

IN THIS CHAPTER

- Understanding the order in which Excel performs calculations.
- Entering and editing formulas using the point-and-click technique.
- Determining totals quickly with AutoSum.
- Inserting functions to perform complex calculations.
- Troubleshooting calculations in formulas.
- Playing “What If?” with formulas and functions by experimenting with values.



AUTOMATING CALCULATIONS WITH FORMULAS AND FUNCTIONS

Although an Excel worksheet is ideal for arranging entries in columns and rows, that's not its main purpose. You can do that with a table in a word processing application. What makes a worksheet so powerful is that it can perform calculations using various values from the worksheet and values you supply. In addition, you can set up unlimited scenarios for your worksheet that supply different numbers in the calculations, enabling you to play “What if...?” with various sets of numbers! In this chapter, you learn how to unleash the power of Excel's formulas, functions, and other calculation tools.

Learning the Order of Operations

One of your grade school math teachers probably introduced you to the *order of operations*, which governs the order in which a series of mathematical equations is performed. Excel follows this standard order of operations, as well. In every formula, Excel performs the equations from left to right in the following order, which gives some operators *precedence* over others:

- 1st All operations in parentheses
- 2nd Exponential equations or operations
- 3rd Multiplication and division
- 4th Addition and subtraction

Keeping precedence in mind is important when you are entering formulas because the order of operations determines the result. For example, if you wanted to determine the average of the values in cells A1, B1, and C1, and you entered `=A1+B1+C1/3`, Excel would probably generate the wrong answer. Rather than total the three values and then divide by three, as you might expect, Excel first divides the value in C1 by three and then adds that result to A1+B1. It calculates this way because division takes precedence over addition. So, how do you correctly determine this average? You must enclose in parentheses the operations you want performed first. In this example, you need to total A1 to C1 first. To do that, enclose the cell addresses in parentheses: `=(A1+B1+C1)/3`. This tells Excel to total the values *first* and then divide the total by three.

Entering Formulas

As you learned in Chapter 1, “Understanding Excel Worksheets (Spreadsheets),” every formula begins with an equal sign (=) and can include cell references, mathematical symbols (such as + and -), and actual numbers. You enter a formula in the cells in which you want the formula’s *results* displayed. Excel gives you two options for entering formulas: You can use the *point-and-click* technique or type formulas. These techniques are described in the following sections.

Using Point-and-Click Entry

The easiest and most foolproof way to enter a formula is to use the point-and-click approach. You simply start your formula with an equal sign, click cells to add their

addresses to the equation, and type the required mathematical symbols. The following instructions lead you step-by-step through the process:

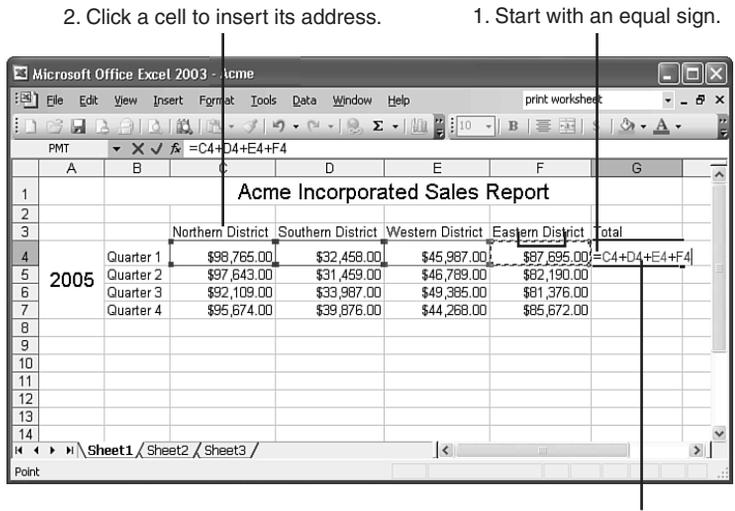
1. Select the cell in which you want the formula's result to appear.
2. Type the equal sign (=).
3. Click the cell whose address you want to appear first in the formula. The cell address appears in the formula bar.
4. Type a mathematical operator after the value to indicate the next operation you want to perform. For example, type + to add the next entry, - to subtract, * to multiply, or / to divide by.
5. Continue clicking cells and typing operators until you finish entering the formula, as shown in Figure 6.1. (Remember to group operations using parentheses, if necessary, to control the order of operations.)
6. When you finish, press **Enter** to accept the formula.



caution

If an error message appears in the cell in which you typed a formula, make sure you did not enter a formula that told Excel to do one of the following: divide by 0 or a blank cell, use a value from a blank cell, delete a cell being used in a formula, or use a range name when a single cell address was expected. For more details about formula error messages, see "Troubleshooting Errors in Formulas," later in this chapter.

FIGURE 6.1
The easiest way to compose formulas is to point and click.



3. Type mathematical operators between cell addresses.

Typing Formulas Manually

Though point-and-click formula entry is the best error-free method of constructing formulas, typing is typically faster. To type a formula, click the cell in which you want the formula's result to appear, and then type the formula, starting with an equal sign, and press **Enter**. To use a value from another cell in your formula, type the cell's address. For example, if cell H3 contains your monthly income and you want to insert your annual income in cell H4, you would type `=H3*12`. This formula tells Excel to multiply the value in cell H3 by 12 and display the result.

Displaying Formulas

When you enter a formula, Excel displays the result of that formula in the cell. When you're checking your worksheet for errors, however, you may want to view the formulas rather than their results. In such cases, you can switch to formula-display mode by pressing `Ctrl+`` (hold down the `Ctrl` key while pressing the grave accent key). Excel not only displays the formula, but also highlights the cells referenced in the formula, as shown in Figure 6.2. Press `Ctrl+`` to switch back to displaying the results. (For more information on viewing and troubleshooting formulas, see "Troubleshooting Errors in Formulas," later in this chapter.)



tip

Name the cells you want to refer to in your formula. You can then use the cell names in your formulas rather than use cryptic cell references. For example, if your worksheet has a cell named `Income` that displays your total income and another cell named `Expenses` that contains your total expenses, you can enter the formula `=Income-Expenses` to determine your net profit. See "Naming Cell Ranges" in Chapter 4, "Entering and Editing Labels and Values."

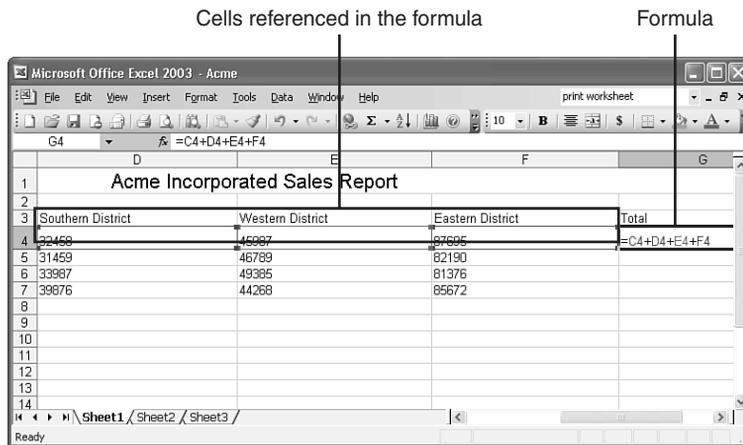


note

To view the formula in a cell when formula-display mode is off, click the cell whose formula you want to view. Excel displays the formula in the formula bar.

FIGURE 6.2

In formula-display mode, Excel displays formulas, rather than their results, in cells.



Editing Formulas

If you make a mistake while entering a formula, backspace over it and enter your correction as you would with any other cell entry. If you already accepted the entry (by pressing Enter or clicking the check mark button), take one of the following steps to edit the entry:

- Double-click the cell to enter Edit mode, and then edit the formula as you would edit any entry.
- Select the cell that contains the formula, click in the formula bar, and edit the formula as you would edit any entry.
- Select the cell that contains the formula, press **F2**, and then edit the formula right inside the cell.

Copying and Pasting Formulas

You can copy and paste formulas just as easily as you copy and paste data entries. When you paste a formula, however, Excel adjusts the cell references in the formula to reflect their new positions in the worksheet. Figure 6.3 illustrates how Excel treats cell references when you paste a formula. Cell B8 contains the formula $=B4+B5+B6+B7$, which determines the total sales revenue for the Northern District. If you copy that formula to cell C8 (to determine the total sales revenue for the Southern District), Excel automatically changes the formula to $=C4+C5+C6+C7$. This is usually what you want Excel to do when you copy or move formulas.

Formula in cell B8 calculates the Northern District's total sales revenue

FIGURE 6.3

Excel adjusts cell references when you copy formulas.

| | A | B | C | D | E | F | G | H | I | |
|---|---|-----------|---------------------------------------|-------------------|------------------|------------------|--------------|---|---|--|
| 1 | | | Acme Incorporated Sales Report | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | Northern District | Southern District | Western District | Eastern District | Total | | | |
| 4 | | Quarter 1 | \$98,765.00 | \$32,458.00 | \$45,987.00 | \$87,695.00 | \$264,905.00 | | | |
| 5 | | Quarter 2 | \$97,643.00 | \$31,459.00 | \$46,789.00 | \$82,190.00 | | | | |
| 6 | | Quarter 3 | \$92,109.00 | \$33,987.00 | \$49,385.00 | \$81,376.00 | | | | |
| 7 | | Quarter 4 | \$95,674.00 | \$39,876.00 | \$44,268.00 | \$85,672.00 | | | | |
| 8 | | Total | \$384,191.00 | \$137,780.00 | | | | | | |

Formula copied into cell C8 determines the Southern District's sales revenue

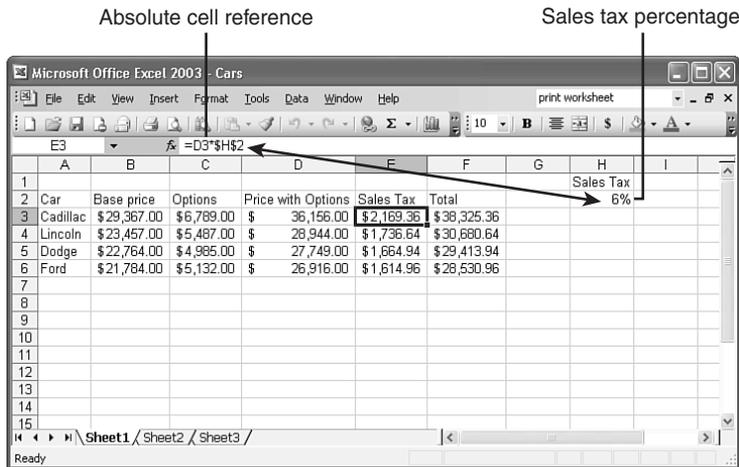
Figure 6.3 shows a formula in which the cell references are *relative*: Excel changes the cell addresses relative to the position of the formula. In this example, the formula was moved one cell to the right, so all the addresses in the formula are also adjusted one cell to the right.

Sometimes, however, you might not want Excel to adjust a cell reference. Say, for instance, that your worksheet has a formula that includes a reference to a cell that contains the state sales tax percentage. You want that cell reference to remain unchanged no matter where you move that formula or paste a copy of it. In such a case, you can mark the cell address in the formula as an *absolute reference* to prevent Excel from changing the address when you copy or move the formula to another cell.

To mark a reference as an absolute, press the **F4** key immediately after typing the reference, or move the insertion point inside the cell reference and press **F4**. When you press this key, Excel places a dollar sign before the column letter and the row number, as shown in Figure 6.4. You can type the dollar signs yourself, but letting Excel do it is usually easier.

You also can mark the column letter *or* the row number (but not both) as absolute. Doing so enables the column letter or row number to change when you copy or move the formula. Keep pressing **F4** until you have the desired combination of dollar signs or type the dollar signs in the cell reference.

FIGURE 6.4
To prevent a cell reference in a formula from changing, mark it as an absolute cell reference.

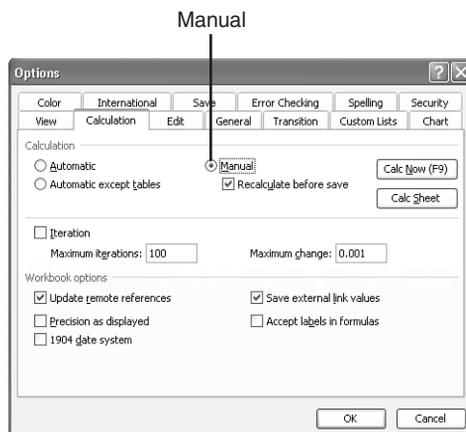


Changing the Recalculation Setting

As you enter formulas, you might notice that Excel immediately performs the calculation and displays the result. If you change a value in a cell that the formula uses, Excel instantly recalculates the entire worksheet! If you have a slow computer and a long worksheet with a lot of formulas, all this recalculating can slow down Excel significantly. To prevent Excel from bogging down, you can turn off the Auto Calculation feature. Here's what you do:

1. Open the **Tools** menu and choose **Options**. The Options dialog box appears.
2. Click the **Calculation** tab. The Calculation options appear, as shown in Figure 6.5.
3. Select **Manual** and click **OK**.

FIGURE 6.5
You can choose manual recalculation to boost Excel's performance.



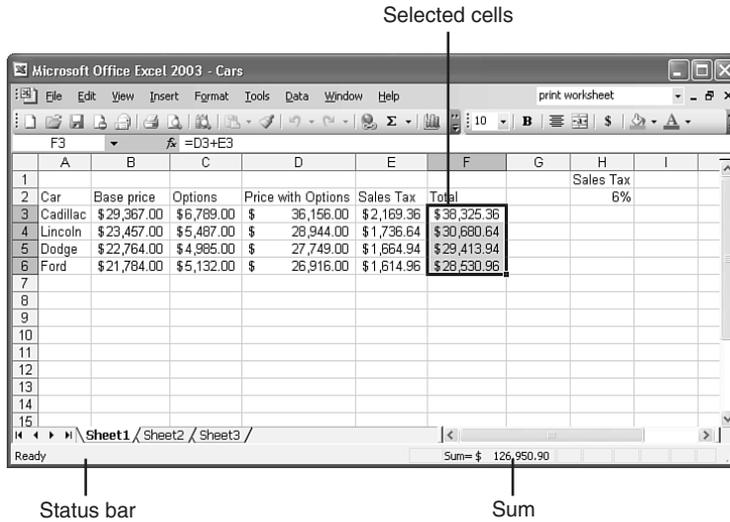
From now on, when you want to recalculate the worksheet, press **F9**.

Using the Auto Calculate Feature

Few Excel users notice that when they select a range of cells that contain values, the status bar displays the sum of those values, as shown in Figure 6.6. This feature provides you with a quick total of any values in the worksheet without your having to use a calculator.

FIGURE 6.6

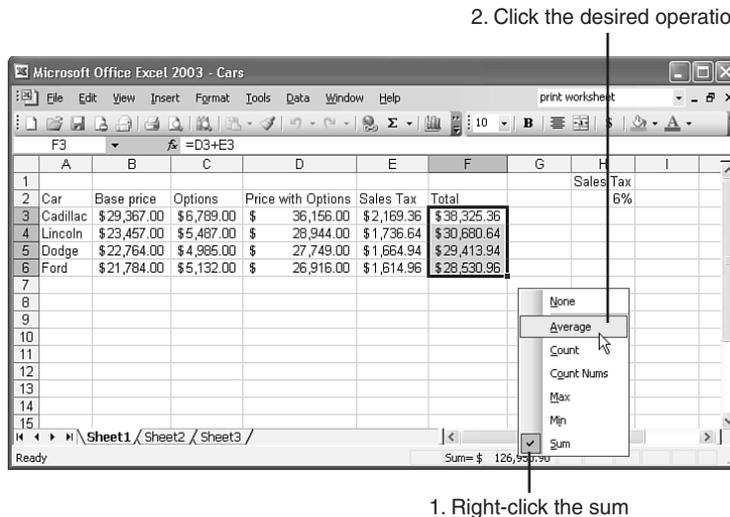
Excel displays the sum of selected values.



Even fewer Excel users realize that they can change the mathematical operation Excel performs on those values. Right-click the sum to display a context menu of available operations, as shown in Figure 6.7, and then click the desired operation.

FIGURE 6.7

You can change the operation Excel performs on the values.



Doing Higher Math with Functions

Functions are ready-made formulas you can use to perform a series of operations using two or more values or a range of values. For example, to determine the sum of a series of values in cells A5 to G5, you can enter the function =SUM(A5:G5) rather than =A5+B5+C5+D5+E5+F5+G5. Other functions can perform more complex operations, such as determining the monthly payment on a loan when you supply the values for the principal, interest rate, and number of payment periods.

Every function must have the following three elements:

- **The equal sign (=):** Indicates that what follows is a formula or function and not a label, value, or date.
- **The function name:** Indicates the type of operation you want Excel to perform—for example, SUM.
- **The argument:** Indicates the cell addresses of the values on which the function acts—for example, A3:F11. The argument is often a range of cells, but it can be much more complex.

A function can be part of another formula. For example, =SUM(A3:A9)+B43 uses the SUM function along with the addition operator to add the value in cell B43 to the total of the values in cells A3 to A9.

Using the AutoSum Tool

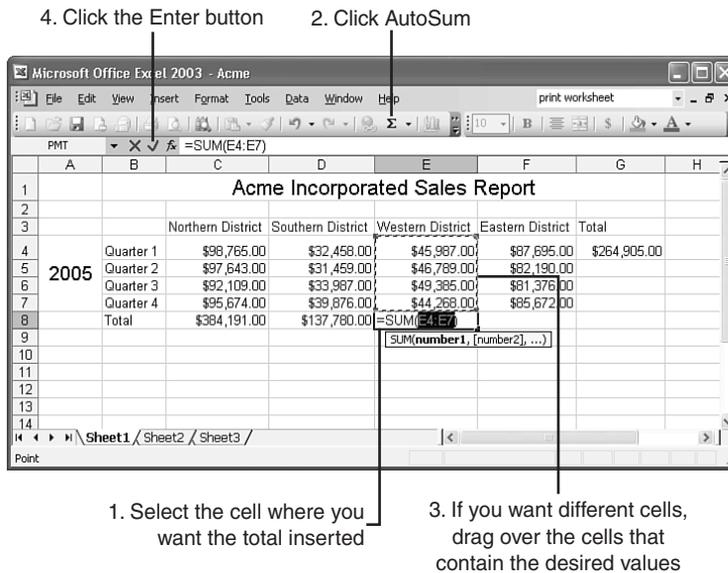
One of the tasks you perform most often is totaling a row or column of values. To simplify the process, Excel provides a tool devoted to determining totals: *AutoSum*.

 To quickly determine the total of a row or column of values, first click an empty cell to the right of the row or just below the column of values. Then click the **AutoSum** button in the Standard toolbar, as shown in Figure 6.8. AutoSum assumes you want to add the values in the cells to the left of or above the currently selected cell, so it displays a marching ants box (called a *marquee*) around those cells. If AutoSum selects an incorrect range of cells, you can edit the selection by dragging over the cells whose values you want to total. When the AutoSum formula is correct, press **Enter** or click another cell.

If your worksheet has two or more cells that contain subtotals, you also can use AutoSum to determine the grand total. Click the cell in which you want to insert the grand total, and then click the **AutoSum** button. Click the first subtotal, and then **Ctrl+click** any additional subtotals you want to include in the grand total. Press **Enter**.

FIGURE 6.8

With the click of a button, AutoSum determines the total.



Note that the AutoSum button doubles as a drop-down list. Click the arrow to the right of the button to access these additional functions:

- **Average** totals the values in the selected cells and divides by the number of values totaled to determine the average value.
- **Count** tallies the number of selected cells to determine the number of entries.
- **Max** compares all values in the selected cells and displays the highest value.
- **Min** compares all values in the selected cells and displays the lowest value.
- **More Functions** displays the Insert Function dialog box, which leads you through the process of selecting a function and constructing the required argument. See the following section, “Entering Functions with the Insert Function Dialog Box.”

Entering Functions with the Insert Function Dialog Box

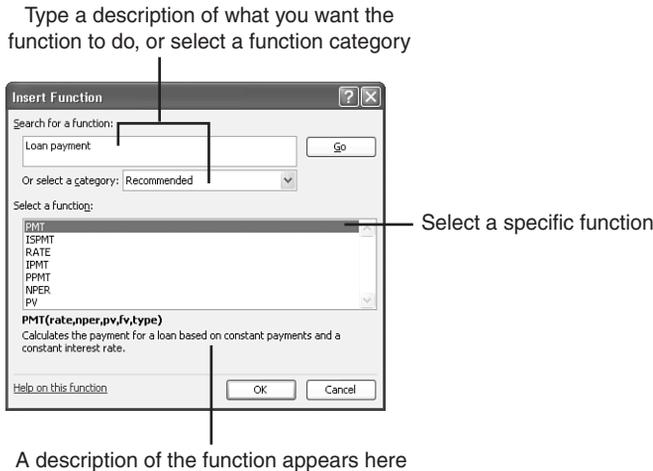
The SUM and AVERAGE functions are fairly easy to enter because their arguments consist merely of a string of numbers. Some of the other functions, however—such as the financial function that determines the payment on a loan—contain several values and require you to enter those values in the proper *syntax* (order). To type the function, you must remember its name and know the required syntax, which can be quite difficult. The *Insert Function* dialog box can simplify the process greatly.

To use the Insert Function dialog box to paste a function into a cell, follow these steps:

1. Select the cell in which you want to insert the function.
2.  Open the **Insert** menu and select **Function**, or click the arrow to the right of the AutoSum button and click **More Functions**, or click the **fx** button in the formula bar. The Insert Function dialog box appears, as shown in Figure 6.9, displaying a list of available functions.

FIGURE 6.9

The Insert Function dialog box enables you to select the function rather than type it.

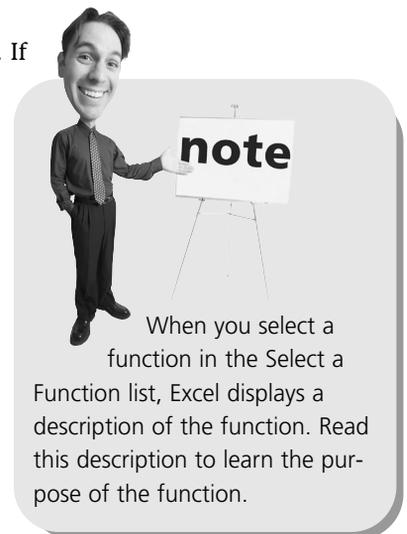


3. Perform one of the following steps:

In the **Search for a Function** box, type a description of what you want the function to do, and then click the **Go** button or press **Enter**.

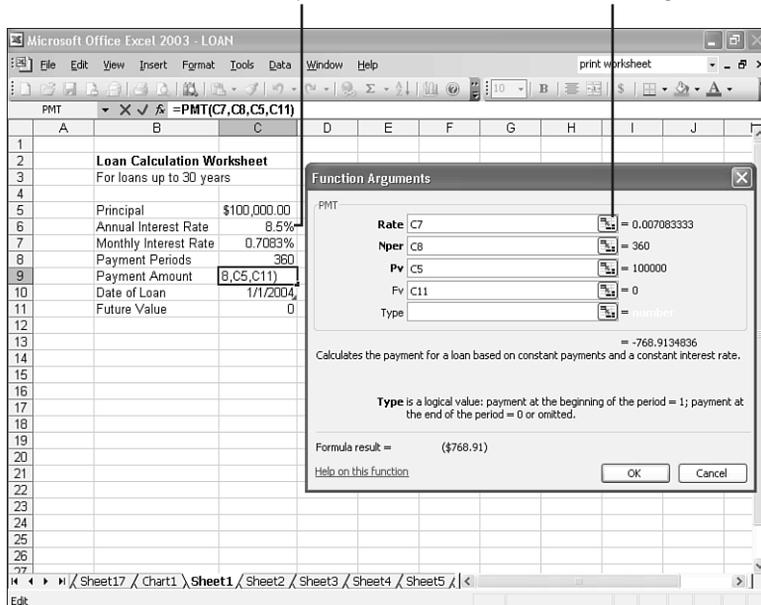
Open the **Or Select a Category** list and select the type of function you want to insert. If you're not sure, select **All** to display the names of all the functions; they are listed alphabetically.

4. Select the function you want to insert from the **Select a Function** list, and click **OK**. The Function Arguments dialog box appears, as shown in Figure 6.10, prompting you to type the argument. You can type values or cell addresses in the various text boxes. Alternatively, you can click the button to the right of the text box and then click the cell that contains the specified value.



- 2. Click the cell that contains the specified value
- 1. Click one of these buttons to hide the dialog box

FIGURE 6.10
Enter the values and cell references that make up the argument.



- 5. Enter the values or cell ranges for the argument. You can type a value or an argument, or click the cells that contain the required values. (Some arguments, such as those that start with “If,” are optional. Excel must “decide” which action to perform based on entries in your worksheet.)
- 6. Click **OK** or press **Enter**. Excel inserts the function and argument in the selected cell and displays the result.

When you need to edit a function, select the cell that contains the function you want to edit. (Make sure you’re not in Edit mode; that is, the insertion point should not appear in the cell. If the insertion point appears in the cell, click a different cell, and then click this cell again.) Open the **Insert** menu and select **Function**, or click the **Insert Function**

caution

If you click a button for one of the items in the Function Arguments dialog box, Excel tucks the dialog box out of the way, displaying the address of the currently selected cell and a button for bringing the dialog box back into view. After you select the desired cell, click the button to the right of the cell address to redisplay the dialog box.

button. This displays the Function Arguments dialog box, which helps you edit your argument.

Seeing a Loan Function in Action

To get some hands-on experience with functions, let's take a look at the PMT (*payment*) function. This function determines the monthly payment on a loan based on the loan amount, rate, and payment periods. Here's how the function and its arguments appear:

=PMT(rate,nper,pv,fv,type)

Let's break this down:

= is an essential element in the function statement, as explained earlier.

PMT is the function name, which stands for "payment."

rate is the percentage rate of the loan per period. In other words, if you take out a 30-year mortgage at 6.5% and plan to make payments every month, the rate is 6.5%/12 or .541666%.

nper is the number of payment periods. For example, on a 30-year mortgage, 12 payments are due per year, so the total number of payment periods would be 360.

pv, which stands for "present value," is the total amount you plan to borrow. This amount must be entered as a negative value. For example, if you're taking out a \$120,000 loan, you would enter **-120000**.

fv, which stands for "future value," is zero—that is, the amount the loan will be worth after you pay the last payment.

type specifies the day in the payment period on which you are required to submit the payment—0 (or omit the type entry) for the last day of the payment period or 1 for the first day.

You can type a function using values in place of the codes. For example, to determine the payment on a \$120,000, 30-year loan, at 6.5%, you could type the following:

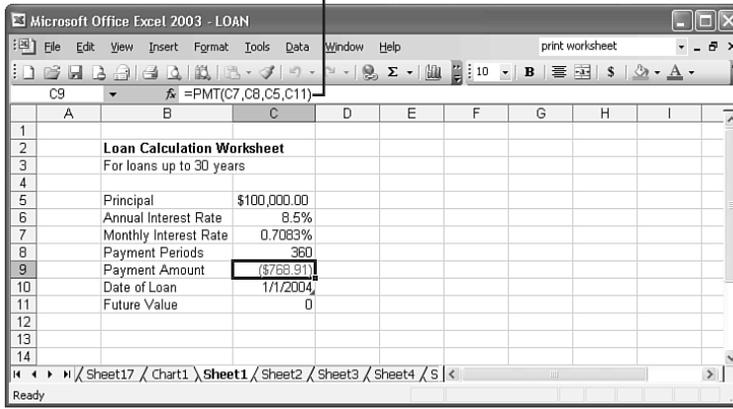
=PMT(.065/12,360,-120000,0,0)

Or, you could use cell references in place of the values. Figure 6.11 shows a sample worksheet used to determine the monthly mortgage payment on a personal loan. Note that each value in the typed example is in a separate cell, and that the function uses cell references in place of actual values.

Function uses cell references

FIGURE 6.11

Use cell references instead of values.



Troubleshooting Errors in Formulas

When you enter a formula or function correctly, the cell that contains the formula or function displays the correct result of the equation. If the result is incorrect or the cell displays one of the error messages described in Table 6.1, the formula or function has a problem.

TABLE 6.1 Formula and Function Error Messages

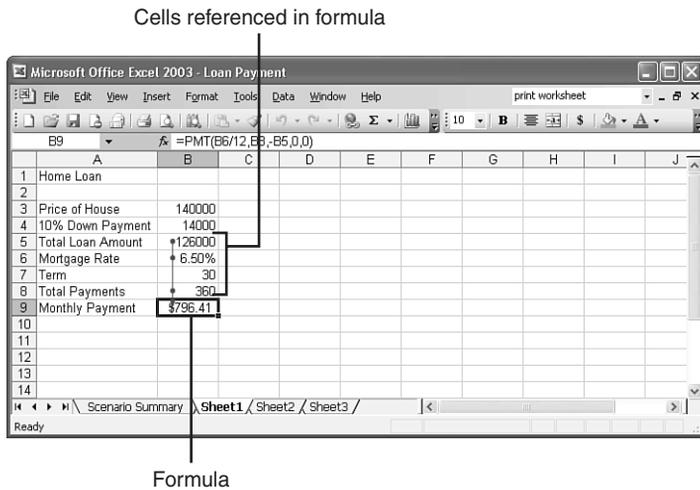
| Error Message | Indicates |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ##### | Cell is too narrow to display the result. |
| #VALUE! | The wrong type of function, argument, or operand is in use. |
| #DIV/0! | The formula or function calls on Excel to divide a value by zero. In math, you are never allowed to divide a number by zero. |
| #NAME? | Excel does not recognize a cell reference or other text in the formula or function. Usually caused by a typo. |
| #N/A | A particular value inside the formula or function is unavailable to it. |
| #REF! | The formula or function contains an invalid cell reference. |
| #NUM! | A numerical value inside the formula or function is invalid. |
| #NULL! | The formula or function references an intersection of two ranges that do not intersect. Usually indicates that the formula has a space between two cell references instead of an operator or comma. |

In many cases, you can spot the cause of the problem by taking a quick glance at the formula or function. You may have mistyped an operator or cell reference or

selected the wrong cell. To spot errors in more complex formulas and functions, however, you might need help. Fortunately, Excel features three of its very own *worksheet auditors* that can help you track down the causes of most errors. Following is a list of the worksheet auditors with a brief description of each:

- **Trace Precedents** highlights the cells that supply values to the formulas, as shown in Figure 6.12. You can then verify the cell references in the formula and check to make sure the cells contain the correct values.

FIGURE 6.12
Trace Precedents highlights the cells that supply values to the formula.



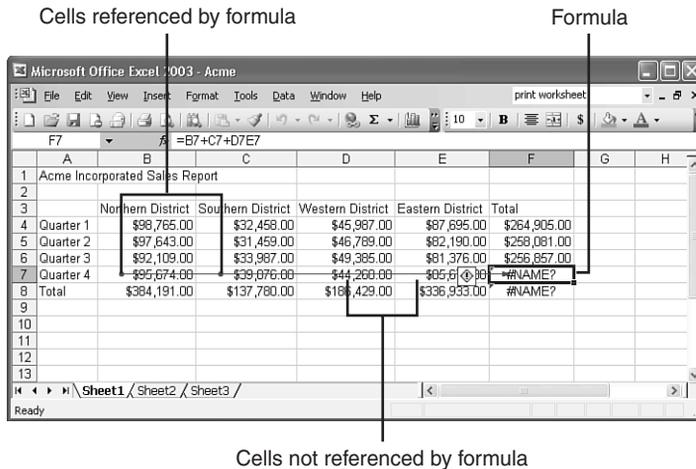
- **Trace Dependents** highlights cells containing formulas that reference the currently selected cell.
- **Trace Error** highlights any likely causes of a particular error message that appears in a cell that contains a formula or function. Trace Error checks for syntax errors, wrong operands (mathematical symbols), and other possible causes.

To run any one of these worksheet auditors, follow these steps:

1. Click the cell that contains the function or formula that is not working properly (or the cell that is referenced by a problem formula or function).
2. Open the **Tools** menu, point to **Formula Auditing**, and select the desired auditing tool: **Trace Precedents**, **Trace Dependents**, or **Trace Error**. The auditing tool displays arrows that point to the referenced cells or highlights errors. Figure 6.13 shows a worksheet analyzed by Trace Error.

FIGURE 6.13

Trace Error can help you inspect a formula for common errors.



4. Examine the contents of the cells that supply values to the formula, and examine the formula for any faulty cell references, wrong mathematical operators, and typos.
5. To remove the auditor's highlighting and arrows, open the **Tools** menu, point to **Formula Auditing**, and click **Remove All Arrows**.

Playing "What If?" with Scenarios

Say you're purchasing a home and need some idea of how much your monthly mortgage payment is going to be for various loan amounts. You have successfully created a worksheet that determines the monthly payment for a \$120,000 house at 6.5%, but you want to know what the payment would be for a \$110,000, a \$130,000, and a \$140,000 home. You also want to see the effects of other loan rates. You could create a bunch of separate worksheets, but a better solution is to create several scenarios for the same worksheet. A *scenario* is simply a set of values you plug into variables in the worksheet.

Excel offers a tool that enables you to plug various sets of values into your formulas to determine the effects of different values on the outcome. The following sections show you how to create and manage your own scenarios.

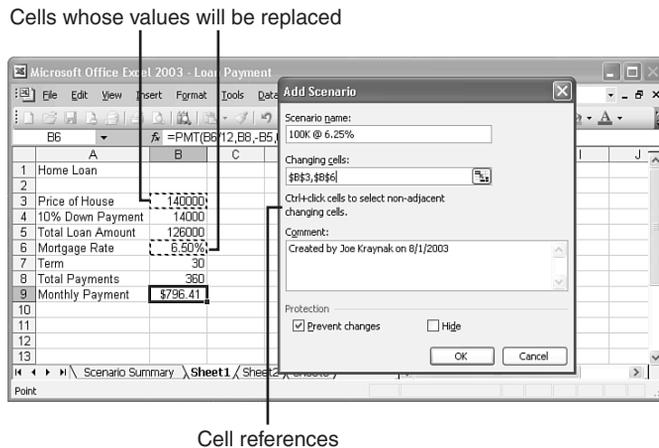
Naming and Saving Different Scenarios

Making a scenario is fairly simple. You name the scenario, tell Excel which cells have the values you want to play with, and then type the replacement values you

want Excel to use for the scenario. The following step-by-step instructions walk you through the process:

1. Display the worksheet for which you want to create a scenario.
2. Open the **Tools** menu and choose **Scenarios**. The Scenario Manager appears, indicating that this worksheet has no current scenarios.
3. Click the **Add** button. The Add Scenario dialog box appears.
4. Type a name for the scenario that describes the specific changes you're going to make. For example, if you were creating this scenario to determine payments for a \$130,000 house at 6.75%, you might type **130K @ 6.75%**.
5. Click the **Changing Cells** text box, and click the cell that contains the value you want to change in your scenario, as shown in Figure 6.14. To change values in other cells, hold down the **Ctrl** key and click them. (When you do, Excel inserts the addresses of the changing cells as absolute references, separating them with commas.)

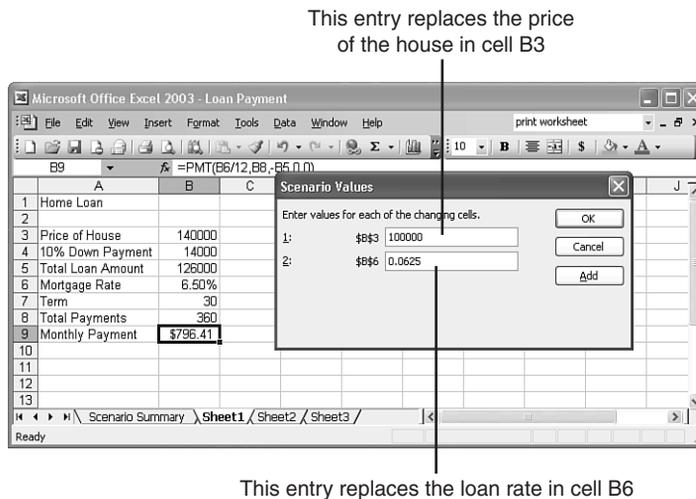
FIGURE 6.14
Choose the cells that contain the values you want to play with.



6. Click **OK**. The Scenario Values dialog box displays the current values in the cells you want to change.
7. Type the values you want to use for this scenario, as shown in Figure 6.15, and click **OK**. The Scenario Manager displays the name of the new scenario.
8. To view a scenario, click its name and click the **Show** button. Excel replaces the values in the changing cells with the values you entered for the scenario.

FIGURE 6.15

To make a scenario, enter different values for the variables.



Viewing the Results of Different Scenarios

Whenever you want to play with the various scenarios you've created, open the **Tools** menu and choose **Scenarios**. When you choose this option, Excel displays the Scenario Manager, introduced in the preceding section. The Scenario Manager offers the following buttons for managing and displaying your scenarios:

- **Show:** Displays the results of the selected scenario right inside the worksheet.
- **Add:** Enables you to add another scenario.
- **Delete:** Removes the selected scenario.
- **Edit:** Enables you to select different cells used for the scenario and insert different values for the variables.
- **Merge:** Takes scenarios from various worksheets and places them on a single worksheet.
- **Summary:** Displays the results of the various worksheets on a single worksheet, as explained in the next section, "Creating a Summary Report."

To play "What if?" with various scenarios, follow these steps to shift from one scenario to another:

1. Open the **Tools** menu and choose **Scenarios**. The Scenario Manager appears.
2. Click the name of the scenario you want to view.

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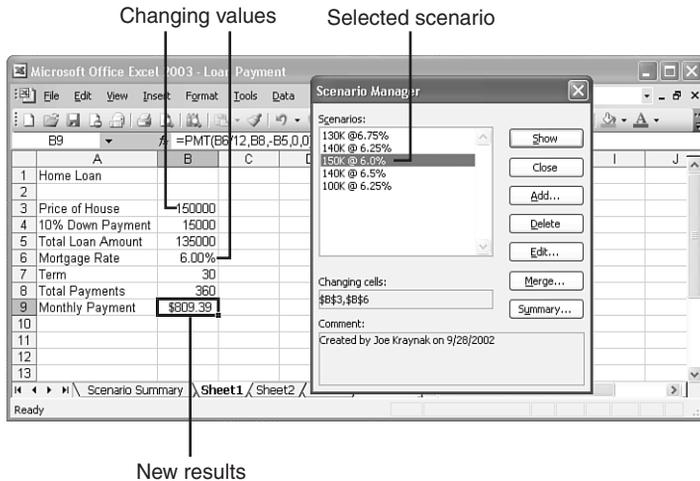
When working with scenarios, make sure the Auto Calculate feature is on, as explained earlier in this chapter. If the Calculation option is set to Manual, whenever you choose a scenario in the Scenario Manager and click Show, Excel does *not* recalculate the result using the scenario's values. To see the results, you must then close the Scenario Manager and press F9 to calculate the results.



3. Click the **Show** button. Excel replaces the values in the changing cells with the values from the scenario and shows the results. See Figure 6.16.
4. Repeat Steps 2 and 3 for any other scenarios you want to view.
5. When you're finished examining scenarios, click the **Close** button.

FIGURE 6.16

Scenario Manager enables you to flip through the various scenarios to compare results.



Creating a Summary Report

Flipping through scenarios is an excellent way to see how the various scenarios affect the bottom line, but for a more thorough approach, consider creating a *scenario report*. A scenario report is a new, separate worksheet that displays the results of all your scenarios on a single page. And best of all, scenario reports are easy to create. Take the following steps:

1. Open the workbook that contains the desired scenarios.
2. Open the **Tools** menu and choose **Scenarios**. The Scenario Manager appears.
3. Click the **Summary** button. The Scenario Summary dialog box appears, prompting you to choose a report type and specify the cell in which the result appears.
4. Make sure Scenario Summary is selected and that the cell in which the scenario's result is displayed is selected.
5. Click **OK**. Excel creates a scenario report and displays a new worksheet tab for it, called Scenario Summary, as shown in Figure 6.17.
6. When you're finished with the report, simply click the tab for a different worksheet.

FIGURE 6.17

The Scenario Summary Report displays the results for all your scenarios on a single worksheet.

| Scenario Summary | | | | | | |
|--------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
| Current Values: 130K @ 6.75% 140K @ 6.25% 150K @ 6.0% 140K @ 6.5% 100K @ 6.25% | | | | | | |
| Changing Cells: | | | | | | |
| \$B\$3 | 150000 | 130000 | 140000 | 150000 | 140000 | 100000 |
| \$B\$6 | 6.00% | 6.75% | 6.25% | 6.00% | 6.50% | 6.25% |
| Result Cells: | | | | | | |
| \$B\$9 | \$809.39 | \$758.86 | \$775.80 | \$809.39 | \$796.41 | \$554.15 |
| Notes: Current Values column represents values of changing cells at | | | | | | |
| time Scenario Summary Report was created. Changing cells for each | | | | | | |
| scenario are highlighted in gray. | | | | | | |

To get rid of the scenario report altogether, right-click the **Scenario Summary** tab and select **Delete**.

THE ABSOLUTE MINIMUM

The most powerful features of any worksheet are the formulas and functions it contains. You can now create custom accounting sheets, complete with their very own built-in calculators. Specifically, you learned how to

- Control the order in which Excel carries out its mathematical operations.

- Enter formulas by typing them or using the point-and-click technique.

- Copy and paste formulas and control cell references in formulas by marking them as absolute or relative.

- Insert functions for performing more complex mathematical operations.

- Track down the cause of many of the most common formula errors.

- Play “What if?” by creating scenarios that substitute one set of key values for another set of key values in a worksheet.

With the skills you acquired in this chapter, you can create a dynamic worksheet capable of computing accurate results in a matter of seconds. In addition, you can safely experiment with other values without affecting the condition of your original worksheet. Now that you have a working worksheet, it's time to move on to the next part, “Formatting, Charting, and Printing Your Worksheet.”