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Excel 2010

Your easy, colorful, SEE-HOW guide to Excel!

Curtis D. Frye

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Excel® 2010 Plain & Simple

Curtis D. Frye

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To Virginia

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6

Using Formulas and Functions

In this section:

- Understanding Formulas and Cell References in Excel
- Creating and Editing Formulas
- Creating, Editing, and Deleting Named Ranges
- Using Named Ranges in Formulas
- Summarizing the Values in Groups of Cells
- Creating Formulas That Reference Cells in Other Workbooks
- Summing with Subtotals and Grand Totals
- Exploring the Excel Function Library
- Creating Conditional Functions
- Debugging Your Formulas

Microsoft Excel 2010 workbooks allow you to do much more than simply store and organize your data. One important task you can perform in Excel is to summarize the values in related cells. Whether those cells represent the sales for a day at your store, the returns from your personal investments, or your times in bicycle races, you can find the total or average of the values, identify the minimum or maximum value in a group, or perform dozens of other calculations on your data. Many times you can't access the information you want without referencing more than one cell; it's also often true that you'll use the data in the same group of cells in more than one calculation. Excel makes it easy to reference a number of cells at once, letting you build your calculations quickly.

Understanding Formulas and Cell References in Excel

After you add your data to a worksheet, you can summarize the data by creating formulas. A formula is an expression that performs calculations on your data. For example, in a worksheet that lists hourly sales for a day in a single row of cells, you can build a formula in the last cell in that row to find the total of all sales for the day. You can also build the formula to calculate the average or find the lowest or highest hourly value.

When you build a formula, you need to identify the worksheet cells that provide the values for the formula and the operations you want to perform on those values. To identify a cell, you give its cell reference. The first cell in the first column is cell A1, meaning column A, row 1. If you examine a formula, you sometimes see a cell reference written as \$A\$1, rather than just A1. The difference is that cell references written with the dollar signs are absolute references, meaning the reference doesn't change when the formula is copied to another cell. Cell references written without the dollar signs are relative references, which do change when the formula with the references is copied to another cell.

The benefit of relative references is that you can write a formula once, copy it to as many other cells as you like, and have Excel update the formulas to reflect the new cells. As an example, consider the worksheet in the following figure, which tracks the number of hourly package pickups for a month.

The cells in column P contain formulas that calculate the sum of the hourly pickup values in column

C through column O. The formula in cell P5, =SUM(C5:O5), finds the sum of cells in row 5, corresponding to January 1. When you copy the formula from cell P5 to cell P6, the formula changes to =SUM(C6:O6). Excel notices that you copied the formula to a new row and assumes that you want the formula to work on that data. Had you written the formula as =SUM(\$C\$5:\$O\$5), however, Excel would notice that the formula used absolute references and would copy the formula as =SUM(\$C\$5:\$O\$5).

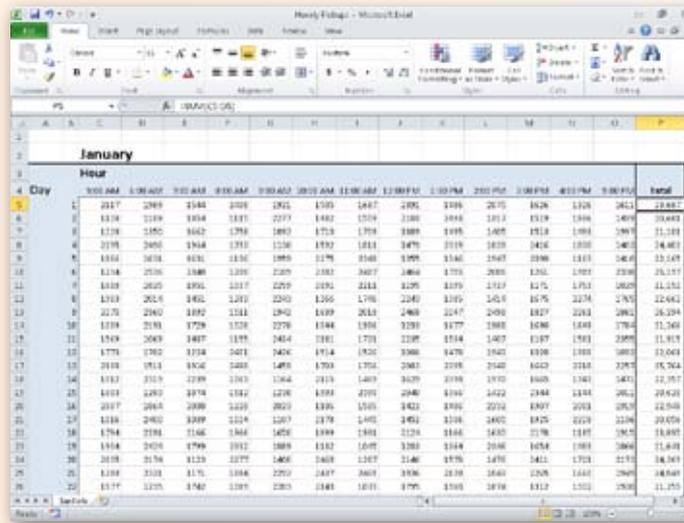
If you want to reference a value from a cell in another workbook, you can do that. Excel uses 3D references, which means that any cell in any workbook can be described by three pieces of information:

- The name of the workbook
- The name of the worksheet
- The cell reference

Here's the reference for cell Q38 on the January worksheet in the Y2010ByMonth workbook:

[Y2010ByMonth.xlsx]
January!\$Q\$38

The good news is that you don't need to remember how to create these references yourself. If you want to use a cell from another workbook in a formula, all you need to do is click the cell where you want to use the value, start the formula, and then click the cell in the other workbook. Excel fills in the reference for you.



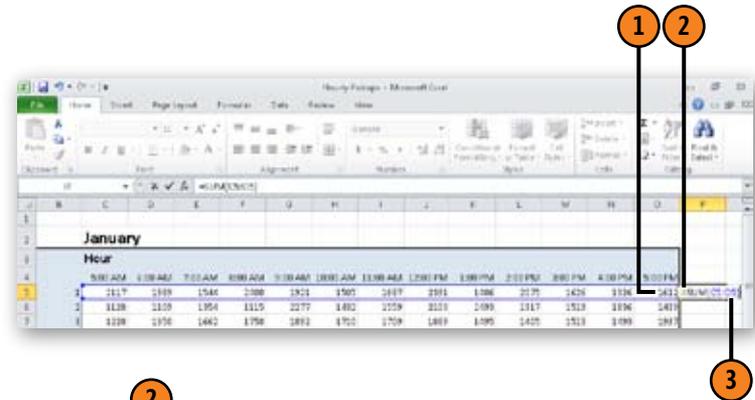
Creating Simple Cell Formulas

Building calculations in Excel is pretty straightforward. If you want to find the sum of the values in two cells, you just type an equal sign (=), the reference of the first cell, a plus sign (+), and

the reference of the second cell. The formula you enter appears on the formula bar, where you can examine and edit it.

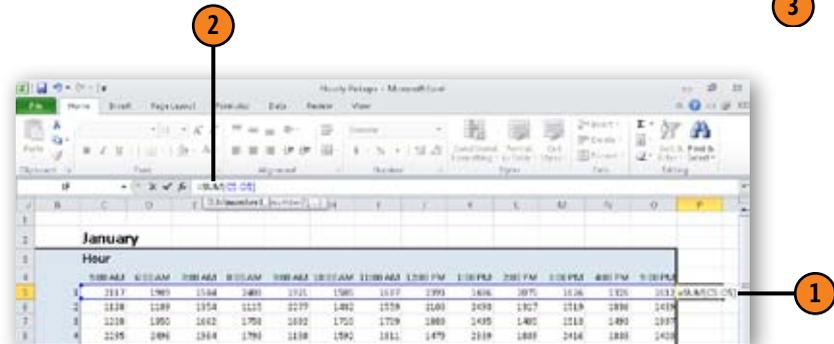
Build a Formula

- 1 Click the cell in which you want to enter a formula.
- 2 Type =.
- 3 Type the expression representing the calculation you want to perform.
- 4 Press Enter.



Edit a Formula

- 1 Click the cell you want to edit.
- 2 Select the part of the formula you want to edit in the formula bar.
- 3 Make any changes that you want.
- 4 Press Enter.



Try This!

Click the Excel Help button. Then, in the Excel Help dialog box, type common formulas in the Search box, press Enter, and click Examples Of Commonly Used Formulas in the list of available topics. The Help file that appears has quite a few examples of formulas you might want to create.

Caution

Be sure that there's no space before the equal sign in your formula. If there is, Excel interprets the cell's contents as text, not a formula.

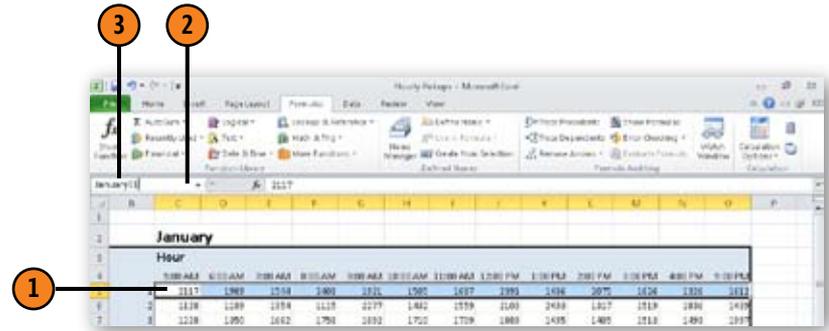
Assigning Names to Groups of Cells

When you work with large amounts of data, it's easy to lose track of which cells contain which data. In addition, it can be difficult to locate data in workbooks you didn't create. Although you might always store product prices in one worksheet column, there's no guarantee that your colleagues will follow the same pattern! One way to prevent confusion is to

define a named range for any cell group that holds specific information. For example, in a worksheet with customer order data, you can define the Totals named range to represent the cells in which the total for each order is stored. After you define the named range, you can display its contents, rename it, or delete it.

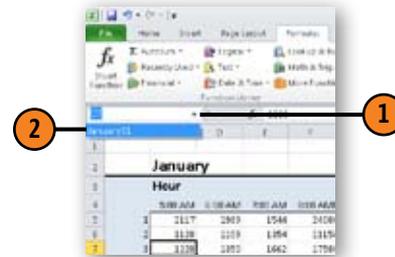
Create a Named Range

- 1 Select the cells you want to name.
- 2 Click the Name Box on the Formula Bar.
- 3 Type the name you want for the range.
- 4 Press Enter.



Go to a Named Range

- 1 Click the Name Box down arrow.
- 2 Click the range to which you want to go.



Caution

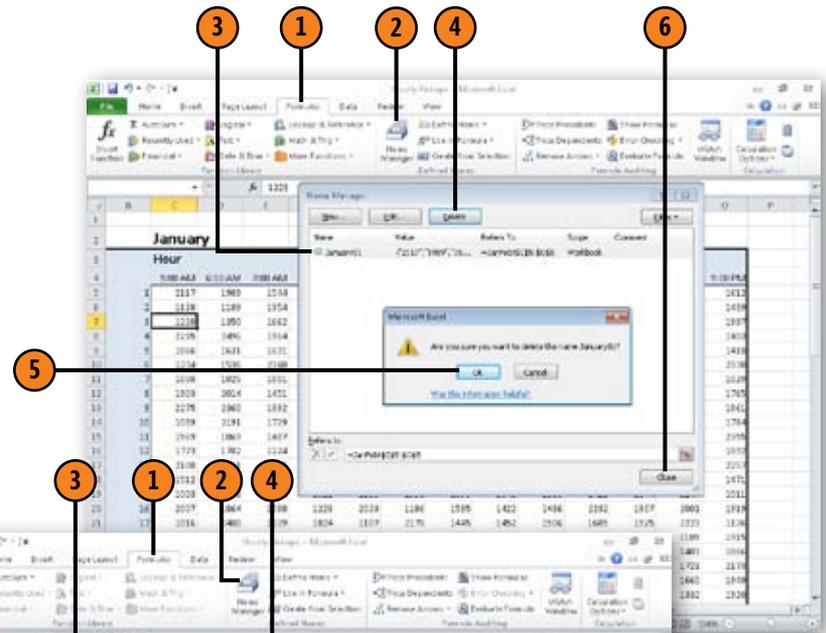
The name you give your named range shouldn't duplicate a potential cell address. For example, typing DAY1 in a formula would reference cell DAY1. To avoid this problem, either ensure that your ranges have names that begin with at least four letters (the last column is XFD) or use an underscore to separate the letters from the rest of the name. The name DAY1 isn't valid, but the name DAY_1 is.

See Also

For information about selecting cells from several parts of the same worksheet, see "Select a Noncontiguous Group of Cells" on page 32.

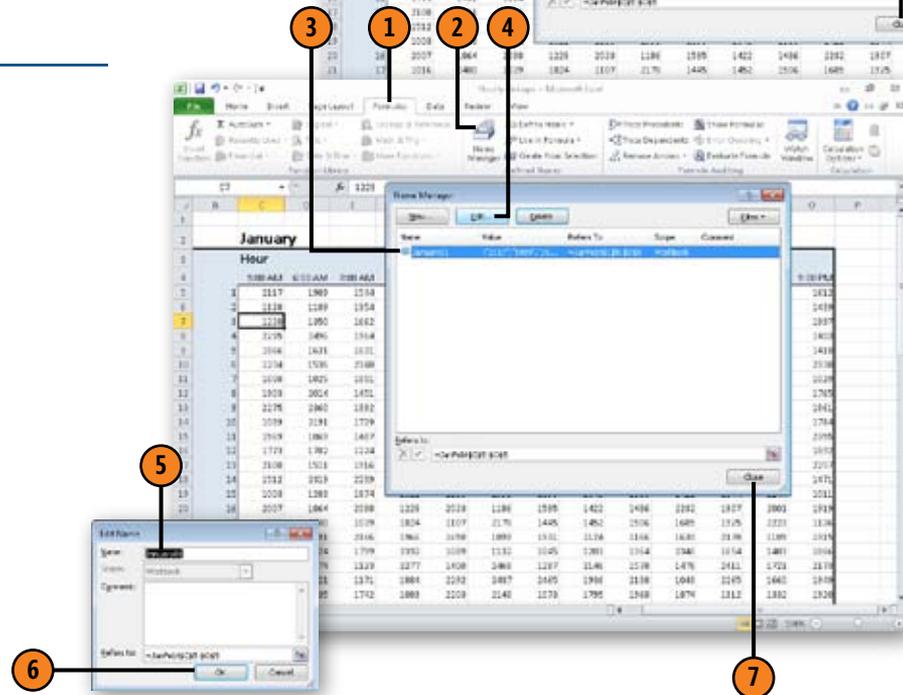
Delete a Named Range

- 1 Click the Formulas tab.
- 2 Click Name Manager.
- 3 Click the named range you want to delete.
- 4 Click Delete.
- 5 Click OK to clear the confirmation dialog box that appears.
- 6 Click Close.



Rename a Named Range

- 1 Click the Formulas tab.
- 2 Click Name Manager.
- 3 Click the named range you want to rename.
- 4 Click Edit.
- 5 Type a new name for the range.
- 6 Click OK.
- 7 Click Close.



Using Names in Formulas

When you define a named range, you create a shortcut that you can use to refer to a group of cells. A great way to use named ranges is in formulas. Instead of entering the references of every cell you want to use in your calculation, you can type the name of the range. When you reference named ranges in formulas, your formulas are shorter and easier to understand. Rather than seeing a series of cell references you need to examine, you and your colleagues can rely on the named ranges to understand the goal of a calculation.

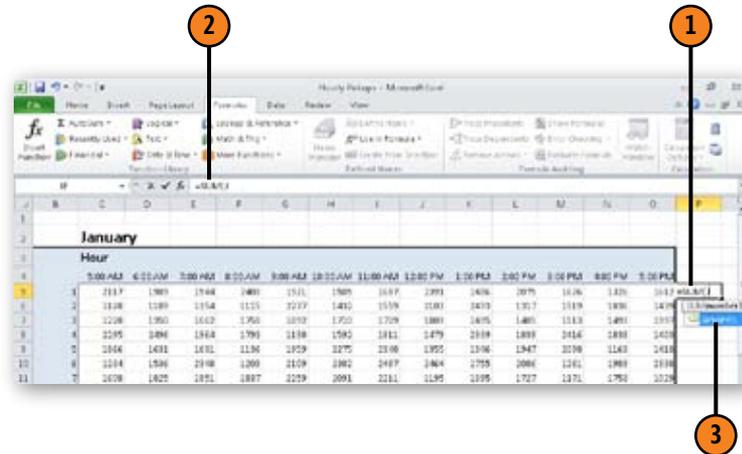
Create a Formula with a Named Range

- 1 Click the cell in which you want to enter a formula.
- 2 Type = followed by the formula you want. When you want to use a range that has a name, start typing the name instead of the cell address.
- 3 Click the named range in the Formula AutoComplete list that appears.
- 4 Press Enter.

Tip

If you change the name of a range of cells, Excel automatically makes the name change in every one of your formulas.

Excel 2010 further streamlines formula creation with Formula AutoComplete. Remember that when you start typing a value into a cell, Excel examines the previous values in that column and offers to let you complete the entry by pressing Tab or Enter. Now, when you start typing a named range's name into a formula, Excel recognizes that you might be entering a named range and displays a list of named ranges (as well as built-in functions) available in the active workbook. All you have to do is click the named range you want, and it's included in the formula immediately.



Creating a Formula That References Values in an Excel Table

In previous versions of Excel, it was a challenge to create named ranges that included an entire column in a data list. Suppose that you created a named range that encompassed the existing cells in a data column, such as the cell range A3:A44; if you added data to cell A45, you would need to change the cells in the named range's definition. Yes, there is

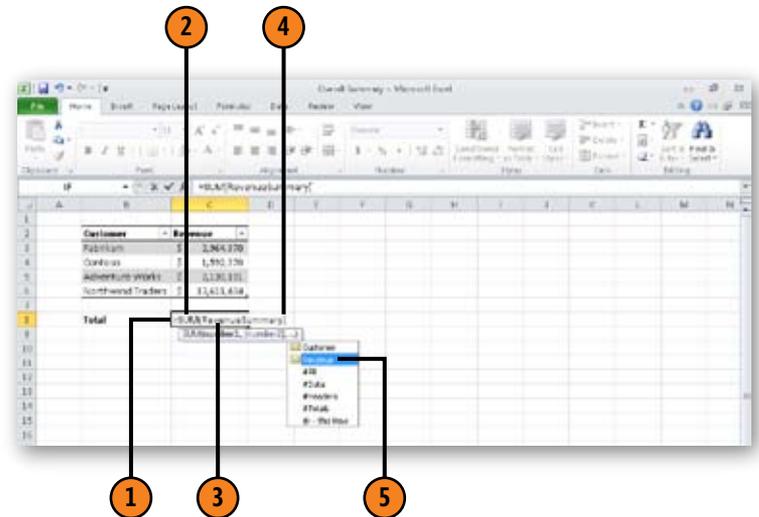
a complicated way to create a dynamic named range in Excel 2003 and earlier versions, but you don't have to worry about it in Excel 2010. All you need to do is create an Excel table (as shown in "Creating an Excel Table" on page 41) and select the headers of the columns that contain the data you want to summarize in your formulas.

Create a Formula with an Excel Table Reference

- 1 Click the cell in which you want to create the formula.
- 2 Type =, followed by the function to include in the formula and a left parenthesis; for example, =SUM(would be a valid way to start.
- 3 Type the name of the Excel table.
- 4 Type a left square bracket.
- 5 Click the name of the table column.
- 6 Type a right square bracket, a right parenthesis, and press Enter.

Tip

To include more than one table column in a formula, either hold down the Shift key, select the column header of the first column to use in the formula, and then click another column to select everything in the span between the two columns, or hold down the Ctrl key and click the other column headers you want to use. Excel includes the references in the formula.



Creating Formulas That Reference Cells in Other Workbooks

One of the strengths of Excel is that you aren't limited to using cells from the current workbook in your formulas. If you want, you can use data from any other workbook in your calculations. For example, you might have a workbook in which you track monthly advertising sales for your newsletter. If you want to create a new workbook to summarize all income and expenses for your publication, you can do so. By letting you create formulas that reference cells from more than one workbook, Excel makes it easy for you to organize your workbooks so that

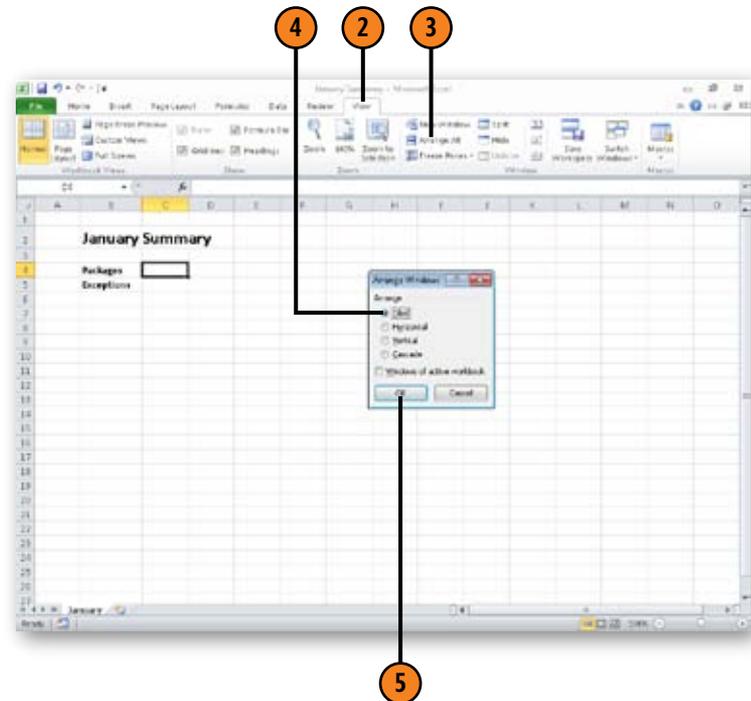
each workbook holds data about a specific subject. Not only can you find the data easily, you can reference it anywhere else.

After you create links between workbooks, you can have Excel update your calculation if the data in the linked cell changes. You can also change the cell to which you linked, or if the workbook with the cell to which you linked has been moved or deleted, you can delete the link and have Excel store the last value from the calculation.

Use Cells from Other Workbooks in a Formula

- 1 Open the workbook with the cell you want to reference in your formula.
- 2 In the workbook where you want to create the formula, click the View tab.
- 3 Click Arrange All.
- 4 Select the Tiled option.
- 5 Click OK.

(continued on next page)



Use Cells from Other Workbooks in a Formula *(continued)*

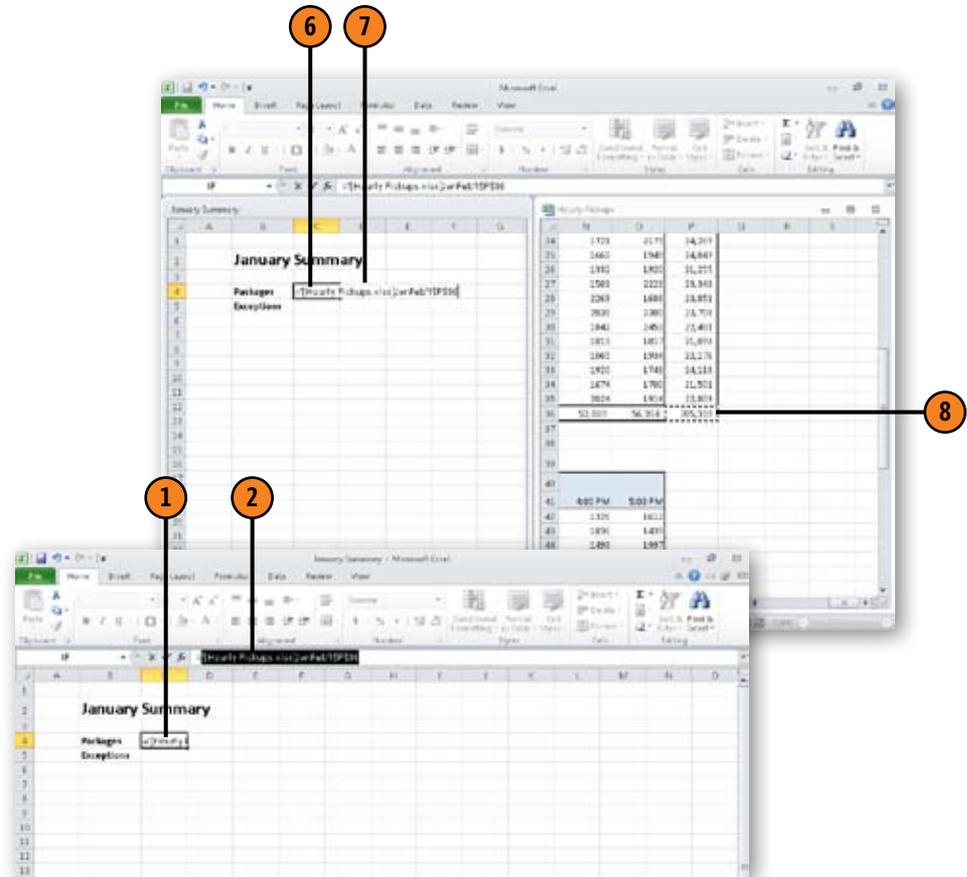
- 6 Click the cell where you want to create the formula.
- 7 Type = followed by the first part of the formula.
- 8 Select the cells with the values you want to use in the formula.
- 9 Press Enter.

Break Links to Other Workbooks and Convert to Values

- 1 Click the cell that contains the formula you want to edit.
- 2 Select the part of the formula representing the link you want to break.
- 3 Press F9.
- 4 Press Enter.

Tip

You can use the techniques here to link to a cell on a different worksheet in the same workbook. Just create the formula, and when you want to put in the cell reference, move to the target worksheet and click the appropriate cell.



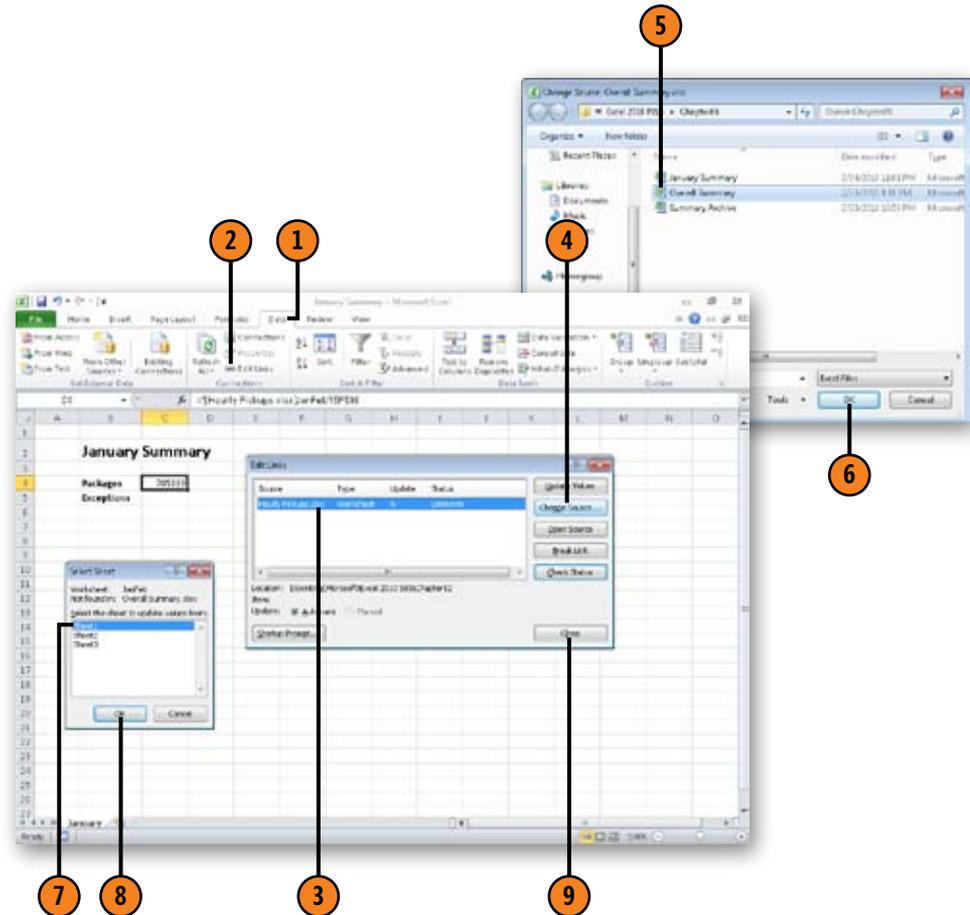
Refresh Links

- 1 Click the Data tab.
- 2 In the Connections group, click Refresh All.



Change Links to Different Workbooks

- 1 Click the Data tab.
- 2 In the Connections group, click Edit Links.
- 3 Click the link you want to change.
- 4 Click Change Source.
- 5 Click the workbook with the new cell to which you want to link.
- 6 Click OK.
- 7 Select the sheet from which to update values.
- 8 Click OK.
- 9 Click Close.



Summing a Group of Cells Without Using a Formula

Sometimes, such as when you're entering data into a worksheet or you're curious to find out the sum or average of the values in a few cells, it's too much work to find a blank cell and write a formula to calculate the sum or average for the cells. Rather than make you create a separate formula, Excel counts the number of cells selected, calculates a running total

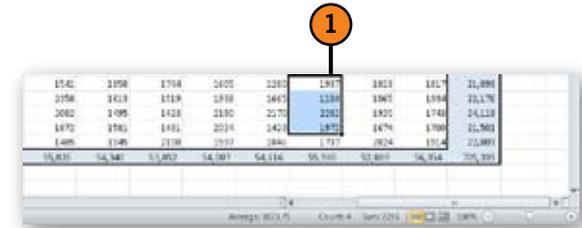
and average for the currently selected cells, and displays the results on the status bar. Finding the sum, average, and count of the values in the selected cells are the most commonly used operations, so Excel calculates those values by default. You can choose from several other operations, however, or even tell Excel not to calculate a running total for any selected cells.

Summarize Data in a Group of Cells

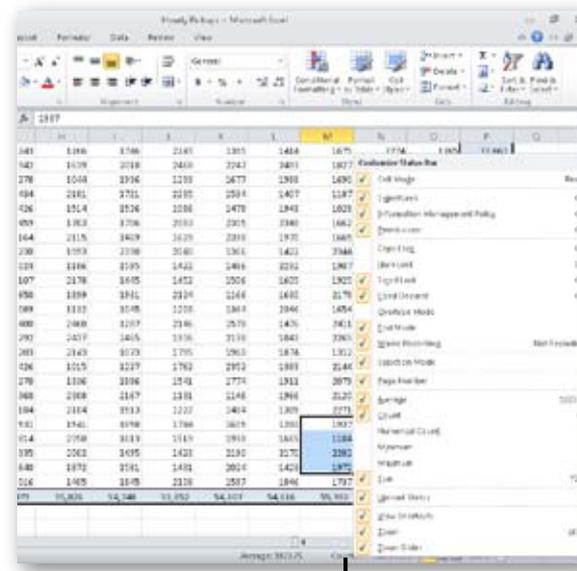
- 1 Select the cells you want to summarize.

Find the Total, Average, or Other Values of Cell Data

- 1 Right-click the status bar, and choose the summary operations you want from the shortcut menu.



The summary operations and results of the summaries appear on the status bar



Tip



Active summary operations are checked on the shortcut menu. Clicking a checked summary operation turns off that operation.



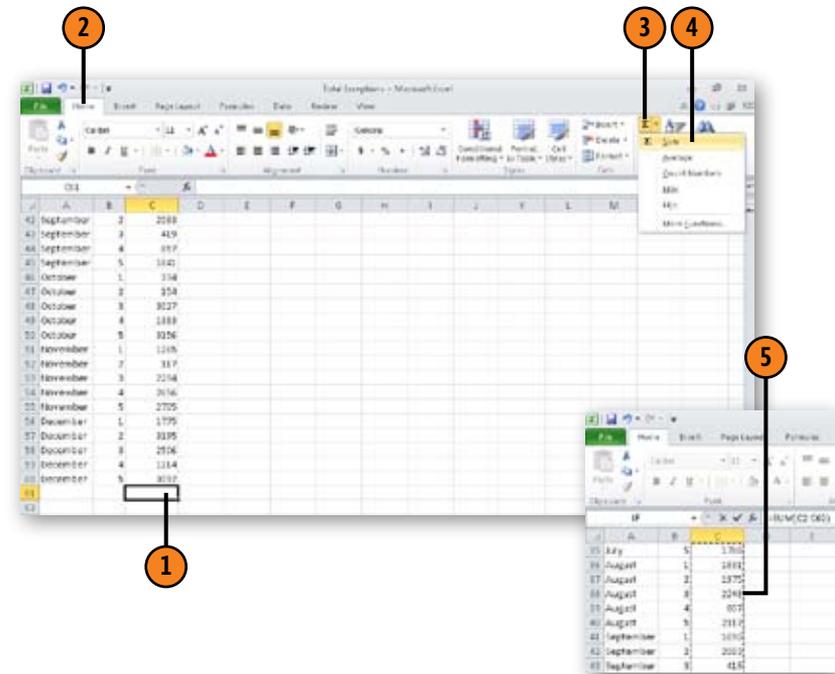
Creating a Summary Formula

After you enter data into a worksheet, you can create formulas to summarize the values and display the result of the calculation. You can summarize the values in a group of cells in many ways: You can find the total or average of the cell values, identify the maximum or minimum value in the group, or simply count the number of cells containing values. You can create these formulas by clicking the cell below or to the right of the cells you want to summarize, displaying either the Home tab

or the Formulas tab, and clicking the AutoSum button. (The button appears on both tabs.) Clicking the AutoSum button itself creates a SUM formula, which finds the arithmetic sum of the values, but you can choose other calculations by clicking the AutoSum button's down arrow. After you create the formula you want, you can use the result in other calculations.

Create an AutoSum Formula

- 1 Click the cell where you want the summary value to appear.
- 2 Click the Home tab.
- 3 Click the AutoSum down arrow.
- 4 Click the AutoSum function you want to use.
- 5 If necessary, select the cells with the data you want to summarize.
- 6 Press Enter.



See Also

For information about finding a running total for a group of cells without creating a formula, see “Summing a Group of Cells Without Using a Formula” on page 93.

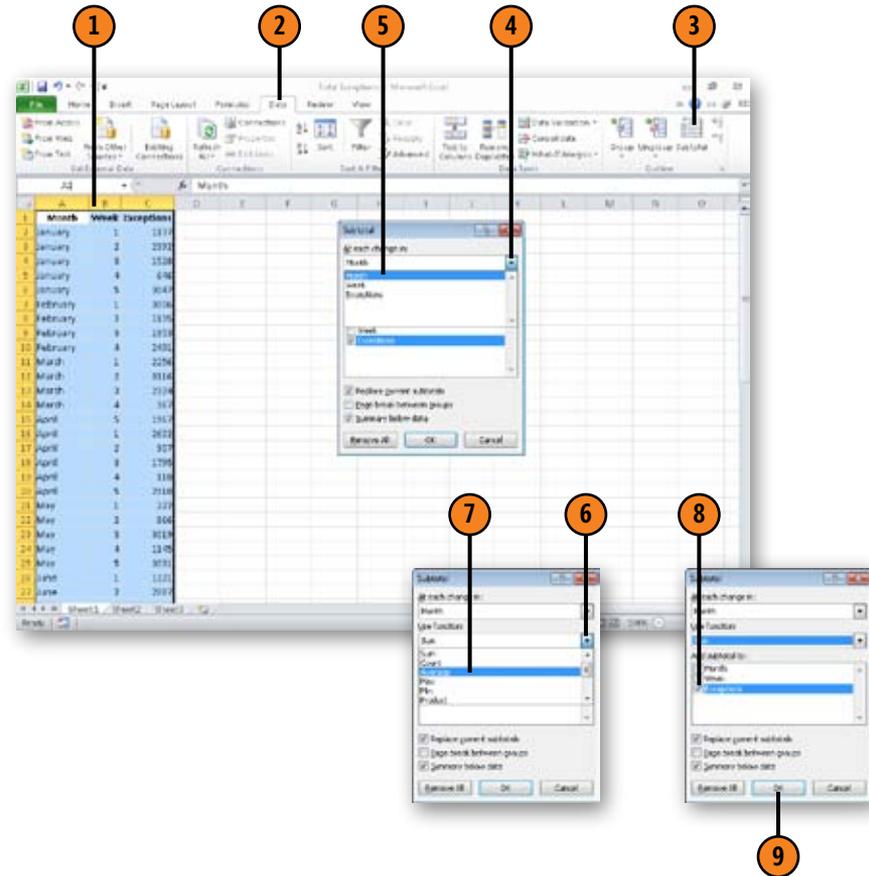
Summing with Subtotals and Grand Totals

You frequently need to organize the data in an Excel worksheet by one or more criteria. For example, you might have a worksheet in which you list yearly sales for each product you offer, with the products broken down by category. If your data is organized this way, you can have Excel calculate a subtotal

for each category of products. When you create a subtotal, you identify the cells with the values to be calculated and the cells that identify the change from one category to the next; Excel updates the subtotal and grand total for you if the value of any cell changes.

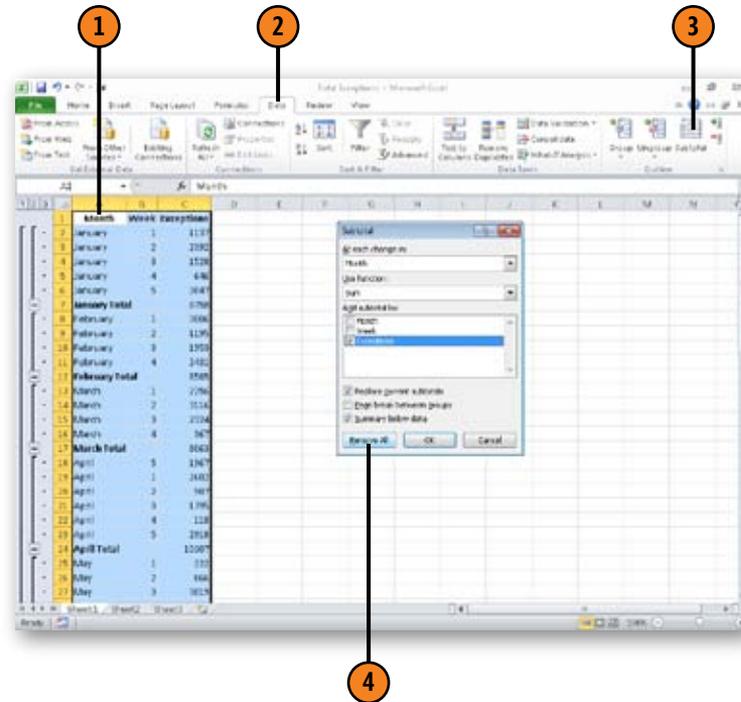
Create a Subtotal

- 1 Click any cell in the range you want to subtotal.
- 2 Click the Data tab.
- 3 In the Outline group, click Subtotal.
- 4 Click the At Each Change In down arrow.
- 5 Click the value on which you want to base the subtotals.
- 6 Click the Use Function down arrow.
- 7 Click the subtotal function you want to use.
- 8 Select which columns should have subtotals calculated.
- 9 Click OK.



Remove a Subtotal

- 1 Click any cell in the subtotaled range.
- 2 Click the Data tab.
- 3 Click Subtotal.
- 4 Click Remove All.



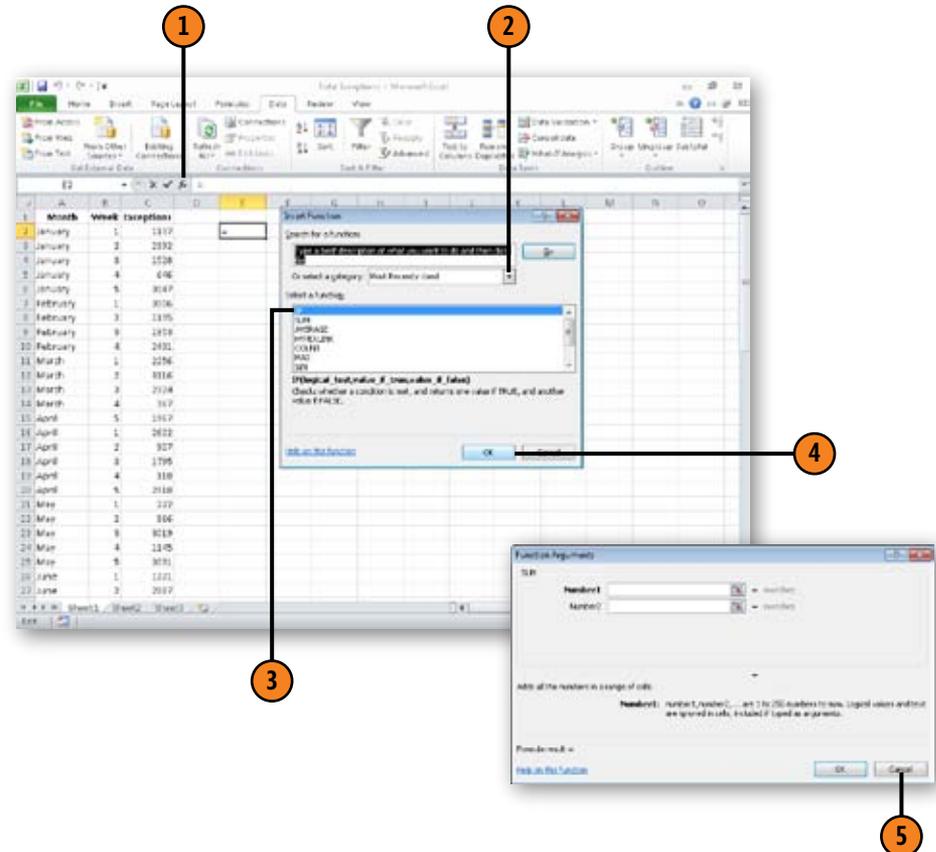
Exploring the Excel Function Library

You can create dozens of different functions in Excel. You can use Excel functions to determine mortgage payments, perform scientific calculations, or find the square root of a number. The best way to become familiar with the formulas available in Excel is to display the Insert Function dialog box and move through the listed functions, clicking the ones that look interesting. When you click a function, its description appears at the bottom of the dialog box.

Another way to get information about a function is to view the ScreenTip that appears next to the function. If you double-click a cell with a function, a ScreenTip with the function's structure and expected values appears below it. Clicking an element of the structure points to the cell or cells providing that value.

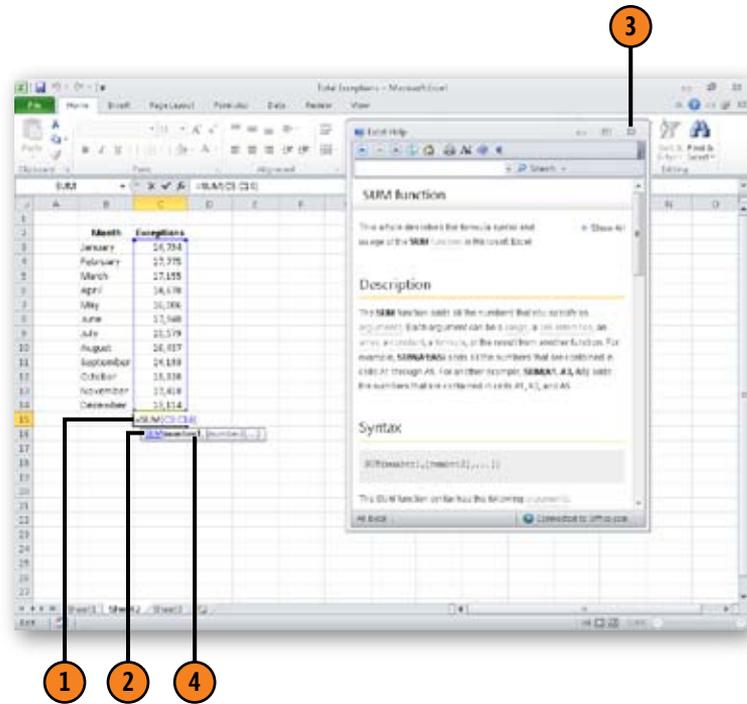
List Functions Available from the Excel Library

- 1 Click the Insert Function button.
- 2 Display the drop-down list, and click the function category you want to view.
- 3 Click the function you want to examine.
- 4 Click OK.
- 5 Click Cancel to close the Function Arguments dialog box.



Use Function ScreenTips

- 1 Double-click a cell that contains a formula.
- 2 In the ScreenTip, click the function name to open the Help file entry for the function.
- 3 Click the Close button to close the Help window.
- 4 Click an argument to select the cells to which it refers.



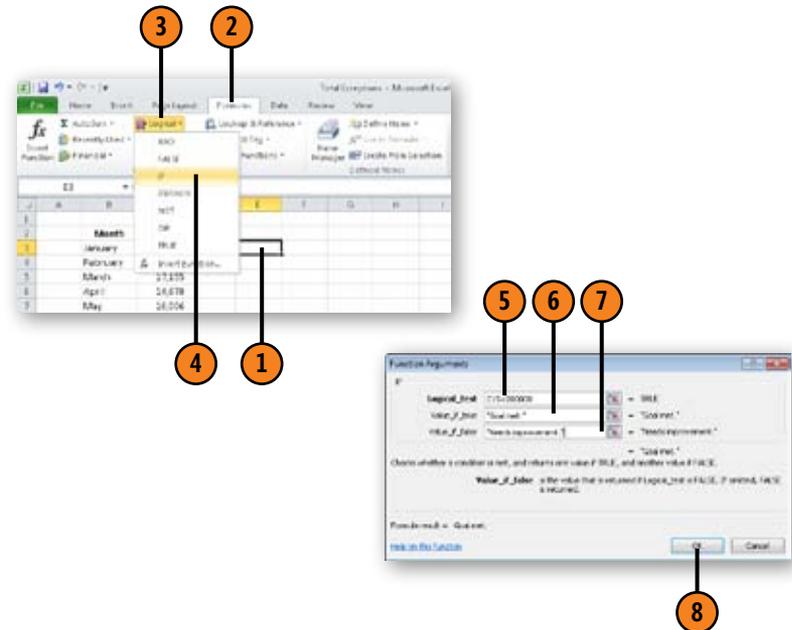
Using the IF Function

In addition to calculating values based on the contents of other cells, you can have Excel take different actions based on the contents of those other cells by using the IF function. For example, if you create a workbook to track the times of riders in a bicycle-racing club, you can create a formula to compare

each rider's time to his previous time. When someone's most recent time is the lowest time in the group, you can have Excel display Personal Best in the cell with the formula, alerting you to congratulate the rider in your next club newsletter.

Create an IF Function

- 1 Click the cell in which you want to enter an IF function.
- 2 Click the Formulas tab.
- 3 Click Logical.
- 4 Click IF.
- 5 Type a conditional statement that evaluates to true or false.
- 6 Type the text you want to appear if the condition is true.
- 7 Type the text you want to appear if the condition is false.
- 8 Click OK.



Caution

The text message must be enclosed in quotation marks.

Tip

You can also create an expression in the Value_If_True and Value_If_False boxes. Excel displays the result of the expression in the appropriate box.

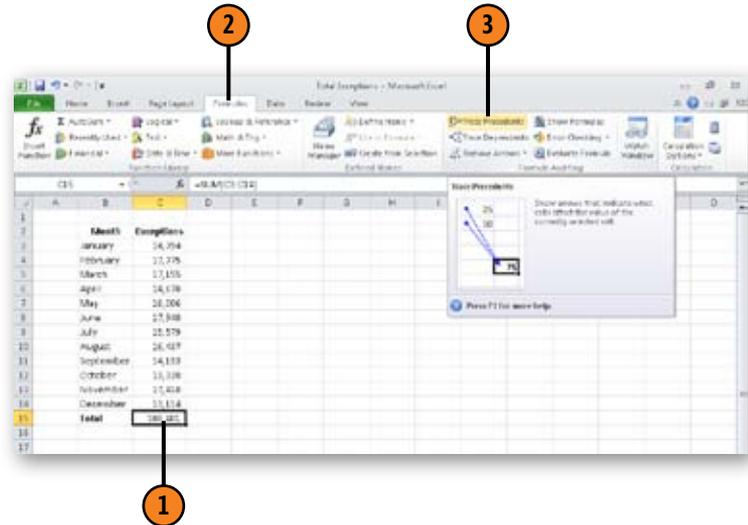
Checking Formula References

When you create a formula that draws values from several different places in your workbook—or from other workbooks—it can be difficult to see what’s going wrong if your formula isn’t producing the expected results. Excel helps you locate a cell’s precedents (the cells the formula uses in its calculation) and

dependents (the cells that depend on the current cell to calculate their own values). To help you find what you need to check your formulas, Excel groups all the tools you need on the Formula Auditing group on the Formulas tab.

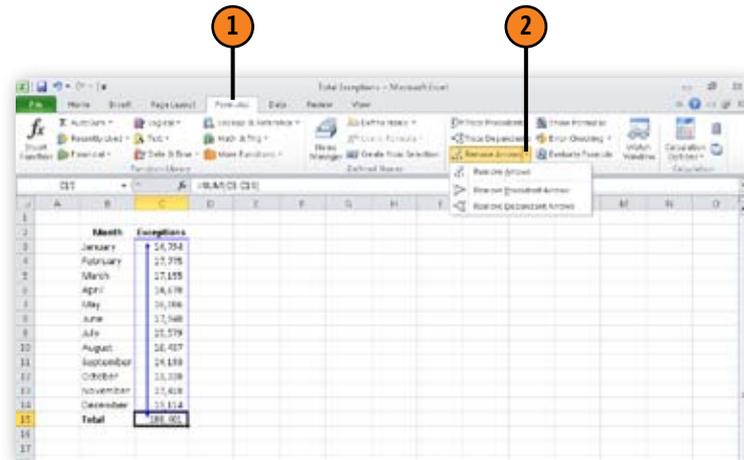
Find Cell Precedents and Dependents

- 1 Click the cell you want to examine.
- 2 Click the Formulas tab.
- 3 Using the controls in the Formula Auditing group, follow either of these steps:
 - Click Trace Precedents.
 - Click Trace Dependents.



Remove Tracer Arrows

- 1 Click the Formulas tab.
- 2 Click the Remove Arrows down arrow, and follow any of these steps:
 - Click Remove Arrows to remove all arrows.
 - Click Remove Precedent Arrows to remove the precedent arrows.
 - Click Remove Dependent Arrows to remove the dependent arrows.



Tip



Tracer arrows are particularly effective when they're used to examine formulas that include named ranges. When you refer to a named range, you know what the indicated cells are supposed to represent.

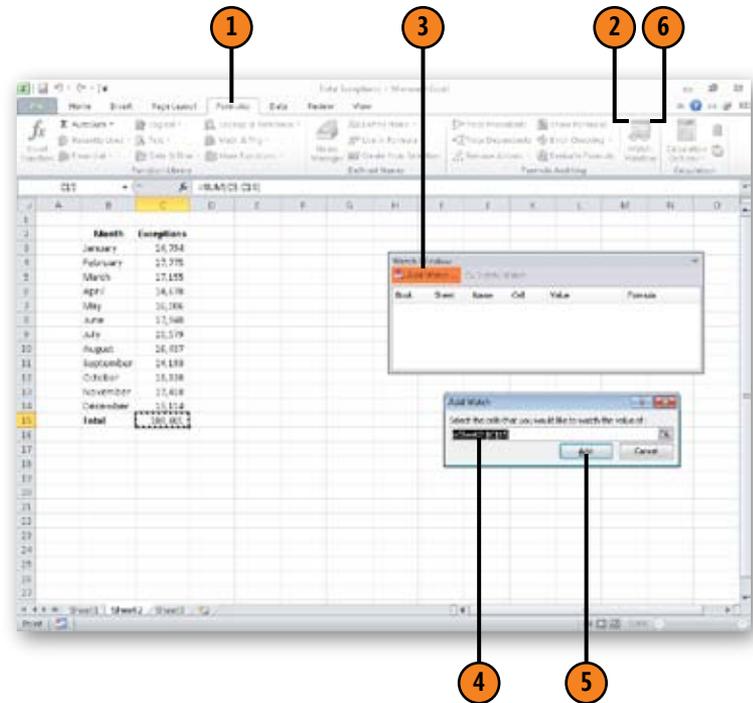
Debugging Your Formulas

When you share a workbook with your colleagues, some of the values in that workbook might change rapidly as new data is entered. For example, workbook data probably will change quickly if you are evaluating stock prices. Stock market values change frequently, so your data will as well. You can monitor the value in a cell even while you're using another workbook by setting a watch. When you set a watch, the values of the cells you're monitoring appear in the Watch Window.

Monitor a Formula for Changes

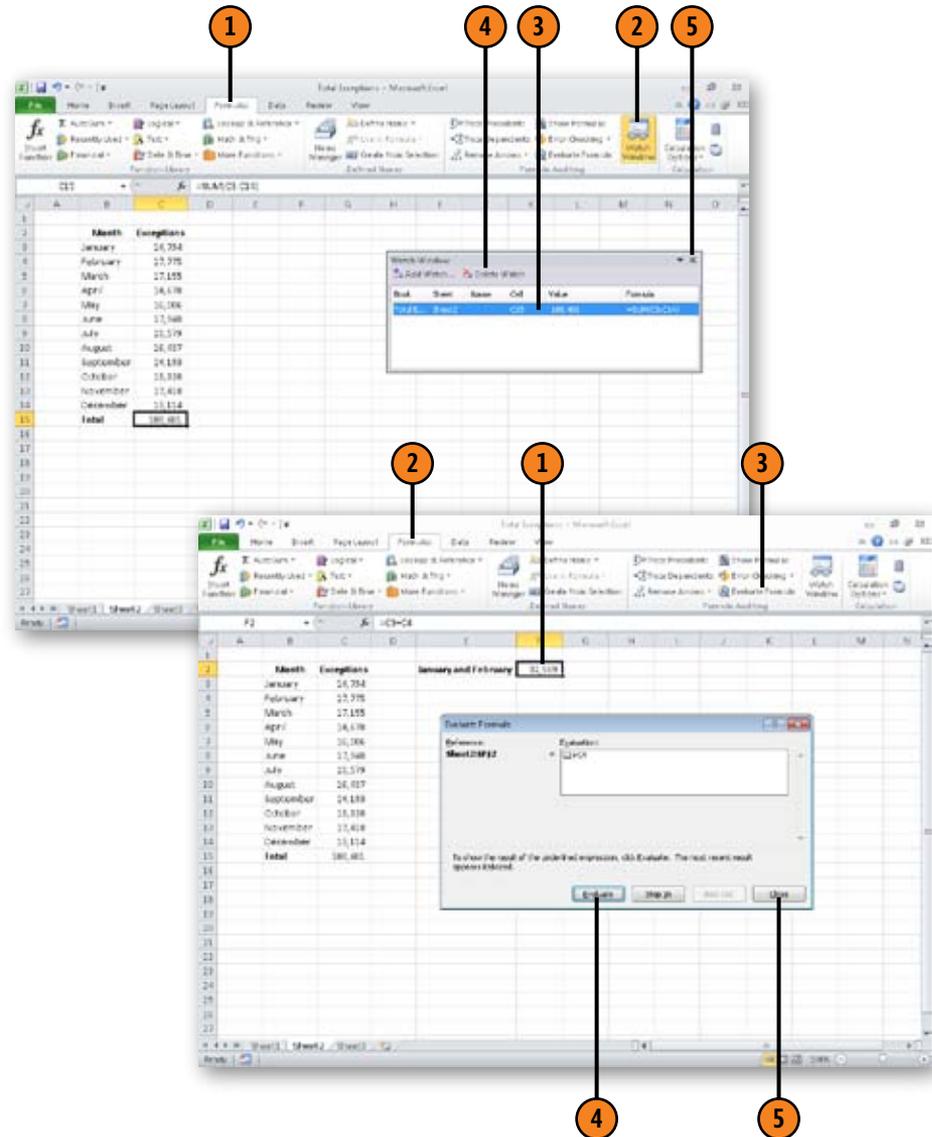
- 1 Click the Formulas tab.
- 2 Click Watch Window.
- 3 Click Add Watch.
- 4 Select the cells you want to watch.
- 5 Click Add.
- 6 Click Watch Window.

Another way you can monitor your data is to check the result of part of a calculation by using the Evaluate Formula dialog box. When you click the Evaluate Formula button, Excel displays the formula in the active cell and the subtotal for part of the calculation. You can move through the formula bit by bit, with Excel showing you the result of each piece of the formula.



Delete a Watch

- 1 Click the Formulas tab.
- 2 Click Watch Window.
- 3 Click the watch you want to delete.
- 4 Click Delete Watch.
- 5 Click the Close button.



Evaluate Parts of a Formula

- 1 Click the cell with the formula you want to evaluate.
- 2 Click the Formulas tab.
- 3 Click Evaluate Formula.
- 4 Click Evaluate (one or more times) to move through the formula's elements.
- 5 Click Close.

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About the Author

Curtis Frye is the author of more than 20 books, including *Microsoft® Office Excel® 2007 Step by Step* and *Microsoft® Office Excel® 2007 Plain & Simple*.