is =B3*C3

But what if the cell references in D2 contained absolute references, like this?

=$B$2*$C$2

In this case, copying the formula to the cells below would produce incorrect results. The formula in cell D3 would be exactly the same as the formula in cell D2.

Now I'll extend the example to calculate sales tax, which is stored in cell B7. In this situation, the formula in cell D2 is:

=(B2*C2)*$B$7

Formula references to the sales tax cell should be absolute

The quantity is multiplied by the price, and the result is multiplied by the sales tax rate stored in cell B7. Notice that the reference to B7 is an absolute reference. When the formula in D2 is copied to the cells below it, cell D3 will contain this formula:

=(B3*C3)*$B$7

Here, the references to cells B2 and C2 were adjusted, but the reference to cell B7 was not — which is exactly what I want because the address of the cell that contains the sales tax never changes.

Below image demonstrates the use of mixed references. The formulas in the C3:F7 range calculate the area for various lengths and widths. The formula in cell C3 is:

=$B3*C$2
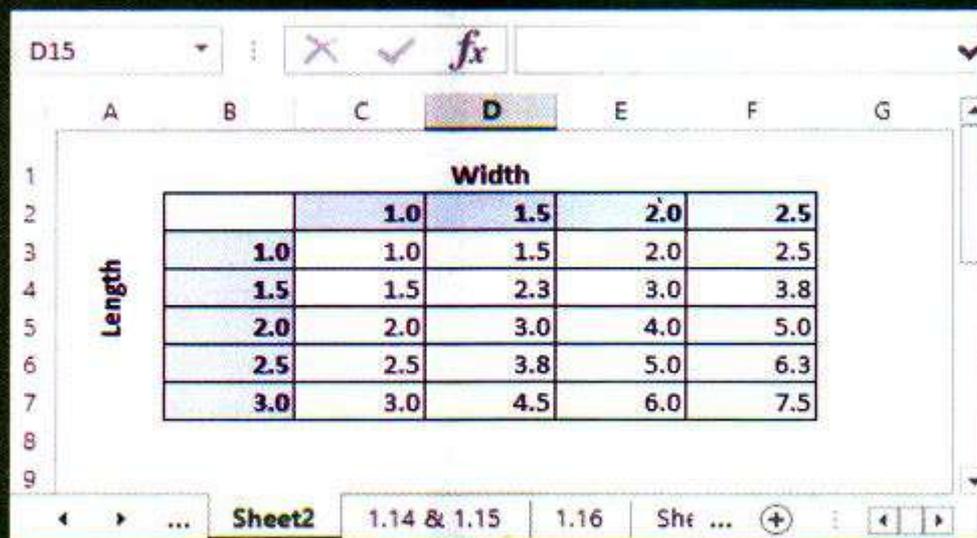
	A	B	C	D	E	F	G
1				**Width**			
2			1.0	1.5	2.0	2.5	
3	Length	1.0	1.0	1.5	2.0	2.5	
4		1.5	1.5	2.3	3.0	3.8	
5		2.0	2.0	3.0	4.0	5.0	
6		2.5	2.5	3.8	5.0	6.3	
7		3.0	3.0	4.5	6.0	7.5	

Using mixed cell references

Notice that both cell references are mixed. The reference to cell B3 uses an absolute reference for the column ($B), and the reference to cell C2 uses an absolute reference for the row ($2). As a result, this formula can be copied down and across, and the calculations will be correct. For example, the formula in cell F7 is:

=$B7*F$2

If C3 used either absolute or relative references, copying the formula would produce incorrect results.
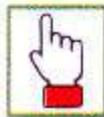
Note

When you cut and paste a formula (move it to another location), the cell references in the formula aren't adjusted. Again, this is usually what you want to happen. When you move a formula, you generally want it to continue to refer to the original cells.

Changing the types of your references

You can enter non relative references (that is, absolute or mixed) manually by inserting dollar signs in the appropriate positions of the cell address. Or you can use a handy shortcut: the F4 key. When you've entered a cell reference (by typing it or by pointing), you can press F4 repeatedly to have Excel cycle through all four reference types.

For example, if you enter =A1 to start a formula, pressing F4 converts the cell reference to =$A$1. Pressing F4 again converts it to =A$1. Pressing it again displays =$A1. Pressing it one more time returns to the original =A1. Keep pressing F4 until Excel displays the type of reference that you want.

Note

When you name a cell or range, Excel (by default) uses an absolute reference for the name. For example, if you give the name Sales Forecast to B1:B12, the Refers To box in the New Name dialog box lists the reference as $B$1:$B$12. This is almost always what you want. If you copy a cell that has a named reference in its formula, the copied formula contains a reference to the original name.

Referencing cells outside the worksheet

Formulas can also refer to cells in other worksheets — and the worksheets don't even have to be in the same workbook. Excel uses a special type of notation to handle these types of references.

Referencing cells in other worksheets

To use a reference to a cell in another worksheet in the same workbook, use this format:

SheetName!CellAddress

In other words, precede the cell address with the worksheet name, followed by an exclamation point. Here's an example of a formula that uses a cell on the Sheet 2 worksheet:

=A1*Sheet2!A1

This formula multiplies the value in cell A1 on the current worksheet by the value in cell A1 on Sheet2.

Tip

If the worksheet name in the reference includes one or more spaces, you must enclose it in single quotation marks.(Excel does that automatically if you use the point-and-click method when creating the formula.) For example, here's a formula that refers to a cell on a sheet named All Depts:

=A1*'All Depts'!A1

Referencing cells in other workbooks

To refer to a cell in a different workbook, use this format:

=[WorkbookName]SheetName!CellAddress

In this case, the workbook name (in square brackets), the worksheet name, and an exclamation point precede the cell address. The following is an example of a formula that uses a cell reference in the Sheet1 worksheet in a workbook named Budget:

=[Budget.xlsx]Sheet1!A1

If the workbook name in the reference includes one or more spaces, you must enclose it (and the sheet name) in single quotation marks. For example, here's a formula that refers to a cell on Sheet1 in a workbook named Budget For 2013:

=A1*'[Budget For 2013.xlsx]Sheet1'!A1

When a formula refers to cells in a different workbook, the other workbook doesn't have to be open. If the workbook is closed, however, you must add the complete path to the reference so that Excel can find it. Here's an example:

=A1*'C:\Users\user name\My Documents\ [Budget For 2013.xlsx]Sheet1'!A1

A linked file can also reside on another system that's accessible on your corporate network.

The following formula refers to a cell in a workbook in the files folder of a computer named Data Server:

='\\DataServer\files\ [budget.xlsx] Sheet1'!$D$7

Tip

To create formulas that refer to cells in a different worksheet, point to the cells rather than enter their references manually. Excel takes care of the details regarding the workbook and worksheet references. The workbook you're referencing in your formula must be open if you're going to use the pointing method.

Note

If you point to a different worksheet or workbook when creating a formula, you'll notice that Excel always inserts absolute cell references. Therefore, if you plan to copy the formula to other cells, make sure that you change the cell references to relative before you copy.

Using Formulas in Tables

A table is a specially designated range of cells, set up with column headers. In this section, we describe how formulas work with tables.

Summarising data in a table

Below image shows a simple table with three columns. The data is entered and then converted the range to a table by choosing Insert ⇨ Tables ⇨ Table. The table is named Table1 by default.

A	B	C	D
1 Month ▼	Projected ▼	Actual ▼	
2 Jan	4000	1225	
3 Feb	4000	2546	
4 Mar	4000	2654	
5 Apr	5000	3582	
6 May	5000	3500	
7 Jun	5000	4606	
8 Jul	6000	5500	
9 Aug	6000	5200	
10 Sep	7000	6290	
11 Oct	8000	7800	
12 Nov	8000	7000	
13 Dec	9000	8042	
14			

A simple table with three columns of information

To calculate the total projected and total actual sales, you don't even need to write a formula. Simply click a button to add a row of summary formulas to the table:

1. **Click any cell in the table.**

2. **Place a check mark next to Table Tools ⇨ Design ⇨ Table Style Options ⇨ Total Row.**

3. **Click a cell in the Total Row and use the drop-down list to select the type of summary formula to use .** For example, to calculate the sum of the Actual column, select SUM from the drop-down list in cell C14. Excel creates this formula:

   =SUBTOTAL(109,[Actual])

For the SUBTOTAL function, 109 is an enumerated argument that represents SUM. The second argument for the SUBTOTAL function is the column name, in square brackets. Using the column name within brackets creates "structured" references within a table (as discussed further in the upcoming section, "Referencing data in a table").

C14		f_x	=SUBTOTAL(109,[Actual])		
A	B	C	D	E	F
1 Month ▼	Projected ▼	Actual ▼			
2 Jan	4000	1225			
3 Feb	4000	2546			
4 Mar	4000	2654			
5 Apr	5000	3582			
6 May	5000	3500			
7 Jun	5000	4606			
8 Jul	6000	5500			
9 Aug	6000	5200			
10 Sep	7000	6290			
11 Oct	8000	7800			
12 Nov	8000	7000			
13 Dec	9000	8042			
14 Total		57945 ▼			
15		None			
16		Average			
17		Count			
		Count Number			
18		Max			
19		Min			
		Sum			
20		StdDev			
21		Var			
		More Function			

A drop-down list enables you to select a summary formula for a table column

Note

You can toggle the Total Row display via Table Tools ⇨ Design ⇨ Table Style Options ⇨ Total Row. If you turn it off, the summary options you selected will be displayed again when you turn it back on.

Using formulas within a table

In many cases, you'll want to use formulas within a table to perform calculations that use other columns in the table. For example, in the table shown below image, you may want a column that shows the difference between the Actual and Projected amounts. To add this formula:

1. **Click cell E2 and type** Difference **for the column header.** Excel automatically expands the table for you to include the new column.

2. **Move to cell E3 and type an equal sign to signify the beginning of a formula.**

3. **Press the left arrow key.** Excel displays [@Actual], which is the column heading, in the Formula bar.

4. **Type a minus sign and then press the left arrow key twice.** Excel displays [@ Projected] in your formula.

5. **Press Enter to end the formula.** Excel copies the formula to all rows in the table.

	A	B	C	D	E	F
1		Month	Projected	Actual	Difference	
2		Jan	4000	1225	-2775	
3		Feb	4000	2546	-1454	
4		Mar	4000	2654	-1346	
5		Apr	5000	3582	-1418	
6		May	5000	3500	-1500	
7		Jun	5000	4606	-394	
8		Jul	6000	5500	-500	
9		Aug	6000	5200	-800	
10		Sep	7000	6290	-710	
11		Oct	8000	7800	-200	
12		Nov	8000	7000	-1000	
13		Dec	9000	8042	-958	
14		Total	71000	57945		

The Difference column contains a formula

Examine the table, and you find this formula for all cells in the Difference column:

=[@Actual]-[@Projected]

Although the formula was entered into the first row of the table, that's not necessary. Any time a formula is entered into an empty table column, it will automatically fill all the cells in that column. And if you need to edit the formula, Excel will automatically copy the edited formula to the other cells in the column.

Note

The at symbol (@) that precedes the column header represents "this row." So, [@Actual] means "the value in the Actual column in this row."

These steps use the pointing technique to create the formula. Alternatively, you could have entered the formula manually using standard cell references rather than column headers. For example, you could have entered the following formula in cell E3:

=D3-C3

If you type the cell references, Excel will still copy the formula to the other cells automatically.

One thing should be clear, however, about formulas that use the column headers instead of cell references: They're much easier to understand.

Tip

When you add a formula to a column in a table, Excel displays the AutoCorrect Options button. To override the automatic column formulas, click the button and click Stop Automatically Creating Calculated Columns. Use this option if you need different formulas for different rows within the table.

Referencing data in a table

Excel offers some other ways to refer to data that's contained in a table by using the table name and column headers.

Note

Remember that you don't need to create names for tables and columns. The data in the table itself has a range name, which is created automatically when you create the table (for example, Table1), and you can refer to data within the table by using the column headers — which are not range names.

You can, of course, use standard cell references to refer to data in a table, but using the table name and column headers has a distinct advantage: The names adjust automatically if the table size changes by adding or deleting rows. In addition, formulas that use table names and column headers will adjust automatically if you change the name of the table or give a new name to a column.

Refer to the table shown in above image. This table is named Table1. To calculate the sum of all the data in the table, enter this formula into a cell outside the table:

=SUM(Table1)

This formula will always return the sum of all the data (excluding calculated Total Row values, if any), even if rows or columns are added or deleted. And if you change the name of Table1, Excel will adjust formulas that refer to that table automatically. For example, if you renamed Table1 to AnnualData (by using the Name Manager, or by choosing Table Tools ⮞ Design ⮞ Properties ⮞ Table Name), the preceding formula would change to:

=SUM(AnnualData)

Most of the time, a formula will refer to a specific column in the table. The following formula returns the sum of the data in the Actual column:

=SUM(Table3[Actual])

Notice that the column name is enclosed in square brackets. Again, the formula adjusts automatically if you change the text in the column heading.

Even better, Excel provides some helpful assistance when you create a formula that refers to data within a table. The formula AutoComplete helping to create a formula by showing a list of the elements in the table. Notice that, in addition to the column headers in the table, Excel lists other table elements that you can reference: #All, #Data, #Headers, #Totals, and @ - This Row.

The formula AutoComplete feature is useful when creating a formula that refers to data in a table
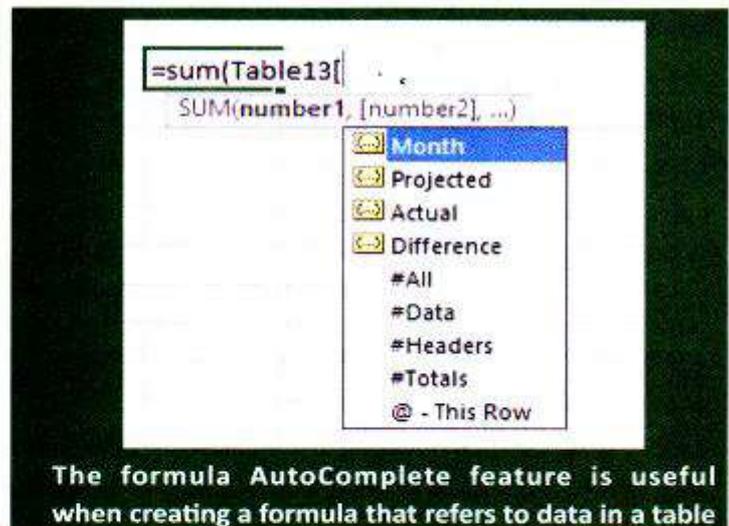
Correcting Common Formula Errors

Sometimes, when you enter a formula, Excel displays a value that begins with a hash mark (#) or pound sign (£). This is a signal that the formula is returning an error value. You have to correct the formula (or correct a cell that the formula references) to get rid of the error display.

Tip

If the entire cell is filled with hash-mark characters, the column isn't wide enough to display the value. You can either widen the column or change the number format of the cell.

In some cases, Excel won't even let you enter an erroneous formula. For example, the following formula is missing the closing parenthesis:

=A1*(B1+C2

If you attempt to enter this formula, Excel informs you that you have unmatched parentheses, and it proposes a correction. Often, the proposed correction is accurate, but you can't count on it.

Below Table lists the types of error values that may appear in a cell that has a formula. Formulas may return an error value if a cell to which they refer has an error value. This is known as the ripple effect—a single error value can make its way into lots of other cells that contain formulas that depend on that one cell.

Table Excel Error Values

Error value	Explanation
#DIV/0!	The formula is trying to divide by zero. This also occurs when the formula attempts to divide by what's in a cell that is empty (that is, by nothing).
#NAME?	The formula uses a name that Excel doesn't recognize. This can happen if you delete a name that's used in the formula or if you have unmatched quotes when using text.
#N/A	The formula is referring (directly or indirectly) to a cell that uses the NA function to signal that data is not available. Some functions (for example, VLOOKUP) can also return #N/A.
#NULL!	The formula uses an intersection of two ranges that don't intersect.
#NUM!	A problem with a value exists; for example, you specified a negative number where a positive number is expected.
#REF!	The formula refers to a cell that isn't valid. This can happen if the cell has been deleted from the worksheet.
#VALUE!	The formula includes an argument or operand of the wrong type. (An operand is a value or cell reference that a formula uses to calculate a result.)

Handling circular references

When you're entering formulas, you may occasionally see a warning message like the one shown in below image, indicating that the formula you just entered will result in a circular reference. A circular reference occurs when a formula refers to its own value — either directly or indirectly. For example, you create a circular reference if you enter =A1+A2+A3 into cell A3 because the formula in cell A3 refers to cell A3. Every time the formula in A3 is calculated, it must be calculated again because A3 has changed. The calculation could go on forever.

Microsoft Excel ✕

Careful, we found one or more circular references in your workbook that might cause your formulas to calculate incorrectly.

FYI: A circular reference can be a formula that refers to its own cell value, or refers to a cell dependent on its own cell value.

OK   Help

If you see this warning, you know that the formula you entered will result in a circular reference

When you get the circular reference message after entering a formula, Excel gives you two options:

- **Click OK, and Excel displays a Help screen that tells you more about circular references.**
- **Click Cancel to enter the formula as is.**

Regardless of which option you choose, Excel displays a message in the left side of the status bar to remind you that a circular reference exists.

Often, a circular reference is quite obvious and easy to identify and correct. But when a circular reference is indirect (as when a formula refers to another formula that refers to yet another formula that refers back to the original formula), it may require a bit of detective work to get to the problem.

Specifying when formulas are calculated

You've probably noticed that Excel calculates the formulas in your worksheet immediately. If you change any cells that the formula uses, Excel displays the formula's new result with no effort on your part. All this happens when Excel's Calculation mode is set to Automatic. In Automatic Calculation mode (which is the default mode), Excel follows these rules when it calculates your worksheet:

- **When you make a change — enter or edit data or formulas, for example — Excel calculates immediately those formulas that depend on new or edited data.**

- **If Excel is in the middle of a lengthy calculation, it temporarily suspends the calculation when you need to perform other worksheet tasks; it resumes calculating when you're finished with your other worksheet tasks.**

- **Formulas are evaluated in a natural sequence.** In other words, if a formula in cell D12 depends on the result of a formula in cell D11, Excel calculates cell D11 before calculating cell D12.

Sometimes, however, you may want to control when Excel calculates formulas. For example, if you create a worksheet with thousands of complex formulas, you'll find that processing can slow to a snail's pace while Excel does its thing. In such a case, set Excel's calculation mode to Manual — which you can do by choosing Formulas ➪ Calculation ➪ Calculation Options ➪ Manual.
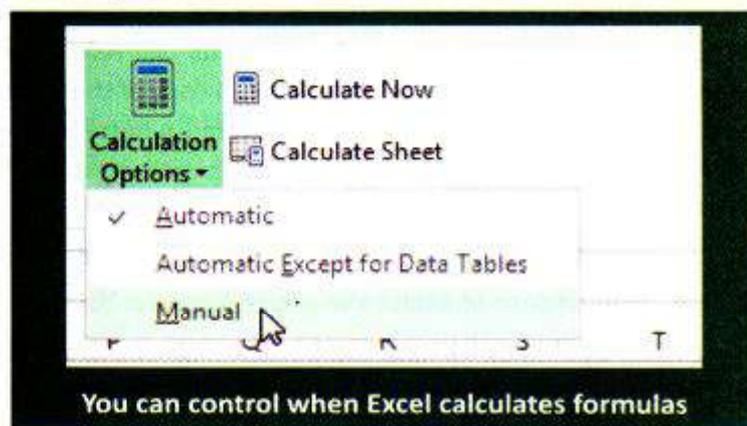
You can control when Excel calculates formulas

When you're working in Manual Calculation mode, Excel displays Calculate in the status bar when you have any uncalculated formulas. You can use the following shortcut keys to recalculate the formulas:

- **F9:** Calculates the formulas in all open workbooks

- **Shift+F9:** Calculates only the formulas in the active worksheet. Other worksheets in the same workbook aren't calculated.

- **Ctrl+Alt+F9:** Forces a complete recalculation of all formulas

Note

Excel's Calculation mode isn't specific to a particular worksheet. When you change the Calculation mode, it affects all open workbooks, not just the active workbook.

Tips for Working with Formulas

Not hard-coding values

When you create a formula, think twice before you use any specific value in the formula. For example, if your formula calculates sales tax (which is 6.5%), you may be tempted to enter a formula, such as the following:

=A1*.065

A better approach is to insert the sales tax rate in a cell — and use the cell reference. Or you can define the tax rate as a named constant, using the technique presented earlier in this chapter. Doing so makes modifying and maintaining

your worksheet easier. For example, if the sales tax rate changed to 6.75%, you would have to modify every formula that used the old value. If you store the tax rate in a cell, however, you simply change that one cell, and Excel updates all the formulas.

Using the Formula bar as a calculator

If you need to perform a quick calculation, you can use the Formula bar as a calculator. For example, enter the following formula — but don't press Enter:

    =(145*1.05)/12

If you press Enter, Excel enters the formula into the cell. But because this formula always returns the same result, you may prefer to store the formula's result rather than the formula itself. To do so, press F9 and watch the result appear in the Formula bar. Press Enter to store the result in the active cell. (This technique also works if the formula uses cell references or worksheet functions.)

Making an exact copy of a formula

When you copy a formula, Excel adjusts its cell references when you paste the formula to a different location. Sometimes, you may want to make an exact copy of the formula. One way to do this is to convert the cell references to absolute values, but this isn't always desirable. A better approach is to select the formula in Edit mode and then copy it to the Clipboard as text. You can do this in several ways. Here's a step-by-step example of how to make an exact copy of the formula in A1 and copy it to A2:

1. **Double-click A1 (or press F2) to get into Edit mode.**
2. **Drag the mouse to select the entire formula.** You can drag from left to right or from right to left. To select the entire formula with the keyboard, press End, followed by Shift+Home.
3. **Choose Home ⇨ Clipboard ⇨ Copy (or press Ctrl+C).** This copies the selected text (which will become the copied formula) to the Clipboard.
4. **Press Esc to leave Edit mode.**
5. **Select cell A2.**
6. **Choose Home ⇨ Clipboard ⇨ Paste (or press Ctrl+V) to paste the text into cell A2.**

You can also use this technique to copy just part of a formula, if you want to use that part in another formula. Just select the part of the formula that you want to copy by dragging the mouse, and then use any of the available techniques to copy the selection to the Clipboard. You can then paste the text to another cell.

Formulas (or parts of formulas) copied in this manner won't have their cell references adjusted when they're pasted into a new cell. That's because the formulas are being copied as text, not as actual formulas.

Tip

You can also convert a formula to text by adding an apostrophe (') in front of the equal sign. Then copy the formula as usual, and paste it to its new location. Remove the apostrophe from the pasted formula, and it will be identical to the original formula. And don't forget to remove the apostrophe from the original formula as well.

Converting formulas to values

If you have a range of formulas that will always produce the same result (that is, dead formulas), you may want to convert them to values. For example, if you use the RANDBETWEEN function to create a set of random numbers and you don't want Excel to recalculate those random numbers each time you press Enter, you can convert the formulas to values. Just follow these steps:

1. **Select A1:A20.**
2. **Choose Home ⇨ Clipboard ⇨ Copy (or press Ctrl+C).**
3. **Choose Home ⇨ Clipboard ⇨ Paste arrow ⇨ Paste Values (V).**
4. **Press Esc to cancel Copy mode.**

How Excel Handles Dates and Times

Understanding date serial numbers

To Excel, a date is simply a number. More precisely, a date is a serial number that represents the January 0, 1900. A serial number of 1 corresponds to January 1, 1900; a serial number of 2 corresponds to January 2, 1900; and so on. This system makes it possible to create formulas that perform calculations with dates. For example, you can create a formula to calculate the number of days between two dates (just subtract one from the other).

Excel supports dates from January 1, 1900, through December 31, 9999 (serial number = 2,958,465).

You may wonder about January 0, 1900. This non date (which corresponds to date serial number 0) is actually used to represent times that aren't associated with a particular day.

To view a date serial number as a date, you must format the cell as a date. Choose Home ➪ Number ➪ Number Format. This drop-down control provides you with two date formats.

Choose your date system: 1900 or 1904

Excel supports two date systems: the 1900 date system and the 1904 date system. Which system you use in a workbook determines what date serves as the basis for dates. The 1900 date system uses January 1, 1900, as the day assigned to date serial number 1. The 1904 date system uses January 1, 1904, as the base date. By default, Excel for Windows uses the 1900 date system, and pre-2011 versions of Excel for Mac use the 1904 date system.

Entering dates

You can enter a date directly as a serial number (if you know the serial number) and then format it as a date. More often, you enter a date by using any of several recognized date formats. Excel automatically converts your entry into the corresponding date serial number (which it uses for calculations), and it also applies the default date format to the cell so that it displays as an actual date rather than as a cryptic serial number.

For example, if you need to enter June 18, 2014 into a cell, you can enter the date by typing June 18, 2014 (or any of several different date formats). Excel interprets your entry and stores the value 41443, the date serial number for that date. It also applies the default date format, so the cell contents may not appear exactly as you typed them.

NOTE

Depending on your regional settings, entering a date in a format such as June 18, 2014, may be interpreted as a text string. In such a case, you need to enter the date in a format that corresponds to your regional settings, such as 18 June 2014.

When you activate a cell that contains a date, the Formula bar shows the cell contents formatted by using the default date format — which corresponds to your system's short date format. The Formula bar doesn't display the date's serial number. If you need to find out the serial number for a particular date, format the cell with a non date number format.

Below Table shows a sampling of the date formats that Excel recognizes . Results will vary if you use a different regional setting.

Table Date Entry Formats Recognized by Excel

Entry	Excel Interpretation (India Settings)
18-6-14	18 June 2014
18-6-2014	18 June 2014
18/6/14	18 June 2014
18/6/2014	18 June 2014

18 June 2014	18 June 2014
18 Jun	June 18 of the current year
18 June	June 18 of the current year
18/6	June 18 of the current year
18-6	June 18 of the current year
18-Jun-2014	18 June 2014
2015/6/14	18 June 2014

As you can see in Above Table, Excel is rather flexible when it comes to recognizing dates entered into a cell. It's not perfect, however. For example, Excel does not recognize any of the following entries as dates:

- June 18 2014
- Jun-18 2014
- Jun-18/2014

Rather, it interprets these entries as text. If you plan to use dates in formulas, make sure that Excel can recognize the date you enter as a date; otherwise, the formulas that refer to these dates will produce incorrect results.

If you attempt to enter a date that lies outside of the supported date range, Excel interprets it as text. If you attempt to format a serial number that lies outside the supported range as a date, the value displays as a series of hash marks (#########).

Searching for dates

If your worksheet uses many dates, you may need to search for a particular date by using the Find and Replace dialog box (Home ➪ Editing ➪ Find & Select ➪ Find, or Ctrl+F). Excel is rather picky when it comes to finding dates. You must enter the date as it appears in the Formula bar. For example, if a cell contains a date formatted to display as June 19, 2014, the date appears in the Formula bar using your system's short date format (for example, 6/19/2014). Therefore, if you search for the date as it appears in the cell, Excel won't find it. But it will find the cell if you search for the date in the format that appears in the Formula bar.

Understanding time serial numbers

When you need to work with time values, you extend the Excel date serial number system to include decimals. In other words, Excel works with times by using fractions of days.

For example, the date serial number for June 1, 2014 is 41791. Noon (halfway through the day) is represented internally as 41791.5.

The serial number equivalent of one minute is approximately 0.00069444. The formula that follows calculates this number by multiplying 24 hours by 60 minutes, and dividing the result into 1.

The denominator consists of the number of minutes in a day (1,440).

    =1/(24*60)

Similarly, the serial number equivalent of one second is approximately 0.00001157, obtained by the following formula:

    1 / 24 hours × 60 minutes × 60 seconds

In this case, the denominator represents the number of seconds in a day (86,400).

    =1/(24*60*60)

In Excel, the smallest unit of time is one one-thousandth of a second. The time serial number shown here represents 23:59:59.999 (one one-thousandth of a second before midnight):

0.99999999

Below Table shows various times of day along with each associated time serial number.

Table Times of Day and Their Corresponding Serial Numbers

Time of Day	Time Serial Number
12:00:00 AM (midnight)	0.00000000
1:30:00 AM	0.06250000
7:30:00 AM	0.31250000
10:30:00 AM	0.43750000
12:00:00 PM (noon)	0.50000000
1:30:00 PM	0.56250000
4:30:00 PM	0.68750000
6:00:00 PM	0.75000000
9:00:00 PM	0.87500000
10:30:00 PM	0.93750000

Entering times

As with entering dates, you normally don't have to worry about the actual time serial numbers. Just enter the time into a cell using a recognized format. Below Table shows some examples of time formats that Excel recognizes.

Table Time Entry Formats Recognized by Excel

Entry	Excel Interpretation
11:30:00 am	11:30 AM
11:30:00 AM	11:30 AM
11:30 pm	11:30 PM
11:30	11:30 AM
13:30	1:30 PM

Because the preceding samples don't have a specific day associated with them, Excel (by default) uses a date serial number of 0, which corresponds to the non-day January 0, 1900. Often, you'll want to combine a date and time. You can do so by using a recognised date-entry format, followed by a space, and then a recognised time-entry format. For example, if you enter 18/6/2014 11:30 in a cell, Excel interprets it as 11:30 a.m. on 18 June, 2014. Its date/time serial number is 41808.4791666667.

When you enter a time that exceeds 24 hours, the associated date for the time increments accordingly.

For example, if you enter 25:00:00 into a cell, it is interpreted as 1:00 a.m. on 1 January, 1900. The day part of the entry increments because the time exceeds 24 hours. Keep in mind that a time value without a date uses January 0, 1900 as the date.

Similarly, if you enter a date and a time (and the time exceeds 24 hours), the date that you entered is adjusted. If you enter 18/9/2014 25:00:00, for example, it's interpreted as 19/9/2014 1:00:00 a.m.

If you enter a time only (without an associated date) into an unformatted cell, the maximum time that you can enter into a cell is 9999:59:59 (just one second less than 10,000 hours). Excel adds the appropriate number of days. In this case, 9999:59:59 is interpreted as 3:59:59 p.m. on 19/02/1901. If you enter a time that exceeds 10,000 hours, the entry is interpreted as a text string rather than a time.

Formatting dates and times

You have a great deal of flexibility in formatting cells that contain dates and times. For example, you can format the cell to display the date part only, the time part only, or both the date and time parts.

You format dates and times by selecting the cells and then using the Number tab of the Format Cells dialog box. To display this dialog box, click the dialog box launcher icon in the Number group of the Home tab, or click the Number Format control and choose More Number Formats from the list that appears.
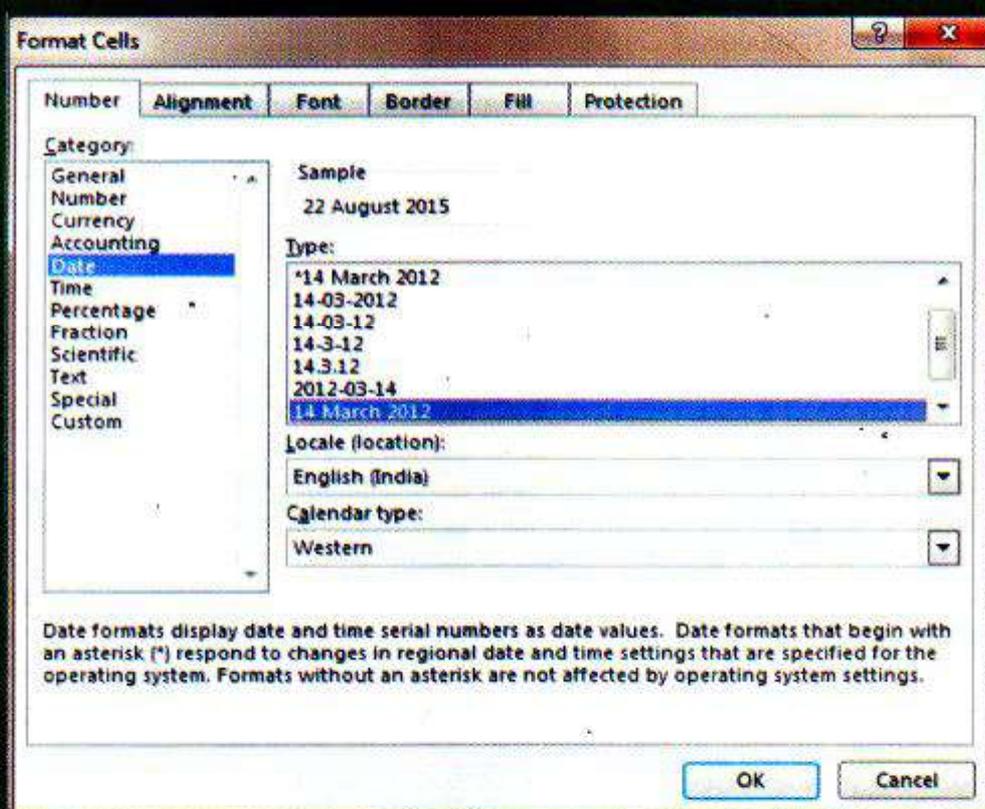
Use the Number tab of the Format Cells dialog box to change the appearance of dates and times

The Date category shows built-in date formats, and the Time category shows built-in time formats. Some formats include both date and time displays. Just select the desired format from the Type list, and then click OK.

TIP

When you create a formula that refers to a cell containing a date or a time, Excel sometimes automatically formats the formula cell as a date or a time. Often, this automation is very helpful; other times, it's completely inappropriate and downright annoying. To return the number formatting to the default General format, choose Home ➪ Number ➪ Number Format and choose General from the drop-down list. Or just press Ctrl+Shift +~ (tilde).

If none of the built-in formats meets your needs, you can create a custom number format. Select the Custom category and then type the custom format codes into the Type box.

Problems with dates

Excel has some problems when it comes to dates. Many of these problems stem from the fact that Excel was designed

many years ago. Excel designers basically emulated the Lotus 1-2-3 program's limited date and time features, which contain a nasty bug that was duplicated intentionally in Excel (described next). If Excel were being designed from scratch today, it likely would be much more versatile in dealing with dates. Unfortunately, users are currently stuck with a product that leaves much to be desired in the area of dates.

Excel's leap year bug

A leap year, which occurs every four years, contains an additional day (February 29). Specifically, years that are evenly divisible by 100 are not leap years, unless they are also evenly divisible by 400. Although the year 1900 was not a leap year, Excel treats it as such. In other words, when you type 2/29/1900 into a cell, Excel interprets it as a valid date and assigns a serial number of 60.

If you type 2/29/1901, however, Excel correctly interprets it as a mistake and doesn't convert it to a date. Instead, it simply makes the cell entry a text string.

How can a product used daily by millions of people contain such an obvious bug? The answer is historical. The original version of Lotus 1-2-3 contained a bug that caused it to treat 1900 as a leap year. When Excel was released some time later, the designers knew about this bug and chose to reproduce it in Excel to maintain compatibility with Lotus worksheet files.

Why does this bug still exist in later versions of Excel? Microsoft asserts that the disadvantages of correcting this bug outweigh the advantages. If the bug were eliminated, it would mess up millions of existing workbooks. In addition, correcting this problem would possibly affect compatibility between Excel and other programs that use dates. As it stands, this bug really causes very few problems because most users don't use dates prior to March 1, 1900.

Pre-1900 dates

The world, of course, didn't begin on January 1, 1900. People who use Excel to work with historical information often need to work with dates before January 1, 1900. Unfortunately, the only way to work with pre-1900 dates is to enter the date into a cell as text. For example, you can enter June 27, 1783 into a cell, and Excel won't complain.

TIP

If you plan to sort information by old dates, you should enter your text dates with a four-digit year, followed by a two digit month, and then a two-digit day — for example, 1783-06-27. You won't be able to work with these text strings as dates, but this format will enable accurate sorting.

Using text as dates works in some situations, but the main problem is that you can't perform any manipulation on a date that's entered as text. For example, you can't change its numeric formatting, you can't determine which day of the week this date occurred on, and you can't calculate the date that occurs seven days later.

Inconsistent date entries

You need to be careful when entering dates by using two digits for the year. When you do so, Excel has some rules that kick in to determine which century to use. And those rules vary, depending on the version of Excel that you use.

Two-digit years between 00 and 29 are interpreted as 21st-century dates, and two-digit years between 30 and 99 are interpreted as 20th-century dates. For example, if you enter 12/15/28, Excel interprets your entry as December 15, 2028. But if you enter 12/15/30, Excel sees it as December 15, 1930, because Windows uses a default boundary year of 2029. You can keep the default as is or change it via the Windows Control Panel. In the Region dialog box (or the equivalent if you're using Windows Server), click the Additional Settings button to display the Customize Format dialog box. Select the Date tab and then specify a different year.

TIP

The best way to avoid any surprises is to simply enter all years using all four digits for the year.

Date-Related Worksheet Functions

Excel has quite a few functions that work with dates. These functions are accessible by choosing Formulas ⇨ Function Library ⇨ Date & Time.

Below Table summarizes the date-related functions available in Excel.

Table Date-Related Functions

Function	Description
DATE	Returns the serial number of a particular date
DATEVALUE	Converts a date in the form of text to a serial number
DAY	Converts a serial number to a day of the month
DAYS***	Returns the number of days between two dates
DAYS360	Calculates the number of days between two dates based on a 360-day year
EDATE*	Returns the serial number of the date that represents the indicated number of months before or after the start date
EOMONTH*	Returns the serial number of the last day of the month before or after a specified number of months
ISOWEEKNUM***	Returns the ISO week number for a date
MONTH	Converts a serial number to a month
NETWORKDAYS*	Returns the number of whole work days between two dates
NETWORKDAYS.INTL**	An international version of the NETWORKDAYS function, which allows nonstandard weekend days
NOW	Returns the serial number of the current date and time
TODAY	Returns the serial number of today's date
WEEKDAY	Converts a serial number to a day of the week
WEEKNUM*	Returns the week number in the year
WORKDAY*	Returns the serial number of the date before or after a specified number of workdays
WORKDAY.INTL**	An international version of the WORKDAY function, which allows nonstandard weekend days
YEAR	Converts a serial number to a year
YEARFRAC*	Returns the year fraction representing the number of whole days between start_date and end_date

* In versions prior to Excel 2007, these functions are available only when the Analysis ToolPak add-in is installed.

** Indicates a function introduced in Excel 2010.

*** Indicates a function introduced in Excel 2013.

Displaying the current date

The following formula uses the TODAY function to display the current date in a cell:

    =TODAY()

You can also display the date combined with text. The formula that follows, for example, displays text, such as Today is Thurday, April 9, 2015:

    ="Today is "&TEXT(TODAY(),"dddd, mmmm d, yyyy")

It's important to understand that the TODAY function is not a date stamp. The function is updated whenever the worksheet is calculated. For example, if you enter either of the preceding formulas into a worksheet, the formulas display the current date. And when you open the workbook tomorrow, they will display the current date (not the date when you entered the formula), assuming the default Workbook Calculation option, Automatic, is selected in File ⇨ Options ⇨ Formulas, under Calculation options.

TIP

To enter a date stamp into a cell, press Ctrl +; (semicolon). This action enters the date directly into the cell and doesn't use a formula. Therefore, the date won't change.

Displaying any date

You can easily enter a date into a cell by simply typing it while using any of the date formats that Excel recognizes. You can also create a date by using the DATE function, which takes three arguments: the year, the month, and the day. The following formula, for example, returns a date comprising the year in cell A1, the month in cell B1, and the day in cell C1:

=DATE(A1,B1,C1)

NOTE

The DATE function accepts invalid arguments and adjusts the result accordingly. For example, the following formula uses 13 as the month argument and returns January 1, 2015. The month argument is automatically translated as month 1 of the following year:

=DATE(2014,13,1)

Often, you'll use the DATE function with other functions as arguments. For example, the formula that follows uses the YEAR and TODAY functions to return the date for India's Republic Day (January 26) of the current year:

=DATE(YEAR(TODAY()),1,26)

The DATEVALUE function converts a text string that looks like a date into a date serial number.

The following formula returns 42030, which is the date serial number for 26 January, 2015:

=DATEVALUE("26/1/2015")

To view the result of this formula as a date, you need to apply a date number format to the cell.

Generating a series of dates

Often, you want to insert a series of dates into a worksheet. For example, in tracking weekly sales, you may want to enter a series of dates, each separated by seven days. These dates will serve to identify the sales figures.

In some cases, you can use the Excel Auto Fill feature to insert a series of dates. Enter the first date and drag the cell's fill handle while holding down the right mouse button. Release the mouse button and select an option from the shortcut menu — Fill Days, Fill Weekdays, Fill Months, or Fill Years. Notice that Excel does not provide a Fill Weeks option.

For more flexibility enter the first two dates in the series — for example, the starting day for week 1 and the starting day for week 2. Then select both cells and drag the fill handle down the column. Excel will complete the date series, with each date separated by the interval represented by the first two dates.

The advantage of using formulas (instead of Auto Fill) to create a series of dates is that when you change the first date, the others update automatically. You need to enter the starting date in a cell and then use formulas (copied down the column) to generate the additional dates.

The following examples assume that you enter the first date of the series into cell A1 and the formula into cell A2. You can then copy this formula down the column as many times as needed.

To generate a series of dates separated by seven days, use this formula:

    =A1+7

To generate a series of dates separated by one month, you need to use a more complicated formula because months don't all have the same number of days. This formula creates a series of dates, separated by one month:

    =DATE(YEAR(A1),MONTH(A1)+1,DAY(A1))

To generate a series of dates separated by one year, use this formula:

    =DATE(YEAR(A1)+1,MONTH(A1),DAY(A1))

To generate a series of weekdays only (no Saturdays or Sundays), use the following formula.

This formula assumes that the date in cell A1 is not a weekend day:

    =IF(WEEKDAY(A1)=6,A1+3,A1+1)

Converting a non date string to a date

You may import data that contains dates coded as text strings. For example, the following text represents August 15, 2015 (a four-digit year followed by a two-digit month, followed by a two-digit day):

    20150815

To convert this string to an actual date, you can use a formula, such as the following. (This formula assumes that the coded data is in cell A1.)

    =DATE(LEFT(A1,4),MID(A1,5,2),RIGHT(A1,2))

This formula uses text functions (LEFT, MID, and RIGHT) to extract the digits, and then it uses these extracted digits as arguments for the DATE function.

Calculating the number of days between two dates

A common type of date calculation determines the number of days between two dates. For example, say you have a financial worksheet that calculates interest earned on a deposit account. The interest earned depends on the number of days the account is open. If your sheet contains the open date and the close date for the account, you can calculate the number of days the account was open.

Because dates are stored as consecutive serial numbers, you can use simple subtraction to calculate the number of days between two dates. For example, if cells A1 and B1 both contain a date, the following formula returns the number of days between these dates:

    =A1-B1

If cell B1 contains a more recent date than the date in cell A1, the result will be negative. If you don't care about which date is earlier and want to avoid displaying a negative value, use this formula:

    =ABS(A1-B1)

NOTE

You can also use the DAYS worksheet function, introduced in Excel 2013. It offers no obvious advantage, but here's an example of how to use it to calculate the number of days between two dates:

    =DAYS(A1,B1)

Using Auto Fill to create a series of dates

Sometimes, calculating the difference between two days is more difficult. To demonstrate, consider the common fence-post analogy. If somebody asks you how many units make up a fence, you can respond with either of two answers: the number of fence posts or the number of gaps between the fence posts. The number of fence posts is always one more than the number of gaps between the posts.

To bring this analogy into the realm of dates, suppose that you start a sales promotion on March 1 and end the promotion on March 9. How many days was the promotion in effect? Subtracting March 1 from March 9 produces an answer of eight days. Actually, though, the promotion lasted nine days. In this case, the correct answer involves counting the fence posts, not the gaps. The formula to calculate the length of the promotion (assuming that you have appropriately named cells) appears like this:

=EndDay-StartDay+1

Calculating the number of workdays between two dates

When calculating the difference between two dates, you may want to exclude weekends and holidays. For example, you may need to know how many business days fall in the month of November. This calculation should exclude Saturdays, Sundays, and holidays. The NETWORKDAYS function can help out.

NOTE

In versions prior to Excel 2007, the NETWORKDAYS function was available only when the Analysis ToolPak add-in was installed. This function is now part of Excel and doesn't require an add-in. This is relevant if you plan to share your workbook with someone who uses an older version of Excel.

The NETWORKDAYS function calculates the difference between two dates, excluding weekend days (Saturdays and Sundays). As an option, you can specify a range of cells that contain the dates of holidays, which are also excluded. Excel has no way of determining which days are holidays, so you must provide this information in a range.

Below image shows a worksheet that calculates the workdays between two dates. The range A2:A11 contains a list of holiday dates. The two formulas in column C calculate the workdays between the dates in column A and column B. For example, the formula in cell C15 is:

=NETWORKDAYS(A15,B15,A2:A11)

	A	B	C	D
1	**Date**	**Holiday**		
2	Wed, January 01, 2014	New Year Day		
3	Sun, January 26, 2014	Republic day		
4	Mon, March 17, 2014	Holi		
5	Mon, April 14, 2014	Good Friday		
6	Fri, August 15, 2014	Independence day		
7	Fri, August 29, 2014	Ganesh Chaturthi		
8	Fri, May 09, 2014	Teacher's day		
9	Mon, February 10, 2014	Mahatma Gandhi Jayanti		
10	Thu, October 23, 2014	Diwali/Deepavali		
11	Thu, December 25, 2014	Christmas Day		
12				
13				
14	**First Day**	**Last Day**	**Working Days**	
15	Wed, January 01, 2014	Tue, January 07, 2014	4	
16	Wed, January 01, 2014	Wed, December 31, 2014	252	
17				
18				

Using the NETWORKDAYS function to calculate the number of workdays between two dates

This formula returns 4, which means that the seven-day period beginning with January 1 and ending on January 7

contains four workdays in the example year. In other words, the calculation excludes one holiday, one Saturday, and one Sunday. The formula in cell C16 calculates the total number of workdays in the year.

Offsetting a date using only workdays

The WORKDAY function is the opposite of the NETWORKDAYS function. For example, if you start a project on January 4 and the project requires ten working days to complete, the WORKDAY function can calculate the date you will finish the project.

NOTE

In versions prior to Excel 2007, the WORKDAY function was available only when the Analysis ToolPak add-in was installed. The function is now part of Excel and doesn't require an add-in.

The following formula uses the WORKDAY function to determine the date that is ten working days from 4 January, 2014. A working day consists of a weekday (Monday through Friday).

    =WORKDAY("4/1/2014",10)

The formula returns a date serial number, which must be formatted as a date. The result is 17 January 2014 (four weekend dates fall between January 4 and January 17).

CAUTION:

The preceding formula may return a different result, depending on your regional date setting. (The hard-coded date may be interpreted as April 1, 2014.) A better formula is

        =WORKDAY(DATE(2014,1,4),10)

The second argument for the WORKDAY function can be negative. And, as with the NETWORKDAYS function, the WORKDAY function accepts an optional third argument (a reference to a range that contains a list of holiday dates).

Calculating the number of years between two dates

The following formula calculates the number of years between two dates. This formula assumes that cells A1 and B1 both contain dates:

    =YEAR(A1)-YEAR(B1)

This formula uses the YEAR function to extract the year from each date and then subtracts one year from the other. If cell B1 contains a more recent date than the date in cell A1, the result is negative.

Note that this function doesn't calculate full years. For example, if cell A1 contains 12/31/2013 and cell B1 contains 01/01/2014, the formula returns a difference of one year even though the dates differ by only one day. See the next section for another way to calculate the number of full years.

Calculating a person's age

A person's age indicates the number of full years that the person has been alive. The formula in the previous section (for calculating the number of years between two dates) won't calculate this value correctly. You can use two other formulas, however, to calculate a person's age.

The following formula returns the age of the person whose date of birth you enter into cell A1. This formula uses the YEARFRAC function.

    =INT(YEARFRAC(TODAY(),A1,1))

NOTE

In versions prior to Excel 2007, the YEARFRAC function was available only when the Analysis ToolPak add-in was installed. The function is now part of Excel and does not require an add-in.

The following formula uses the DATEDIF function to calculate an age. (See the sidebar, "Where's the DATEDIF Function?")

    =DATEDIF(A1,TODAY(),"Y")

Where's the DATEDIF Function?

One of Excel's mysteries is the DATEDIF function. You may notice that this function doesn't appear in the drop-down function list for the Date & Time category, nor does it appear in the Insert Function dialog box. Therefore, when you use this function, you must always enter it manually.

The DATEDIF function has its origins in Lotus 1-2-3, and apparently Excel provides it for compatibility purposes. The function has been available since Excel 5, but Excel 2000 is the only version that ever documented it in its Help system.

DATEDIF is a handy function that calculates the number of days, months, or years between two dates. The function takes three arguments: start_date, end_date, and a code that represents the time unit of interest. Here's an example of a formula that uses the DATEDIF function (it assumes cells A1 and A2 contain a date). The formula returns the number of complete years between those two dates:

    =DATEDIF(A1,A2,"y")

The following table displays valid codes for the third argument. (You must enclose the codes in quotation marks.)

Unit Code	Returns
"y"	The number of complete years in the period
"m"	The number of complete months in the period
"d"	The number of days in the period
"md"	The difference between the days in start_date and end_date. The months and years of the dates are ignored.
"ym"	The difference between the months in start_date and end_date. The days and years of the dates are ignored.
"yd"	The difference between the days of start_date and end_date. The years of the dates are ignored.

The start_date argument must be earlier than the end_date argument or else the function returns an error.

Determining the day of the year

January 1 is the first day of the year, and December 31 is the last day. But what about all those days in between? The following formula returns the day of the year for a date stored in cell A1:

    =A1-DATE(YEAR(A1),1,0)

Here's a similar formula that returns the day of the year for the current date:

    =TODAY()-DATE(YEAR(TODAY()),1,0)

The following formula returns the number of days remaining in the year after a particular date (assumed to be in cell A1):

    =DATE(YEAR(A1),12,31)-A1

Here's the formula modified to use the current date:

    =DATE(YEAR(TODAY()),12,31)-TODAY()

When you enter either formula, Excel applies date formatting to the cell. You need to apply a non date number format to view the result as a number.

To convert a particular day of the year (for example, the 90th day of the year) to an actual date in a specifi ed year, use the following formula, which assumes that the year is stored in cell A1 and that the day of the year is stored in cell B1:

    =DATE(A1,1,B1)

This formula takes advantage of the fact that the DATE function accepts invalid dates (such as the 90th day of January) and adjusts automatically. The 90th day of January is actually the 90th day of the year.

Determining the day of the week

The WEEKDAY function accepts a date argument and returns an integer between 1 and 7 that corresponds to the day of the week. The following formula, for example, returns 5 because the first day of the year 2015 falls on a Thursday:

```
=WEEKDAY(DATE(2015,1,1))
```

The WEEKDAY function uses an optional second argument that specifies the day numbering system for the result. If you specify 2 as the second argument, the function returns 1 for Monday, 2 for Tuesday, and so on. If you specify 3 as the second argument, the function returns 0 for Monday, 1 for Tuesday, and so on.

Determining the week of the year

To determine the week of the year for a date, use the WEEKNUM function. The following function returns the week number for the data in cell A1:

```
=WEEKNUM(A1)
```

When you use the WEEKNUM function, you can specify a second optional argument to indicate the type of week numbering system you prefer. The second argument can be one of ten values, which are described in the Help system.

NOTE

Excel includes a new function, ISOWEEKNUM. This function returns the same result as WEEKNUM with a second argument of 21. Use this function if your organization uses the ISO week date system for numbering weeks (for fiscal or other tracking purposes), including weeks with leap years.

Determining the date of the most recent Sunday

You can use the following formula to return the date for the previous Sunday. If the current day is a Sunday, the formula returns the current date:

```
=TODAY()-MOD(TODAY()-1,7)
```

To modify this formula to find the date of a day other than Sunday, change the 1 to a different number between 2 (for Monday) and 7 (for Saturday).

Determining the first day of the week after a date

This formula returns the specified day of the week that occurs after a particular date. For example, use this formula to determine the date of the first Monday after a particular date. The formula assumes that cell A1 contains a date and cell A2 contains a number between 1 and 7 (1 for Sunday, 2 for Monday, and so on):

```
=A1+A2-WEEKDAY(A1)+(A2<WEEKDAY(A1))*7
```

If cell A1 contains June 1, 2013 (a Saturday), and cell A2 contains 2 (for Monday), the formula returns June 3, 2013. This is the first Monday following June 1, 2013.

Determining the nth occurrence of a day of the week in a month

You may need a formula to determine the date for a particular occurrence of a weekday. For example, suppose that your company payday falls on the second Friday of each month and you need to determine the paydays for each month of the year. The following formula makes this type of calculation:

```
=DATE(A1,A2,1)+A3-WEEKDAY(DATE(A1,A2,1))+
(A4-(A3>=WEEKDAY(DATE(A1,A2,1))))*7
```

The formula in this section assumes that

- Cell A1 contains a year.
- Cell A2 contains a month.

- Cell A3 contains a day number (1 for Sunday, 2 for Monday, and so on).
- Cell A4 contains the occurrence number (for example, 2 to select the second occurrence of the weekday specified in cell A3).

If you use this formula to determine the date of the second Friday in November 2013, it returns November 8, 2013.

NOTE

If the value in cell A4 exceeds the number of the specified day in the month, the formula returns a date from a subsequent month. For example, if you attempt to determine the date of the fifth Friday in October 2013 (there is no such date), the formula returns the first Friday in November.

Determining the last day of a month

To determine the date that corresponds to the last day of a month, you can use the DATE function. However, you need to increment the month by 1 and use a day value of 0. In other words, the "0th" day of the next month is the last day of the current month.

The following formula assumes that a date is stored in cell A1. The formula returns the date that corresponds to the last day of the month:

    =DATE(YEAR(A1),MONTH(A1)+1,0)

You can use a variation of this formula to determine how many days are in a specified month. The following formula returns an integer that corresponds to the number of days in the month for the date in cell A1:

    =DAY(DATE(YEAR(A1),MONTH(A1)+1,0))

Determining whether a year is a leap year

To determine whether a particular year is a leap year, you can write a formula that determines whether the 29th day of February occurs in February or March. You can take advantage of the fact that the Excel DATE function adjusts the result when you supply an invalid argument — for example, a day of 29 when February contains only 28 days.

The following formula returns TRUE if the year in cell A1 is a leap year. Otherwise, it returns FALSE:

    =IF(MONTH(DATE(A1,2,29))=2,TRUE,FALSE)

The following formula is a bit more complicated, but it correctly identifies 1900 as a non leap year. This formula assumes that cell A1 contains a year:

    =IF(OR(MOD(A1,400)=0,AND(MOD(A1,4)=0,MOD(A1,100)<>0)),TRUE, FALSE)

Determining a date's quarter

For financial reports, you may find it useful to present information in terms of quarters. The following formula returns an integer between 1 and 4 that corresponds to the calendar quarter for the date in cell A1:

    =ROUNDUP(MONTH(A1)/3,0)

This formula divides the month number by 3 and then rounds up the result.

Time-Related Functions

Excel also includes a number of functions that enable you to work with time values in your formulas. This section contains examples that demonstrate the use of these functions.

Below Table summarizes the time-related functions available in Excel. These functions work with date serial numbers. When you use the Insert Function dialog box, these functions appear in the Date & Time function category.

Table Time-Related Functions

Function	Description
HOUR	Returns the hour part of a serial number
MINUTE	Returns the minute part of a serial number
NOW	Returns the serial number of the current date and time
SECOND	Returns the second part of a serial number
TIME	Returns the serial number of a specified time
TIMEVALUE	Converts a time in the form of text to a serial number

Displaying the current time

This formula displays the current time as a time serial number (or as a serial number without an associated date):

    =NOW()-TODAY()

You need to format the cell with a time format to view the result as a recognizable time. The quickest way is to choose Home ➪ Number ➪ Format Number and select Time from the drop-down list.

Or just use the following formula, which returns the current date and time. You can apply a number format that shows the time only:

    =NOW()

TIP

To enter a time stamp (that doesn't change) into a cell, press Ctrl+Shift+: (colon).

Displaying any time

One way to enter a time value into a cell is to just type it, making sure that you include at least one colon (:). You can also create a time by using the TIME function. For example, the following formula returns a time comprising the hour in cell A1, the minute in cell B1, and the second in cell C1:

    =TIME(A1,B1,C1)

Like the DATE function, the TIME function accepts invalid arguments and adjusts the result accordingly. For example, the following formula uses 80 as the minute argument and returns 10:20:15 AM. The 80 minutes are simply added to the hour, with 20 minutes remaining:

    =TIME(9,80,15)

CAUTION

If you enter a value greater than 24 as the first argument for the TIME function, the result may not be what you expect. Logically, a formula such as the one that follows should produce a date/time serial number of 1.041667 (that is, one day and one hour).

    =TIME(25,0,0)

In fact, this formula is equivalent to the following:

    =TIME(1,0,0)

You can also use the DATE function along with the TIME function in a single cell. The formula that follows generates a date and time with a serial number of 41977.7708333333 — which represents 6:30 PM on 4 December, 2014:

    =DATE(2014,12,4)+TIME(18,30,0)

The TIMEVALUE function converts a text string that looks like a time into a time serial number. This formula returns 0.2395833333, the time serial number for 5:45 a.m.:

=TIMEVALUE("5:45 am")

To view the result of this formula as a time, you need to apply number formatting to the cell. The TIMEVALUE function doesn't recognize all common time formats. For example, the following formula returns an error because Excel doesn't like the periods in "a.m."

=TIMEVALUE("5:45 a.m.")

Calculating the difference between two times

Because times are represented as serial numbers, you can subtract the earlier time from the later time to get the difference. For example, if cell A2 contains 5:30:00 and cell B2 contains 14:00:00, the following formula returns 08:30:00 (a difference of 8 hours and 30 minutes):

=B2-A2

If the subtraction results in a negative value, however, it becomes an invalid time; Excel displays a series of hash marks (#######) because a time without a date has a date serial number of 0. A negative time results in a negative serial number, which cannot be displayed — although you can still use the calculated value in other formulas.

If the direction of the time difference doesn't matter, you can use the ABS function to return the absolute value of the difference:

=ABS(B2-A2)

This "negative time" problem often occurs when calculating an elapsed time — for example, calculating the number of hours worked given a start time and an end time. This presents no problem if the two times fall in the same day. But if the work shift spans midnight, the result is an invalid negative time. For example, you may start work at 10:00 p.m. and end work at 6:00 a.m. the next day. Below image shows a worksheet that calculates the hours worked. As you can see, the shift that spans midnight presents a problem (cell C3).

	A	B	C	D	E
1	**Start Shift**	**End Shift**	**Hours Worked**		
2	8:00 AM	5:30 PM	09:30		
3	10:00 PM	6:00 AM	##############		
4	9:00 AM	4:30 PM	07:30		
5	11:30 AM	7:45 PM	08:15		
6	6:15 AM	1:45 PM	07:30		
7					

Calculating the number of hours worked returns an error if the shift spans midnight

Using the ABS function (to calculate the absolute value) isn't an option in this case because it returns the wrong result (16). The following formula, however, does work:

=IF(B2<A2,B2+1,B2)-A2

TIP

Negative times are permitted if the workbook uses the 1904 date system. To switch to the 1904 date system, use the Advanced section of the Excel Options dialog box. Select the Use 1904 Date System option. But beware! When changing the workbook's date system, if the workbook uses dates, the dates will be off by four years.

Summing times that exceed 24 hours

Many people are surprised to discover that when you sum a series of times that exceed 24 hours, Excel doesn't display the correct total. Below image shows an example. The range B2:B8 contains times that represent the hours and minutes worked each day. The formula in cell B9 is:

=SUM(B2:B8)

	A	B	C	D	E
1	**Day**	**Hours Worked**			
2	Sunday	0			
3	Monday	08:30			
4	Tuesday	08:00			
5	Wednesday	09:00			
6	Thursday	09:30			
7	Friday	04:15			
8	Saturday	02:30			
9	**Total Hours**	**17:45**			
10					
11					
12					

Sheet2   Sheet3   3.9   3.10   3.11
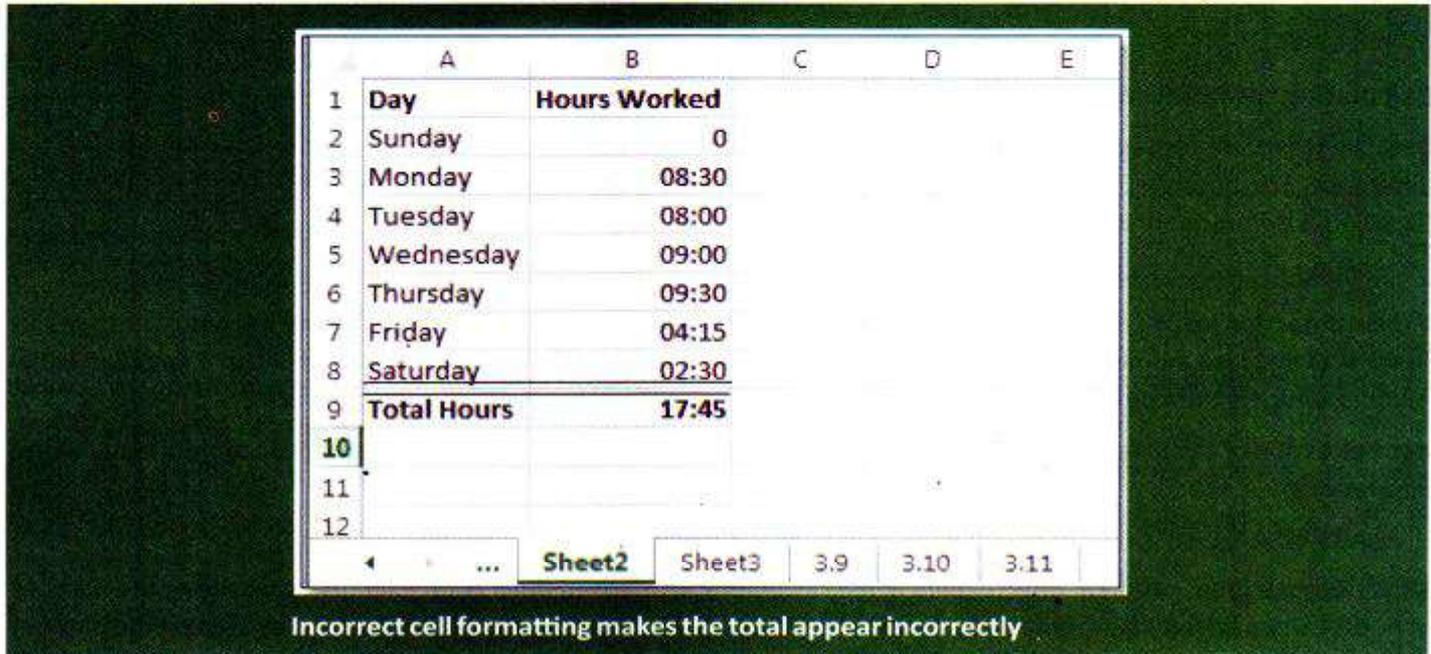
Incorrect cell formatting makes the total appear incorrectly

As you can see, the formula returns a seemingly incorrect total (17 hours, 45 minutes). The total should read 41 hours, 45 minutes. The problem is that the formula is displaying the total as a date/time serial number of 1.7395833, but the cell formatting is not displaying the date part of the date/time. In other words, the answer is correct, but it appears incorrect because cell B9 has the wrong number format.

To view a time that exceeds 24 hours, you need to apply a custom number format for the cell so that square brackets surround the hour part of the format string. Applying the number format here to cell B9 displays the sum correctly:

[h]:mm

Below image shows another example of a worksheet that manipulates times. This worksheet keeps track of hours worked during a week (regular hours and overtime hours).

Employee Timesheet

Employee Name:	Rita Patel
Department:	Tech Support
Start Day:	11-Jan-14

Weekday	Date	Start Work	Time Out(Lunch)	Time In(Lunch)	End Work	Total Hours	Weekly Hours
Monday	11-Jan-14	8:00AM	12:00PM	1:00PM	6:00PM	09:00	09:00
Tuesday	12-Jan-14	10:00AM	2:00PM	2:30PM	7:00PM	08:30	17:30
Wednesday	13-Jan-14	9:00AM	12:00PM	1:00PM	6:30PM	08:30	26:00:00
Thursday	14-Jan-14	8:00AM	12:00PM	1:00PM	6:30PM	09:30	35:30:00
Friday	15-Jan-14	9:30AM	2:00PM	3:30PM	5:00PM	06:00	41:30:00
Saturday	16-Jan-14					00:00	41:30:00
Sunday	17-Jan-14					00:00	41:30:00

Weekly Total	
Total Hours:	41:30
Regular Hours	40:00
Overtime Hours:	1:30

Clear   Help

| Overtime: | 40:00 |

An employee timesheet workbook

The week's starting date appears in cell D5, and the formulas in column B fill in the dates for the days of the week. Times appear in the range D8:G14, and formulas in column H calculate the number of hours worked each day. For example, the formula in cell H8 is:

    =IF(E8<D8,E8+1-D8,E8-D8)+IF(G8<F8,G8+1-G8,G8-F8)

The first part of this formula subtracts the time in column D from the time in column E to get the total hours worked before lunch. The second part subtracts the time in column F from the time in column G to get the total hours worked after lunch. I use IF functions to accommodate graveyard shift cases that span midnight — for example, an employee may start work at 10:00 p.m. and begin lunch at 2:00 a.m. Without the IF function, the formula returns a negative result.

The following formula in cell H17 calculates the weekly total by summing the daily totals in column H:

    =SUM(H8:H14)

This worksheet assumes that hours in excess of 40 hours in a week are considered overtime hours. The worksheet contains a cell named Overtime, in cell C23. This cell contains a formula that returns 40:00. If your standard workweek consists of something other than 40 hours, you can change this cell.

The following formula (in cell H18) calculates regular (non overtime) hours. This formula returns the smaller of two values: the total hours or the overtime hours:

    =MIN(E17,Overtime)

The final formula, in cell H19, simply subtracts the regular hours from the total hours to yield the overtime hours:

    =E17-E18

The times in the range H17:H19 and cell C23 may display time values that exceed 24 hours, so these cells use a custom number format:

    [h]:mm

Converting from military time

Military time is expressed as a four-digit number from 0000 to 2359. For example, 1:00 a.m. is expressed as 0100 hours, and 3:30 p.m. is expressed as 1530 hours. The following formula converts such a number (assumed to be in cell A1) to a standard time:

    =TIMEVALUE(LEFT(A1,2)&":"& RIGHT(A1,2))

The formula returns an incorrect result if the contents of cell A1 do not contain four digits. The following formula corrects the problem, and it returns a valid time for any military time value from 0 to 2359:

    =TIMEVALUE(LEFT(TEXT(A1,"0000"),2)&":"& RIGHT(A1,2))

Following is a simpler formula that uses the TEXT function to return a formatted string and then the TIMEVALUE function to express the result in terms of a time:

    =TIMEVALUE(TEXT(A1,"00\:00"))

Converting decimal hours, minutes, or seconds to a time

To convert decimal hours to a time, divide the decimal hours by 24. For example, if cell A1 contains 9.25 (representing hours), this formula returns 09:15:00 (9 hours, 15 minutes):

    =A1/24

To convert decimal minutes to a time, divide the decimal hours by 1,440 (the number of minutes in a day). For example, if cell A1 contains 500 (representing minutes), the following formula returns 08:20:00 (8 hours, 20 minutes):

    =A1/1440

To convert decimal seconds to a time, divide the decimal hours by 86,400 (the number of seconds in a day). For example, if cell A1 contains 65,000 (representing seconds), the following formula returns 18:03:20 (18 hours, 3 minutes, and 20 seconds):

=A1/86400

Adding hours, minutes, or seconds to a time

You can use the TIME function to add any number of hours, minutes, or seconds to a time. For example, assume that cell A1 contains a time. The following formula adds 2 hours and 30 minutes to that time and displays the result:

=A1+TIME(2,30,0)

You can use the TIME function to fill a range of cells with incremental times. Below image shows a worksheet with a series of times in ten-minute increments. Cell A1 contains a time that was entered directly. Cell A2 contains the following formula, which was copied down the column:

=A1+TIME(0,10,0)

Using a formula to create a series of incremental times
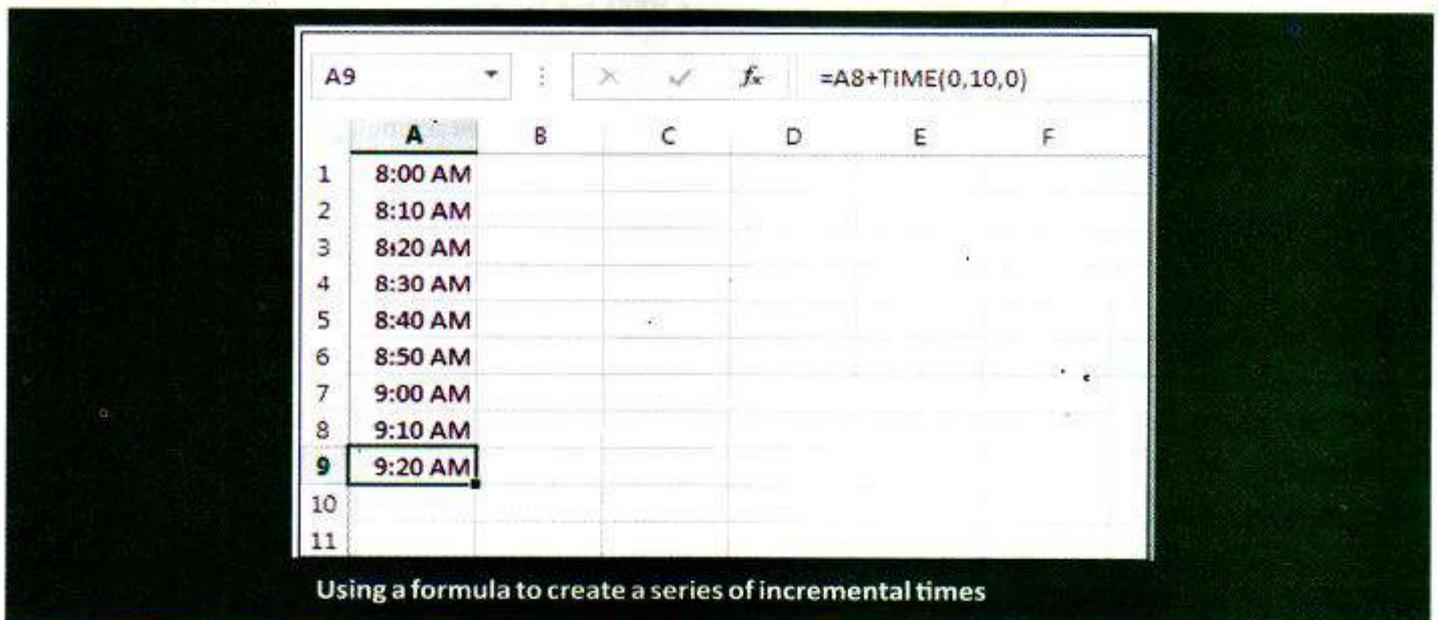
Rounding time values

You may need to create a formula that rounds a time to a particular value. For example, you may need to enter your company's time records rounded to the nearest 15 minutes. This section presents examples of various ways to round a time value.

The following formula rounds the time in cell A1 to the nearest minute:

=ROUND(A1*1440,0)/1440

The formula works by multiplying the time by 1,440 (to get total minutes). This value is passed to the ROUND function, and the result is divided by 1,440. For example, if cell A1 contains 11:52:34, the formula returns 11:53:00.

The following formula resembles this example, except that it rounds the time in cell A1 to the nearest hour:

=ROUND(A1*24,0)/24

If cell A1 contains 5:21:31, the formula returns 5:00:00. The following formula rounds the time in cell A1 to the nearest 15 minutes (a quarter of an hour):

=ROUND(A1*24/0.25,0)*(0.25/24)

In this formula, 0.25 represents the fractional hour. To round a time to the nearest 30 minutes, change 0.25 to 0.5, as in the following formula:

=ROUND(A1*24/0.5,0)*(0.5/24)

Working with non-time-of-day values

Sometimes, you may want to work with time values that don't represent an actual time of day. For example, you may want to create a list of the finish times for a race or record the amount of time you spend in meetings each day. Such times don't represent a time of day. Instead, a value represents the time for an event (in hours, minutes, and seconds). The time to complete a test, for example, may be 35 minutes and 45 seconds. You can enter that value into a cell as:

00:35:45

Excel interprets such an entry as 12:35:45 a.m., which works fine. (Just make sure that you format the cell so that it appears as you like.) When you enter such times, which don't have an hour component, you must include at least one zero for the hour. If you omit a leading zero for a missing hour, Excel interprets your entry as 35 hours and 45 minutes.

Below image shows an example of a worksheet set up to keep track of a person's jogging activity. Column A contains simple dates. Column B contains the distance in miles. Column C contains the time it took to run the distance. Column D contains formulas to calculate the speed in miles per hour. For example, the formula in cell D2 is:

=B2/(C2*24)

	A	B	C	D	E	F	G	H
1	Date	Distance	Time	Speed (mph)	Place(min /mile)	YTD Distance	Cumulative Time	
2	01-01-2014	1.50	00:18:45	4.80	12.50	1.50	00:18:45	
3	02-01-2014	1.50	00:17:40	5.09	11.78	3.00	00:36:25	
4	03-01-2014	2.00	00:21:30	5.58	10.75	5.00	00:57:55	
5	04-01-2014	1.50	00:15:20	5.87	10.22	6.50	01:13:15	
6	05-01-2014	2.40	00:25:05	5.74	10.45	8.90	01:38:20	
7	06-01-2014	3.00	00:31:06	5.79	10.37	11.90	02:09:26	
8	07-01-2014	3.80	00:41:06	5.55	10.82	15.70	02:50:32	
9	08-01-2014	5.00	01:09:00	4.35	13.80	20.70	03:59:32	
10	09-01-2014	4.00	00:45:10	5.31	11.29	24.70	04:44:42	
11	10-01-2014	3.00	00:29:06	6.19	9.70	27.70	05:13:48	
12	11-01-2014	5.50	01:08:30	4.82	12.45	33.20	06:22:18	
13								
14								

This worksheet uses times not associated with a time of day

Column E contains formulas to calculate the pace, in minutes per mile. For example, the formula in cell E2 is:

=(C2*60*24)/B2

Columns F and G contain formulas that calculate the year-to-date distance (using column B) and the cumulative time (using column C). The cells in column G are formatted using the following number format (which permits time displays that exceed 24 hours):

[hh]:mm:ss

Counting and Summing Worksheet Cells

Generally, a counting formula returns the number of cells in a specified range that meet certain criteria. A summing formula returns the sum of the values of the cells in a range that meet certain criteria.

Below Table lists the Excel worksheet functions that come into play when creating counting and summing formulas.

Table Excel Counting and Summing Functions

Function	Description
COUNT	Returns the number of cells that contain a numeric value.
COUNTA	Returns the number of nonblank cells.
COUNTBLANK	Returns the number of blank cells.
COUNTIF	Returns the number of cells that meet a specified criterion.
COUNTIFS*	Returns the number of cells that meet multiple criteria.
DCOUNT	Counts the number of records that meet specified criteria; used with a worksheet database.
DCOUNTA	Counts the number of nonblank records that meet specified criteria; used with a worksheet database.
DSUM	Returns the sum of a column of values that meet specified criteria; used with a worksheet database.
FREQUENCY	Calculates how often values occur within a range of values and returns a vertical array of numbers. Used only in a multicell array formula.
SUBTOTAL	When used with a first argument of 2, 3, 102, or 103, returns a count of cells that comprise a subtotal; when used with a first argument of 9 or 109, returns the sum of cells that comprise a subtotal.
SUM	Returns the sum of its arguments.
SUMIF	Returns the sum of cells that meet a specified criterion.
SUMIFS*	Returns the sum of cells that meet multiple criteria.
SUMPRODUCT	Multiplies corresponding cells in two or more ranges and returns the sum of those products.

* These functions were introduced in Excel 2007.

Getting a Quick Count or Sum

The Excel status bar can display useful information about the currently selected cells — no formulas required. Normally, the status bar displays the sum and count of the values in the selected range. You can, however, right-click the status bar to bring up a menu with other options. You can choose any or all of the following: Average, Count, Numerical Count, Minimum, Maximum, and Sum.
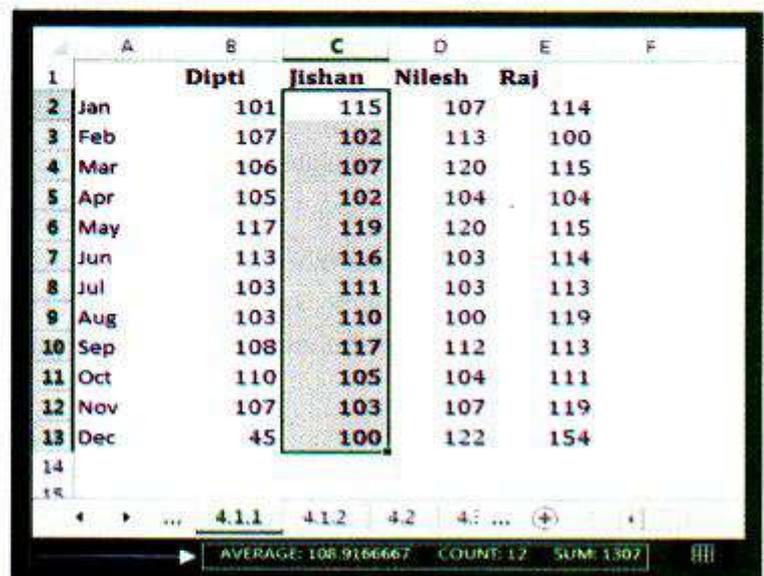
	A	B	C	D	E	F
1		Dipti	Jishan	Nilesh	Raj	
2	Jan	101	115	107	114	
3	Feb	107	102	113	100	
4	Mar	106	107	120	115	
5	Apr	105	102	104	104	
6	May	117	119	120	115	
7	Jun	113	116	103	114	
8	Jul	103	111	103	113	
9	Aug	103	110	100	119	
10	Sep	108	117	112	113	
11	Oct	110	105	104	111	
12	Nov	107	103	107	119	
13	Dec	45	100	122	154	
14						
15						

... 4.1.1 4.1.2 4.2 4.: ... ⊕

AVERAGE: 108.9166667 COUNT: 12 SUM: 1307

Excel status bar displays the sum, count &
average of the values in the selected range

Basic Counting Formulas

The basic counting formulas presented in this section are all straightforward and relatively simple. They demonstrate the capability of the Excel counting functions to count the number of cells in a range that meet specific criteria.

Below image shows a worksheet that uses formulas (in column E) to summarize the contents of range A1:B10 — a 20-cell range named Data. This range contains a variety of information, including values, text, logical values, errors, and empty cells.

	A	B	C	D	E	F
1	Jan	Feb		Total Cells:	20	
2	525	718		Blank Cells:	6	
3				NonBlank Cells:	14	
4	3			Numeric Values:	7	
5	552	911		Non-text cells:	17	
6	250	98		Text Cells:	3	
7				Logical Values:	2	
8	TRUE	FALSE		Error Values:	2	
9		#DIV/0!		#NA errors:	0	
10	Total	#NAME?		#NULL! errors:	0	
11				#DIV/0! Errors:	1	
12				#VALUE! Errors:	0	
13				#REF! errors:	0	
14				#NAME? errors:	1	
15				#NUM! errors:	0	
16						

Formulas in column E display various counts of the data in A1:B10

About This Chapter's Examples

Most of the examples in this chapter use named ranges for function arguments. When you adapt these formulas for your own use, you'll need to substitute either the actual range address or a range name defined in your workbook.

Also, some examples consist of array formulas. An array formula is a special type of formula that enables you to perform calculations that would not otherwise be possible. You can spot an array formula because it's enclosed in curly brackets when it's displayed in the Formula bar. In addition, we use this syntax for the array formula examples presented in this book. For example:

    {=Data*2}

When you enter an array formula, press Ctrl+Shift+Enter (not just Enter), but don't type the curly brackets (Excel inserts the brackets for you). If you need to edit an array formula, don't forget to press Ctrl+Shift+Enter when you finish editing; otherwise, the array formula will revert to a normal formula, and it will return an incorrect result.

Counting the total number of cells

Excel doesn't have a function that simply counts the number of cells in a range reference. To get a count of the total number of cells in a range (empty and nonempty cells), use the following formula. This formula returns the number of cells in a range named Data. It simply multiplies the number of rows (returned by the ROWS function) by the number of columns (returned by the COLUMNS function).

    =ROWS(Data)*COLUMNS(Data)

This formula will not work if the Data range consists of noncontiguous cells. In other words, Data must be a rectangular range of cells.

Counting blank cells

The following formula returns the number of blank (empty) cells in a range named Data:

    =COUNTBLANK(Data)

This function works only with a contiguous range of cells. If Data is defined as a noncontiguous range, the function returns a #VALUE! error.

The COUNTBLANK function also counts cells containing a formula that returns an empty string. For example, the formula that follows returns an empty string if the value in cell A1 is greater than 5. If the cell meets this condition, the COUNTBLANK function counts that cell.

    =IF(A1>5,"",A1)

You can use the COUNTBLANK function with an argument that consists of entire rows or columns. For example, the following formula returns the number of blank cells in column A:

    =COUNTBLANK (A:A)

The following formula returns the number of empty cells on the entire worksheet named Sheet1. You must enter this formula on a sheet other than Sheet1, or it will create a circular reference.

    =COUNTBLANK (Sheet1!1:1048576)

Counting non blank cells

To count non blank cells, use the COUNTA function. The following formula uses the COUNTA function to return the number of nonblank cells in a range named Data:

    =COUNTA (Data)

The COUNTA function counts cells that contain values, text, or logical values (TRUE or FALSE).

Note

If a cell contains a formula that returns an empty string, that cell is included in the count returned by COUNTA, even though the cell appears to be blank.

Counting numeric cells

To count only the numeric cells in a range, use the following formula (which assumes the range is named Data):

    =COUNT(Data)

Cells that contain a date or a time are considered to be numeric cells. Cells that contain a logical value (TRUE or FALSE) aren't considered to be numeric cells.

Counting text cells

To count the number of text cells in a range, you need to use an array formula. The array formula that follows returns the number of text cells in a range named Data:

    {=SUM(IF(ISTEXT(Data),1))}

Counting nontext cells

The following array formula uses the Excel ISNONTEXT function, which returns TRUE if its argument refers to any non text cell (including a blank cell). This formula returns the count of the number of cells not containing text (including blank cells):

    {=SUM(IF(ISNONTEXT(Data),1))}

Counting logical values

The following array formula returns the number of logical values (TRUE or FALSE) in a range named Data:

    {=SUM(IF(ISLOGICAL(Data),1))}

Counting error values in a range

Excel has three functions that help you determine whether a cell contains an error value:

- **ISERROR:** Returns TRUE if the cell contains any error value (#N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME?, or #NULL!)

- **ISERR:** Returns TRUE if the cell contains any error value except #N/A

- **ISNA:** Returns TRUE if the cell contains the #N/A error value

You can use these functions in an array formula to count the number of error values in a range. The following array formula, for example, returns the total number of error values in a range named Data:

    {=SUM(IF(ISERROR(data),1))}

Depending on your needs, you can use the ISERRor ISNA function in place of ISERROR.

If you want to count specific types of errors, you can use the COUNTIF function. The following formula, for example, returns the number of #DIV/0! error values in the range named Data:

    =COUNTIF(Data,"#DIV/0!")   ·

Note that the COUNTIF functions works only with a contiguous range argument. If Data is a noncontiguous range, the formula returns a #VALUE! error.

Advanced Counting Formulas

Most of the basic examples presented earlier in this chapter use functions or formulas that perform conditional counting. The advanced counting formulas that we present in this section represent more complex examples for counting worksheet cells, based on various types of criteria.

Counting cells by using the COUNTIF function

The COUNTIF function, which is useful for single-criterion counting formulas, takes two arguments:

- **range:** The range that contains the values that determine whether to include a particular cell in the count

- **criteria:** The logical criteria that determine whether to include a particular cell in the count

Below Table lists several examples of formulas that use the COUNTIF function. These formulas all work with a range named Data. As you can see, the criteria argument proves quite flexible. You can use constants, expressions, functions, cell references, and even wildcard characters (* and ?).

Note that the COUNTIF functions works only with a contiguous range argument. If Data is defined as a noncontiguous range, the formula returns a #VALUE! error.

Table Examples of Formulas Using the COUNTIF Function

=COUNTIF(Data,12)	Returns the number of cells containing the value 12
=COUNTIF(Data,"<0")	Returns the number of cells containing a negative value
=COUNTIF(Data,"<>0")	Returns the number of cells not equal to 0
=COUNTIF(Data,">5")	Returns the number of cells greater than 5
=COUNTIF(Data,A1)	Returns the number of cells equal to the contents of cell A1
=COUNTIF(Data,">"&A1)	Returns the number of cells greater than the value in cell A1

=COUNTIF(Data,"*")	Returns the number of cells containing text
=COUNTIF(Data,"???")	Returns the number of text cells containing exactly three characters
=COUNTIF(Data,"budget")	Returns the number of cells containing the single word budget (not case sensitive)
=COUNTIF(Data,"*budget*")	Returns the number of cells containing the text budget anywhere within the text
=COUNTIF(Data,"A*")	Returns the number of cells containing text that begins with the letter A (not case sensitive)
=COUNTIF(Data,TODAY())	Returns the number of cells containing the current date
=COUNTIF(Data,">"& AVERAGE (Data))	Returns the number of cells with a value greater than the average of the values
=COUNTIF(Data,">"& AVERAGE (Data)+STDEV(Data)*3)	Returns the number of values exceeding three standard deviations above the mean
=COUNTIF(Data,3)+COUNTIF (Data,-3)	Returns the number of cells containing the value 3 or –3
=COUNTIF(Data,TRUE)	Returns the number of cells containing the logical value TRUE
=COUNTIF(Data,TRUE)+ COUNTIF (Data,FALSE)	Returns the number of cells containing a logical value (TRUE or FALSE)
=COUNTIF(Data,"#N/A")	Returns the number of cells containing the #N/A error value

Counting cells based on multiple criteria

In many cases, you're counting formula will need to count cells only if two or more criteria are met. These criteria can be based on the cells that are being counted or on a range of corresponding cells.

Below image shows a simple worksheet used for the examples. This sheet shows sales data categorized by Month, Sales Rep, and Type. The worksheet contains four named ranges that correspond to the labels in row 1.

	A	B	C	D	E
1	**Month**	**SalesRep**	**Type**	**Amount**	
2	January	Amit	New	85	
3	January	Amit	New	675	
4	January	Bhushan	New	130	
5	January	Disha	New	1350	
6	January	Disha	Existing	685	
7	January	Bhushan	New	1350	
8	January	Disha	New	475	
9	January	Bhushan	New	1205	
10	February	Bhushan	Existing	450	
11	February	Amit	New	495	
12	February	Disha	New	210	
13	February	Disha	Existing	1050	
14	February	Amit	New	140	
15	February	Bhushan	New	900	
16	February	Bhushan	New	900	
17	February	Disha	New	95	
18	February	Disha	New	780	
19	March	Bhushan	New	900	
20	March	Amit	Existing	875	
21	March	Bhushan	New	50	
22	March	Bhushan	New	875	
23	March	Disha	Existing	225	
24	March	Disha	New	175	
25	March	Bhushan	Existing	400	
26	March	Amit	New	840	
27	March	Disha	New	132	
28					

This worksheet demonstrates various counting techniques that use multiple criteria

Using And criteria

An And criterion counts cells if all specified conditions are met. A common example is a formula that counts the number of values that fall within a numerical range. For example, you may want to count cells that contain a value that's greater than 100 and less than or equal to 200. For this example, the COUNTIFS function will do the job:

    =COUNTIFS(Amount,">100",Amount,"<=200")

Note

If the data is contained in a table, you can use table referencing in your formulas. For example, if the table is named Table1, you can rewrite the preceding formula as:

    =COUNTIFS(Table1[Amount],">100",Table1[Amount],"<=200")

This method of writing formulas does not require named ranges. Excel automatically creates names for the table and each column in the table.

The COUNTIFS function accepts any number of paired arguments. The first member of the pair is the range to be counted (in this case, the range named Amount); the second member of the pair is the criterion. The preceding example contains two sets of paired arguments and returns the number of cells in which Amount is greater than 100 and less than or equal to 200.

Prior to Excel 2007, you would need to use a formula like this:

    =COUNTIF(Amount,">100")-COUNTIF(Amount,">200")

This formula counts the number of values that are greater than 100 and then subtracts the number of values that are greater than or equal to 200. The result is the number of cells that contain a value greater than 100 and less than or equal to 200. This formula can be confusing because the formula refers to a condition ">200" even though the goal is to count values that are less than or equal to 200.

Yet another alternate technique is to use an array formula, like the one that follows. You may find it easier to create this type of formula:

    {=SUM((Amount>100)*(Amount<=200))}

Note

When you enter an array formula, remember to press Ctrl+Shift+Enter, but don't type the curly brackets. Excel includes the brackets for you.

Sometimes, the counting criteria will be based on cells other than the cells being counted. You may, for example, want to count the number of sales that meet all the following criteria:

- Month is January and
- SalesRep is Amit and
- Amount is greater than 1,000.

The following formula (for Excel 2007 and later) returns the number of items that meet all three criteria. Note that the COUNTIFS function uses three sets of paired arguments.

    =COUNTIFS(Month,"January",SalesRep,"Amit",Amount,">1000")

An alternative formula, which works with all versions of Excel, uses the SUMPRODUCT function. The following formula returns the same result as the previous formula:

    =SUMPRODUCT((Month="January")*(SalesRep="Amit")*(Amount>1000))

Yet another way to perform this count is to use an array formula:

    {=SUM((Month="January")*(SalesRep="Amit")*(Amount>1000))}

Using Or criteria

An Or criterion counts cells if any of the multiple conditions is met. To count cells by using an Or criterion, you can sometimes use multiple COUNTIF functions. The following formula, for example, counts the number of sales made in January or February:

    =COUNTIF(Month,"January")+COUNTIF(Month,"February")

You can also use the COUNTIF function in an array formula. The following array formula, for example, returns the same result as the previous formula:

    {=SUM(COUNTIF(Month,{"January","February"}))}

But if you base your Or criteria on cells other than the cells being counted, the COUNTIF function won't work. Suppose that you want to count the number of sales that meet at least one of the following criteria:

- Month is January or
- SalesRep is Amit or
- Amount is greater than 1,000.

If you attempt to create a formula that uses COUNTIF, some double counting will occur. The solution is to use an array formula like this:

    {=SUM(IF((Month="January")+(SalesRep="Amit")+(Amount>1000),1))}

Combining And and Or criteria

In some cases, you may need to combine And criteria and Or criteria when counting. For example, perhaps you want to count sales that meet both of the following criteria:

- Month is January.
- SalesRep is Brooks or SalesRep is Cook.

This array formula returns the number of sales that meet the criteria:

    {=SUM((Month="January")*IF((SalesRep="Amit")+(SalesRep="Cook"),1))}

Counting the most frequently occurring entry

The MODE function returns the most frequently occurring value in a range. Following figure shows a worksheet with values in range A1:A10 (named Data). The formula that follows returns 10 because that value appears most frequently in the Data range:

    =MODE(Data)
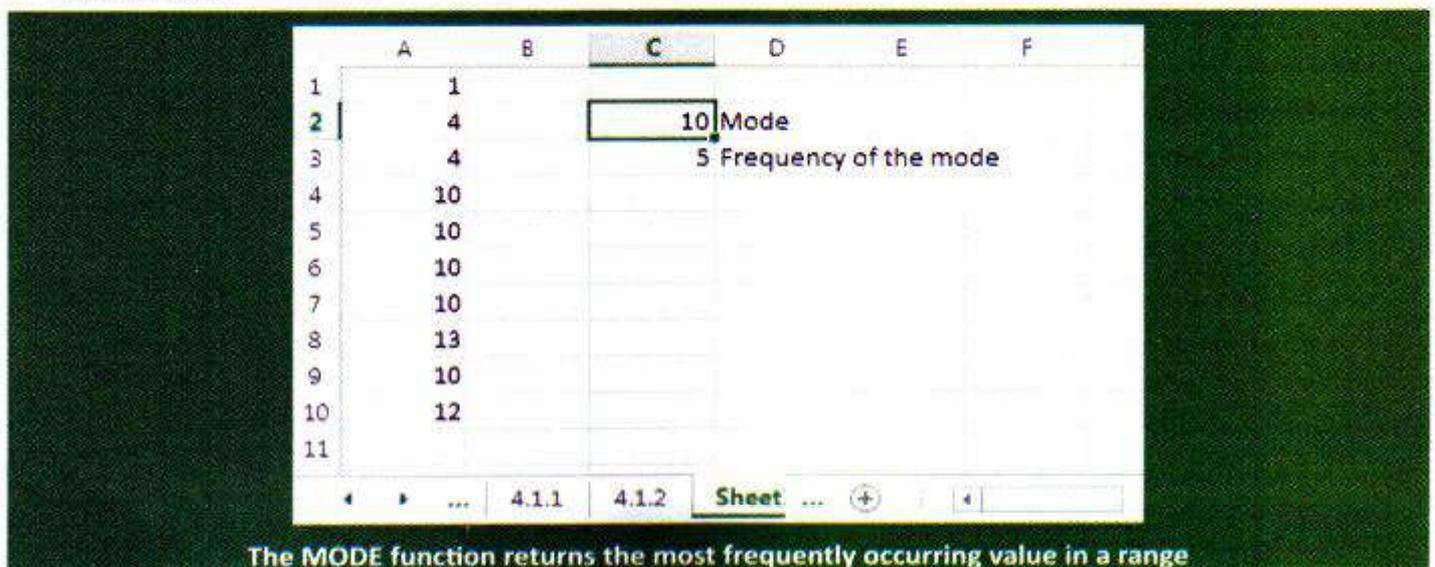
	A	B	C	D	E	F
1	1					
2	4		10	Mode		
3	4		5	Frequency of the mode		
4	10					
5	10					
6	10					
7	10					
8	13					
9	10					
10	12					
11						

The MODE function returns the most frequently occurring value in a range

To count the number of times the most frequently occurring value appears in the range (in other words, the frequency of the mode), use the following formula:

=COUNTIF(Data,MODE(Data))

This formula returns 5 because the modal value (10) appears five times in the Data range.

The MODE function works only for numeric values. It simply ignores cells that contain text. To find the most frequently occurring text entry in a range, you need to use an array formula.

To count the number of times the most frequently occurring item (text or values) appears in a range named Data, use the following array formula:

{=MAX(COUNTIF(Data,Data))}

This next array formula operates like the MODE function except that it works with both text and values:

{=INDEX(Data,MATCH(MAX(COUNTIF(Data,Data)),COUNTIF(Data,Data),0))}

Counting the occurrences of specific text

The examples in this section demonstrate various ways to count the occurrences of a character or text string in a range of cells. Below image shows a worksheet used for these examples. Various text strings appear in the range A1:A10 (named Data); cell B1 is named Text.

	A	B	C	D	E	F	G	H	I
1	aa '	alpha			2	Entire cell(not case -sensitive)			
2	Alpha				1	Entire cell(case -sensitive)			
3	AAA								
4	aaa				3	Part of cell(not case -sensitive)			
5	Beta				1	Part of cell cell(case -sensitive)			
6	Beta								
7	BBB				3	Total occurences In range(not case -sensitive)			
8	Alpha Beta				1	Total occurences In range(case -sensitive)			
9	AB								
10	alpha								
11									

This worksheet demonstrates various ways to count character strings in a range

Entire cell contents

To count the number of cells containing the contents of the Text cell (and nothing else), you can use the COUNTIF function as the following formula demonstrates:

=COUNTIF(Data,Text)

For example, if the Text cell contains the string Alpha, the formula returns 2 because two cells in the Data range contain this text. This formula is not case sensitive, so it counts both Alpha (cell A2) and alpha (cell A10). Note, however, that it does not count the cell that contains Alpha Beta (cell A8).

The following array formula is similar to the preceding formula, but this one is case sensitive:

{=SUM(IF(EXACT(Data,Text),1))}

Partial cell contents

To count the number of cells that contain a string that includes the contents of the Text cell, use this formula:

=COUNTIF(Data,"*"&Text&"*")

For example, if the Text cell contains the text Alpha, the formula returns 3 because three cells in the Data range contain the text alpha (cells A2, A8, and A10). Note that the comparison is not case sensitive.

If you need a case-sensitive count, you can use the following array formula:

{=SUM(IF(LEN(Data)-LEN(SUBSTITUTE(Data,Text,""))>0,1))}

If the Text cells contain the text Alpha, the preceding formula returns 2 because the string appears in two cells (A2 and A8).

Total occurrences in a range

To count the total number of occurrences of a string within a range of cells, use the following array formula:

{=(SUM(LEN(Data))-SUM(LEN(SUBSTITUTE(Data,Text,""))))/LEN(Text)}

If the Text cell contains the character B, the formula returns 7 because the range contains seven instances of the string. This formula is case sensitive.

The following array formula is a modified version that is not case sensitive:

{=(SUM(LEN(Data))-SUM(LEN(SUBSTITUTE(UPPER(Data),UPPER(Text),""))))/ LEN(Text)}

Counting the number of unique values

The following array formula returns the number of unique values in a range named Data:

{=SUM(1/COUNTIF(Data,Data))}

Useful as it is, this formula does have a serious limitation: If the range contains any blank cells, it returns an error. The following array formula solves this problem:

{=SUM(IF(COUNTIF(Data,Data)=0,"",1/COUNTIF(Data,Data)))}

Creating a frequency distribution

A frequency distribution is a summary table that shows the frequency of each value in a range. For example, an instructor may create a frequency distribution of grades. The table would show the count of As, Bs, Cs, and so on. Excel provides a number of ways to create frequency distributions. You can:

- Use the FREQUENCY function.
- Create your own formulas.
- Use the Analysis ToolPak add-in.
- Use a PivotTable.

The FREQUENCY function

Using the FREQUENCY function to create a frequency distribution can be a bit tricky, and this is probably the most difficult way to create a frequency distribution. The FREQUENCY function always returns an array, so you must use it in an array formula that's entered into a multi cell range.

Below image shows some data in range A1:E25 (named Data). These values range from 1 to 500. The range G2:G11 contains the bins used for the frequency distribution. Each cell in this bin range contains the upper limit for the bin. In this case, the bins consist of <=50, 51–100, 101–150, and so on. The goal is to count the number of values that fall into each bin.

Creating a frequency distribution for the data in A1:E25

To create the frequency distribution, select a range of cells that corresponds to the number of cells in the bin range (in this example, select H2:H11 because the bins are in G2:G11). Then enter the following array formula into the selected range (press Ctrl+Shift+Enter it):

    {=FREQUENCY(Data,G2:G11)}

The array formula returns the count of values in the Data range that fall into each bin. To create a frequency distribution that consists of percentages, use the following array formula:

    {=FREQUENCY(Data,G2:G11)/COUNT(Data)}

Below image shows two frequency distributions — one in terms of counts and one in terms of percentages. The figure also shows a chart (histogram) created from the frequency distribution.
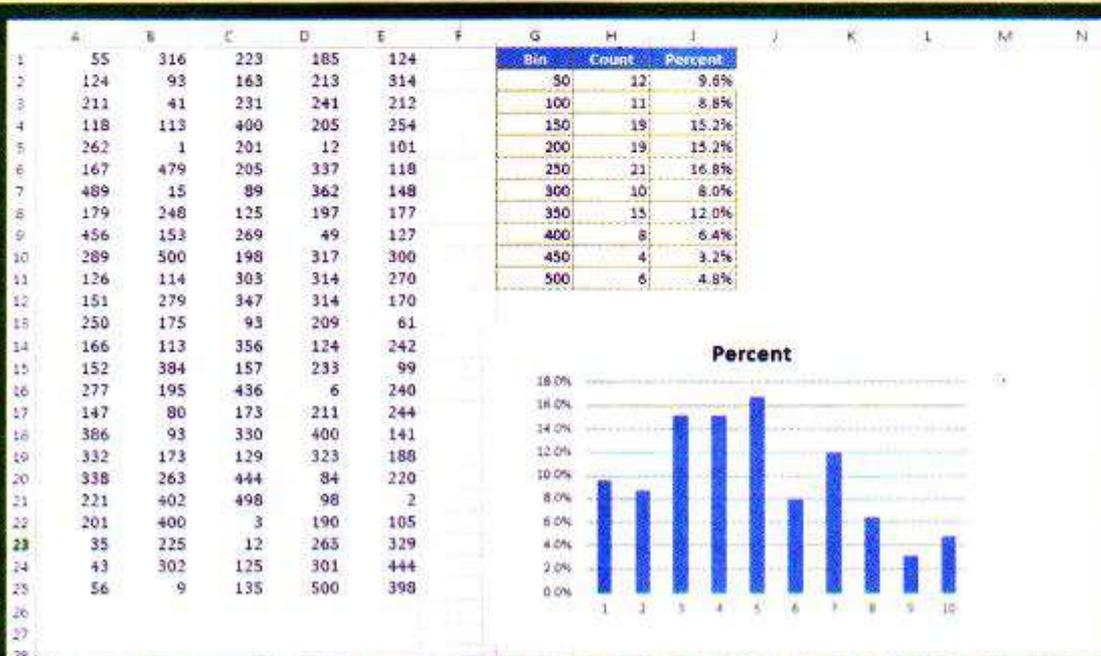
Frequency distributions created by using the FREQUENCY function

Using formulas to create a frequency distribution

Below image shows a worksheet that contains test scores for 50 students in column B (the range is named Grades). Formulas in columns G and H calculate a frequency distribution for letter grades. The minimum and maximum values for each letter grade appear in columns D and E. For example, a test score between 80 and 89 (inclusive) earns a B. In addition, a chart displays the distribution of the test scores.
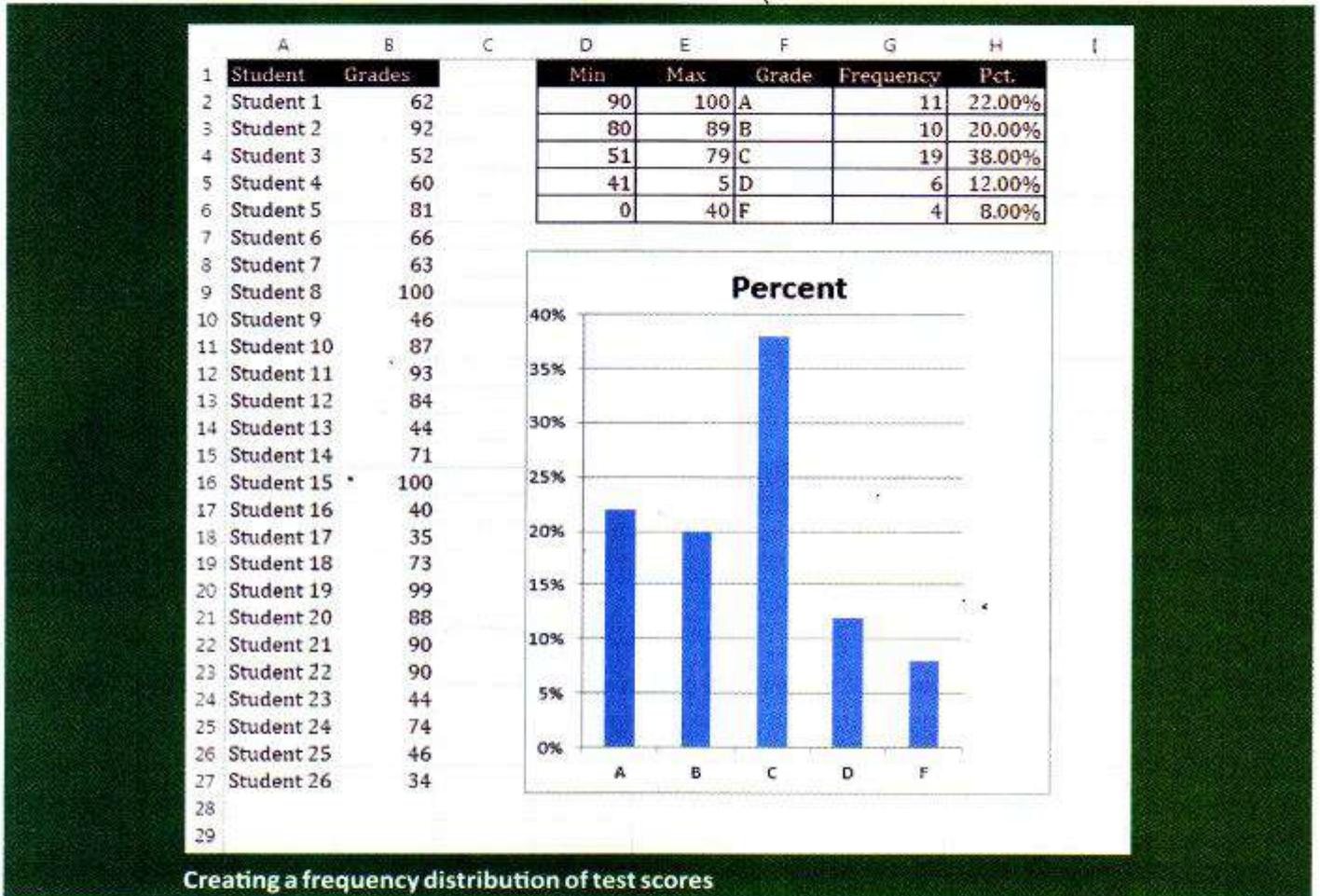
Creating a frequency distribution of test scores

The formula in cell G2 that follows counts the number of scores that qualify for an A:

    =COUNTIFS(Grades,">="&D2,Grades,"<="&E2)

You may recognize this formula from a previous section in this chapter (see "Counting cells based on multiple criteria"). This formula was copied to the four cells below G2.

Note

The preceding formula uses the COUNTIFS function, which first appeared in Excel 2007. For compatibility with previous Excel versions, use this array formula:

    {=SUM((Grades>=D2)*(Grades<=E2))}

The formulas in column H calculate the percentage of scores for each letter grade. The formula in H2, which was copied to the four cells below H2, is:

    =G2/SUM($G$2:$G$6)

Using the Analysis ToolPak to create a frequency distribution

The Analysis ToolPak add-in, distributed with Excel, provides another way to calculate a frequency distribution:

1. Enter your bin values in a range.

2. **Choose Data ⇨ Analysis ⇨ Data Analysis.** The Data Analysis dialog box appears. If this command is not available, see the sidebar, "Is the Analysis ToolPak Available?"

3. In the Data Analysis dialog box, select **Histogram, and then click OK.** The Histogram dialog box appears.

4. **Specify the ranges for your data (Input Range), bins (Bin Range), and results (Output Range), and then select any options and click OK.** Below image shows a frequency distribution (and chart) created with the Histogram option.

The Analysis ToolPak's Histogram dialog box

A frequency distribution and chart generated by the Analysis ToolPak's Histogram option
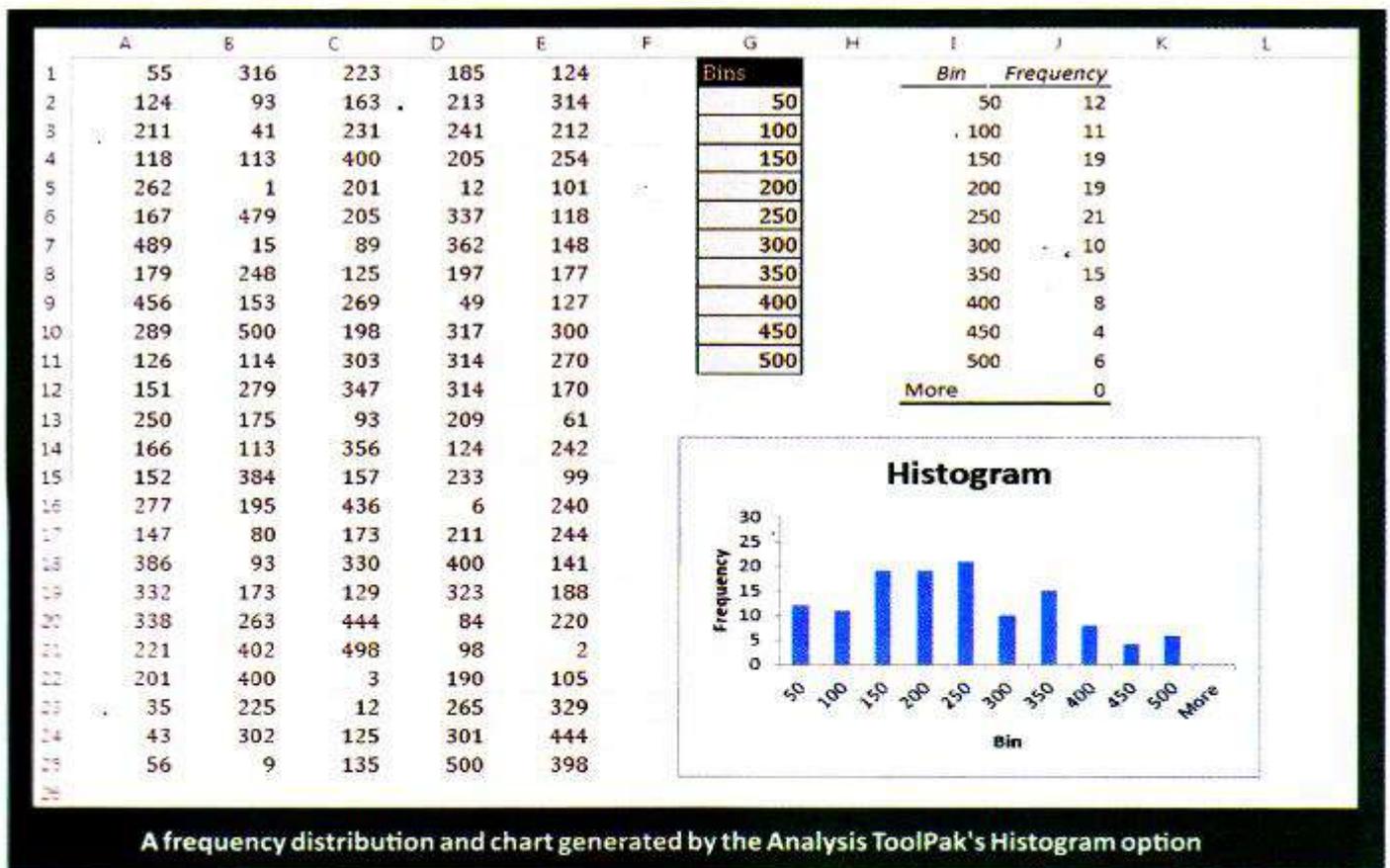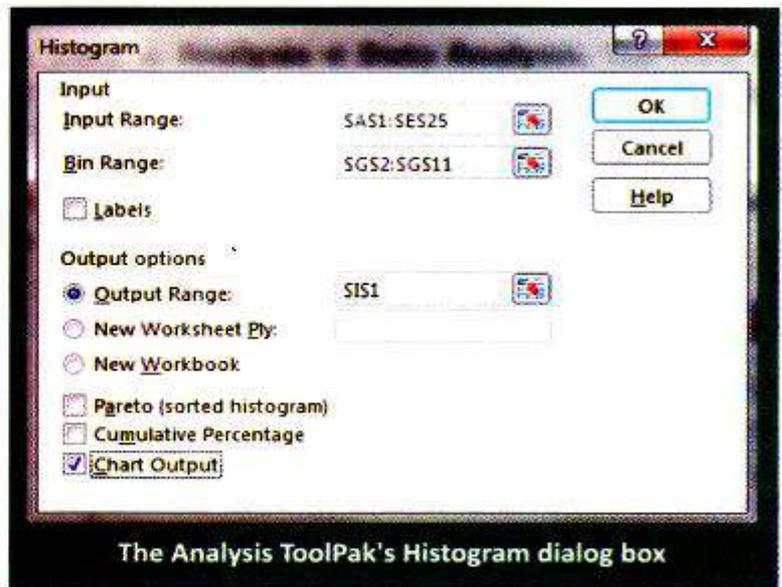
Is the Analysis ToolPak Available?

To make sure that the Analysis ToolPak add-in is available for use, click the Data tab. If the Ribbon displays the Data Analysis command in the Analysis group, you're all set. If not, you'll need to install the add-in:

1. **Choose File ⇨ Options.** The Excel Options dialog box appears.

2. **Click the Add-Ins tab on the left.**

3. **Select Excel Add-Ins from the Manage drop-down list.**

4. Click Go to display the Add-Ins dialog box.

5. Place a check mark next to Analysis ToolPak.

6. Click OK.

If you've enabled the Developer tab, you can display the Add-Ins dialog box by choosing Developer ➪ Add-Ins ➪ Add-Ins.

Note

In the Add-Ins dialog box, you see an additional add-in, Analysis ToolPak – VBA. This add-in is for programmers, and you don't need to install it.

Using a Pivot Table to create a frequency distribution

If your data is in the form of a table, you may prefer to use a PivotTable and a PivotChart to create a histogram. Below image shows the student grade data summarized in a PivotTable and a PivotChart. The counts were created by grouping.

Using a Pivot Chart to display a histogram
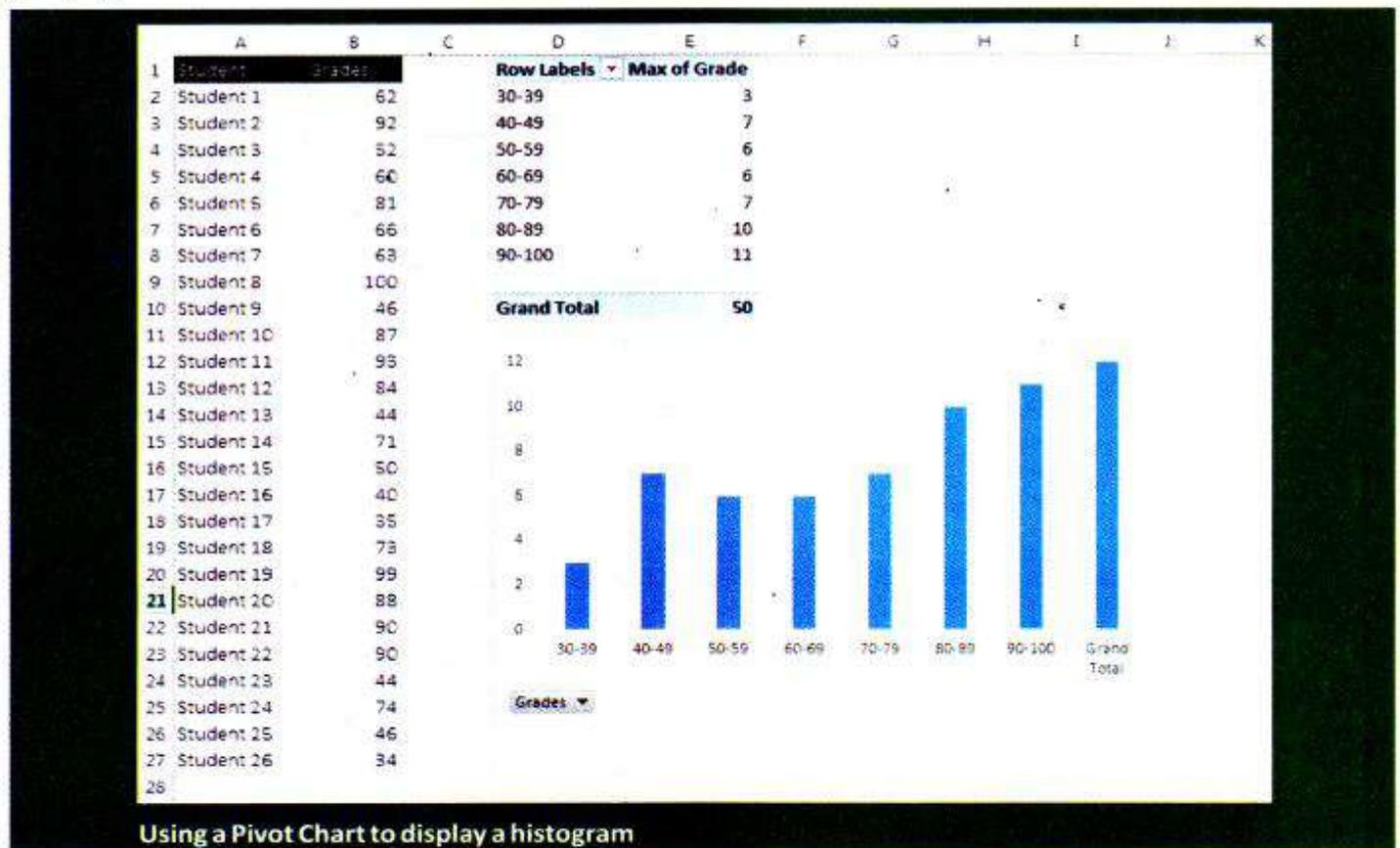
Summing Formulas

The examples in this section demonstrate how to perform common summing tasks by using formulas. The formulas range from very simple to relatively complex array formulas that compute sums by using multiple criteria.

Summing all cells in a range

It doesn't get much simpler than this. The following formula returns the sum of all values in a range named Data:

    =SUM(Data)

The SUM function can take up to 255 arguments. The following formula, for example, returns the sum of the values in five noncontiguous ranges:

    =SUM(A1:A9,C1:C9,E1:E9,G1:G9,I1:I9)

You can use complete rows or columns as an argument for the SUM function. The formula that follows, for example, returns the sum of all values in column A. If this formula appears in a cell in column A, it generates a circular reference error.

    =SUM(A:A)

The following formula returns the sum of all values on Sheet 1 by using a range reference that consists of all rows. To avoid a circular reference error, this formula must appear on a sheet other than Sheet1.

    =SUM(Sheet1!1:1048576)

The SUM function is very versatile. The arguments can be numerical values, cells, ranges, text representations of numbers (which are interpreted as values), logical values, and even embedded functions. For example, consider the following formula:

    =SUM(B1,5,"6",,SQRT(4),A1:A5,TRUE)

This odd formula, which is perfectly valid, contains all the following types of arguments, listed here in the order of their presentation:

- A single cell reference: B1
- A literal value: 5
- A string that looks like a value: "6"
- A missing argument: ,,
- An expression that uses another function: SQRT(4)
- A range reference: A1:A5
- A logical value: TRUE

Computing a cumulative sum

You may want to display a cumulative sum of values in a range — sometimes known as a "running total." Below image illustrates a cumulative sum. Column B shows the monthly amounts, and column C displays the cumulative (year-to-date) totals.

	A	B	C	D
1	Month	Amount	Year-To-Date	
2	January	850	850	
3	February	900	1,750	
4	March	750	2,500	
5	April	1,100	3,600	
6	May	600	4,200	
7	June	500	4,700	
8	July	1,200	5,900	
9	August		5,900	
10	September		5,900	
11	October		5,900	
12	November		5,900	
13	December		5,900	
14	TOTAL	5,900		
15				

Simple formulas in column C display a cumulative sum of the values in column B.

The formula in cell C2 is:

=SUM(B$2:B2)

Notice that this formula uses a mixed reference — that is, the first cell in the range reference always refers to the same row (in this case, row 2). When this formula is copied down the column, the range argument adjusts such that the sum always starts with row 2 and ends with the current row. For example, after copying this formula down column C, the formula in cell C8 is:

=SUM(B$2:B8)

You can use an IF function to hide the cumulative sums for rows in which data hasn't been entered. The following formula, entered in cell C2 and copied down the column, is:

=IF(B2<>"",SUM(B$2:B2),"")

Below figure shows this formula at work.

	A	B	C	D
1	**Month**	**Amount**	**Year-To-Date**	
2	January	850	850	
3	February	900	1,750	
4	March	750	2,500	
5	April	1,100	3,600	
6	May	600	4,200	
7	June	500	4,700	
8	July	1,200	5,900	
9	August			
10	September			
11	October			
12	November			
13	December			
14	**TOTAL**	**5,900**		
15				

Using an IF function to hide cumulative sums for missing data

Ignoring errors when summing

The SUM function does not work if the range to be summed includes any errors. For example, if one of the cells to be summed displays #N/A, the SUM function will also return #N/A.

To add the values in a range and ignore the error cells, use the AGGREGATE function. For example, to sum a range named Data (which may have error values), use this formula:

=AGGREGATE(9,6,Data)

The AGGREGATE function is very versatile, and can do a lot more than just add values. In this example, the first argument (9) specifi es SUM. The second argument (6), means ignore error values.

The arguments are described in the Excel Help. Excel also provides good autocomplete assistance when you enter a formula that uses this function.

Summing the "top n" values

In some situations, you may need to sum the n largest values in a range — for example, the top ten values. If your data

resides in a table, you can use auto filtering to hide all but the top n rows and then display the sum of the visible data in the table's total row.

Another approach is to sort the range in descending order and then use the SUM function with an argument consisting of the first n values in the sorted range.

A better solution — which doesn't require a table or sorting — uses an array formula like this one:

{=SUM(LARGE(Data,{1,2,3,4,5,6,7,8,9,10}))}

This formula sums the ten largest values in a range named Data. To sum the ten smallest values, use the SMALL function instead of the LARGE function:

{=SUM(SMALL(Data,{1,2,3,4,5,6,7,8,9,10}))}

These formulas use an array constant comprised of the arguments for the LARGE or SMALL function. If the value of n for your top-n calculation is large, you may prefer to use the following variation. This formula returns the sum of the top 30 values in the Data range. You can, of course, substitute a different value for 30. Figure shows this array formula in use.

{=SUM(LARGE(Data,ROW(INDIRECT("1:30"))))}
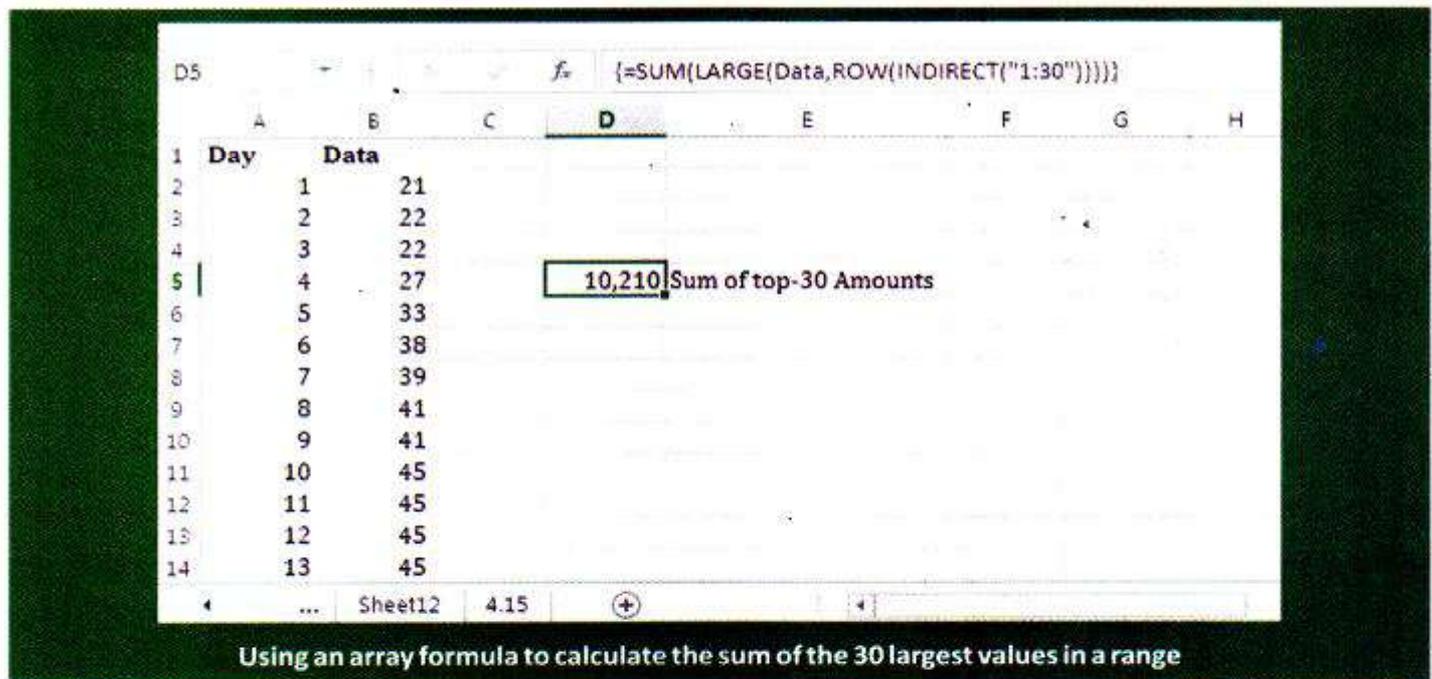
Using an array formula to calculate the sum of the 30 largest values in a range

Conditional Sums Using a Single Criterion

Often, you need to calculate a conditional sum. With a conditional sum, values in a range that meet one or more conditions are included in the sum. This section presents examples of conditional summing by using a single criterion.

The SUMIF function is very useful for single-criterion sum formulas. The SUMIF function takes three arguments:

- **range:** The range containing the values that determine whether to include a particular cell in the sum
- **criteria:** An expression that determines whether to include a particular cell in the sum
- **sum_range:** Optional. The range that contains the cells you want to sum. If you omit this argument, the function uses the range specified in the first argument.

The examples that follow demonstrate the use of the SUMIF function. These formulas are based on the worksheet shown in below image, set up to track invoices. Column F contains a formula that subtracts the date in column E from the date in column D. A negative number in column F indicates a past-due payment. The worksheet uses named ranges that correspond to the labels in row 1.

	A	B	C	D	E	F	G
1	**InvoiceNum**	**Office**	**Amount**	**DateDue**	**Today**	**Difference**	
2	AG-0145	Mumbai	5000.00	4/1/2014	5/5/2014	-34	
3	AG-0189	Pune	450.00	4/19/2014	5/5/2014	-16	
4	AG-0220	Gujarat	3211.56	4/28/2014	5/5/2014	-7	
5	AG-0310	Mumbai	250.00	4/30/2014	5/5/2014	-5	
6	AG-0355	Gujarat	125.50	5/4/20014	5/5/2014	-1	
7	AG-0409	Gujarat	3000.00	5/10/2014	5/5/2014	-5	
8	AG-0581	Mumbai	2100.00	5/24/2014	5/5/2014	5	
9	AG-0600	Mumbai	335.39	5/24/2014	5/5/2014	19	
10	AG-0602	Gujarat	65.00	5/28/2014	5/5/2014	19	
11	AG-0633	Pune	250.00	5/31/2010	5/5/2014	23	
12	**TOTAL**		**14787.45**			**29**	
13							

A negative value in column F indicates a past-due payment

Summing only negative values

The following formula returns the sum of the negative values in column F. In other words, it returns the total number of past-due days for all invoices. For this worksheet, the formula returns –63.

    =SUMIF(Difference,"<0")

Because you omit the third argument, the second argument ("<0") applies to the values in the Difference range.

You don't need to hard-code the arguments for the SUMIF function into your formula. For example, you can create a formula, such as the following, which gets the criteria argument from the contents of cell G2:

    =SUMIF(Difference,G2)

This formula returns a new result if you change the criteria in cell G2.

Summing values based on a different range

The following formula returns the sum of the past-due invoice amounts (in column C):

    =SUMIF(Difference,"<0",Amount)

This formula uses the values in the Difference range to determine whether the corresponding values in the Amount range contribute to the sum.

Summing values based on a text comparison

The following formula returns the total invoice amounts for the Mumbai office:

    =SUMIF(Office,"=Mumbai",Amount)

Using the equal sign in the argument is optional. The following formula has the same result:

    =SUMIF(Office,"Mumbai",Amount)

To sum the invoice amounts for all offices except Mumbai, use this formula:

    =SUMIF(Office,"<>Mumbai",Amount)

Summing values based on a date comparison

The following formula returns the total invoice amounts that have a due date after May 1, 2013:

    =SUMIF(DateDue,">="&DATE(2013,5,1),Amount)

Notice that the second argument for the SUMIF function is an expression. The expression uses the DATE function, which returns a date. Also, the comparison operator, enclosed in quotes, is concatenated (using the & operator) with the result of the DATE function.

The formula that follows returns the total invoice amounts that have a future due date (including today):

    =SUMIF(DateDue,">="&TODAY(),Amount)

Conditional Sums Using Multiple Criteria

The examples in the preceding section all used a single comparison criterion. The examples in this section involve summing cells based on multiple criteria.

Below image shows the sample worksheet again, for your reference. The worksheet also shows the result of several formulas that demonstrate summing by using multiple criteria.

	A	B	C	D	E	F	G	H
1	**InvoiceNum**	**Office**	**Amount**	**DateDue**	**Today**	**Difference**		
2	AG-0145	Mumbai	5000.00	4/1/2014	5/5/2014	-34		
3	AG-0189	Pune	450.00	4/19/2014	5/5/2014	-16		
4	AG-0220	Ahmedabad	3211.56	4/28/2014	5/5/2014	-7		
5	AG-0310	Mumbai	250.00	4/30/2014	5/5/2014	-5		
6	AG-0355	Ahmedabad	125.50	5/4/20014	5/5/2014	-1		
7	AG-0409	Ahmedabad	3000.00	5/10/2014	5/5/2014	5		
8	AG-0581	Mumbai	2100.00	5/24/2014	5/5/2014	19		
9	AG-0600	Mumbai	335.39	5/24/2014	5/5/2014	19		
10	AG-0602	Ahmedabad	65.00	5/28/2014	5/5/2014	23		
11	AG-0633	Pune	250.00	5/31/2010	5/5/2014	26		
12	**TOTAL**		**14787.45**			**29**		
13								
14		-63	Total overdue days					
15		-63	Total overdue days (array formula)					
16								
17		₹ 9,037.06	Total amount overdue					
18		₹ 9,037.06	Total amount overdue(array formula)					
19								
20		₹ 7,685.39	Total for Mumbai only					
21								
22		₹ 7,102.06	Total for all except Mumbai					
23								
24		₹ 5,875.89	Total amount with due date beyond May 1					
25								
26		₹ 5,250.00	Total overdue amount for Mumbai(Excel 2007 or later only)					
27		₹ 5,250.00	Total overdue amount for Mumbai (array formula)					
28								
29		₹ 11,472.45	Total overdue amount OR amounts for Mumbai(array formula)					
30								
31		₹ 5,700.00	Total overdue amounts for Mumbai & Pune(array formula)					
32								

This worksheet demonstrates summing based on multiple criteria

Using And criteria

Suppose that you want to get a sum of the invoice amounts that are past due and associated with the Mumbai office. In other words, the value in the Amount range will be summed only if both of the following criteria are met:

- The corresponding value in the Difference range is negative, and
- The corresponding text in the Office range is Mumbai.

If the worksheet won't be used by anyone running a version prior to Excel 2007, the following formula does the job:

    =SUMIFS(Amount,Difference,"<0",Office,"Mumbai")

The following array formula returns the same result and will work in all versions of Excel:

    {=SUM((Difference<0)*(Office="Mumbai")*Amount)}

Using Or criteria

Suppose that you want to get a sum of past-due invoice amounts or ones associated with the Mumbai office. In other words, the value in the Amount range will be summed if either of the following criteria is met:

- The corresponding value in the Difference range is negative, or
- The corresponding text in the Office range is Mumbai.

This example requires an array formula:

    {=SUM(IF((Office="Mumbai")+(Difference<0),1,0)*Amount)}

A plus sign (+) joins the conditions; you can include more than two conditions.

Using And and Or criteria

As you may expect, things get a bit tricky when your criteria consists of both And and Or operations. For example, you may want to sum the values in the Amount range when both of the following conditions are met:

- The corresponding value in the Difference range is negative.
- The corresponding text in the Office range is Mumbai or Pune.

Notice that the second condition actually consists of two conditions joined with Or. The following array formula does the trick:

    {=SUM((Difference<0)*IF((Office="Mumbai")+(Office="Pune"),1)*Amount)}

What Is a Chart?

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets since the early days of Lotus 1-2-3. Charts generated by early spreadsheet products were quite crude, but they've improved significantly over the years. Excel provides you with the tools to create a wide variety of highly customizable professional-quality charts.

Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships. Making a chart can often help you spot trends and patterns that may otherwise go unnoticed.

Below image shows a worksheet that contains a simple column chart that depicts a company's sales volume by month. Viewing the chart makes it very apparent that sales were down in the summer months (June through August), but they increased steadily during the final four months of the year. You could, of course, arrive at this same conclusion simply by studying the numbers. But viewing the chart makes the point much more quickly.

A simple column chart depicts the monthly sales volume
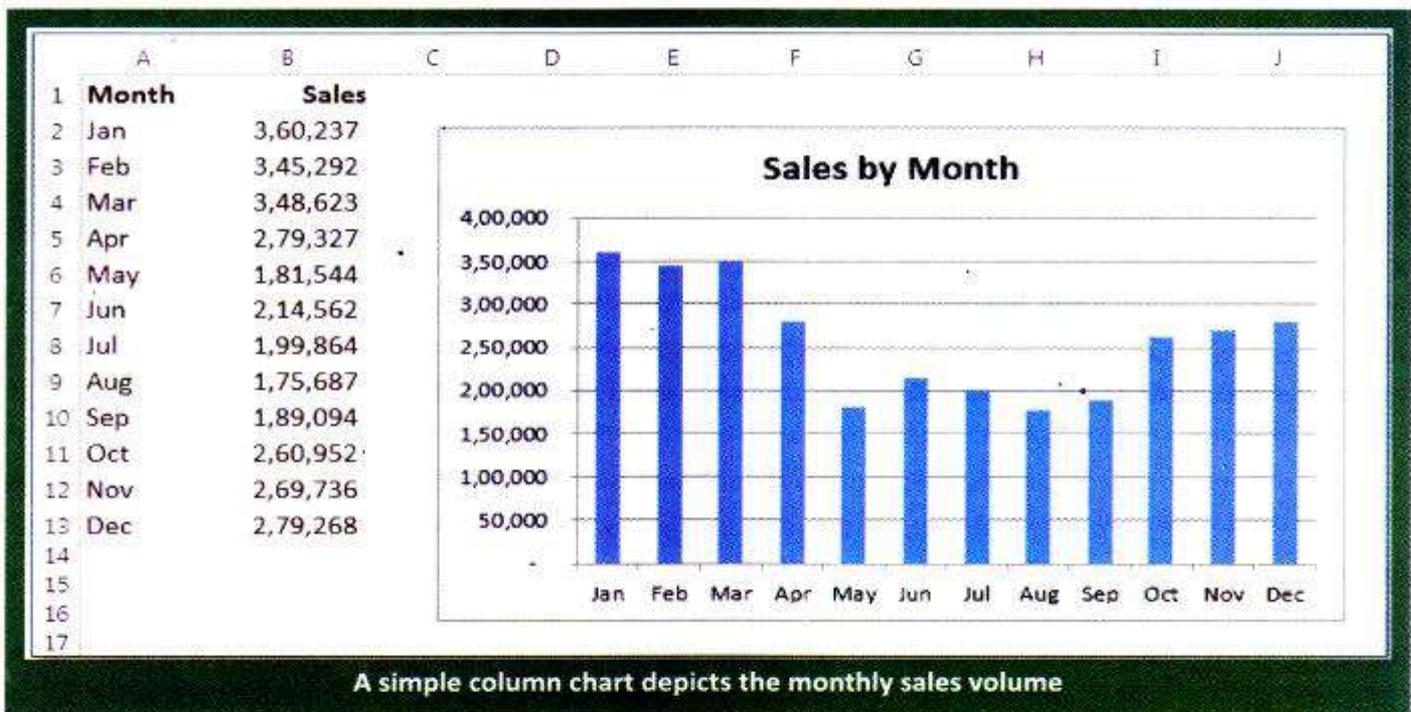
A column chart is just one of many different types of charts that you can create with Excel. Later in this chapter, we discuss all chart types so you can make the right choice for your data.

Handling Charts

Before you can create a chart, you must have some numbers — sometimes known as data. The data, of course, is stored in the cells in a worksheet. Normally, the data that a chart uses resides in a single worksheet, but that's not a strict requirement. A chart can use data that's stored in a different worksheet or even in a different workbook.

A chart is essentially an object that Excel creates upon request. This object consists of one or more data series, displayed graphically. The appearance of the data series depends on the selected chart type. For example, if you create a line chart that uses two data series, the chart contains two lines, each representing one data series. The data for each series is stored in a separate row or column. Each point on the line is determined by the value in a single cell and is represented by a marker. You can distinguish each of the lines by its thickness, line style, color, or data markers (squares, circles, and so on).

Below image shows a line chart that plots two data series across a 12-month period. we used different data markers (squares versus circles) to identify the two series, as shown in the legend at the bottom of the chart. The chart clearly

shows the sales in the Western Region are declining steadily, while Eastern Region sales are increasing a bit after remaining level for several months.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Month	Western Region	Eastern Region									
2	Jan	22,534	41,350									
3	Feb	19,954	41,125									
4	Mar	21,467	39,865									
5	Apr	22,014	37,745									
6	May	22,598	36,455									
7	Jun	21,711	35,876									
8	Jul	18,975	35,856									
9	Aug	19,975	34,965									
10	Sep	18,567	34,012									
11	Oct	20,872	33,356									
12	Nov	21,100	32,156									
13	Dec	21,234	30,654									
14												
15												
16												
17												
18												
19												

This line chart displays two data series
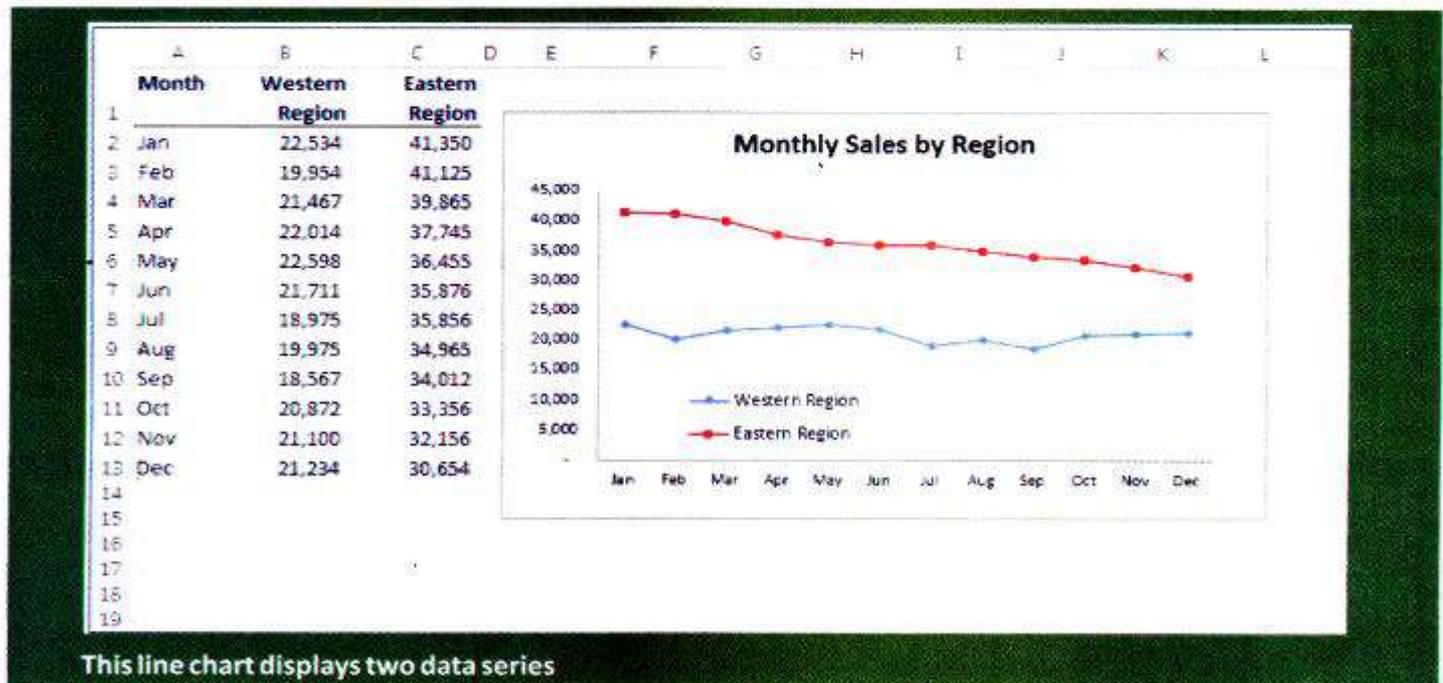
A key point to keep in mind is that charts are dynamic. In other words, a chart series is linked to the data in your worksheet. If the data changes, the chart is updated automatically to reflect those changes.

After you create a chart, you can always change its type, change the formatting, add or remove specific elements (such as the title or legend), add new data series to it, or change an existing data series so that it uses data in a different range.

A chart is either embedded in a worksheet or displayed on a separate chart sheet. It's very easy to move an embedded chart to a chart sheet (and vice versa).

Embedded charts

An embedded chart basically floats on top of a worksheet, on the worksheet's drawing layer. The charts shown previously in this chapter are both embedded charts.

As with other drawing objects (such as Shapes or SmartArt), you can move an embedded chart, resize it, change its proportions, adjust its borders, and perform other operations. Using embedded charts enables you to print the chart next to the data that it uses.

To make any changes to the actual chart in an embedded chart object, you must click it to activate the chart. When a chart is activated, Excel displays the Chart Tools contextual tabs. The Ribbon provides many tools for working with charts, and even more tools are available in the Format task pane.

With one exception, every chart starts out as an embedded chart. The exception is when you create a default chart by selecting the data and pressing F11. In that case, the chart is created on a chart sheet.

Chart sheets

When a chart is on a chart sheet, you view it by clicking its sheet tab. A chart sheet contains a single chart. Chart sheets and worksheets can be interspersed in a workbook.

To move an embedded chart to a chart sheet, click the chart to select it and then choose Chart Tools ⇨ Design ⇨ Location ⇨ Move Chart. The Move Chart dialog box appears. Select the New Sheet option and provide a name for the chart sheet (or accept Excel's default name). Click OK, the chart is moved, and the new chart sheet is displayed.
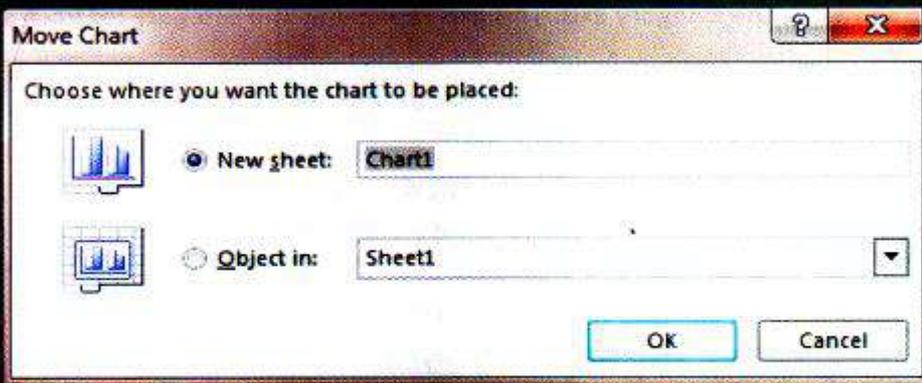
The Move Chart dialog box lets you move a chart to a chart sheet

Tip

This operation also works in the opposite direction: You can select a chart on a chart sheet and relocate it to a worksheet as an embedded chart. In the Move Chart dialog box, choose Object In, and then select the worksheet from the drop-down list.

When you place a chart on a chart sheet, the chart occupies the entire sheet. If you plan to print a chart on a page by itself, using a chart sheet is often your better choice. If you have many charts, you may want to put each one on a separate chart sheet to avoid cluttering your worksheet. This technique also makes locating a particular chart easier because you can change the names of the chart sheets' tabs to provide a description of the chart that it contains.

The Excel Ribbon changes when a chart sheet is active, similar to the way it changes when you select an embedded chart. You have access to the same editing tools for embedded charts and charts on chart sheets.

If the chart isn't fully visible in the window, you can use the scrollbars to scroll it, or adjust the zoom factor to make it smaller. You can also change its orientation (tall or wide) by choosing Page Layout ⇨ Page Setup ⇨ Orientation.

Parts of a Chart

Refer to the accompanying chart as you read the following description of the chart's elements.

The particular chart is a combination chart that displays two data series: Sales Calls and Units Sold. Sales Calls are plotted as vertical columns, and the Units Sold are plotted as a line with circular markers. Each column (or marker on the line) represents a single data point (the value in a cell). The chart data is stored in the range A1:C7.
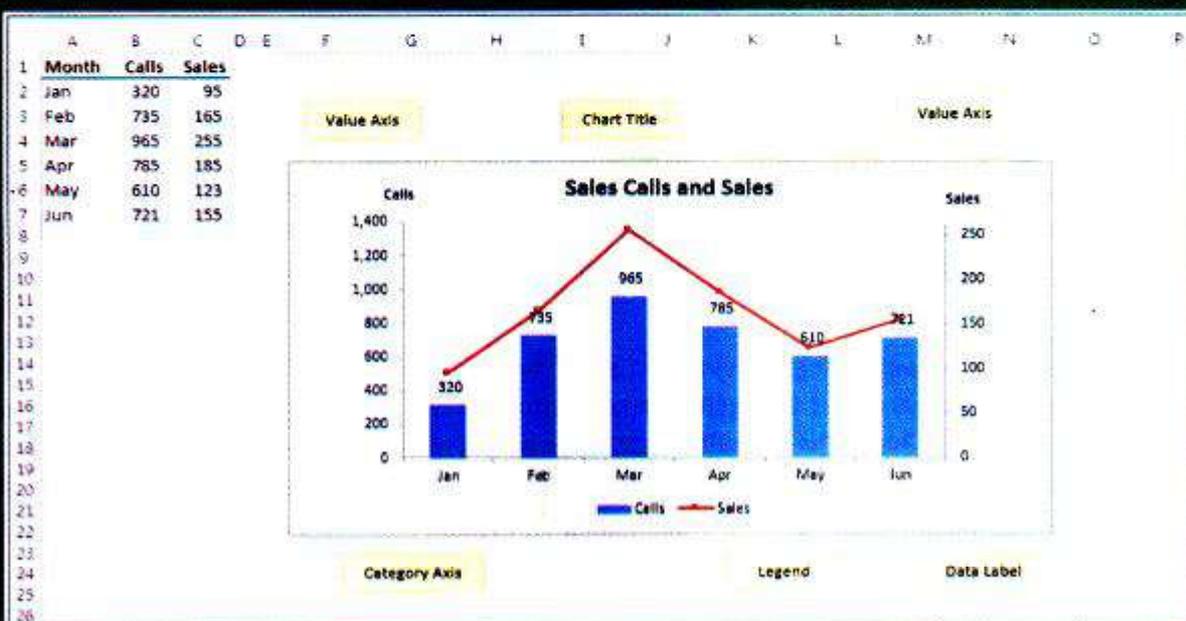
It has a horizontal axis, known as the category axis. This axis represents the category for each data point (January, February, and so on).

It has two vertical axes, known as value axes, and each one has a different scale. The axis on the left is for the columns (Sales Calls), and the axis on the right is for the line (Units Sold).

The value axes also display scale values. The axis on the left displays scale values from 0 to 1,200, in major unit increments of 200. The value axis on the right uses a different scale: 0 to 160, in increments of 20.

Why two value axes? A chart with two value axes is appropriate because the two data series vary dramatically in scale. If the Sales data were plotted using the left axis, the line would barely be visible. Most charts provide some method of identifying the data series or data points. A legend, for example, is often used to identify the various series in a chart. In this example, the legend appears on the bottom of the chart. Some charts also display data labels to identify specific data points. This chart displays data labels for the Units Sold series, but not for the Sales Calls series. In addition, most charts (including the example chart) contain a chart title and additional labels to identify the axes or categories.

It also contains horizontal gridlines (which correspond to the left value axis). Gridlines are basically extensions of the value axis scale, which makes it easier for the viewer to determine the magnitude of the data points.

All charts have a chart area (the entire background area of the chart) and a plot area. The plot area shows the actual chart, and in this example, the plot area has a different background color.

Charts can have additional parts or fewer parts, depending on the chart type. For example, a pie chart has slices and no axes. A 3-D chart may have walls and a floor. You can also add many other types of items to a chart. For example, you can add a trend line or display error bars. In other words, after you create a chart, you have a great deal of flexibility in customizing it.

Creating a Chart

Creating a chart is fairly simple:

1. **Make sure that your data is appropriate for a chart.**

2. **Select the range that contains your data.**

3. **Select the Insert tab and select a chart type from the Charts group.** These icons display drop-down lists that display subtypes. Excel creates the chart and places it in the center of the window.

4. **(Optional) Use the various tools and commands to change the look or layout of the chart or add or delete chart elements.**

Note

Excel 2013 includes a new option in the Insert ➪ Charts groups: Recommended Charts. If you choose this option, the Insert Chart dialog box appears with two tabs. The Recommended Charts tab contains a list of suggested chart types appropriate for your data; sometimes this feature can be useful, but you can't always assume that all the recommended charts are suitable. The second tab, All Charts, gives you access to all of Excel's chart types. The charts displayed in the Insert Chart dialog box are not generic thumbnails; the charts depict your actual data.

Tip

You can create a chart with a single keystroke. Select the range to be used in the chart and then press Alt+F1 (for an embedded chart) or F11 (for a chart on a chart sheet). Excel displays the chart of the selected data, using the default chart type. The default chart type is a column chart, but you can change it. To change the default chart type, select any chart and choose Chart Tools ➪ Design ➪ Type Change Chart Type. The Change Chart Type dialog box appears. Choose a chart type from the list on the left, and then right-click a chart in the row of thumbnails and choose Set As Default Chart.

Hands On: Creating and Customizing a Chart

This section contains a step-by-step example of creating a chart and applying some customizations. If you've never created a chart, this is a good opportunity to get a feel for how the process works.

Below image shows a worksheet with a range of data. This data shows customer survey results by month, broken down by customers in three age groups. In this case, the data resides in a table (created by choosing Insert ⇨ Tables ⇨ Table), but that's not a requirement to create a chart.

	A	B	C	D	E
1	**Customer Satisfaction by Age Group**				
2	Percent Very Satisfied by Customer Age				
3					
4	**Month**	**<30**	**30 - 49**	**>50**	
5	Jan	42%	46%	25%	
6	Feb	35%	52%	28%	
7	Mar	29%	38%	33%	
8	Apr	22%	29%	25%	
9	May	48%	53%	29%	
10	Jun	50%	57%	23%	
11					
12					

The source data for the hands-on chart example

Selecting the data

The first step is to select the data for the chart. Your selection should include such items as labels and series identifiers (row and column headings). For this example, select the entire table (range A4:D10). This range includes the category labels but not the title (which is in A1).

Tip

If you want to chart all data in a table (or a rectangular range separated from other data), you can select just a single cell. Excel will almost always select the range for the chart accurately.

Note

The data that you use in a chart need not be in contiguous cells. You can press Ctrl and make a multiple selection. The initial data, however, must be on a single worksheet. If you need to plot data that exists on more than one worksheet, you can add more series after the chart is created. In all cases, however, data for a single chart series must reside on one sheet.

Choosing a chart type

After you select the data, select a chart type from the Insert ⇨ Charts group. Each control in this group is a drop-down list, which lets you further refine your choice by selecting a subtype.

For this example, let Excel recommend a chart type. Choose Insert ⇨ Charts ⇨ Recommended Charts. Excel displays the dialog box shown in below image. This dialog box shows several recommended charts, using your actual data. Select the first choice, Clustered Column, and click OK. Excel inserts the chart in the middle of the workbook window. You can move the chart by dragging any of its borders. You can also resize it by dragging in one of its corners. Below image shows the chart positioned next to the source data range.

Letting Excel recommend a chart type
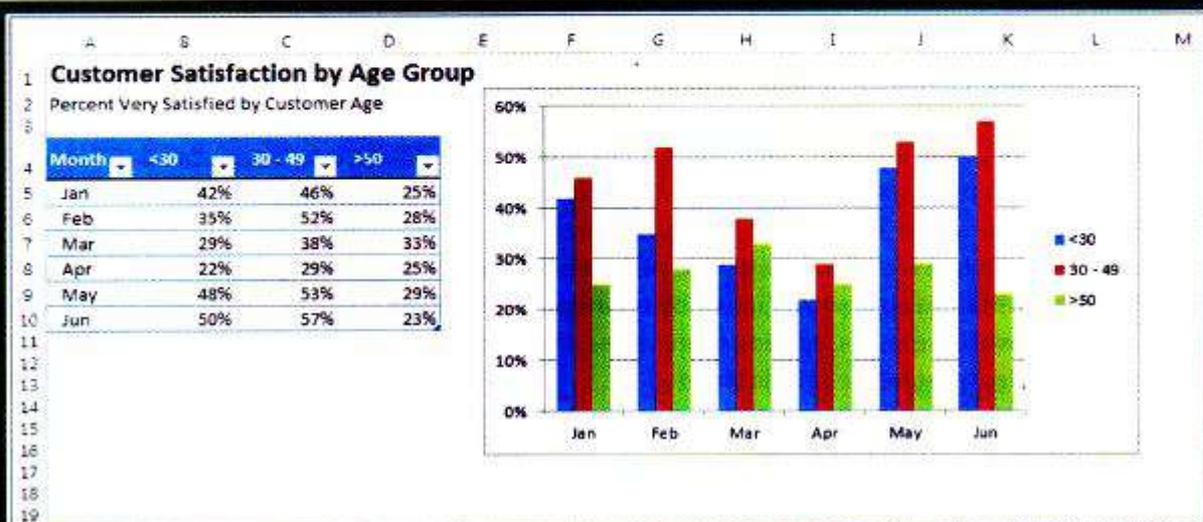
A clustered column chart created from the data in the table

Experimenting with different styles

The chart looks pretty good, but it's just one of several predefined styles for a clustered column chart.

To see some other looks for the chart, select the chart (click it) and check out a few other predefined styles in the Chart Tools ⇨ Design ⇨ Chart Styles group. Just hover your mouse over a thumbnail in the gallery, and your chart shows a Live Preview of the new style. If you find a style you like, click the thumbnail to apply the style. Notice that this Ribbon group also includes a Change Colors tool, which lets you quickly modify the colors used in the chart.

You can also access the chart styles and colors by using the Chart Styles button, which appears to the right of the chart when you select it (the button displays a paintbrush). The choices are presented in a scrollable list. The choices are exactly the same as those displayed in the Chart Tools ⇨ Design ⇨ Chart Styles group.

Experimenting with different layouts

Every chart type has a set of layouts that you can choose from. A layout contains additional chart elements, such as a title, data labels, axes, and so on. You can add your own elements to your chart, but often, using a predefined layout saves time. Even if the layout isn't exactly what you want, it may be close enough that you need to make only a few adjustments.

To try a different predefined layout, select the chart and choose Chart Tools ⇨ Design ⇨ Chart Layouts ⇨ Quick Layout.

To manually add or remove elements from the chart, click the Chart Elements button, which appears to the right of the chart and has an image of a plus sign. Note that each item expands to provide more options, such as the location of the element within the chart. The Chart Elements icon contains the same option as the Chart Tools ⇨ Design ⇨ Chart Layouts ⇨ Add Chart Element control.

Below image shows the chart after selecting a different style and changing the colors. I choose a layout that displays the legend on the right and includes axis titles. I customized the generic title and vertical axis title and deleted the horizontal axis title because it's obvious that it displays months.

The chart, after selecting a different style and layout

Tip

You can link the chart title to a cell so the title always displays the contents of a particular cell. To create a link to a cell, click the chart title, type an equal sign (=), click the cell, and press Enter. Excel displays the link in the Formula bar.

Experiment with the Chart Tools ⇨ Design tab to make other changes to the chart. Also try the tools that appear to the right of the chart when you click it. For example, you can remove the gridlines add axis titles, relocate the legend, and so on. Making these changes is easy and fairly intuitive.

Up until now, the changes made to the chart have been strictly cosmetic. The following sections describe how to make more substantial changes to a chart.

Trying another view of the data

The chart, at this point, shows six clusters (months) of three data points in each (age groups). Would the data be easier to understand if you plotted the information in the opposite way?

Try it. Select the chart and then choose Chart Tools ⇨ Design ⇨ Data ⇨ Switch Row/Column. Below image shows the result of this change.

Customer Satisfaction by Age Group

The chart, after changing the row and column orientation
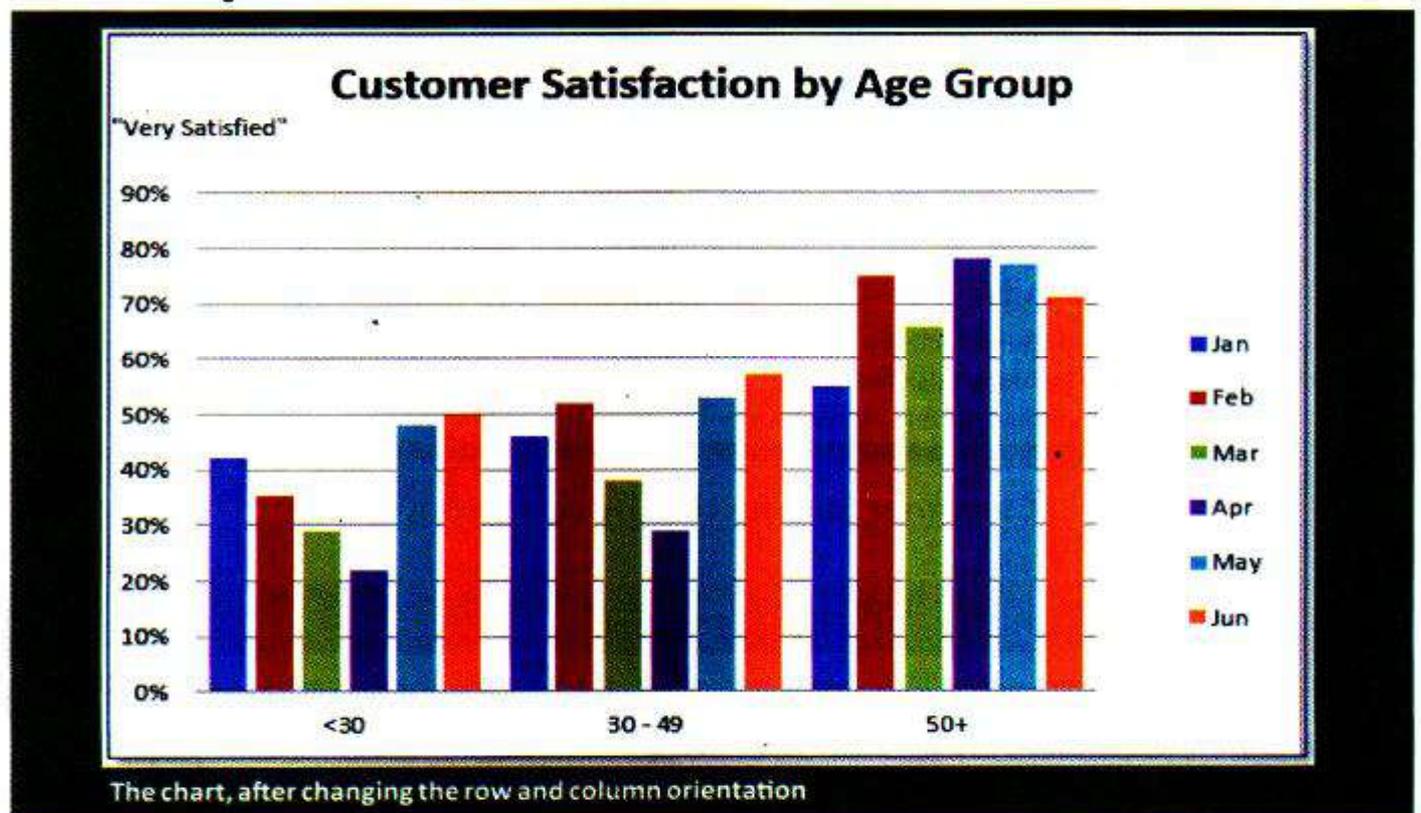
Note

The orientation of the data has a drastic effect on the look of your chart. Excel has its own rules that it uses to determine the initial data orientation when you create a chart. If Excel's orientation doesn't match your expectation, it's easy enough to change.

The chart, with this new orientation, reveals information that wasn't so apparent in the original version. The <30 and 30–49 age groups both show a decline in satisfaction for March and April. The 50+ age group didn't have this problem, however.

Trying other chart types

Although a clustered column chart seems to work well for this data, there's no harm in checking out some other chart types. Choose Design ⇨ Type ⇨ Change Chart Type to experiment with other chart types. This command displays the Change Chart Type dialog box, shown in below image. The figure shows how the data would look as a line chart.

Use this dialog box to change the chart type
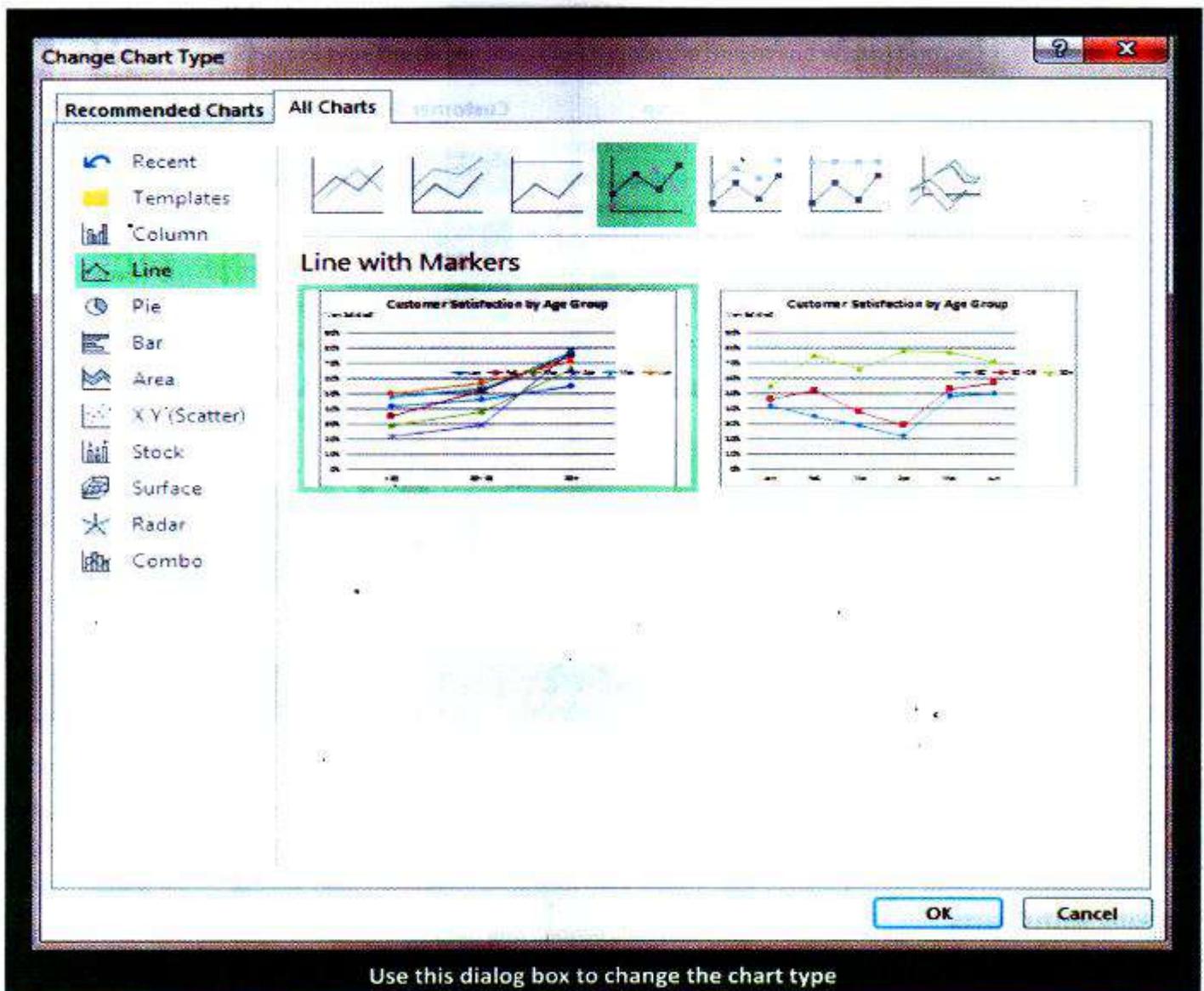
The main chart categories are listed on the left, and the subtypes are shown as a horizontal row of icons. Select an icon and the display shows how the chart will look in both data orientations. When you find a suitable chart type, click OK and Excel changes the chart. Notice that this dialog box has a tab at the top that lets you access Excel's recommended chart types for the data.

If you don't like the result after clicking OK, select Undo from the Quick Access Toolbar.

Tip

You can also change the chart type by selecting the chart and using the controls in the Insert ⇨ Charts group.

Below image shows a few different chart type options using the customer satisfaction data.

The customer satisfaction data, displayed using four different chart types
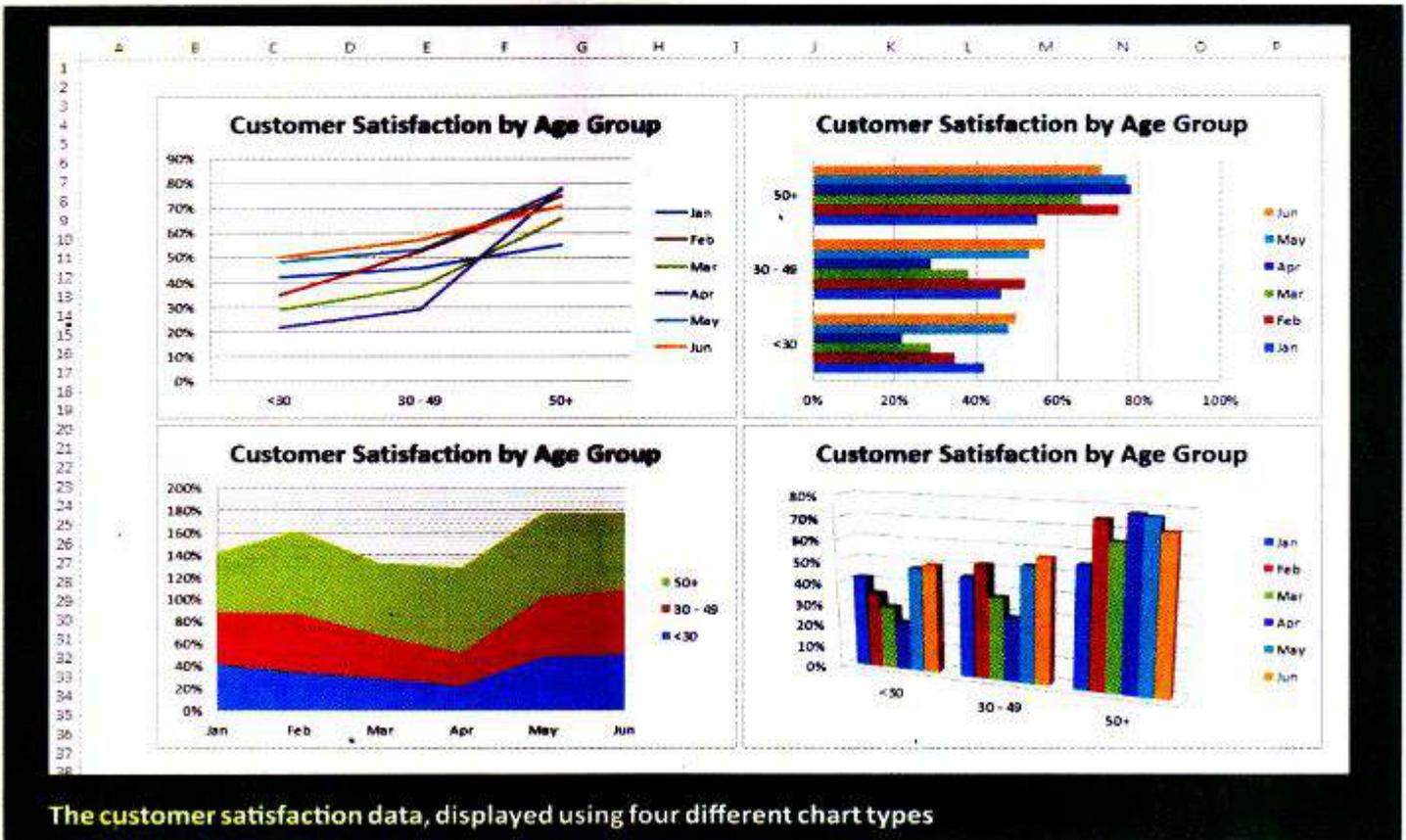
Tip

The styles displayed in **the gallery depend** on the workbook's theme. When you choose Page Layout ⇨ Themes ⇨ Themes to **apply a different theme, you'll have a new** selection of chart styles and colors designed for the selected theme.

Working with Charts

This section covers some common chart modifications:

- Resizing and moving charts
- Copying a chart
- Deleting a chart
- Adding chart elements
- Moving and deleting chart elements
- Formatting chart elements
- Printing charts

Note

Before you can modify a chart, the chart must be activated or selected. To select an embedded chart, click it. Doing so activates the chart and selects the element that you click. To select a chart on a chart sheet, just click its sheet tab.

Resizing a chart

If your chart is an embedded chart, you can freely resize it with your mouse. Click the chart's border. Square handles appear on the chart's corners and edges. Move the mouse pointer over a handle and when the pointer turns into a double arrow, drag to resize the chart.

When a chart is selected, choose Chart Tools ➪ Format ➪ Size and use the two controls to adjust the height and width of the chart. Use the spinners or type the dimensions directly into the Height and Width controls.

Moving a chart

To move an embedded chart to a different location on a worksheet, click the chart to select it, move the mouse pointer over one of its borders, and then drag. You can use standard cut-and-paste techniques to move an embedded chart. In fact, this is the only way to move a chart from one worksheet to another. Select the chart and choose Home ➪ Clipboard ➪ Cut (or press Ctrl+X). Then activate a cell near the desired location and choose Home ➪ Clipboard ➪ Paste (or press Ctrl+V). The new location can be in a different worksheet or even in a different workbook. If you paste the chart to a different workbook, the chart will be linked to the data in the original workbook.

To move an embedded chart to a chart sheet (or vice versa), select the chart and choose Chart Tools ➪ Design ➪ Location ➪ Move Chart; the Move Chart dialog box appears. Choose New Sheet and provide a name for the chart sheet (or use the Excel proposed name).

Copying a chart

To make an exact copy of an embedded chart on the same worksheet, click the chart's border, press and hold the Ctrl key, and drag. Release the mouse button, and a new copy of the chart is created.

To make a copy of a chart sheet, use the same procedure, but drag the chart sheet's tab.

You also can use standard copy-and-paste techniques to copy a chart. Select the chart (an embedded chart or a chart sheet) and choose Home ➪ Clipboard ➪ Copy (or press Ctrl+C). Then activate a cell near the desired location and choose Home ➪ Clipboard ➪ Paste (or press Ctrl+V). The new location can be in a different worksheet or even in a different workbook.

If you paste the chart to a different workbook, it will be linked to the data in the original workbook.

Deleting a chart

To delete an embedded chart, press Ctrl and click the chart (to select the chart as an object). Then press Delete. When the Ctrl key is pressed, you can select multiple charts, and then delete them all with a single press of the Delete key.

To delete a chart sheet, right-click its sheet tab and choose Delete from the shortcut menu. To delete multiple chart sheets, select them by pressing Ctrl while you click the sheet tabs.

Adding chart elements

To add new elements to a chart (such as a title, legend, data labels, or gridlines), activate the chart and click the Chart Elements button, which appears to the right of the chart. Click the check box beside one of the listed chart elements to display or hide it. Note that each item expands to display additional options.

You can also use the Add Chart Element control on the Chart Tools ➪ Design ➪ Chart Layouts group.

Moving and deleting chart elements

Some elements within a chart can be moved: titles, legend, and data labels. To move a chart element, simply click it to select it and then drag it by its border.

The easiest way to delete a chart element is to select it and then press Delete. You can also use the controls on the Chart Elements icon, which appears to the right of the chart.

Note

A few chart elements consist of multiple objects. For example, the data labels element consists of one label for each data point. To move or delete one data label, click once to select the entire element and then click a second time to select the specific data label. You can then move or delete the single data label.

Formatting chart elements

Many users are content to stick with the predefined chart styles and layouts. For more precise customizations, Excel allows you to work with individual chart elements and apply additional formatting. You can use the Ribbon commands for some modifications, but the easiest way to format chart elements is to right-click the element and choose Format <Element> from the shortcut menu. The exact command depends on the element you select. For example, if you right-click the chart's title, the shortcut menu command is Format Chart Title.

The Format command displays a pane with options for the selected element. Changes that you make appear immediately. When you select a new chart element, the dialog box changes to display the properties for the newly selected element. You can keep this task pane displayed while you work on the chart. It can be docked along the left or right part of the window or made free floating and sizable.

Tip

If the Format pane doesn't appear, you can double-click a chart element to display it.

Refer to the "Exploring the Format Pane" sidebar for an explanation of how the Format task panes work.

Tip

If you apply formatting to a chart element and decide that it wasn't such a good idea, you can revert to the original formatting for the particular chart style. Right-click the chart element and choose Reset to Match Style from the shortcut menu. To reset the entire chart, select the chart area when you issue the command.

Exploring the Format Pane

The Format pane can require some exploration. It contains many options that aren't visible, and you sometimes have to do quite a bit of clicking to find the formatting option you're looking for. The accompanying figure shows the task pane for the chart title. The name of the task pane depends on which chart element is selected. The task pane varies quite a bit, depending on which chart element is selected.

Notice that the task pane displays two choices along the top: Title Options and Text Options. Click Title Options, and you see three icons: Fill & Line, Effects, and Size & Properties. Each of these icons has its own set of controls, which can be expanded or contracted by clicking the triangle icon to the left of the category name.

Similarly, the Text Options choice displays three icons: Text Fill & Outline, Text Effects, and Textbox. Again, each of these icons has its own set of options that you can expand or collapse using the triangle icons.

So, if you want to change the color of the text in a chart's title by using the Format Chart Title pane, you would follow these steps:

1. **If the Format pane is displayed, click the chart's title; if the pane is not displayed, double-click the chart's title.**

2. **In the Format Chart Title pane, click Text Options at the top.**

3. **Click the Text Fill & Outline icon.**

4. **Expand the Text Fill section.**

5. **Choose a color from the Color control.**
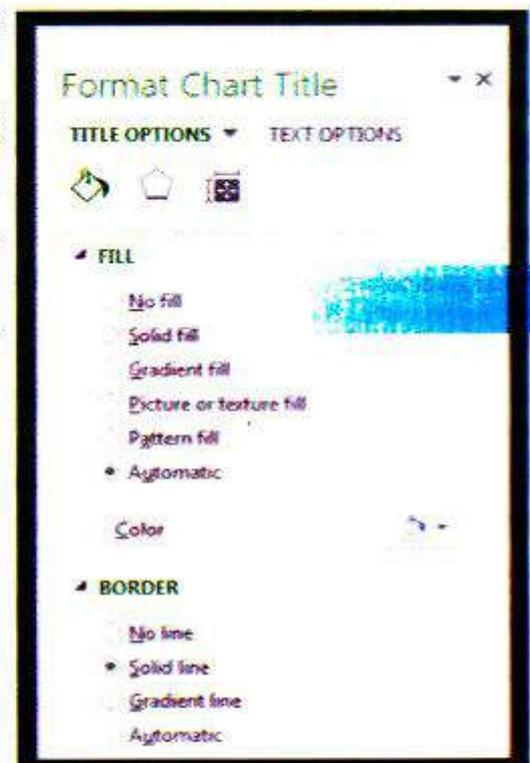
At first, the Format pane will seem complicated and confusing. But as you get acquainted with it, it gets much easier to use.

Also, keep in mind that many formatting choices are available on the Ribbon. For example, a quicker way to change the text color in a chart title is to select the title, click the Home tab on the Ribbon, and use the Font Color control.

Printing charts

Printing embedded charts is nothing special; you print them the same way that you print a worksheet. As long as you include the embedded chart in the range that you want to print, Excel prints the chart as it appears on-screen. When printing a sheet that contains embedded charts, it's a good idea to preview first (or use Page Layout view) to ensure that your charts don't span multiple pages. If you created the chart on a chart sheet, Excel always prints the chart on a page by itself.

Tip

If you select an embedded chart and choose File ➪ Print, Excel prints the chart on a page by itself and does not print the worksheet.

If you don't want a particular embedded chart to appear on your printout, access the Format Chart Area pane and select the Size & Properties icon. Then Expand the Properties section and clear the Print Object check box.

Understanding Chart Types

People who create charts usually do so to make a point or to communicate a specific message. Often, the message is explicitly stated in the chart's title or in a text box within the chart. The chart itself provides visual support.

Choosing the correct chart type is often a key factor in the effectiveness of the message. Therefore, it's often well worth your time to experiment with various chart types to determine which one conveys your message best.

In almost every case, the underlying message in a chart is some type of comparison. Examples of some general types of comparisons include:

- **Comparing an item to other items:** A chart may compare sales in each of a company's sales regions.
- **Comparing data over time:** A chart may display sales by month and indicate trends over time.
- **Making relative comparisons:** A common pie chart can depict relative proportions in terms of pie "slices."
- **Comparing data relationships:** An XY chart is ideal for this comparison. For example, you might show the relationship between monthly marketing expenditures and sales.
- **Comparing frequency:** You can use a common histogram, for example, to display the number (or percentage) of students who scored within a particular grade range.
- **Identifying outliers or unusual situations:** If you have thousands of data points, creating a chart may help identify data that isn't representative.

Choosing a chart type

A common question among Excel users is "How do I know which chart type to use for my data?" Unfortunately, this question has no cut-and-dried answer. Perhaps the best answer is a vague one: Use the chart type that gets your message across in the simplest way. A good starting point is Excel's recommended charts. Select your data and choose Insert ➪ Charts ➪ Recommended Charts to see the chart types that Excel suggests. Remember that these suggestions are not always the best choices.

Note

In the Ribbon, the Charts group of the Insert tab shows the Recommended Charts button, plus eight other drop-down buttons. Some of these drop-down buttons display multiple chart types. For example, stock, surface, and radar charts are all available from a single drop-down button. Similarly, scatter charts and bubble charts share a single button. Probably the easiest way to choose a particular chart type is to select Insert ⇨ Charts ⇨ Recommended Charts, which displays the Insert Chart dialog box. Select the All Charts tab and you'll have a concise list of all chart types and subchart types.

Below image shows the same set of data plotted by using six different chart types. Although all six charts represent the same information (monthly website visitors), they look quite different from one another.

The same data, plotted by using six chart types
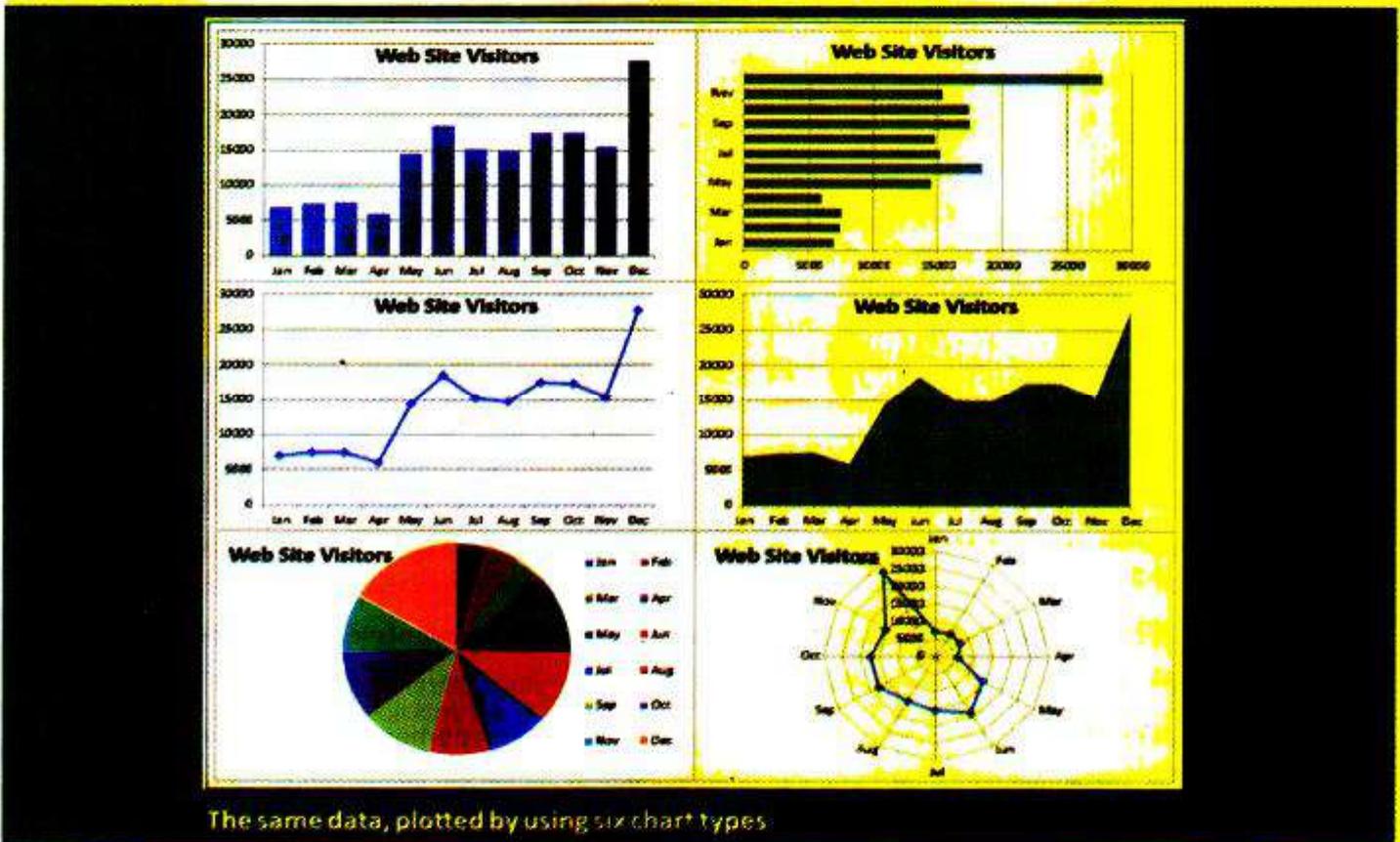
The column chart (upper left) is probably the best choice for this particular set of data because it clearly shows the information for each month in discrete units. The bar chart (upper right) is similar to a column chart, but the axes are swapped. Most people are more accustomed to seeing time-based information extend from left to right rather than from top to bottom, so this isn't the optimal choice.

The line chart (middle left) may not be the best choice because it can imply that the data is continuous — that points exist in between the 12 actual data points. This same argument may be made against using an area chart (middle right).

The pie chart (lower left) is simply too confusing and does nothing to convey the time based nature of the data. Pie charts are most appropriate for a data series in which you want to emphasize proportions among a relatively small number of data points. If you have too many data points, a pie chart can be impossible to interpret.

The radar chart (lower right) is clearly inappropriate for this data. People aren't accustomed to viewing time-based information in a circular direction!

Fortunately, changing a chart's type is easy, so you can experiment with various chart types until you find the one that represents your data accurately, clearly, and as simply as possible.

Creating a Table

A table is a rectangular range of structured data. **Each row in the table corresponds to a single entity.** For example, a row can contain information about a customer, a bank transaction, an employee, a product, and so on. Each column contains a specific piece of information. **For example, if each row contains information about an employee, the** columns can contain data such as name, **employee number,** hire date, salary, department, and so on. Tables typically have a header row at the top that describes the information contained in each column.

You must tell Excel to convert a range of data into an "official" table. You do this by selecting any cell within the range and then choosing Insert ⮕ Tables ⮕ Table. When you explicitly identify a range as a table, Excel can respond more intelligently to the actions you perform with that range. For example, if you create a chart from a table, the chart will expand automatically as you add new rows to the table. And if you enter a formula into a cell, Excel will propagate the formula to other rows in the table. Below image shows a range converted to a table by choosing Insert ⮕ Tables ⮕ Table. Notice the drop-down list arrows at the top.

	A	B	C	D	E	F	G	H	I
1	Agent	Date Listed	Area	List Price	Bedrooms	Baths	Sq.ft	Pool	Sold
2	Priti	8/22/2012	Pune	799,000	5	5	4,696	TRUE	FALSE
3	Sushma	3/28/2012	Pune	325,000	6	5	4,598	FALSE	FALSE
4	Soniya	4/30/2012	Pune	451,000	4	4	3,456	TRUE	FALSE
5	Vrushali	5/28/2012	Pune	1,292,000	4	3	2,549	TRUE	FALSE
6	Tejas	4/17/2012	Mumbai	785,000	4	3.	1,940	FALSE	FALSE
7	Ravi	6/23/2012	Mumbai	693,000	3	2	1,696	FALSE	FALSE
8	Rakesh	4/24/2012	Mumbai	585,000	3	2.5	2,545	FALSE	FALSE
9	Siddharth	7/28/2012	Pune	6,456,000	3	2.5	3,250	FALSE	FALSE
10	Sanam	6/25/2012	Mumbai	458,000	3	2	4,595	TRUE	TRUE
11	Aaliya	3/5/2012	Mumbai	156,000	2	3	3,565	TRUE	FALSE
12	Shweta	4/15/2012	Pune	1,252,000	2	3	9,686	TRUE	TRUE
13	Saniya	8/12/2012	Pune	856,000	2	4	7,825	FALSE	FALSE
14	Sameer	9/14/2012	Pune	789,000	5	4	4,560	FALSE	TRUE
15	Ajay	10/10/2012	Mumbai	4,521,000	5	4	2,450	TRUE	FALSE
16	Reshma	5/16/2012	Mumbai	456,000	4	5	2,495	TRUE	TRUE
17	Dipika	4/8/2012	Mumbai	1,545,000	3	3	3,568	TRUE	TRUE
18									

An Excel table

What's the difference between a standard range and a table? With a table:

- Activating any cell in the table gives you access to the Table Tools ⮕ Design contextual tab on the Ribbon.
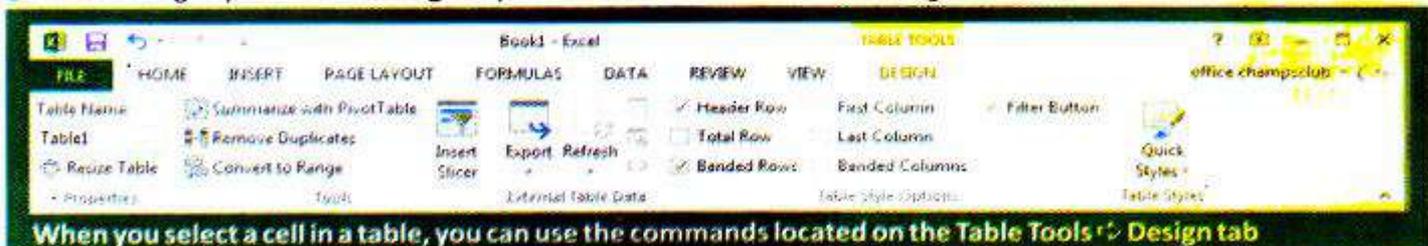
When you select a cell in a table, you can use the commands located on the Table Tools ⮕ Design tab

- The cells contain background color and text color formatting. This formatting is optional.

- Each column header contains a Filter Button — a drop-down list that you can use to sort the data or filter the table to display only rows that meet certain criteria. Displaying the Filter Button is optional.

- You can create easy-to-use Slicers to simplify filtering data.

- If the active cell is within the table, when you scroll down the sheet so that the header row disappears, the table headers replace the column letters in the worksheet header.

- **Tables support calculated columns.** A single formula in a column is automatically propagated to all cells in the column.

- **Tables support structured references.** Instead of using cell references, formulas can use table names and column headers.

- **The lower-right corner of the lower-right cell contains a small control that you can click and drag to extend the table's size, either horizontally (add more columns) or vertically (add more rows).**

- **Selecting rows and columns within the table is simplified.**

Most of the time, you'll create a table from an existing range of data. However, Excel also enables you to create a table from an empty range so that you can fill in the details later. The following instructions assume that you already have a range of data that's suitable for a table.

1. **Make sure that the range doesn't contain any completely blank rows or columns; otherwise, Excel will not guess the table range correctly.**

2. **Select any cell within the range.**

3. **Choose Insert ⇨ Tables ⇨ Table (or press Ctrl+T).** Excel responds with its Create Table dialog box. Excel tries to guess the range, as well as whether the table has a header row. Most of the time, it guesses correctly. If not, correct the range in the Where is the data for your table? Text box.

4. **Click OK.** The range is converted to a table (using the default table style), and the Table Tools ⇨ Design tab of the Ribbon appears.

	A	B	C	D	E	F	G	H	I
1	Agent	Date Listed	Area	List Price	Bedrooms	Baths	Sq.ft	Pool	Sold
2	Priti	8/22/2012	Pune	799,000	5	5	4,696	TRUE	FALSE
3	Sushma	3/28/2012	Pune	325,000	6	5	4,598	FALSE	FALSE
4	Soniya	4/30/2012	Pune	451,0				TRUE	FALSE
5	Vrushali	5/28/2012	Pune	1,292,				TRUE	FALSE
6	Tejas	4/17/2012	Mumbai	785,				ALSE	FALSE
7	Ravi	6/23/2012	Mumbai	693,				ALSE	FALSE
8	Rakesh	4/24/2012	Mumbai	585,				ALSE	FALSE
9	Siddharth	7/28/2012	Pune	6,456,				ALSE	FALSE
10	Sanam	6/25/2012	Mumbai	458,				TRUE	TRUE
11	Aaliya	3/5/2012	Mumbai	156,				TRUE	FALSE
12	Shweta	4/15/2012	Pune	1,252,000	2	3	9,686	TRUE	TRUE
13	Saniya	8/12/2012	Pune	856,000	2	4	7,825	FALSE	FALSE
14	Sameer	9/14/2012	Pune	789,000	5	4	4,560	FALSE	TRUE
15	Ajay	10/10/2012	Mumbai	4,521,000	5	4	2,450	TRUE	FALSE
16	Reshma	5/16/2012	Mumbai	456,000	4	5	2,495	TRUE	TRUE
17	Dipika	4/8/2012	Mumbai	1,545,000	3	3	3,568	TRUE	TRUE
18									

Create Table

Where is the data for your table?

= $A$1:$I$17

✓ My table has headers

OK   Cancel

Use the Create Table dialog box to verify that Excel selected the table dimensions correctly

Note

Excel may not specify the table's dimensions correctly if the table isn't separated from other information by at least one empty row or column. If Excel doesn't choose the range correctly, just specify the exact range for the table in the Create Table dialog box. Better yet, click Cancel and rearrange your worksheet such that the table is separated from your other data by at least one blank row or column.

To create a table from an empty range, just select the range and choose Insert ⇨ Tables ⇨ Table. Excel creates the table, adds generic column headers (such as Column1 and Column2), and applies table formatting to the range. Almost always, you'll want to replace the generic column headers with more meaningful text.

Changing the Look of a Table

When you create a table, Excel applies the default table style. The actual appearance depends on which document theme is used in the workbook (Page Layout ⇨ Themes ⇨ Themes). If you prefer a different look, you can easily change the entire look of the table.

Select any cell in the table and choose Table Tools ⇨ Design ⇨ Table Styles. (At a lower screen resolution, you will need to click the Quick Styles button in the Table Styles group of the Design tab.) The Ribbon shows one row of styles, but if you click the More button at the bottom of the scroll bar to the right, the Table Styles group expands, as shown in below image. The styles are grouped into three categories: Light, Medium, and Dark. Notice that you get a Live Preview on the table as you move your mouse among the styles. When you see one you like, just click to apply it. For a different set of table style choices, choose Page Layout ⇨ Themes ⇨ Themes to select a different document theme.

Excel offers many different table styles
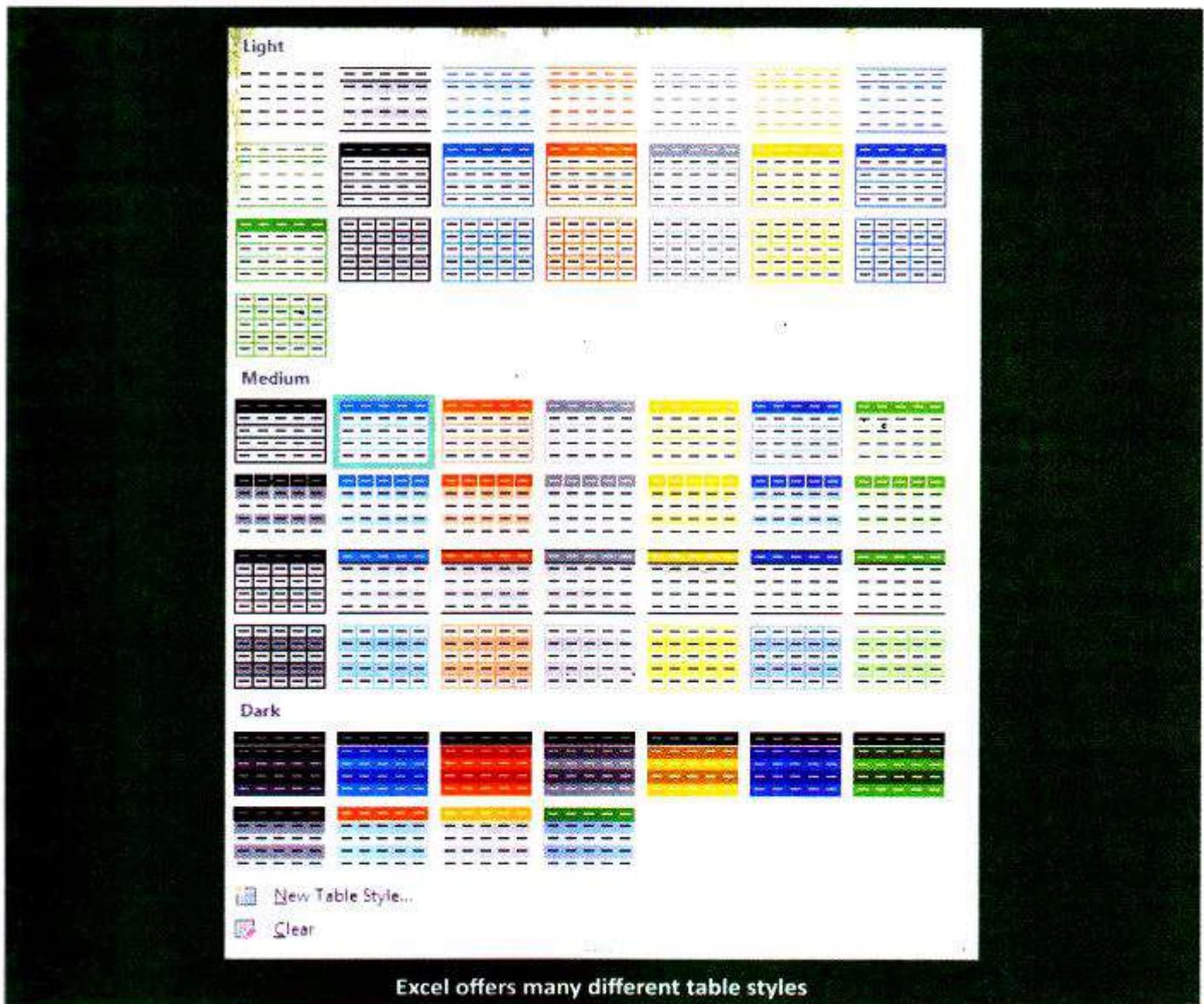
You can change some elements of the style by using the check box controls in the Table Tools ⇨ Design ⇨ Table Style Options group. These controls determine whether various elements of the table are displayed, and whether some formatting options are in effect:

- **Header Row:** Toggles the display of the Header Row.
- **Total Row:** Toggles the display of the Total Row.

- **First Column:** Toggles special formatting for the first column. Depending on the table style used, this command might have no effect.

- **Last Column:** Toggles special formatting for the last column. Depending on the table style used, this command might have no effect.

- **Banded Rows:** Toggles the display of banded (alternating color) rows.

- **Banded Columns:** Toggles the display of banded columns.

- **Filter Button:** Toggles the display of the drop-down buttons in the table's header row.

Tip

If applying table styles isn't working, it's probably because the range was already formatted before you converted it to a table. Table formatting doesn't override normal formatting. To clear existing background fill colors, select the entire table and choose Home ⇨ Font ⇨ Fill Color ⇨ No Fill. To clear existing font colors, choose Home ⇨ Font ⇨ Font Color ⇨ Automatic. To clear existing borders, choose Home ⇨ Font ⇨ Borders ⇨ No Borders. After you issue these commands, the table styles should work as expected.

If you'd like to create a custom table style, choose Table Tools ⇨ Design ⇨ Table Styles ⇨ New Table Style to display the New Table Style dialog box. You can customize any or all of the 12 items in the Table Element list. Select an element from the list, click Format, and specify the formatting for that element. When you're finished, give the new style a name and click OK. Your custom table style will appear in the Table Styles gallery in the Custom category. Unfortunately, custom table styles are available only in the workbook in which they were created.

Tip

If you want to make changes to an existing table style, locate it in the Ribbon and right-click. Choose Duplicate from the shortcut menu. Excel displays the Modify Table Style dialog box with all the settings from the specified table style. Make your changes, give the style a new name, and click OK to save it as a custom table style.

Working with Tables

Navigating in a table

Selecting cells in a table works just like selecting cells in a normal range. One difference is when you use the Tab key. Pressing Tab moves to the cell to the right, but when you reach the last column, pressing Tab again moves to the first cell in the next row.

Selecting parts of a table

When you move your mouse around in a table, you may notice that the pointer changes shapes. These shapes help you select various parts of the table.

- **To select an entire column:** Move the mouse to the top of a cell in the header row, and the mouse pointer changes to a down-pointing arrow. Click to select the data in the column. Click a second time to select the entire table column (including the Header Row and the Total Row, if it has one). You can also press Ctrl+Spacebar (once or twice) to select a column.

- **To select an entire row:** Move the mouse to the left of a cell in the first column, and the mouse pointer changes to a right-pointing arrow. Click to select the entire table row. You can also press Shift+Spacebar to select a table row.

- **To select the entire table:** Move the mouse to the upper-left part of the upper left cell. When the mouse pointer turns into a diagonal arrow, click to select the data area of the table. Click a second time to select the entire table (including the Header Row and the Total Row). You can also press Ctrl+A (once or twice) to select the entire table.

Tip

Right-clicking a cell in a table displays several selection options in the shortcut menu.

Adding new rows or columns

To add a new column to the end of a table, select a cell in the column to the right of the table and start entering the data. Excel automatically extends the table horizontally and adds a generic column name for the new column. Similarly, if you enter data in the row below a table, Excel extends the table vertically to include the new row.

Note

An exception to automatically extending tables is when the table is displaying a Total Row. If you enter data below the Total Row, the table won't be extended and the data won't be part of the table.

To add rows or columns within the table, right-click and choose Insert from the shortcut menu. The Insert shortcut menu command displays additional menu items:

- Table Columns to the Left
- Table Columns to the Right
- Table Rows Above
- Table Rows Below

Tip

When the cell pointer is in the bottom-right cell of a table, pressing Tab inserts a new row at the bottom of the table, above the Total Row (if the table has one).

When you move your mouse to the resize handle at the bottom-right cell of a table, the mouse pointer turns into a diagonal line with two arrowheads. Drag down to add more rows to the table. Drag to the right to add more columns.

When you insert a new column, the Header Row displays a generic description, such as Column1, Column2, and so on. Typically, you'll want to change these names to more descriptive labels. Just select the cell, type new text, and press Enter.

Deleting rows or columns

To delete a row (or column) in a table, select any cell in the row (or column) to be deleted. To delete multiple rows or columns, select a range of cells. Then right-click and choose Delete ➪ Table Rows (or Delete ➪ Table Columns).

Note

To move a table to a new location in the same worksheet, move the mouse pointer to any of its borders. When the mouse pointer turns into a cross with four arrows, Drag the table to its new location on the current sheet or another visible worksheet. It may be easier to cut and paste to move a table to another worksheet or workbook. Press Ctrl+A twice to select the entire table, then press Ctrl+X to cut it. Display the destination worksheet, click in the upper-left corner of the range where you want to paste the table, and press Ctrl+V.

Working with the Total Row

The Total Row in a table contains formulas that summarize the information in the columns. When you create a table, the Total Row isn't turned on. To display the Total Row, choose Table **Tools** ➪ **Design** ➪ **Table Style Options** and put a check mark next to Total Row.

By default, a Total Row displays the sum of the values in a column of numbers. In some cases, you'll want a different type of summary formula. When you select a cell in the Total Row, a drop-down arrow appears in the cell. Click the arrow, and you can select from a number of other summary formulas:

Agent	Date Listed	Area	List Price	Bedrooms	Baths	Sq.ft	Pool	Sold
Ravi	6/23/2012	Mumbai	693,000	3	2	1,696	FALSE	FALSE
Rakesh	4/24/2012	Mumbai	585,000	3	2.5	2,545	FALSE	FALSE
Siddharth	7/28/2012	Pune	6,456,000	3	2.5	3,250	FALSE	FALSE
Sanam	6/25/2012	Mumbai	458,000	3	2	4,595	TRUE	TRUE
Aaliya	3/5/2012	Mumbai	156,000	2	3	3,565	TRUE	FALSE
Shweta	4/15/2012	Pune	1,252,000	2	3	9,686	TRUE	TRUE
Saniya	8/12/2012	Pune	856,000	2	4	7,825	FALSE	FALSE
Sameer	9/14/2012	Pune	789,000	5	4	4,560	FALSE	TRUE
Ajay	10/10/2012	Mumbai	4,521,000	5	4	2,450	TRUE	FALSE
Reshma	5/16/2012	Mumbai	456,000	4	5	2,495	TRUE	TRUE
Dipika	4/8/2012	Mumbai	1,545,000	3	3	3,568	TRUE	TRUE

Total			308037					

None
Average
Count
Count Number
Max
Min
Sum
StdDev
Var
More Function

Several types of summary formulas are available for the Total Row

- **None:** No formula
- **Average:** Displays the average of the numbers in the column
- **Count:** Displays the number of entries in the column (Blank cells are not counted.)
- **Count Numbers:** Displays the number of numeric values in the column (Blank cells, text cells, and error cells are not counted.)
- **Max:** Displays the maximum value in the column
- **Min:** Displays the minimum value in the column
- **Sum:** Displays the sum of the values in the column
- **StdDev:** Displays the standard deviation of the values in the column (Standard deviation is a statistical measure of how "spread out" the values are.)
- **Var:** Displays the variance of the values in the column (Variance is another statistical measure of how "spread out" the values are.)
- **More Functions:** Displays the Insert Function dialog box so that you can select a function that isn't in the list

Removing duplicate rows from a table

If data in a table was compiled from multiple sources, the table may contain duplicate items. Most of the time, you want to eliminate the duplicates. In the past, removing duplicate data was essentially a manual task, but it's very easy if the data is in a table.

Start by selecting any cell in your table. Then choose Table Tools ➪ Design ➪ Tools ➪ Remove Duplicates. Excel opens the Remove Duplicates dialog box shown in below image. The dialog box lists all the columns in your table. Place a

check mark next to the columns that you want to be included in the duplicate search. Most of the time, you'll want to select all the columns, which is the default. Click OK, and Excel weeds out the duplicate rows and displays a message that tells you how many duplicates it removed.

Removing duplicate rows from a table is easy
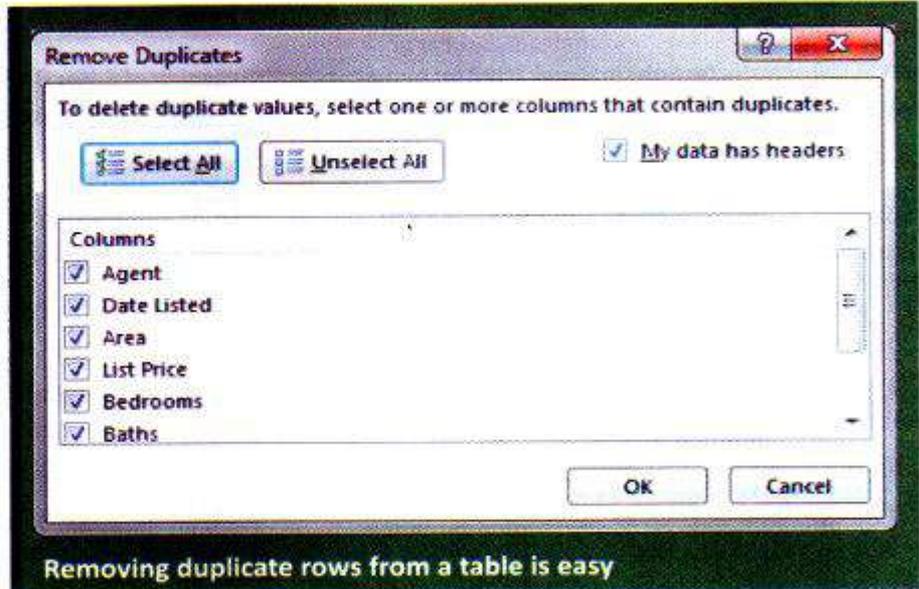
When you select all columns in the Remove Duplicates dialog box, Excel will delete a row only if the content of every column is duplicated. In some situations, you may not care about matching some columns, so you would deselect those columns in the Remove Duplicates dialog box. When duplicate rows are found, the first row is kept and subsequent duplicate rows are deleted.

Tip

Data does not have to be in the form of a designated table to remove duplicates. To remove duplicate rows from a normal range, choose Data ➪ Data Tools ➪ Remove Duplicates.

Sorting and filtering a table

Each item in the Header Row of a table contains a drop-down arrow known as a Filter Button. When clicked, the Filter Button displays sorting and filtering options.
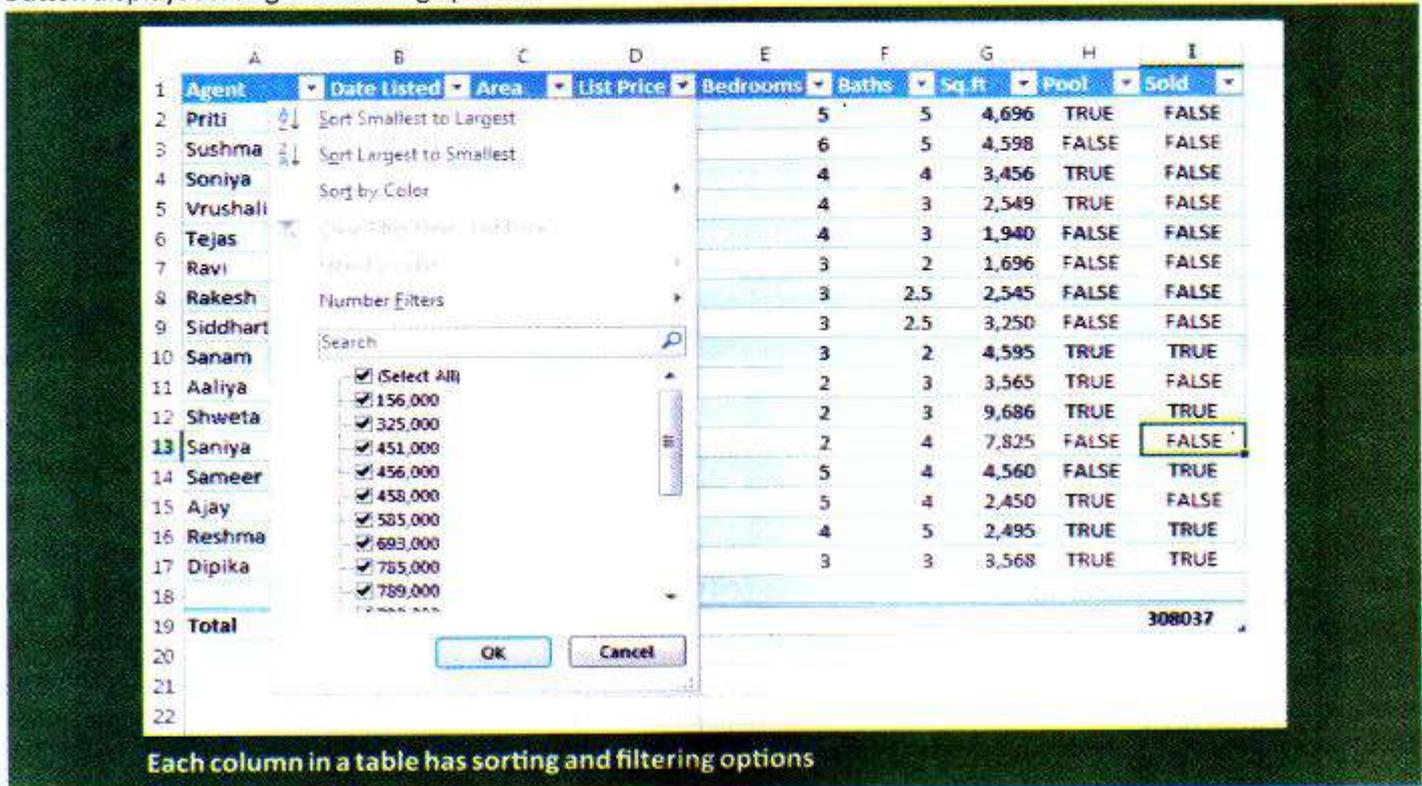
Each column in a table has sorting and filtering options

Tip

A new feature in Excel 2013 lets you toggle the display of Filter Buttons in a table's Header Row. Choose Table Tools ➪ Design ➪ Table Style Options ➪ Filter Button to display or hide the drop-down arrows.

Sorting a table

Sorting a table rearranges the rows based on the contents of a particular column. You may want to sort a table to put names in alphabetical order. Or, maybe you want to sort your sales staff by the totals sales made.

To sort a table by a particular column, click the Filter Button in the column header and choose one of the sort commands. The exact command varies, depending on the type of data in the column. You can also select Sort by Color to sort the rows based on the background or text color of the data. This option is relevant only if you've overridden the table style colors with custom formatting.

You can sort on any number of columns. The trick is to sort the least significant column first and then proceed until the most significant column is sorted last. For example, in a real estate table, you may want to sort the list by agent. And within each agent's group, sort the rows by area. And within each area, sort the rows by list price. For this type of sort, first sort by the List Price column, then sort by the Area column, and then sort by the Agent column. Below image shows the table sorted in this manner.

	A	B	C	D	E	F	G	H	I	J
1	Agent	Date Listed	Area	List Price	Bedrooms	Baths	Sq. Ft.	Pool	Sold	
2	Ajay	3-May-15	Pune	122247	2	1	3456	FALSE	TRUE	
3	Ajay	26-Dec-14	Pune	458996	2	1	2500	TRUE	FALSE	
4	Ajay	12-Aug-15	Pune	799900	3	1	4696	TRUE	FALSE	
5	Akash	2-Jan-15	Mumbai	1292000	5	3	7549	FALSE	FALSE	
6	Akash	21-Dec-14	Pune	2024626	4	2	5000	FALSE	TRUE	
7	Amit	3-Mar-15	Pune	444512	3	2	4598	FALSE	FALSE	
8	Amit	22-Jan-14	Pune	1711500	4	2	5660	TRUE	FALSE	
9	Baban	1-Jan-15	Mumbai	785000	3	3	1940	TRUE	FALSE	
10	Baban	24-Jul-14	Pune	1085248	5	3	7844	FALSE	FALSE	
11	Chitra	9-Dec-14	Mumbai	1398374	5	3	7444	FALSE	TRUE	
12	Chitra	30-Jun-14	Pune	693000	3	2	1696	FALSE	TRUE	
13	Disha	30-Dec-14	Mumbai	585000	2	1	2545	TRUE	FALSE	
14	Esha	25-Aug-14	Mumbai	772122	4	2	5552	FALSE	TRUE	
15	Esha	29-Dec-14	Mumbai	1458770	4	2	5250	FALSE	FALSE	
16	Farukh	28-Dec-14	Pune	1145230	5	3	4595	FALSE	FALSE	
17	Ganesh	27-Aug-14	Mumbai	145870	2	1	3565	FALSE	FALSE	
18										

A table, after performing a three-column sort

Note

When a column is sorted, the Filter button in the header row displays a different graphic to remind you that the table is sorted by that column.

Another way of performing a multiple-column sort is to use the Sort dialog box (choose Home ➪ Editing ➪ Sort & Filter ➪ Custom Sort). Or right-click any cell in the table and choose Sort ➪ Custom Sort from the shortcut menu.

In the Sort dialog box, use the drop-down lists to specify the sort specifications. In this example, you start with Agent. Then click the Add Level button to insert another set of search controls. In this new set of controls, specify the sort specifications for the Area column. Then add another level and enter the specifications for the List Price column. Click OK to apply the sort. This technique produces exactly the same sort as described in the previous paragraph.

Filtering a table

Filtering a table refers to displaying only the rows that meet certain conditions. The other rows are hidden. Note that the entire rows are hidden. Therefore, if you have other data to the left or right of your table, that information will also be hidden. If you plan to filter your list, don't include any other data to the left or right of your table.

Using the example real estate table we've been discussing, assume that you're only interested in the data for the Mumbai area. Click the Filter Button in the Area Row Header and remove the checkmark from Select All, which deselects everything. Then, place a check mark next to Mumbai and click OK. The table, shown in below image, is now filtered to display only the listings in the Mumbai area. Notice that some of the row numbers are missing. These rows are hidden and contain data that does not meet the specified criteria.

	Agent	Date Listed	Area	List Price	Bedrooms	Baths	Sq. Ft.	Pool	Sold
5	Akash	2-Jan-15	Mumbai	1292000	5	3	7549	FALSE	FALSE
6	Baban	1-Jan-15	Mumbai	785000	3	3	1940	TRUE	FALSE
8	Disha	30-Dec-14	Mumbai	585000	2	1	2545	TRUE	FALSE
9	Esha	29-Dec-14	Mumbai	1458770	4	2	5250	FALSE	FALSE
11	Ganesh	27-Aug-14	Mumbai	145870	2	1	3565	FALSE	FALSE
13	Esha	25-Aug-14	Mumbai	772122	4	2	5552	FALSE	TRUE
15	Chitra	9-Dec-14	Mumbai	1398374	5	3	7444	FALSE	TRUE
18									
19									
20									

This table is filtered to show only the information for Mumbai.

Also notice that the Filter Button in the Area column now shows a different graphic — an icon that indicates the column is filtered.

You can filter by multiple values in a column using multiple check marks. For example, to filter the table to show only Mumbai and Central, place a check mark next to both values in the drop-down list in the Area Row Header.

You can filter a table using any number of columns. For example, you may want to see only the Mumbai listings in which the Type is Single Family. Just repeat the operation using the Type column. All tables then display only the rows in which the Area is Mumbai and the Type is Single Family.

For additional filtering options, select Text Filters (or Number Filters, if the column contains values). The options are fairly self-explanatory, and you have a great deal of flexibility in displaying only the rows that you're interested in. For example, you can display rows in which the List Price is greater than or equal to 200,000, but less than 300,000. Click OK to apply the filter and close the Custom AutoFilter dialog box.

In addition, you can right-click a cell and use the Filter command on the shortcut menu. This menu item leads to several additional filtering options.

Custom AutoFilter

Show rows where:
Agent

is greater than or equal to   200000

And   Or

is less than   300000

Use ? to represent any single character
Use * to represent any series of characters

OK   Cancel

Specifying a more complex numeric filter
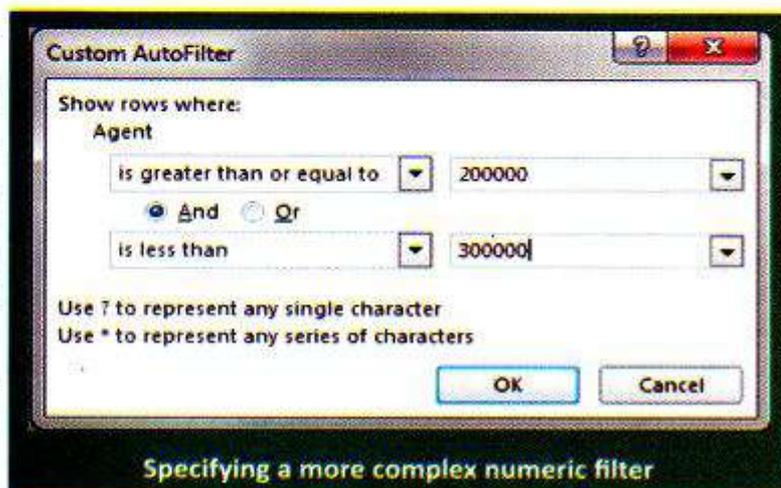
Note

As you may expect, when you use filtering, the Total Row is updated to show the total only for the visible rows.

When you copy data from a filtered table, only the visible data is copied. In other words, rows that are hidden by filtering don't get copied. This filtering makes it very easy to copy a subset of a larger table and paste it to another area of your worksheet. Keep in mind, though, that the pasted data is not a table — it's just a normal range. You can, however, convert the copied range to a table.

To remove filtering for a column, click the drop-down in the Row Header and select Clear Filter. If you've filtered using multiple columns, it may be faster to remove all filters by choosing Home ⇨ Editing ⇨ Sort & Filter ⇨ Clear.

Converting a table back to a range

If you need to convert a table back to a normal range, just select a cell in the table and choose Table Tools ⇨ Design ⇨ Tools ⇨ Convert to Range. The table style formatting remains intact, but the range no longer functions as a table.

About Conditional Formatting

Conditional formatting enables you to apply cell formatting selectively and automatically, based on the contents of the cells. For example, you can apply conditional formatting in such a way that all negative values in a range have a light-yellow background color. When you enter or change a value in the range, Excel examines the value and checks the conditional formatting rules for the cell. If the value is negative, the background is shaded; otherwise, no formatting is applied.

Conditional formatting is an easy way to quickly identify erroneous cell entries or cells of a particular type. You can use a format (such as bright-red cell shading) to make particular cells easy to identify.

Following figure shows a worksheet with nine ranges, each with a different type of conditional formatting rule applied. Here's a brief explanation of each:

- **Greater than ten:** Values greater than ten are highlighted with a different background color. This rule is just one of many numeric-value-related rules that you can apply.

- **Above average:** Values that are higher than the average value are highlighted.

- **Duplicate values:** Values that appear in the range more than once are highlighted.

- **Words that contain X:** If the cell contains X (upper- or lowercase), the cell is highlighted.

- **Data bars:** Each cell displays a horizontal bar, the length of which is proportional to its value.
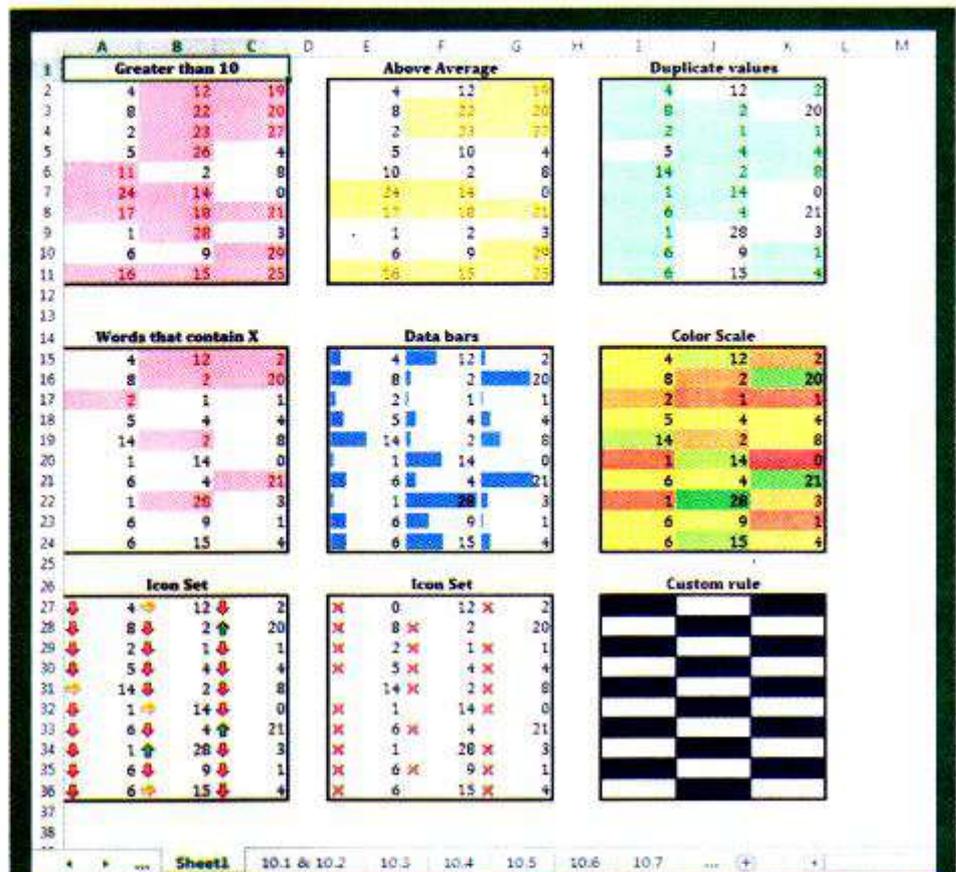
This worksheet demonstrates a few conditional formatting rules.

- **Color scale:** The background color varies, depending on the value of the cells. You can choose from several different color scales or create your own.

- **Icon set:** One of several icon sets. It displays a small graphic in the cell. The graphic varies, depending on the cell value.

- **Icon set:** Another icon set, with all but one icon in the set hidden

- **Custom rule:** The rule for this checkerboard pattern is based on a formula:

  =MOD(ROW(),2)=MOD(COLUMN(),2)

Specifying Conditional Formatting

To apply a conditional formatting rule to a cell or range, select the cells and then use one of the commands from the Home ⇨ Styles ⇨ Conditional Formatting drop-down list to specify a rule. The choices are:

- **Highlight Cell Rules:** Examples include highlighting cells that are greater than a particular value, between two values, contain specific text string, contain a date, or are duplicated.

- **Top Bottom Rules:** Examples include highlighting the top ten items, the items in the bottom 20%, and items that are above average.

- **Data Bars:** Applies graphic bars directly in the cells, proportional to the cell's value

- **Color Scales:** Applies background color, proportional to the cell's value

- **Icon Sets:** Displays icons directly in the cells. The icons depend on the cell's value.

- **New Rule:** Enables you to specify other conditional formatting rules, including rules based on a logical formula

- **Clear Rules:** Deletes all the conditional formatting rules from the selected cells

- **Manage Rules:** Displays the Conditional Formatting Rules Manager dialog box, in which you create new conditional formatting rules, edit rules, or delete rules

Formatting types you can apply

When you select a conditional formatting rule, Excel displays a dialog box specific to that rule. These dialog boxes have one thing in a common: a drop-down list with common formatting suggestions.

Following figure shows the dialog box that appears when you choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Highlight Cells Rules ⇨ Between. This particular rule applies the formatting if the value in the cell falls between two specified values. In this case, you enter the two values (or specify cell references), and then use choices from the drop-down list to set the type of formatting to display if the condition is met.
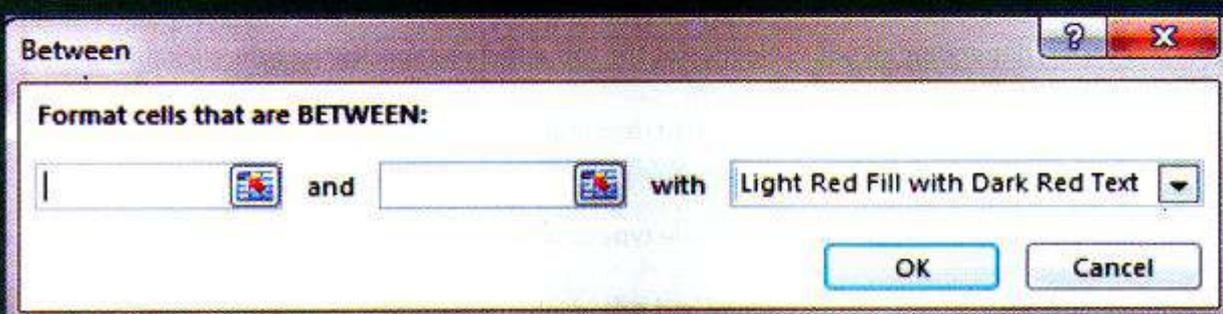
One of several different conditional formatting dialog boxes

The formatting suggestions in the drop-down list are just a few of thousands of different formatting combinations. If none of Excel's suggestions are what you want, choose the Custom Format option to display the Format Cells dialog box. You can specify the format in any or all of the four tabs: **Number, Font, Border, and Fill.**

Note

The Format Cells dialog box used for conditional formatting is a modified version of the standard Format Cells dialog box. It doesn't have the Alignment and Protection tabs, and some of the Font formatting options are disabled. The dialog box also includes a Clear button that clears any formatting already selected.

Making your own rules

For maximum control, Excel provides the New Formatting Rule dialog box, shown in following figure. Access this dialog box by choosing Home ⇨ Styles ⇨ Conditional Formatting ⇨ New Rules.
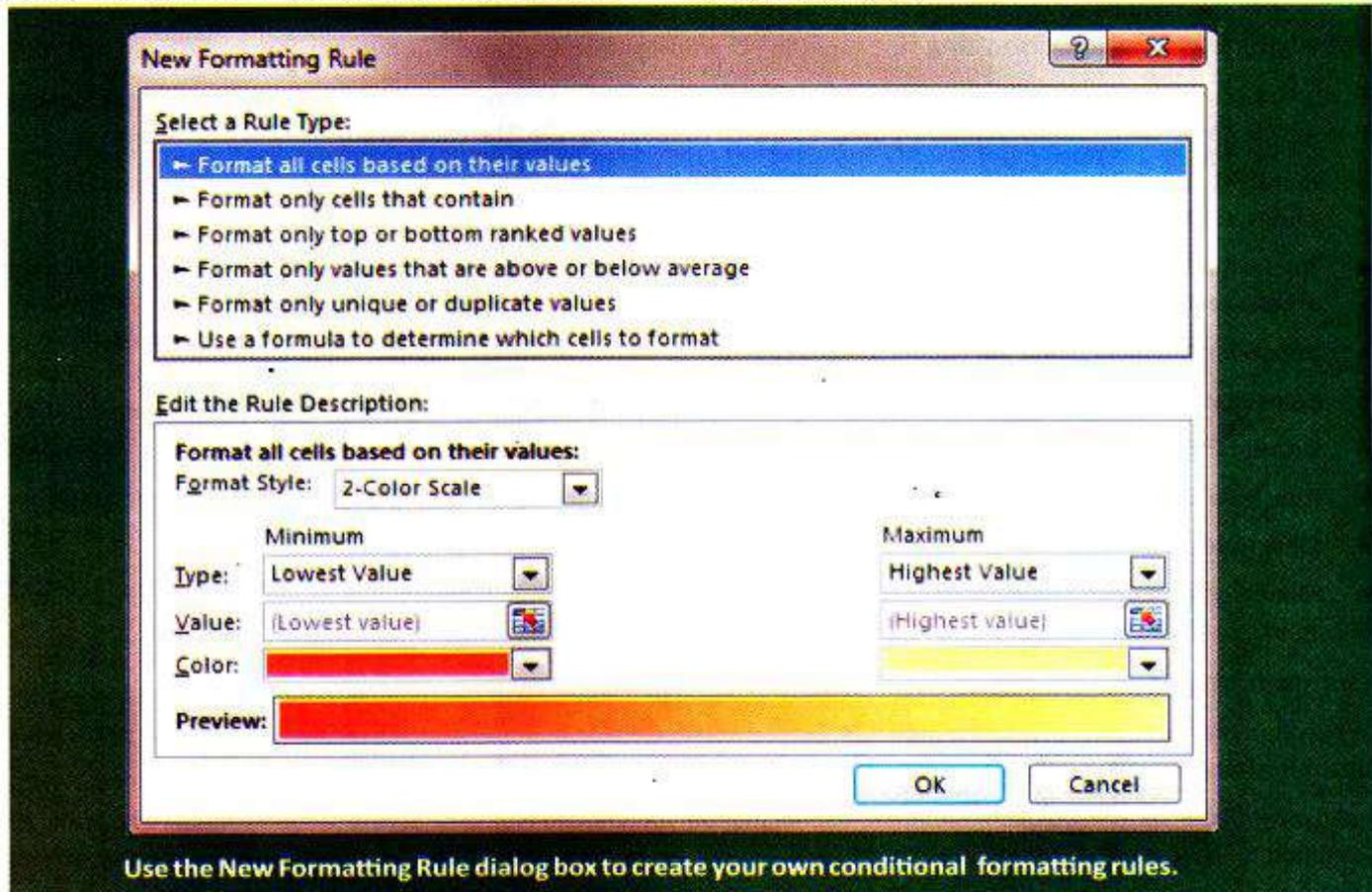
Use the New Formatting Rule dialog box to create your own conditional formatting rules.

Use the New Formatting Rule dialog box to adjust any of the conditional format rules available via the Ribbon, as well as creating unique new rules. First, select a general rule type from the list at the top of the dialog box. The bottom part of the dialog box varies, depending on your selection at the top. After you specify the rule, click the Format button to specify the type of formatting to apply if the condition is met. An exception is the first rule type (Format All Cells Based on Their Values), which doesn't have a Format button (it uses graphics rather than cell formatting).

Here is a summary of the rule types:

- **Format all cells based on their values:** Use this rule type to create rules that display data bars, color scales, or icon sets.

- **Format only cells that contain:** Use this rule type to create rules that format cells based on mathematical comparisons (greater than, less than, greater than or equal to, less than or equal to, equal to, not equal to, between, not between). You can also create rules based on text, dates, blanks, nonblanks, and errors.

- **Format only top- or bottom-ranked values:** Use this rule type to create rules that involve identifying cells in the top n, top n%, bottom n, and bottom n%.

- **Format only values that are above or below average:** Use this rule type to create rules that identify cells that are above average, below average, or within a specified standard deviation from the average.

- **Format only unique or duplicate values:** Use this rule type to create rules that format unique or duplicate values in a range.

- **Use a formula to determine which cells to format:** Use this rule type to create rules based on a logical formula (see "Creating Formula-Based Rules," later in this chapter).

Conditional Formats That Use Graphics

This section describes the three conditional formatting options that display graphics: data bars, color scales, and icon sets. These types of conditional formatting can be useful for visualizing the values in a range.

Using data bars

The data bars conditional format displays horizontal bars directly in the cell. The length of the bar is based on the value of the cell, relative to the other values in the range.

A simple data bar

Following figure shows an example of data bars. It's a list of tracks on Lata Mangeshkar albums, with the length of each track in column C. We applied data bar conditional formatting to the values in column C. You can tell at a glance which tracks are longer than the rest .

	Singer	Track	Length
1	Singer	Track	Length
2	Lata Mangeshkar	Bedard Tere Pyar Ko	4.20
3	Lata Mangeshkar	Aayega Aanewala	3.10
4	Lata Mangeshkar	Aaj Mere Naseeb Ne Mujhko	5.00
5	Lata Mangeshkar	Aa Ri Aa Nindiya Tu Aaja	5.06
6	Lata Mangeshkar	Phaili hui hai sapnon ki baahein	4.20
7	Lata Mangeshkar	Aaja Re Pardesi	2.05
8	Lata Mangeshkar	O Sajana Barkha Bahar	6.53
9	Lata Mangeshkar	Pyar Kiya To Darna Kya	5.20
10	Lata Mangeshkar	Kaise Din Beete	4.36
11	Lata Mangeshkar	Allah Tero Naam	3.56
12	Lata Mangeshkar	Kahin Deep Jale Kahin Dil	7.05
13	Lata Mangeshkar	Ae Dilruba	6.50
14	Lata Mangeshkar	Woh Chup Rahe To	2.45
15	Lata Mangeshkar	Naina Barse Rim Jhim	3.28
16	Lata Mangeshkar	Dil Ka Diya Jale	8.05
17	Lata Mangeshkar	Duniya Kare Sawal	7.06
18	Lata Mangeshkar	Kya Janoon Sajan	3.62
19	Lata Mangeshkar	Dil-Vil Pyar-Vyar	4.35
20	Lata Mangeshkar	Chalo Sajana	3.35
21	Lata Mangeshkar	Bhai Batoor	3.09

The length of the data bars is proportional to the track length in the cell in column C.

Tip

When you adjust the column width, the bar lengths adjust accordingly. The differences among the bar lengths are more prominent when the column is wider.

Excel provides quick access to 12 data bar styles via Home ⇨ Styles ⇨ Conditional Formatting ⇨ Data Bars. For additional choices, click the More Rules option, which displays the New Formatting Rule dialog box. Use this dialog box to:

- Show the bar only (hide the numbers).
- Specify Minimum and Maximum values for the scaling.
- Change the appearance of the bars.
- Specify how negative values and the axis are handled.
- Specify the direction of the bars.

Note

Oddly, if you add data bars using one of the 12 data bar styles, the colors used for data bars are not theme colors. If you apply a new document theme, the data bar colors do not change. However, if you add the data bars by using the New Formatting Rule dialog box, the colors you choose are theme colors.

Using data bars in lieu of a chart

Using the data bars conditional formatting can sometimes serve as a quick alternative to creating a chart. Following figure shows a three-column range (in B3:D14) with data bars.

Conditional formatting in column D (column D contains references to the values in column C). The conditional formatting in column D uses the Show Bars Only option, so the values are not displayed.
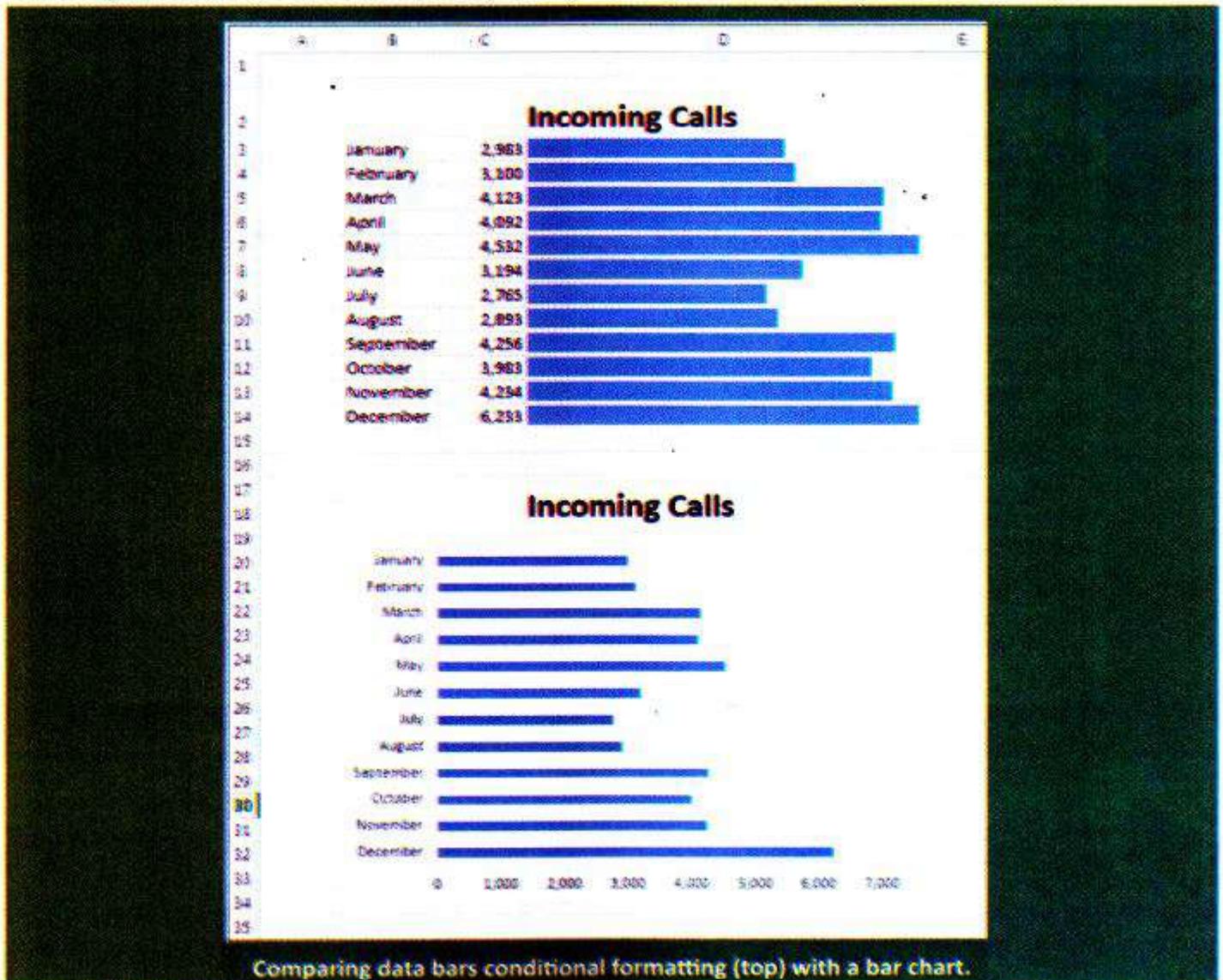
Comparing data bars conditional formatting (top) with a bar chart.

Above figure also shows an actual bar chart created from the same data. The bar chart takes about the same amount

of time to create and is a lot more flexible. But for a quick-and-dirty chart, data bars may be a good option — especially when you need to create several such charts.

Using color scales

The color scale conditional formatting option varies the background color of a cell based on the cell's value, relative to other cells in the range.

A color scale example

Following figure shows examples of color scale conditional formatting. The example on the left depicts monthly sales for three regions. Conditional formatting was applied to the range B4:D15. The conditional formatting uses a three-color scale, with red for the lowest value, yellow for the midpoint, and green for the highest value. Values in between are displayed using a color within the gradient. It's clear that the Central region consistently has lower sales volumes, but the conditional formatting doesn't help identify monthly difference for a particular region.

Two examples of color scale conditional formatting
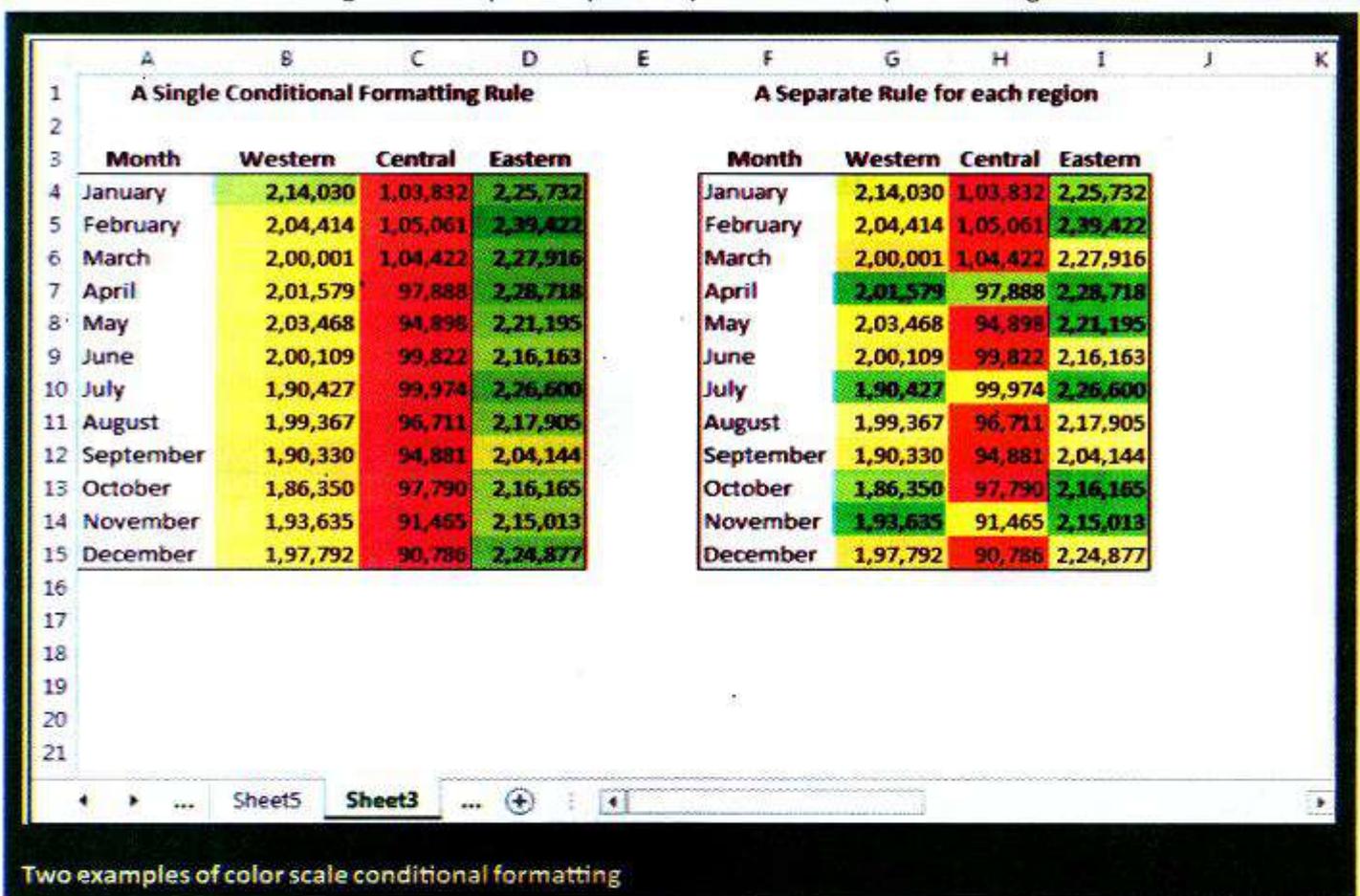
The example on the right shows the same data, but conditional formatting was applied to each region separately. This approach facilitates comparisons within a region and can also help identify high or low sales months. Neither one of these approaches is necessarily better. The way you set up conditional formatting depends entirely on what you're trying to visualize.

Excel provides four two-color scale presets and four three-color scale presets, which you can apply to the selected range by choosing Home ⇨ Styles ⇨ Conditional Formatting ⇨ Color Scales. To customize the colors and other options, choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Color Scales ⇨ More Rules. The New Formatting Rule dialog box, shown in following figure, appears. Adjust the settings, and watch the Preview box to see the effects of your changes.
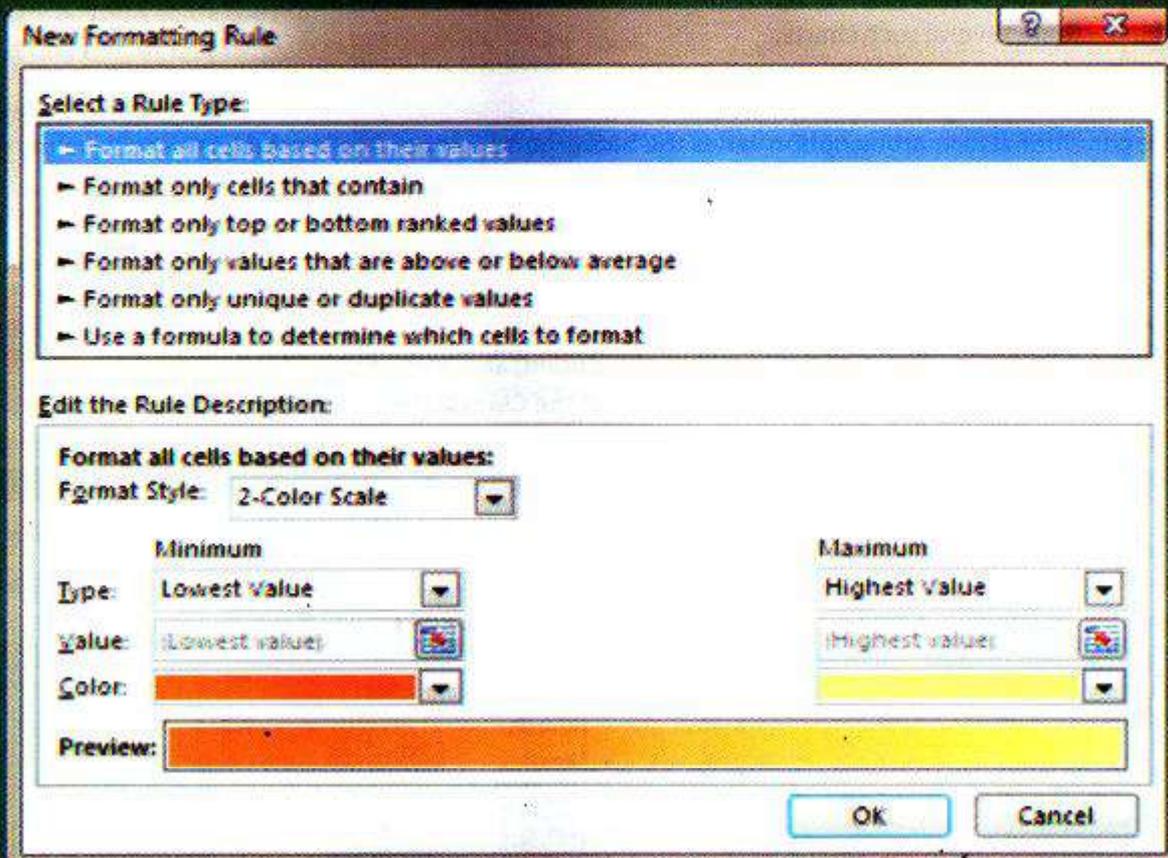
Use the New Formatting Rule dialog box to customize a color scale.

An extreme color scale example

It's important to understand that colour scale conditional formatting uses a gradient. For example, if you format a range using a two-colour-scale, you will get a lot more than two colours. You'll get colours with the gradient between the two specified colours.

Following figure shows an extreme example that uses colour scale conditional formatting on a range of 10,000 cells (100 rows x 100 columns). The worksheet is zoomed down to 20% to display a very smooth three-colour gradient. The range contains formulas like this one, in cell C5:

    =SIN($A2)+COS(B$1)

Values in column A and row 1 range from 0 to 4.0, in increments of 0.04. When viewed onscreen, the result looks quite stunning.

This worksheet, which uses colour scale conditional formatting, displays an impressive colour gradient.

Using icon sets

Yet another conditional formatting option is to display an icon in the cell. The icon displayed depends on the value of the cell.

To assign an icon set to a range, select the cells and choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Icon Sets. Excel provides 20 icon sets to choose from. The number of icons in the sets ranges from three to five. You can't create a custom icon set.

An icon set example

Following figure shows an example that uses an icon set. The symbols graphically depict the status of each project, based on the value in column C.

By default, the symbols are assigned using percentiles. For a three-symbol set, the items are grouped into three percentiles. For a four-symbol set, they're grouped into four percentiles. And for a five-symbol set, the items are grouped into five percentiles.

	A	B	C	D
1		Project Status Report		
2				
3				
4	Project	Pct. Completed		
5	Project 1	✖	90%	
6	Project 2	✔	100%	
7	Project 3	✖	20%	
8	Project 4	❗	0%	
9	Project 5	✔	100%	
10	Project 6	✖	97%	
11	Project 7	❗	0%	
12	Project 8	✖	98%	
13	Project 9	✔	100%	
14	Project 10	❗	0%	
15				
16				
17				

Using an icon set to indicate the status of projects

If you would like more control over how the icons are assigned, choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Icon Sets ⇨ More Rules to display the New Formatting Rule dialog box. To modify an existing rule, choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Manage Rules. Then select the rule to modify and click the Edit Rule button.

Following figure shows how to modify the icon set rules such that only projects that are 100 percent completed get the check mark icons. Projects that are 0 percent completed get the X icon. All other projects get no icon. Click OK to apply the change.
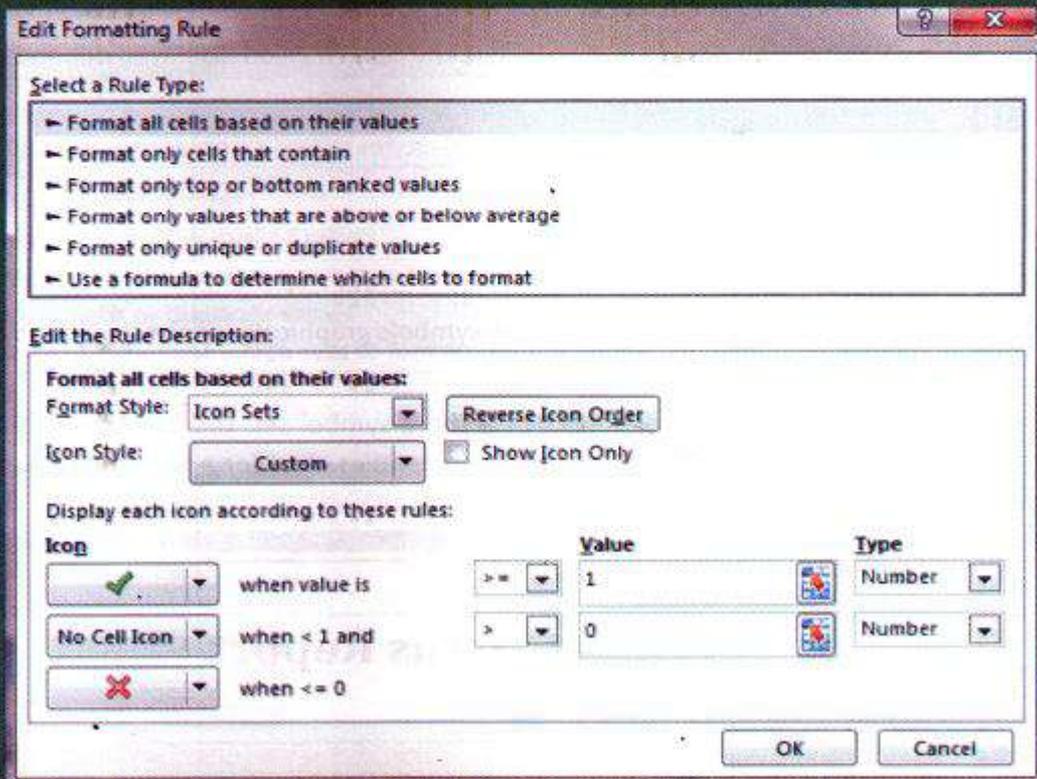
Changing the icon assignment rule

Another icon set example

Following figure shows a table that contains two test scores for each student. The Change column contains a formula that calculates the difference between the two tests. The Trend column uses an icon set to display the trend graphically.

Student	Test 1	Test 2	Change	Trend
Anil	59	65	6	⬆
Amit	56	69	13	⬆
Asha	87	90	3	➡
Bhushan	56	78	22	⬆
Bhavesh	45	89	44	⬆
Chetan	75	42	-33	⬇
Dipika	46	43	-3	➡
Esha	65	47	-18	⬇
Farukh	60	58	-2	➡
Ganesh	53	55	2	➡
Harshada	42	62	20	⬆
John	78	64	-14	⬇
Kalpana	70	80	10	⬆
Latika	66	89	23	⬆
Mohini	55	79	24	⬆
Nupur	43	65	22	⬆
Om	90	39	-51	⬇
Prutha	78	80	2	➡
Reshma	86	77	-9	⬇
Sachin	52	46	-6	⬇
Tushar	39	74	35	⬆

The arrows depict the trend from Test 1 to Test 2.

This example uses the icon set named 3 Arrows, and with the rule customized:

- **Up Arrow:** When value is >= 5
- **Level Arrow:** When value < 5 and > –5
- **Down Arrow:** When value is <= –5

In other words, a difference of no more than five points in either direction is considered an even trend. An improvement of at least five points is considered a positive trend, and a decline of five points or more is considered a negative trend.

Note

The Trend column contains a formula that references the Change column. The column has the Show Icon Only option applied, which also centers the icon in the column.

In some cases, using icon sets can cause your worksheet to look a bit cluttered. Displaying an icon for every cell in a range might result in visual overload. For the example of the test results table, you could hide the level (right pointing) arrows by clicking the down arrow beside that cell in the Edit Formatting Rule dialog box and clicking No Cell Icon in the palette that appears.

Creating formula - based rules

Excel's conditional formatting feature is versatile, but sometimes it's just not quite versatile enough. Fortunately, you can extend its versatility by writing conditional formatting formulas.

The examples later in this section describe how to create conditional formatting formulas to:

- Identify text entries.
- Identify dates that fall on a weekend.
- Format cells that are in odd-numbered rows or columns (for dynamic alternate row or columns shading).
- Format groups of rows (for example, shade every two groups of rows).
- Display a sum only when all precedent cells contain values.

Some of these formulas may be useful to you. If not, they may inspire you to create other conditional formatting formulas.

To specify conditional formatting based on a formula, select the cells and then choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ New Rule. The New Formatting Rule dialog box appears. Click the rule type Use a formula to determine which cells to format, and then specify the formula. You can type the formula directly into the box or enter a reference to a cell that contains a logical formula. As with normal Excel formulas, the formula you enter here must begin with an equal sign (=). Click OK to finish creating the rule.

Note

The formula must be a logical formula that returns either TRUE or FALSE. If the formula evaluates to TRUE, the condition is satisfied and the conditional formatting is applied. If the formula evaluates to FALSE, the conditional formatting is not applied.

Understanding relative and absolute references

If the formula that you enter into the New Formatting Rule dialog box contains a cell reference, that reference is considered a relative reference, based on the upper-left cell in the selected range.

For example, suppose that you want to set up a conditional formatting condition that applies shading to cells in range A1:B10 only if the cell contains text. None of Excel's conditional formatting options can do this task, so you need to create a formula that will return TRUE if the cell contains text and FALSE otherwise. Follow these steps:

1. **Select the range A1:B10 and ensure that cell A1 is the active cell.**

2. **Choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ New Rule.** The New Formatting Rule dialog box appears.

3. **Click the Use a formula to determine which cells to format rule type.**

4. **Enter the following formula in the Formula box:**

    =ISTEXT(A1)

5. **Click the Format button.** The Format Cells dialog box appears.

6. **From the Fill tab, specify the cell shading that will be applied if the formula returns TRUE.**

7. **Click OK to return to the New Formatting Rule dialog box.**

New Formatting Rule

Select a Rule Type:

- ► Format all cells based on their values
- ► Format only cells that contain
- ► Format only top or bottom ranked values
- ► Format only values that are above or below average
- ► Format only unique or duplicate values
- ► Use a formula to determine which cells to format

Edit the Rule Description:

Format values where this formula is true:

=ISTEXT(A1)

Preview: AaBbCcYyZz   Format...

OK   Cancel

Creating a conditional formatting rule based on a formula

8. **Click OK to close the New Formatting Rule dialog box.**

Notice that the formula entered in Step 4 contains a relative reference to the upper-left cell in the selected range.

Generally, when entering a conditional formatting formula for a range of cells, you'll use a reference to the active cell, which is typically the upper-left cell in the selected range. One exception is when you need to refer to a specific cell. For example, suppose that you select range A1:B10, and you want to apply formatting to all cells in the range that exceed the value in cell C1. Enter this conditional formatting formula:

    =A1>$C$1

In this case, the reference to cell C1 is an absolute reference; it will not be adjusted for the cells in the selected range. In other words, the conditional formatting formula for cell A2 looks like this:

    =A2>$C$1

The relative cell reference is adjusted, but the absolute cell reference is not.

Conditional formatting formula examples

Each of these examples uses a formula entered directly into the New Formatting Rule dialog box, after selecting the Use a Formula to Determine Which Cells to Format rule type. You decide the type of formatting that you apply conditionally.

Identifying weekend days

Excel provides a number of conditional formatting rules that deal with dates, but it doesn't let you identify dates that fall on a weekend. Use this formula to identify weekend dates:

    =OR(WEEKDAY(A1)=7,WEEKDAY(A1)=1)

This formula assumes that a range is selected and that cell A1 is the active cell.

Highlighting a row based on a value

Following figure shows a worksheet that contains a conditional formula in the range A3:D23. If a name entered in cell B1 is found in the first column, the entire row for that name is highlighted.

	A	B	C	D	E
1	Name:	Mohini			
2					
3	Anil	59	65	55	
4	Amit	56	69	13	
5	Asha	87	90	23	
6	Bhushan	56	78	22	
7	Bhavesh	45	89	44	
8	Chetan	75	42	7	
9	Dipika	46	43	9	
10	Esha	65	47	10	
11	Farukh	60	58	80	
12	Ganesh	53	55	20	
13	Harshada	42	62	20	
14	John	78	64	15	
15	Kalpana	70	80	10	
16	Latika	66	89	23	
17	Mohini	55	79	24	
18	Nupur	43	65	22	
19	Omkar	90	39	50	
20	Prutha	78	80	22	
21	Reshma	86	77	99	
22	Sachin	52	46	10	
23	Tushar	39	74	35	
24					
25					

Highlighting a row, based on a matching name

The conditional formatting formula is:

    =$A3=$B$1

Notice that a mixed reference is used for cell A3. Because the column part of the reference is absolute, the comparison is always done using the contents of column A.

Displaying alternate-row shading

The conditional formatting formula that follows was applied to the range A1:D19, as shown in following figure, to apply shading to alternate rows.

    =MOD(ROW(),2)=0

	A	B	C	D	E
1	400	233	843	455	
2	788	522	235	800	
3	820	456	892	120	
4	250	320	145	362	
5	550	230	105	963	
6	147	455	587	895	
7	528	800	564	777	
8	222	120	111	251	
9	233	362	444	820	
10	554	963	524	224	
11	110	990	563	550	
12	880	520	455	666	
13	874	463	587	980	
14	224	147	874	220	
15	857	280	190	150	
16	555	400	898	125	
17	887	235	145	148	
18	592	500	544	567	
19	605	518	524	575	
20					
21					
22					

Using conditional formatting to apply formatting to alternate rows

Alternate row shading can make your spreadsheets easier to read. If you add or delete rows within the conditional formatting area, the shading is updated automatically.

This formula uses the ROW function (which returns the row number) and the MOD function (which returns the remainder of its first argument divided by its second argument). For cells in even-numbered rows, the MOD function returns 0, and cells in that row are formatted.

For alternate shading of columns, use the COLUMN function instead of the ROW function.

Creating checkerboard shading

The following formula is a variation on the example in the preceding section. It applies formatting to alternate rows and columns, creating a checkerboard effect.

```
=MOD(ROW(),2)=MOD(COLUMN(),2)
```

Shading groups of rows

Here's another row shading variation. The following formula shades alternate groups of rows. It produces four shaded rows, followed by four unshaded rows, followed by four more shaded rows, and so on.

```
=MOD(INT((ROW()-1)/4)+1,2)=1
```

For different sized groups, change the 4 to some other value. For example, use this formula to shade alternate groups of two rows:

```
=MOD(INT((ROW()-1)/2)+1,2)=1
```

Displaying a total only when all values are entered

Suppose a range has a formula that uses the SUM function in cell C6. Conditional formatting is used to display the sum only when all of the four cells above aren't blank. The conditional formatting formula you would apply to cell C6 (and cell B6, which contains the label for the row) is:

    =COUNT($C$2:$C$5)=4

This formula returns TRUE only if C2:C5 contains no empty cells. The conditional formatting applied to B6:C6 is a dark background color. The text color in those cells is white, so it's legible only when the conditional formatting rule is satisfied. Following figure shows the worksheet when one of the values is missing.

A missing value causes the sum to be hidden.
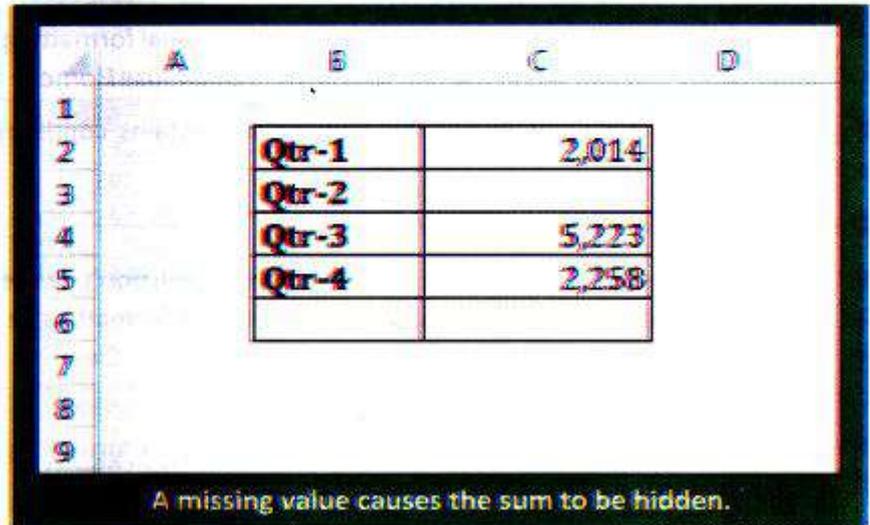
Working with Conditional Formats

This section describes some additional information about conditional formatting that you may find useful.

Managing rules

The Conditional Formatting Rules Manager dialog box is useful for checking, editing, deleting, and adding conditional formats. First select any cell in the range that contains conditional formatting. Then choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Manage Rules.

You can specify as many rules as you like by clicking the New Rule button. As you can see in following figure , cells can even use data bars, color scales, and icon sets all at the same time — if you can think of a good reason to apply all those types of formatting to one set of data.
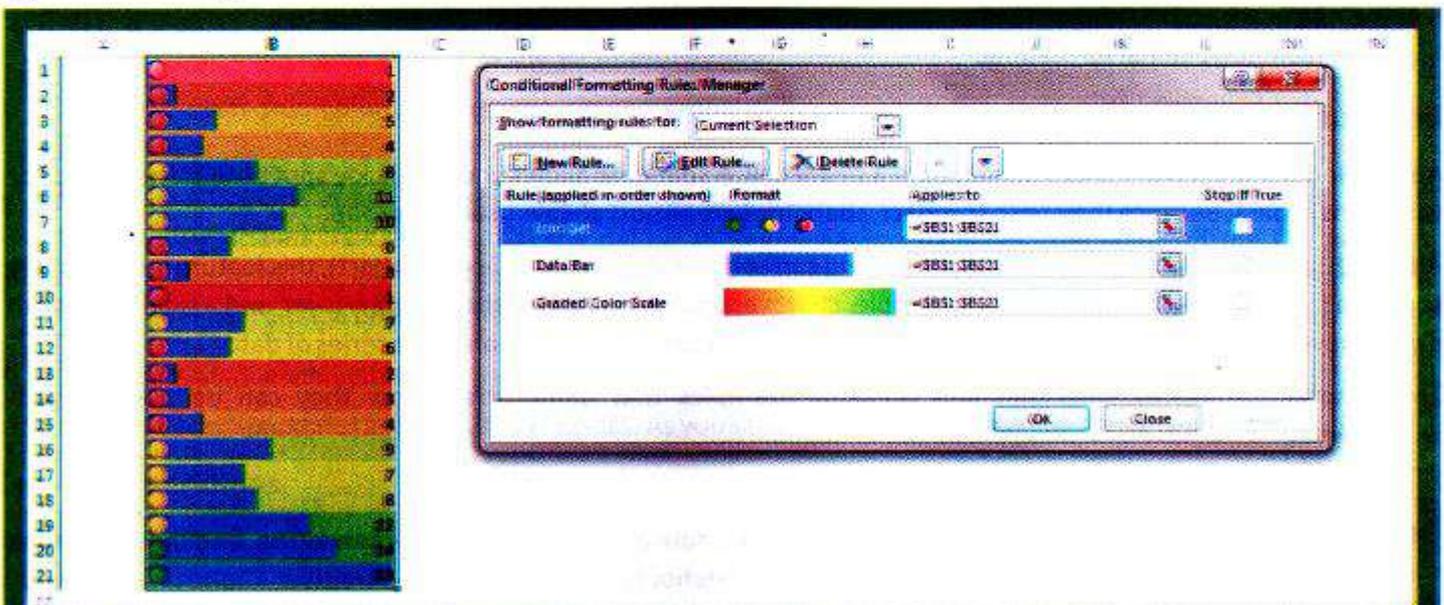
This range uses data bars, color scales, and icon sets.

Copying cells that contain conditional formatting

Conditional formatting information is stored with a cell much like standard formatting information is stored with a cell. As a result, when you copy a cell that contains conditional formatting, you also copy the conditional formatting.

Tip

To copy only the formatting (including conditional formatting), copy the cells and then use the Paste Special dialog box and select the Formats option. Or choose Home ⇨ Clipboard ⇨ Paste ⇨ Formatting (R).

If you insert rows or columns within a range that contains conditional formatting, the new cells have the same conditional formatting.

Deleting conditional formatting

When you press Delete to delete the contents of a cell, you don't delete the conditional formatting for the cell (if any). To remove all conditional formats (as well as all other cell formatting), select the cell and then choose Home ⇨ Editing ⇨ Clear ⇨ Clear Formats. Or choose Home ⇨ Editing ⇨ Clear ⇨ Clear All to delete the cell contents and the conditional formatting.

To remove only conditional formatting (and leave the other formatting intact), choose Home ⇨ Styles ⇨ Conditional Formatting ⇨ Clear Rules.

Locating cells that contain conditional formatting

You can't always tell, just by looking at a cell, whether it contains conditional formatting. You can, however, use the Go to Special dialog box to select such cells.

1. **Choose Home ⇨ Editing ⇨ Find & Select ⇨ Go to Special.** The Go to Special dialog box appears.

2. **In the Go to Special dialog box, select the Conditional Formats option.**

3. **To select all cells on the worksheet containing conditional formatting, select the All option; to select only the cells that contain the same conditional formatting as the active cell, select the Same option.**

4. **Click OK**. Excel selects the cells for you.

Note

The Excel Find and Replace dialog box includes a feature that allows you to search your worksheet to locate cells that contain specific formatting. This feature does not locate cells that contain formatting resulting from conditional formatting.

Introducing Sparklines

A sparkline is a small chart that's displayed in a single cell. A sparkline allows you to quickly spot time-based trends or variations in data. Because they're so compact, sparklines are almost always used in a group.

Although sparklines look like miniature charts (and can sometimes take the place of a chart), this feature is completely separate from the charting feature. For example, charts are placed on a worksheet's draw layer, and a single chart can display several series of data. A sparkline is displayed inside a cell and displays only one series of data.

This chapter introduces sparklines and presents examples that demonstrate how they can be used in your worksheets.

Note

Sparklines were introduced in Excel 2010. If you create a workbook that uses sparklines, and that workbook is opened using a previous version of Excel, the cells holding sparklines will be empty.

Sparkline Types

Excel supports three types of sparklines. Following figure shows examples of each, displayed in column H. Each sparkline depicts the six data points to the left.

	A	B	C	D	E	F	G	H
1	**Line Sparklines**							
2								
3	**Fund Number**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Sparklines**
4	A-13	103.93	98.92	38.12	86.34	75.58	71.2	
5	C-09	212.74	218.7	202.13	193.56	190.12	131.74	
6	K-33	75.74	73.63	69.36	60.34	64.92	59.46	
7	W-91	91.78	95.44	98.1	99.46	93.63	105.36	
8	M-03	324.48	309.14	313.1	287.82	276.24	260.9	
9								
10	**Column Sparklines**							
11								
12	**Fund Number**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Sparklines**
13	A-13	103.93	98.92	38.12	86.34	75.58	71.2	
14	C-09	212.74	218.7	202.13	193.56	190.12	181.74	
15	K-33	75.74	73.63	69.36	60.34	64.92	59.46	
16	W-91	91.78	95.44	98.1	99.46	93.63	105.86	
17	M-03	324.48	309.14	313.1	287.82	276.24	260.9	
18								
19	**Win/Loss Sparklines**							
20								
21	**Fund Number**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Sparklines**
22	A-13	#N/A	-5.06	-10.8	-1.78	-10.76	-4.38	
23	C-09	#N/A	5.96	-16.52	-3.62	-3.44	-8.38	
24	K-33	#N/A	-2.06	-3.82	-9.52	4.58	-5.46	
25	W-91	#N/A	3.66	2.66	1.36	-0.78	7.13	
26	M-03	#N/A	-15.34	3.96	-25.28	-11.58	-15.34	
27								

Three groups of sparklines

- **Line:** Similar to a line chart. As an option, the line can display with a marker for each data point. The first group in figure shows line sparklines, with markers. A quick glance reveals that, with the exception of Fund Number W-91, the funds have been losing value over the six-month period.

- **Column:** Similar to a column chart. The second group in figure shows the same data displayed with column sparklines.

- **Win/Loss:** A "binary"-type chart that displays each data point as a high block or a low block. The third group shows win/loss sparklines. Notice that the data is different. Each cell displays the change from the previous month. In the sparkline, each data point is depicted as a high block (win) or a low block (loss). In this example, a positive change from the previous month is a win, and a negative change from the previous month is a loss.

Why Sparklines?

In the case of Excel, sparklines are cell-sized graphics. As you see in this chapter, sparklines aren't limited to lines.

Creating Sparklines

Sparklines provide a great way to summarize data visually. For example, following figure shows column sparklines summarizing precipitation data. To create sparkline graphics, follow these steps:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Average Monthly Precipitation (Inches)														
2															
3		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
4	Achalpur, MH	4.06	3.83	4.59	3.5	4.41	4.38	3.87	4.3	3.72	3.17	3.82	3.39		
5	Achhnera, UP	1.18	1.21	1.41	0.45	0.24	0.12	0	0.08	0.15	0.3	0.59	0.76		
6	Adalaj, GJ	6.19	5.1	5.07	5.56	5.34	5.33	5.96	5.86	4.84	3.81	4.76	5.26		
7	Adoor, KL	0.81	0.57	1.12	1.74	2.48	1.89	1.28	0.85	1.34	1.26	0.75	0.67		
8	Darbhanga, BR	3.13	2.74	3.84	2.54	3.26	5.69	5.17	6.09	6.61	4.48	3.03	2.71		
9	Eluru, AP	7.65	6.35	5.8	3.66	2.66	1.53	0.64	0.99	1.54	3.35	8.44	8.29		
10	Faridabad, HR	2.73	2.35	1.89	1.11	0.78	0.43	0.5	0.46	0.74	2.18	2.26	2.85		
11	Firozpur, PB	2.14	2.28	3.6	3.69	4.11	3.76	3.9	2.98	2.96	2.76	3.71	2.86		
12	Gudur, AP	0.99	0.88	0.81	0.28	0.24	0.24	2.07	2.3	1.45	1.21	0.67	1.03		
13															

Column sparklines summarize the precipitation data for nine cities.

1. **Select the data that will be depicted (data only, not column headings); if you're creating multiple sparklines, select all the data.** In the example in above figure, you would start by selecting B4:M12.

2. **With the data selected, click the Insert tab, and in the Sparklines group, click one of the three sparkline types: Line, Column, or Win/Loss.** The Create Sparklines dialog box, shown in following figure, appears.

Use the Create Sparklines dialog box to specify the data range and the location for the Sparkline graphics.

3. **Specify the location for the sparklines in the Location Range box.** Typically, you'll put the sparklines next to the data, but that's not a requirement. Most of the time, you'll use an empty range to hold the sparklines. However, Excel doesn't prevent your from inserting sparklines into cells that already contain data. The sparkline location that you specify must match the source data in terms of number of rows or number of columns. For this example, you would specify N4:N12 as the Location Range.

4. **Click OK.** Excel creates the sparklines graphics of the type you specified.

The sparklines are linked to the data, so if you change any of the values in the data range, the sparkline graphic will update. Often, you'll want to increase the column width or row height to improve the readability of the sparklines.

Tip

Most of the time, you'll create sparklines on the same sheet that contains the data. If you want to create sparklines on a different sheet, start by activating the sheet where the sparklines will be displayed. Then, in the Create Sparklines dialog box, specify the source data either by pointing or by typing the complete sheet reference (for example, Sheet 1 A1:C12). The Create Sparklines dialog box lets you specify a different sheet for the Data Range, but not for the Location Range. Or, you can just create the sparklines on the same sheet as the data, and then cut and paste the cells to a different worksheet.

Understanding sparkline groups

In most situations, you'll probably create a group of sparklines — one for each row or column of data. A worksheet can

hold any number of sparkline groups. Excel remembers each group, and you can work with the group as a single unit. For example, you can select one sparkline in a group, and then modify the formatting of all sparklines in the group. When you select one sparkline cell, Excel displays an outline of all the other sparklines in the group.

You can, however, perform some operations on an individual sparkline in a group:

- Change the sparkline's data source. Select the sparkline cell and choose Sparkline Tools ⇨ Design ⇨ Sparkline ⇨ Edit Data ⇨ Edit Single Sparklines Data. Excel displays a dialog box that lets you change the data source for the selected sparkline.

- Delete the sparkline. Select the sparkline cell and choose Sparkline Tools ⇨ Design ⇨ Group ⇨ Clear ⇨ Clear Selected Sparklines.

Both operations are available from the shortcut menu that appears when you right-click a sparkline cell.

You can also ungroup a set of sparklines by selecting any sparkline in the group and choosing Sparkline Tools ⇨ Design ⇨ Group ⇨ Ungroup. After you ungroup a set of sparklines, you can work with each sparkline individually.

Customizing Sparklines

When you select a cell that contains a sparkline, Excel displays an outline around all the sparklines in its group. You can then use the commands on the Sparkline Tools ⇨ Design tab to customize the group of sparklines.

Sizing sparkline cells

When you change the width or height of a cell that contains a sparkline, the sparkline adjusts accordingly. In addition, you can insert a sparkline into merged cells. Following figure shows the same sparkline, displayed at four sizes resulting from column width, row height, and merged cells. As you can see, the size and proportions of the cell (or merged cells) make a big difference in the appearance.

A sparkline at various sizes
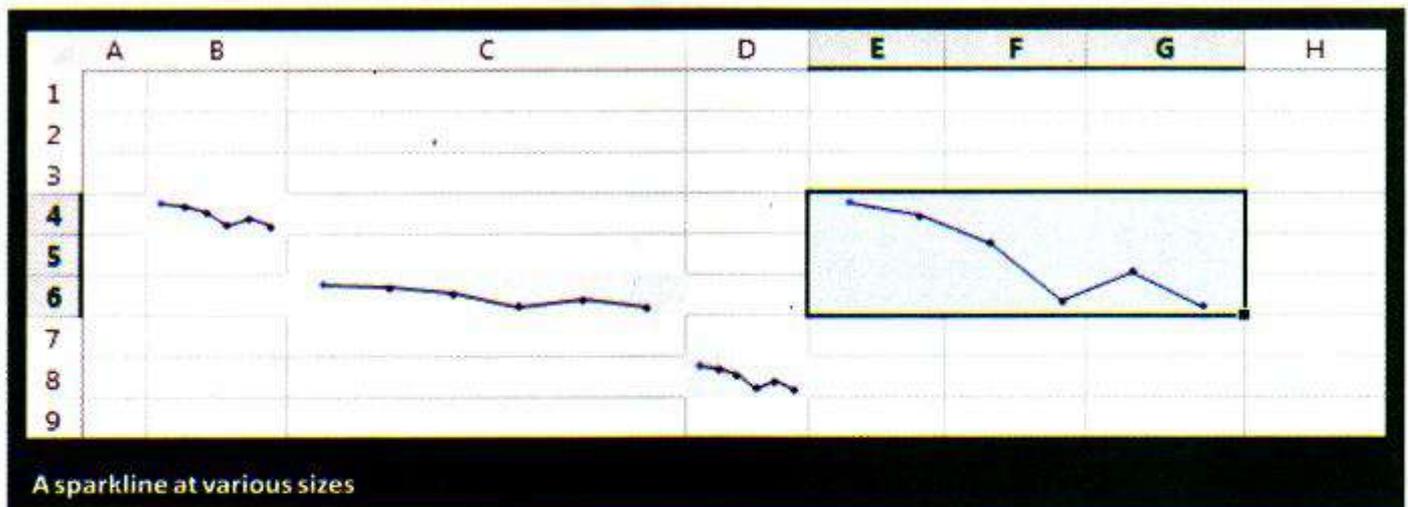
Handling hidden or missing data

By default, if you hide rows or columns that are used in a sparkline graphic, the hidden data does not appear in the sparkline. Also, missing data (an empty cell) is displayed as a gap in the graphic. To change these settings, choose Sparkline Tools ⇨ Design ⇨ Sparkline ⇨ Edit Data ⇨ Hidden and Empty Cells. In the Hidden and Empty Cell Settings dialog box that appears, choose Gaps, Zero, or Connect data points with line under Show empty cells as. Click to place a check beside Show data in hidden rows and columns if desired, and then click OK.

As mentioned earlier, Excel supports three sparkline types: Line, Column, and Win/Loss. After you create a sparkline or group of sparklines, you can easily change the type by selecting the sparkline and clicking one of the three icons in the Sparkline Tools ⇨ Design ⇨ Type group. If the selected sparkline is part of a group, all sparklines in the group are changed to the new type.

Tip

If you've customized the appearance, Excel remembers your customization settings for each type if you switch among sparkline types.

Changing sparkline colors and line width

After you've created a sparkline, changing the color is easy. Use the controls in the Sparkline Tools ⇨ Design ⇨ Style group.

Note

Colors used in sparkline graphics are tied to the document theme. Therefore, if you change the theme (by choosing Page Layout ⇨ Themes ⇨ Themes), the sparkline colors will change to the new theme colors.

For Line sparklines, you can also specify the line width. Choose Sparkline Tools ⇨ Design ⇨ Style ⇨ Sparkline Color ⇨ Weight.

Highlighting certain data points

Use the commands in the Sparkline Tools ⇨ Design ⇨ Show group to customize the sparklines to highlight certain aspects of the data. The options are:

- High Point: Apply a different color to the highest data point in the sparkline.
- Low Point: Apply a different color to the lowest data point in the sparkline.
- Negative Points: Apply a different color to negative values in the sparkline.
- First Point: Apply a different color to the first data point in the sparkline.
- Last Point: Apply a different color to the last data point in the sparkline.
- Markers: Show data markers in the sparkline. This option is available only for Line sparklines.

You control the color of the highlighting by using the Marker Color control in the Sparkline Tools ⇨ Design ⇨ Style group. Unfortunately, you can't change the size of the markers in Line sparklines. Following figure shows some Line sparklines with various types of highlighting applied.

Highlighting options for Line Sparklines
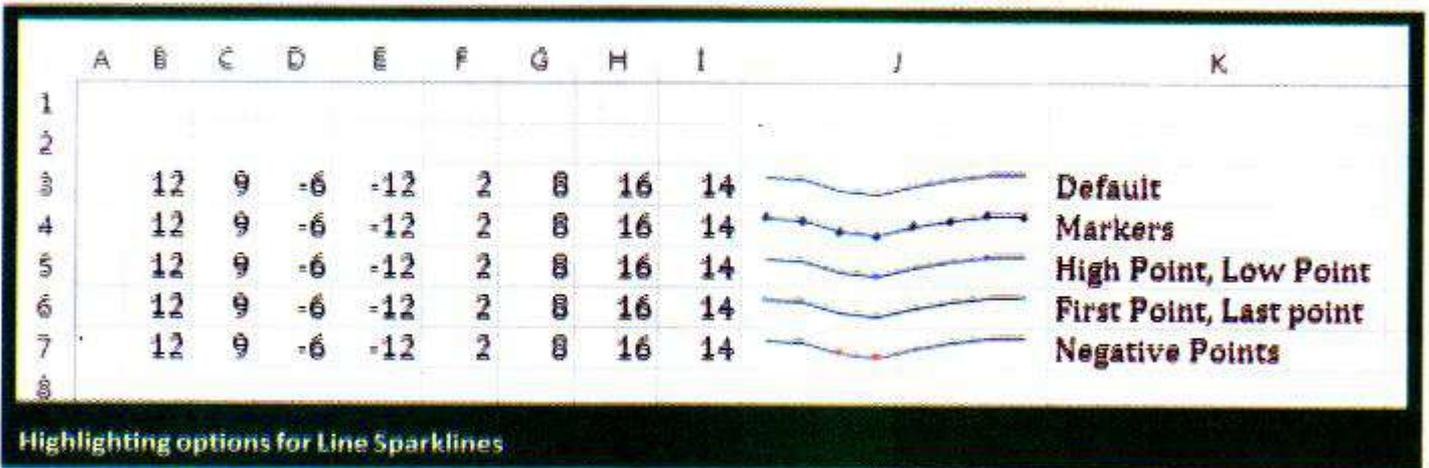
Adjusting sparkline axis scaling

When you create one or more sparklines, they all use (by default) automatic axis scaling. In other words, the minimum and maximum vertical axis values are determined automatically for each sparkline in the group, based on the numeric range of the data used by the sparkline.

The Sparkline Tools ⇨ Design ⇨ Group ⇨ Axis command lets you override this automatic behavior and control the minimum and maximum value for each sparkline or for a group of sparklines. For even more control, you can use the Custom Value option and specify the minimum and maximum for the sparkline group.

> **Note**
>
> Sparklines don't actually display a vertical axis, so you're essentially adjusting an invisible axis.

Following figure shows two groups of sparklines. The group at the top uses the default axis settings (Automatic for Each Sparkline). Each sparkline shows the six-month trend for the product, but there is no indication of the magnitude of the values.

The bottom group of sparklines shows the effect of using the same axis minimum and maximum values for all sparklines in a group.

For the sparkline group at the bottom (which uses the same data), the vertical axis minimum and maximum was changed to use the Same for All Sparklines setting. With these settings in effect, the magnitude of the values across the products is apparent — but the trend across the months within a product is not apparent.

The axis scaling option you choose depends upon what aspect of the data you want to emphasize.

Specifying a Date Axis

Normally, data displayed in a sparkline is assumed to be at equal intervals. For example, a sparkline might display a daily account balance, sales by month, or profits by year. But what if the data isn't at equal intervals?

Following figure shows data, by date, along with a sparklines graphic created from column B. Notice that some dates are missing, but the sparkline shows the columns as if the values were spaced at equal intervals.

The sparkline displays the values as if they are at equal time intervals.

To better depict the data, the solution is to specify a date axis. Select the sparkline and choose Sparkline Tools ⇨ Design ⇨ Group ⇨ Axis ⇨ Dateaxis Type. Excel displays a dialog box, asking for the range that contains the dates. In this example, specify range A2:A11. Click OK, and the sparkline displays gaps for the missing dates.
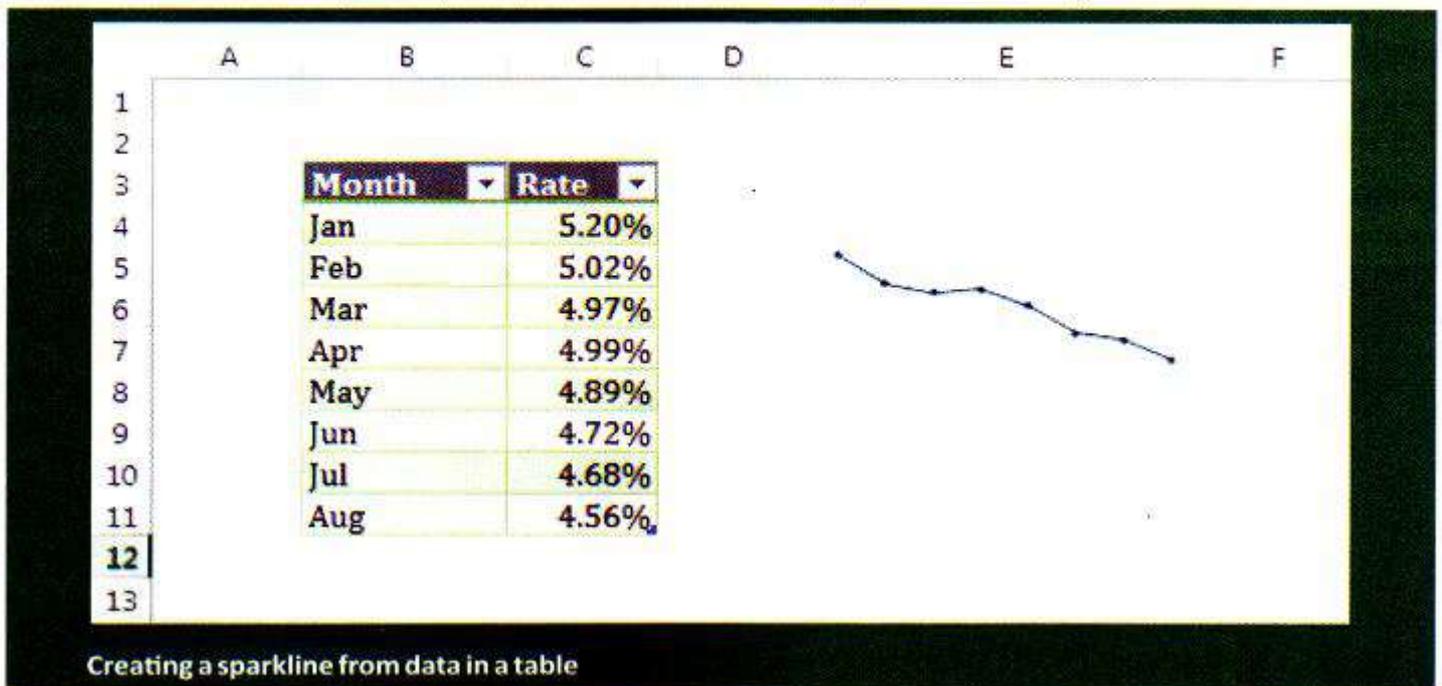
	A	B	C	D	E
1	Date	Amount			
2	1/1/2014	154			
3	1/2/2014	201			
4	1/3/2014	245			
5	1/4/2014	176			
6	1/11/2014	267			
7	1/12/2014	289			
8	1/13/2014	331			
9	1/14/2014	365			
10	1/18/2014	298			
11	1/19/2014	424			
12					
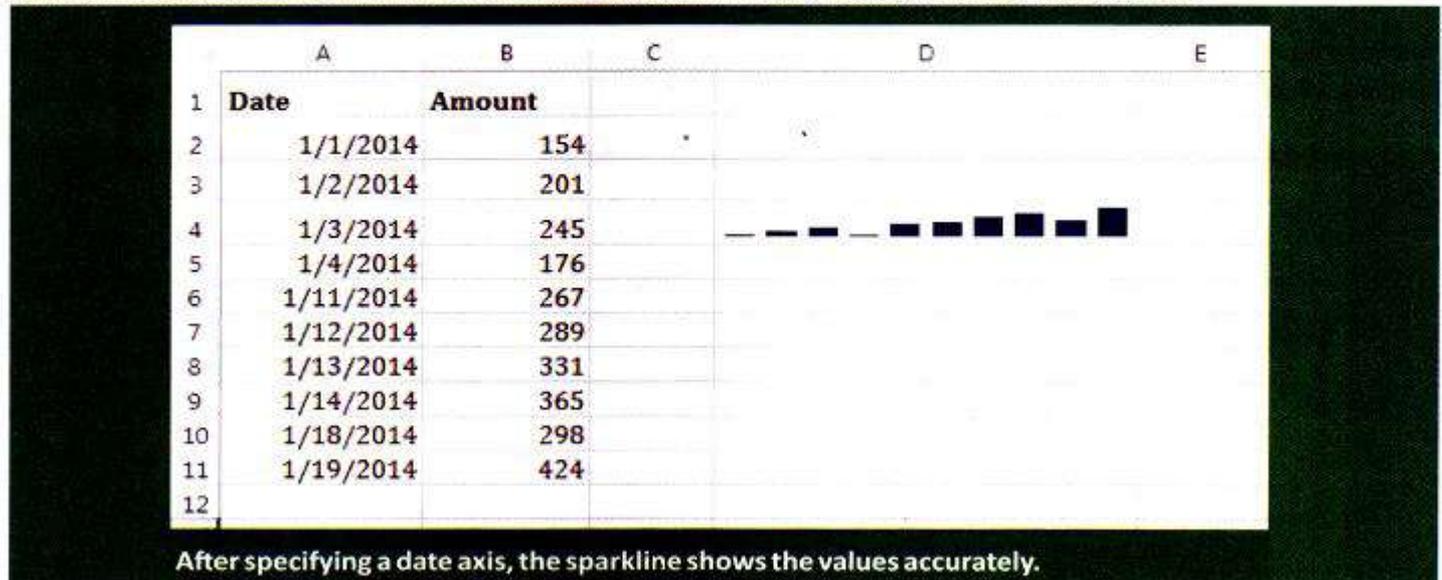
After specifying a date axis, the sparkline shows the values accurately.

Auto-Updating Sparklines

If a sparkline uses data in a normal range of cells, adding new data to the beginning or end of the range does not force the sparkline to use the new data. You need to use the Edit Sparklines dialog box to update the data range (choose Sparkline Tools ⇨ Design ⇨ Sparkline ⇨ Edit Data). But, if the sparkline data is in a column within a table (created by choosing Insert ⇨ Tables ⇨ Table), then the sparkline will use new data that's added to the end of the table.

Following figure shows an example. The sparkline was created using the data in the Rate column of the table. When you add the new rate for September, the sparkline will automatically update its Data Range.

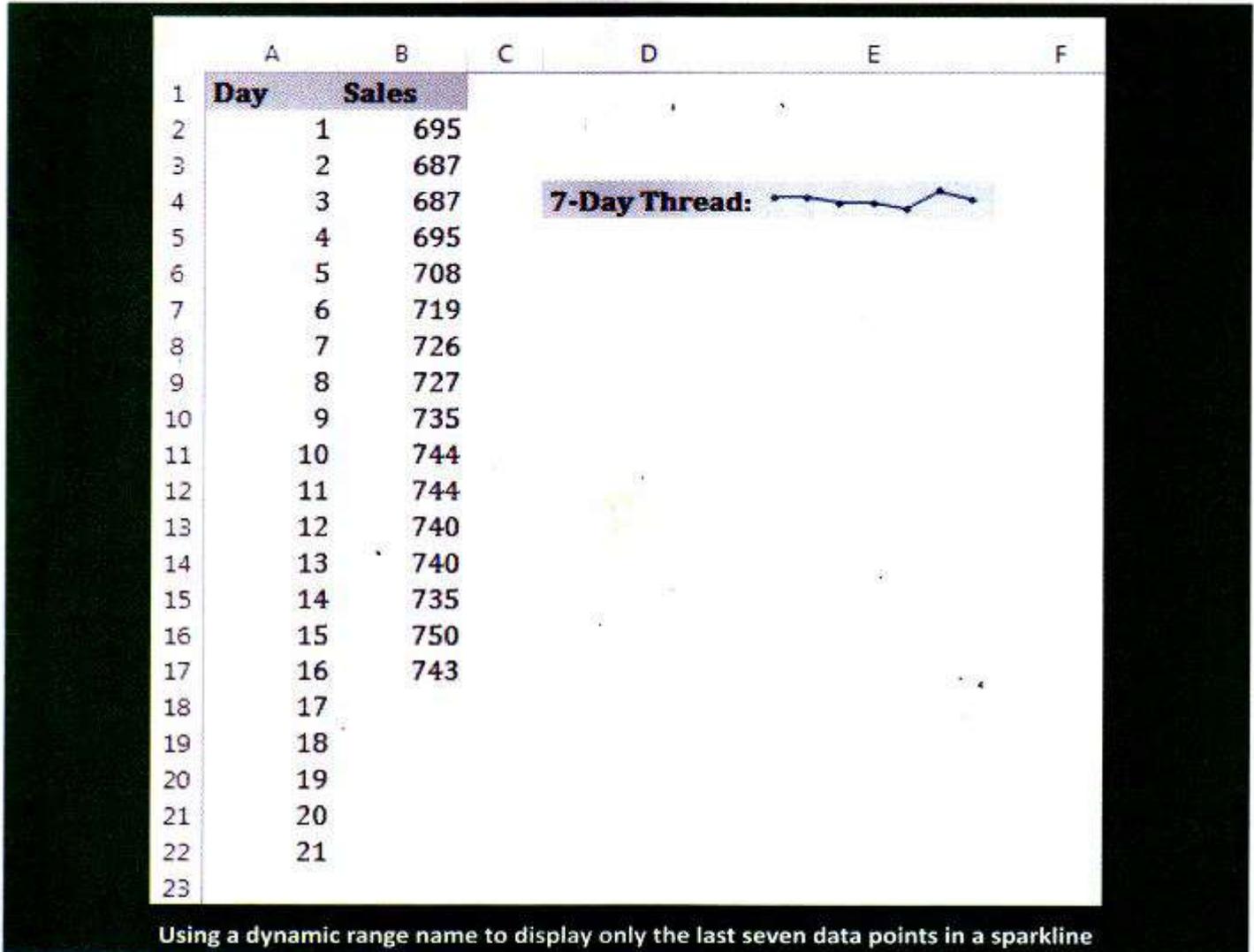|	A	B	C	D	E	F
1						
2						
3		Month ▼	Rate ▼			
4		Jan	5.20%			
5		Feb	5.02%			
6		Mar	4.97%			
7		Apr	4.99%			
8		May	4.89%			
9		Jun	4.72%			
10		Jul	4.68%			
11		Aug	4.56%			
12						
13						

Creating a sparkline from data in a table

Displaying a Sparkline for a Dynamic Range

The example in this section describes how to create a sparkline that displays only the most recent data points in a range. Following figure shows a worksheet that tracks daily sales. The sparkline, displays only the seven most recent

data points in column B. When new data is added to column B, the sparkline will adjust to show only the most recent seven days of sales.

	A	B	C	D	E	F
1	**Day**	**Sales**				
2	1	695				
3	2	687				
4	3	687		**7-Day Thread:**		
5	4	695				
6	5	708				
7	6	719				
8	7	726				
9	8	727				
10	9	735				
11	10	744				
12	11	744				
13	12	740				
14	13	740				
15	14	735				
16	15	750				
17	16	743				
18	17					
19	18					
20	19					
21	20					
22	21					
23						

Using a dynamic range name to display only the last seven data points in a sparkline

Start this process by creating a dynamic range name. Here's how:

1. **Choose Formulas ⇨ Defined Names ⇨ Define Name, specify Last7 as the Name, and enter the following formula in the Refers To field:**

    =ȮFFSET($B$2,COUNTA($B:$B)-7-1,0,7,1)

This formula calculates a range by using the OFFSET function. The fi rst argument is the first cell in the range (B2). The second argument is the number of cells in the column (minus the number to be returned and minus 1 to accommodate the label in B1).

This name always refers to the last seven nonempty cells in column B. To display a different number of data points, change both instances of 7 to a different value.

2. **Choose Insert ⇨ Sparklines ⇨ Line.**

3. **In the Data Range field, type** Last7 (the dynamic range name); specify cell E4 as the Location Range. The sparkline shows the data in range B11:B17.

4. **Add new data to column B.** The sparkline adjusts to display only the last seven data points.