

Excel 2007

Basic Functions

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Excel 2007: Basic Functions

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What are formulas?

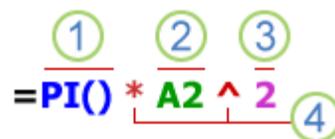
Formulas are equations that perform calculations on values in your worksheet. A formula starts with an **equal sign (=)**. For example, the following formula multiplies 2 by 3 and then adds 5 to the result.

=5+2*3

A formula can also contain any or all of the following: functions.

Parts of a formula

- 1 Functions:** The PI() function returns the value of pi: 3.142...
- 2 References:** A2 returns the value in cell A2.
- 3 Constants:** Numbers or text values entered directly into a formula, such as 2.
- 4 Operators:** The ^ (caret) operator raises a number to a power, and the * (asterisk) operator multiplies.



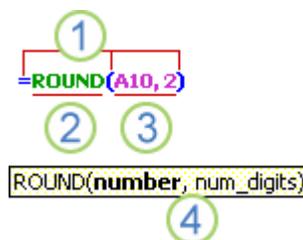
What are functions?

Functions are predefined formulas that perform calculations by using specific values, called arguments, in a particular order, or structure. Functions can be used to perform simple or complex calculations.

The following example of the ROUND function rounding off a number in cell A10 illustrates the syntax of a function.

Structure of a function

- 1 Structure.** The structure of a function begins with an equal sign (=), followed by the function name, an opening parenthesis, the arguments for the function separated by commas, and a closing parenthesis.
- 2 Function name.** For a list of available functions, click a cell and press SHIFT+F3.
- 3 Arguments.** Arguments can be numbers, text, logical values such as TRUE or FALSE, arrays, error values such as #N/A, or cell references. The argument you designate must produce a valid value for that argument. Arguments can also be constants, formulas, or other functions.
- 4 Argument tooltip.** A tooltip with the syntax and arguments appears as you type the function. For example, type `=ROUND(` and the tooltip appears. Tooltips only appear for built-in functions.



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Calculation operators and precedence

Operators specify the type of calculation that you want to perform on the elements of a formula. There is a default order in which calculations occur, but you can change this order by using parentheses.

Types of operators

There are four different types of calculation operators: arithmetic, comparison, text concatenation, and reference.

- **Arithmetic operators**

To perform basic mathematical operations such as addition, subtraction, or multiplication; combine numbers; and produce numeric results, use the following arithmetic operators.

Arithmetic operator	Meaning	Example
+ (plus sign)	Addition	3+3
- (minus sign)	Subtraction Negation	3-1 -1
* (asterisk)	Multiplication	3*3
/ (forward slash)	Division	3/3
% (percent sign)	Percent	20%
^ (caret)	Exponentiation	3^2

- **Comparison operators**

You can compare two values with the following operators. When two values are compared by using these operators, the result is a logical value either TRUE or FALSE.

Comparison operator	Meaning	Example
= (equal sign)	Equal to	A1=B1
> (greater than sign)	Greater than	A1>B1
< (less than sign)	Less than	A1<B1
>= (greater than or equal to sign)	Greater than or equal to	A1>=B1
<= (less than or equal to sign)	Less than or equal to	A1<=B1
<> (not equal to sign)	Not equal to	A1<>B1

- **Text concatenation operator**

Use the ampersand (&) to join, or concatenate, one or more text strings to produce a single piece of text.

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Text operator	Meaning	Example
& (ampersand)	Connects, or concatenates, two values to produce one continuous text value	("North"&"wind")

- **Reference operators**

Combine ranges of cells for calculations with the following operators.

Reference operator	Meaning	Example
: (colon)	Range operator, which produces one reference to all the cells between two references, including the two references	B5:B15
, (comma)	Union operator, which combines multiple references into one reference	SUM(B5:B15,D5:D15)
(space)	Intersection operator, which produces one reference to cells common to the two references	B7:D7 C6:C8

The order in which Excel performs operations in formulas

In some cases, the order in which calculation is performed can affect the return value of the formula, so it's important to understand how the order is determined and how you can change the order to obtain desired results.

- **Calculation order**

Formulas calculate values in a specific order. A formula in Excel always begins with an equal sign (=). The equal sign tells Excel that the succeeding characters constitute a formula. Following the equal sign are the elements to be calculated (the operands), which are separated by calculation operators. Excel calculates the formula from left to right, according to a specific order for each operator in the formula.

- **Operator precedence**

If you combine several operators in a single formula, Excel performs the operations in the order shown in the following table. If a formula contains operators with the same precedence — for example, if a formula contains both a multiplication and division operator — Excel evaluates the operators from left to right.

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Operator	Description
: (colon) (single space) , (comma)	Reference operators
–	Negation (as in –1)
%	Percent
^	Exponentiation
* and /	Multiplication and division
+ and –	Addition and subtraction
&	Connects two strings of text (concatenation)
= < > <= >= <>	Comparison

Use more than one math operator in a formula

If a formula has more than one operator, Excel follows the rules of operator precedence instead of just calculating from left to right. Multiplication is done before addition: $=11.97+3.99*2$ is 19.95. Excel multiplies 3.99 by 2, and then adds the result to 11.97.

Operations inside parentheses take place first: $=(11.97+3.99)*2$ is 31.92. Excel adds first and then multiplies the result by 2.

Excel does use operators from left to right if they have the same level of precedence. Multiplication and division are on the same level. Lower than multiplication and division, addition and subtraction are on the same level.

Use of parentheses

To change the order of evaluation, enclose in parentheses the part of the formula to be calculated first. For example, the following formula produces 11 because Excel calculates multiplication before addition. The formula multiplies 2 by 3 and then adds 5 to the result.

$=5+2*3$

In contrast, if you use parentheses to change the syntax, Excel adds 5 and 2 together and then multiplies the result by 3 to produce 21.

$=(5+2)*3$

In the example below, the parentheses around the first part of the formula force Excel to calculate $B4+25$ first and then divide the result by the sum of the values in cells D5, E5, and F5.

$=(B4+25)/SUM(D5:F5)$

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Enter formulas

- **Add, divide, multiply, and subtract**

Type an equal sign (=), use a math operator (+,-,*,/), and then press ENTER.

Formulas are visible in the formula bar  when you click a cell that contains a result. If the formula bar is not visible, on the **View** tab on the Ribbon, in the **Show/Hide** group, select the **Formula Bar** check box.

Instead of entering values directly in the formula, you should refer to the cells that contain the values that you want to calculate. Using cell references in a formula makes sure that any changes to the values are automatically updated in the calculation result of the formula.

1. On a worksheet, click the cell in which you want to enter the formula.
2. To start the formula, type =
3. To enter the first numeric value, do one of the following:
 - Type the value that you want to use.
 - Select the cell that contains the value that you want to use.
4. To enter the math operator that you want to use, do one of the following:
 - To use a plus sign (+) to add the values in the formula, type +
 - To use a minus sign (-) to subtract the values in the formula, type -. There is no **SUBTRACT** function in Excel. Use the **SUM** function and convert any numbers that you want to subtract to their negative values. For example, **SUM(100,-32,15,-6)** returns 77.
 - To use an asterisk (*) to multiply the values in the formula, type *. You can use **PRODUCT** function as well.
 - To use a forward slash (/) to divide the values in the formula, type /
5. To enter the next value numeric value, do the following:
 - Type the value that you want to use.
 - Select the cell that contains the value that you want to use.
6. Repeat steps 4 and 5 for any additional math operations and values that you want to include in the formula.

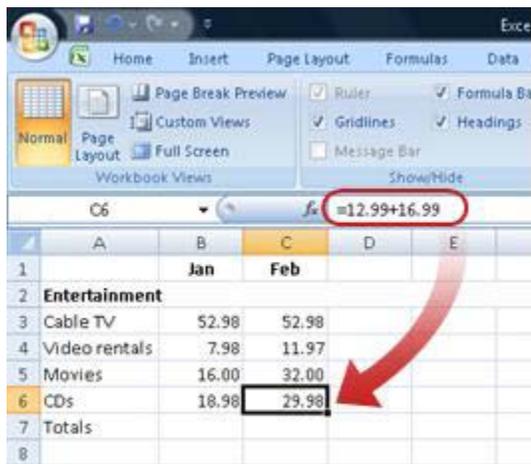
TIP: For an operation to take precedence in the calculation, use parentheses around that operation. For example, type $=(10+5)*2$ or $=(A1+B1)*C1$.

7. When the formula is complete, press ENTER.

By default, the resulting value of the formula appears in the selected cell, and the formula itself is displayed in the formula bar.

NOTE: If results are not updated, on the **Formulas** tab, in the **Calculation** group, click **Calculation Options**. Then click **Automatic**.

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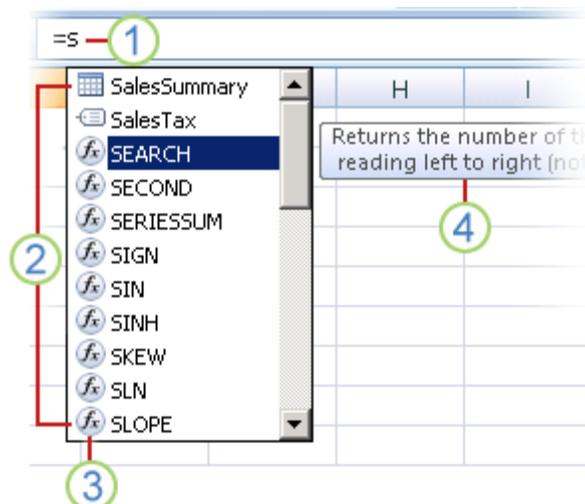
- **Multiply a range of numbers by a number**

IMPORTANT: This procedure replaces the numbers in the range with the result of the multiplication.

1. In an empty cell, enter the number that you want to multiply by.
2. Select the cell, and on the **Home** tab, in the **Clipboard** group, click **Copy** .
3. Select the range of numbers that you want to multiply.
4. On the **Home** tab, in the **Clipboard** group, click the arrow below **Paste**, and then click **Paste Special**.
5. Under **Operation**, click **Multiply**.
6. Click **OK**.
7. Delete the content of the cell entered in the first step.

- **Use Formula AutoComplete**

To make it easier to create and edit formulas and minimize typing and syntax errors, use Formula AutoComplete. After you type an = (equal sign) and beginning letters or a display trigger, Microsoft Office Excel displays below the cell a dynamic drop-down list of valid functions, names, and text strings that match the letters or trigger. You can then insert an item in the drop-down list into the formula by using an insert trigger.



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- 1 Type the **= (equal sign) and beginning letters** or a display trigger to start Formula AutoComplete
- 2 As you type, a scrollable list of valid items is displayed with the closest match highlighted.
- 3 Icons represent the type of entry, such as a function or table reference.
- 4 Detailed ScreenTips help you make the best choice.

- **Turn Formula AutoComplete on or off**

1. Click the **Microsoft Office Button** , click **Excel Options**, and then click the **Formulas** category.
2. Under **Working with formulas**, select or clear **Formula AutoComplete**.

TIP: You can also press **ALT+DOWN ARROW**.

- **Use Function ScreenTips**

If you are familiar with the arguments of a function, you can use the function ScreenTip that appears after you type the function name and an opening parenthesis. Click the function name to view the Help topic on the function, or click an argument name to select the corresponding argument in your formula.

- **Create a simple formula by using constants and calculation operators**

1. **Click the cell** in which you want to enter the formula.
2. Type **= (equal sign)**.
3. To enter the formula, do one of the following:
 - **Type the constants and operators** that you want to use in the calculation.

Example formula	What it does
=5+2	Adds 5 and 2
=5-2	Subtracts 2 from 5
=5/2	Divides 5 by 2
=5*2	Multiplies 5 times 2
=5^2	Raises 5 to the 2nd power

- **Click the cell that contains the value** that you want to use in the formula, type the operator that you want to use, and then click another cell that contains a value.

Example formula	What it does
=A1+A2	Adds the values in cells A1 and A2
=A1-A2	Subtracts the value in cell A2 from the value in A1
=A1/A2	Divides the value in cell A1 by the value in A2
=A1*A2	Multiplies the value in cell A1 times the value in A2
=A1^A2	Raises the value in cell A1 to the exponential value specified in A2

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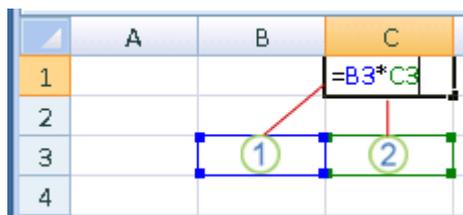
TIP: You can enter as many constants and operators as you need to achieve the calculation result that you want.

4. Press **ENTER**.

• Create a formula by using cell references and names

The example formulas at the end of this section contain relative references to and names of other cells. The cell that contains the formula is known as a dependent cell when its value depends on the values in other cells. For example, cell B2 is a dependent cell if it contains the formula **=C2**.

1. **Click the cell** in which you want to enter the formula.
2. In the formula bar , type **= (equal sign)**.
3. Do one of the following:
 - To create a reference, **select a cell, a range of cells**, a location in another worksheet, or a location in another workbook. This behavior is called semi-selection. You can drag the border of the cell selection to move the selection, or drag the corner of the border to expand the selection.



1 The first cell reference is B3, the color is blue, and the cell range has a blue border with square corners.

2 The second cell reference is C3, the color is green, and the cell range has a green border with square corners.

NOTE: If there is no square corner on a color-coded border, the reference is to a named range.

- To enter a reference to a named range, press F3, select the name in the Paste name box, and click OK.

Example formula	What it does
=C2	Uses the value in the cell C2
=Sheet2!B2	Uses the value in cell B2 on Sheet2
=Asset-Liability	Subtracts the value in a cell named Liability from the value in a cell named Asset

4. Press **ENTER**.

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- **Create a formula by using a function**

1. **Click the cell** in which you want to enter the formula.
2. To start the formula with the function, click **Insert Function**  on the formula bar .
3. **Select the function** that you want to use.

You can enter a question that describes what you want to do in the **Search for a function** box (for example, "add numbers" returns the **SUM** function), or browse from the categories in the **Or Select a category** box.

4. **Enter the arguments.**

TIP: To enter cell references as an argument, click **Collapse Dialog**  (which temporarily hides the dialog box), select the cells on the worksheet, and then press **Expand Dialog** .

Example formula	What it does
=SUM(A:A)	Adds all numbers in column A
=AVERAGE(A1:B4)	Averages all numbers in the range

5. After you complete the formula, press **ENTER**.

TIP: To summarize values quickly, you can also use AutoSum. On the Home tab, in the Editing group, click AutoSum, and then click the function that you want.

Delete a formula

When you delete a formula, the resulting values of the formula is also deleted. However, you can instead remove the formula only and leave the resulting value of the formula displayed in the cell.

To delete formulas along with their resulting values, do the following:

1. **Select the cell or range of cells** that contains the formula.
2. Press **DELETE**.

To delete formulas without removing their resulting values, do the following:

1. Select the cell or range of cells that contains the formula.
If the formula is an array formula, select the range of cells that contains the array formula.
 2. On the **Home** tab, in the **Clipboard** group, click **Copy** .
- Keyboard shortcut** You can also press CTRL+C.

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3. On the **Home** tab, in the **Clipboard** group, click the arrow below **Paste** , and then click **Paste Values**.

Let the Status Bar do the work



Why struggle with creating formulas when the answers are already at the bottom of the screen? Select some data, and Excel immediately analyzes that data and shows you the results on its highly informative Status Bar.

1. **Select the cells** in which you are interested in.
2. You will see the sum of the range displayed on the Status Bar.
3. **Right-click the status bar.**
4. Select another formula.

Customize Status Bar		
<input checked="" type="checkbox"/>	Cell Mode	Ready
<input checked="" type="checkbox"/>	Signatures	Off
<input checked="" type="checkbox"/>	Information Management Policy	Off
<input checked="" type="checkbox"/>	Permissions	Off
<input type="checkbox"/>	Caps Lock	Off
<input type="checkbox"/>	Num Lock	Off
<input checked="" type="checkbox"/>	Scroll Lock	Off
<input checked="" type="checkbox"/>	Fixed Decimal	Off
<input type="checkbox"/>	Overtyping Mode	
<input checked="" type="checkbox"/>	End Mode	
<input checked="" type="checkbox"/>	Macro Recording	Not Recording
<input checked="" type="checkbox"/>	Selection Mode	
<input checked="" type="checkbox"/>	Page Number	
<input checked="" type="checkbox"/>	Average	1103.857143
<input checked="" type="checkbox"/>	Count	7
<input type="checkbox"/>	Numerical Count	
<input type="checkbox"/>	Minimum	
<input type="checkbox"/>	Maximum	
<input checked="" type="checkbox"/>	Sum	7727

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Display or hide zero values on a worksheet:

1. Click the **Microsoft Office Button**  , click **Excel Options**, and then click the **Advanced** category.
2. Under **Display options for this worksheet**, select a worksheet, and then do one of the following:
 - To display zero (0) values in cells, select the **Show a zero in cells that have zero value** check box.
 - To display zero values as blank cells, clear the **Show a zero in cells that have zero value** check box.

Switch between displaying formulas and their values on a worksheet

You can easily inspect all the formulas on a worksheet at the same time by switching between a view that shows formulas in their cells and the default view that shows the values of formulas in their cells. This affects all formulas on the worksheet.

1. Press **CTRL + `** (grave accent).
2. To switch back, press **CTRL + `** again.

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Move or Copy a Formula

It's important to be aware of what can happen to **cell references**, whether they are **absolute** or **relative**, when you move a formula by cutting and pasting it, or copy a formula by copying and pasting it.

- ↓ When you **move** a formula, the cell references within the formula do not change no matter what type of cell reference that you use.
- ↓ When you **copy** a formula, the cell references may change based on the type of cell reference that you use.

• Move a formula

1. Select the cell that contains the formula that you want to move.
2. On the **Home** tab, in the **Clipboard** group, click **Cut**.

You can also move formulas by dragging the border of the selected cell to the upper-left cell of the paste area. Any existing data is replaced.

3. Do one of the following:
 - To paste the formula and any formatting, on the **Home** tab, in the **Clipboard** group, click **Paste**.
 - To paste the formula only, on the **Home** tab, in the **Clipboard** group, click **Paste**, click **Paste Special**, and then click **Formulas**.

• Copy a formula

1. Select the cell that contains the formula that you want to copy.
2. On the **Home** tab, in the **Clipboard** group, click **Copy**.
3. Do one of the following:
 - To paste the formula and any formatting, on the **Home** tab, in the **Clipboard** group, click **Paste**.
 - To paste the formula only, on the **Home** tab, in the **Clipboard** group, click **Paste**, click **Paste Special**, and then click **Formulas**.

NOTE: You can paste only the formula results. On the **Home** tab, in the **Clipboard** group, click **Paste**, click **Paste Special**, and then click **Values**.

4. Verify that the cell references in the formula produce the result that you want. If necessary, switch the type of reference by doing the following:
 - **Select the cell** that contains the formula.
 - In the formula bar  , select the reference that you want to change.
 - Press **F4** to switch between the combinations.
 - The following table summarizes how a reference type updates if a formula that contains the reference is copied two cells down and two cells to the right.

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For a formula being copied:	If the reference is:	It changes to:
	\$A\$1 (absolute column and absolute row)	\$A\$1
	A\$1 (relative column and absolute row)	C\$1
	\$A1 (absolute column and relative row)	\$A3
	A1 (relative column and relative row)	C3

NOTE: You can also copy formulas into adjacent cells by using the fill handle . After verifying that the cell references in the formula produce the result that you want in step 4, select the cell that contains the copied formula, and then drag the fill handle over the range that you want to fill.

- **Fill a formula into adjacent cells**

When you fill a formula into adjacent cells, either in a row or column, the formula automatically adjusts to calculate the values in the corresponding row or column.

1. On a worksheet, select the cell that contains the formula that you want to fill into adjacent cells.
2. Drag the fill handle  across the cells that you want to fill.

NOTE: The fill handle is displayed by default, but if it is not available you must first specify an option in Excel to enable the fill handle.

3. To specify how you want to fill the selection, click Auto Fill Options , and then click the option that you want.

If automatic workbook calculation is not enabled, formulas will not recalculate when you fill cells. To check your workbook calculation options, do the following:

1. Click the **Microsoft Office Button** , click **Excel Options**, and then click the **Formulas** category.
2. Under **Calculation options**, look under **Workbook Calculation**.
 - **Automatic** Formulas automatically recalculate.
 - **Automatic except for data tables** Formulas automatically recalculate, unless the formula is in a data table
 - **Manual** Formulas never automatically recalculate.
 - **Recalculate workbook before saving** This option is available only if **Workbook Calculation** is set to **Manual**. If this check box is selected, formulas do not automatically recalculate until you save the workbook. Note that several other actions can cause the workbook to be saved, such as using the **Send To** command.

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- **Quickly copy formulas**

You can quickly enter the same formula into a range of cells. Select the range that you want to calculate, type the formula, and then press **CTRL+ENTER**. For example, if you type =SUM(A1:B1) in range C1:C5, and then press CTRL+ENTER, Excel enters the formula in each cell of the range, using A1 as a relative reference. Copy cell values, not formulas

Sometimes, when you copy the contents of a cell, you want to paste just the value and not the underlying formula that is displayed in the formula bar.

For example, you might want to copy the resulting value of a formula to a cell on another worksheet. Or you might want to delete the values that you used in a formula after you copied the resulting value to another cell on the worksheet. Both of these actions cause an invalid cell reference error (#REF!) error to appear in the destination cell, because the cells that contain the values that you used in the formula can no longer be referenced.

You can avoid this error by pasting the resulting values of formulas without the formula in destination cells.

1. On a worksheet, select the cells that contain the resulting values of a formula that you want to copy.
2. On the **Home** tab, in the **Clipboard** group, click **Copy** .
3. Select the upper-left cell of the paste area



TIP: To move or copy a selection to a different worksheet or workbook, click another worksheet tab or switch to another workbook, and then select the upper-left cell of the paste area.

4. On the **Home** tab, in the **Clipboard** group, click **Paste** , and then click **Paste Values**.

- **Tips**

You can also fill the active cell with the formula of an adjacent cell by using the **Fill** command (on the **Home** tab in the **Editing** group) or by pressing CTRL+D to fill a cell below or CTRL+R to fill a cell to the right of the cell that contains the formula.

You can automatically fill a formula downward, for all adjacent cells that it applies to, by double-clicking the fill handle of the first cell that contains the formula. For example, cells A1:A15 and B1:B15 contain numeric values, and you type the formula =A1+B1 in cell C1. To copy that formula into cells C2:C15 (so that C2=A2+B2, C3=A3+B3, and so on), select cell C1 and double-click the fill handle.

If you are looking for an even faster method for filling formulas, you may want to place your data in an Excel table. In an Excel table, you can create a calculated column by simply entering one formula, and Excel automatically uses that formula in the whole column. Magic math! For more information, see Overview of Excel tables.

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The difference between Absolute, Relative and Mixed References

Relative references A relative cell reference in a formula, such as A1, is based on the relative position of the cell that contains the formula and the cell the reference refers to. If the position of the cell that contains the formula changes, the reference is changed. If you copy or fill the formula across rows or down columns, the reference automatically adjusts. By default, new formulas use relative references. For example, if you copy or fill a relative reference in cell B2 to cell B3, it automatically adjusts from =A1 to =A2.

	A	B
1	■	
2	■	=A1
3		=A2

Absolute references An absolute cell reference in a formula, such as \$A\$1, always refer to a cell in a specific location. If the position of the cell that contains the formula changes, the absolute reference remains the same. If you copy or fill the formula across rows or down columns, the absolute reference does not adjust. By default, new formulas use relative references, and you may need to switch them to absolute references. For example, if you copy or fill an absolute reference in cell B2 to cell B3, it stays the same in both cells =A\$1.

	A	B
1	■	
2		=A\$1
3		=A\$1

Mixed references A mixed reference has either an absolute column and relative row, or absolute row and relative column. An absolute column reference takes the form \$A1, \$B1, and so on. An absolute row reference takes the form A\$1, B\$1, and so on. If the position of the cell that contains the formula changes, the relative reference is changed, and the absolute reference does not change. If you copy or fill the formula across rows or down columns, the relative reference automatically adjusts, and the absolute reference does not adjust. For example, if you copy or fill a mixed reference from cell A2 to B3, it adjusts from =A\$1 to =B\$1.

	A	B	C
1	■	■	
2		=A\$1	
3			=B\$1

To switch between relative, absolute, and mixed references:

1. Select the cell that contains the formula.
2. In the formula bar  , select the reference that you want to change.
3. Press **F4** to switch between the reference types.

Print formulas

1. Display formulas on the worksheet. On the **Formulas** tab, in the **Formula Auditing** group, click **Show Formulas** .
2. Click the **Microsoft Office Button**  in the upper left. Then click **Print**.
3. Hide the formulas on the worksheet by repeating step 1.

TIP: You can also press CTRL+` (the ` key is next to the 1 key on most keyboards) to display or hide formulas.

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Statistical Functions

- **COUNT**

The COUNT function counts the number of cells that contain numbers, and counts numbers within the list of arguments. Use the COUNT function to get the number of entries in a number field that is in a range or array of numbers.

Syntax: COUNT(value1, [value2],...)

The COUNT function syntax has these arguments

value1 Required. The first item, cell reference, or range within which you want to count numbers.

value2, ... Optional. Up to 255 additional items, cell references, or ranges within which you want to count numbers.

- **COUNTA**

The COUNTA function counts the number of cells that are not empty in a range.

Syntax: COUNTA(value1, [value2], ...)

The **COUNTA** function syntax has the following arguments

value1 Required. The first argument representing the values that you want to count.

value2, ... Optional. Additional arguments representing the values that you want to count, up to a maximum of 255 arguments.

- **COUNTIF**

The COUNTIF function counts the number of cells within a range that meet a single criterion that you specify. For example, you can count all the cells that start with a certain letter, or you can count all the cells that contain a number that is larger or smaller than a number you specify.

Syntax: COUNTIF(range, criteria)

The **COUNTIF** function syntax has the following arguments:

range Required. One or more cells to count, including numbers or names, arrays, or references that contain numbers. Blank and text values are ignored.

criteria Required. A number, expression, cell reference, or text string that defines which cells will be counted. For example, criteria can be expressed as 32, ">32", B4, "apples", or "32".

- **AVERAGE, MAX, or MIN**

1. Click a cell below or to the right of values for which you want to find the average (arithmetic mean), the maximum, or the minimum.

Excel 2007: Basic Functions

2. Click the arrow next to **Sum**  on the **Home tab**, in the **Editing group**. Click **Average**, **Max**, or **Min**, and then press **ENTER**.

To see more functions, click **More Functions** on the **AutoSum** list to open the **Insert Function** dialog box. Or click the **Formulas** tab.

TIP: You can also enter formulas and cell references by typing them in the formula bar



after selecting a cell.

Math & Trigonometry Functions

- **ABS**

Returns the absolute value of a number. The absolute value of a number is the number without its sign.

Syntax: **ABS(number)**

Number is the real number of which you want the absolute value.

- **ROUND**

The **ROUND** function rounds a number to a specified number of digits.

Syntax: **ROUND(number, num_digits)**

The **ROUND** function syntax has the following arguments:

number Required. The number that you want to round.

num_digits Required. The number of digits to which you want to round the number argument.

- **SUM (also known as AutoSUM)**

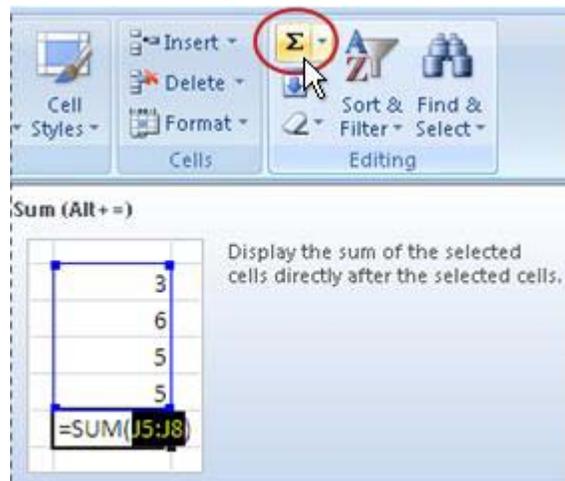
Use the **SUM** function, which is a prewritten formula, to calculate the numeric values directly above or to the left of the selected cell.

AutoSum is the button that displays the "summation" symbol (the uppercase Sigma of the Greek alphabet). Within easy reach in two locations on the Ribbon, you can find this button on the **Home** tab in the **Editing** group and on the **Formulas** tab in the **Function Library** group.

The **SUM** function can include up to **30** cell or range references.

When you select a cell to the right of or below a range of numeric values and then click **AutoSum**, Excel automatically includes that range in the formula and calculates the values.

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In a formula that uses a function, such as **SUM**, the cell reference that appears inside the parentheses is the argument of the formula. The argument determines which values the formula is going to calculate. The colon (:) in the cell reference (**B3:B6** in the example) indicates that the cell reference is a range of cells. Parentheses are always required in a formula that uses a function — they separate the argument from the function name in the formula.

When a cell reference is used in the argument of a formula instead of the actual values, Excel can automatically update the formula result whenever the values in the referenced cells are updated.

Use the SUM function to total numeric values in a column or row

To calculate the total of a series of numeric values in a row or column, you do not have to enter all those values manually into a formula. Instead you can use a predefined formula that uses the SUM function.

1. On a worksheet, click a cell below or to the right of the numeric values that you want to total.
2. On the **Home** tab, in the **Editing** group, click **AutoSum** .

TIP: AutoSum is also available on the Formulas tab, in the Function Library group.

3. Press ENTER to display the **SUM** function result in the selected cell.

The formula itself appears in the formula bar.

TIP: If you are looking for a quick way to total values in a column, you may want to place your data in an Excel table. In an Excel table, you can add a total row so that you can instantly summarize the values in a column.

1. Click a cell below the column of values or to the right of the row of values.
2. On the **Home** tab, in the **Editing** group, click the **Sum** button , and then press ENTER.

TIP: The Sum button is also located on the Formulas tab, in the Function Library group.

To add some of the values in a column or row:

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1. Type an **equal sign**, type **SUM**, and then type an **opening parenthesis**.
2. **Type or select the cell references** you want to add. A **comma (,)** separates individual arguments that tell the function what to calculate.
3. Type a **closing parenthesis**, and then press **ENTER**.

For example: =SUM(B2:B4,B6) and =SUM(B2,B5,B7)

- **SUMIF (Add numbers based on one condition)**

You can use the SUMIF function to create a total value for one range based on a value in another range, as in the following example.

The SUMIF function uses the following arguments


=SUMIF(A2:A7, "Buchanan", B2:B7)

Formula with SUMIF function

- 1 Range to evaluate: Check these cells to determine whether a row meets your criteria.
- 2 Criteria: The condition that the cells you evaluate must meet for the row to be included in the sum.
- 3 Range to sum: Add the numbers in these cells provided that the row satisfies the condition.

- **SUMIFs (Add numbers based on multiple conditions)**

To do this task, use the IF and SUM functions.

The formulas in the example must be entered as array formulas (array formula: A formula that performs multiple calculations on one or more sets of values, and then returns either a single result or multiple results. Array formulas are enclosed between braces { } and are entered by pressing CTRL+SHIFT+ENTER.). After copying the example to a blank worksheet, select the formula cell. Press F2, and then press CTRL+SHIFT+ENTER. If the formula is not entered as an array formula, the error #VALUE! is returned.

Logical Functions

- **IF**

Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE. Use IF to conduct conditional tests on values and formulas.

Syntax: IF(logical_test,value_if_true,value_if_false)

Logical_test is any value or expression that can be evaluated to TRUE or FALSE. For example, A10=100 is a logical expression; if the value in cell A10 is equal to 100, the expression

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evaluates to TRUE. Otherwise, the expression evaluates to FALSE. This argument can use any comparison calculation operator.

Value_if_true is the value that is returned if logical_test is TRUE. For example, if this argument is the text string "Within budget" and the logical_test argument evaluates to TRUE, then the IF function displays the text "Within budget". If logical_test is TRUE and value_if_true is blank, this argument returns 0 (zero). To display the word TRUE, use the logical value TRUE for this argument. Value_if_true can be another formula.

Value_if_false is the value that is returned if logical_test is FALSE. For example, if this argument is the text string "Over budget" and the logical_test argument evaluates to FALSE, then the IF function displays the text "Over budget". If logical_test is FALSE and value_if_false is omitted, (that is, after value_if_true, there is no comma), then the logical value FALSE is returned. If logical_test is FALSE and value_if_false is blank (that is, after value_if_true, there is a comma followed by the closing parenthesis), then the value 0 (zero) is returned. Value_if_false can be another formula.

Text Functions

- **CONCATENATE (combine text strings)**

The CONCATENATE function joins up to 255 text strings into one text string. The joined items can be text, numbers, cell references, or a combination of those items. For example, if your worksheet contains a person's first name in cell A1 and the person's last name in cell B1, you can combine the two values in another cell by using the following formula:

Syntax: =**CONCATENATE(A1," ",B1)**

Text1 Required. The first text item to be concatenated.

Text2 ... Optional. Additional text items. The items must be separated by commas.

- **TRIM (Removes spaces in text)**

Removes all spaces from text except for single spaces between words. Use TRIM on text that you have received from another application that may have irregular spacing.

Syntax: **TRIM(text)**

Text is the text from which you want spaces removed.

- **EXACT (Checks to see if two text values are identical)**

Compares two text strings and returns TRUE if they are exactly the same, FALSE otherwise. EXACT is case-sensitive but ignores formatting differences. Use EXACT to test text being entered into a document.

Syntax: **EXACT(text1,text2)**

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Text1 is the first text string.

Text2 is the second text string.

- **LEN (Returns the number of characters in a text string)**

LEN returns the number of characters in a text string.

Syntax: **LEN(text)**

Text is the text whose length you want to find. Spaces count as characters.

- **PROPER (Capitalizes the first letter in each word of a text value)**

Capitalizes the first letter in a text string and any other letters in text that follow any character other than a letter. Converts all other letters to lowercase letters.

Syntax: **PROPER(text)**

Text is text enclosed in quotation marks, a formula that returns text, or a reference to a cell containing the text you want to partially capitalize.

Date and Time Functions

- **YEAR (Calculate the difference between two times in years)**

Microsoft Excel stores dates as sequential serial numbers so they can be used in calculations. By default, January 1, 1900 is serial number 1, and January 1, 2008 is serial number 39448 because it is 39,448 days after January 1, 1900. Microsoft Excel for the Macintosh uses a different date system as its default.

Values returned by the YEAR, MONTH and DAY functions will be Gregorian values regardless of the display format for the supplied date value.

Use the **subtraction operator (-)** to find the difference between times.

	A	B
1	Date	
2	6/9/2007	
3	6/4/2010	
4	Formula	Description (Result)
5	=YEAR(A3)-YEAR(A2)	Years occurring between two dates (3)

- **TODAY**

The TODAY function is useful when you need to have the current date displayed on a worksheet, regardless of when you open the workbook. It is also useful for calculating intervals.

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Syntax: TODAY()

The TODAY function syntax has no arguments.

- **NOW**

The NOW function is useful when you need to display the current date and time on a worksheet or calculate a value based on the current date and time, and have that value updated each time you open the worksheet.

Syntax: **NOW()**

The NOW function syntax has no arguments

- **Insert a static date or time**

1. On a worksheet, **select the cell** into which you want to insert the current date or time.
2. Do one of the following:
 - To insert the current date, press **CTRL+;** (semi-colon).
 - To insert the current time, press **CTRL+SHIFT+;** (semi-colon).

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Understand error values

Cells with errors such as #NAME? may display a color triangle. If you click the cell, an error button  appears to give you some error correction options. How to use the button is not covered in this course.

- **To quickly locate cell with errors**

Sometimes when you enter a formula an error will occur. This is to indicate that the formula syntax is incorrect. This error may be caused by missing parentheses or incorrect arguments being passed to functions (e.g. passing a string when it is expecting a number).

If this error occurs press **OK** to be taken back to the formula bar. You can either correct the formula or press **ESC** to remove the formula completely.

To quickly locate any cells that contain errors, in **Home tab**, in the **Editing group**, click **Find and Select**, and click on **Go to Special**. Place a check mark for **Formulas** and click **OK**.



- **Correct common errors when entering formulas**

The following table summarizes some of the most common errors that a user can make when entering a formula, and explains how to correct those errors:

Make sure that you...	More information
Start every function with the equal sign (=)	If you omit the equal sign, what you type may be displayed as text or as a date. If you type 11/2, Excel displays the date 2-Nov (assuming the cell format is General) instead of dividing 11 by 2.
Match all open and close parentheses	Make sure that all parentheses are part of a matching pair (opening and closing). When you use a function in a formula, it is important for each parenthesis to be in its correct position for the function to work correctly.
Use a colon to indicate a	When you refer to a range of cells, use a colon (:) to separate the reference to the first cell in the range and the reference to the last cell in

Excel 2007: Basic Functions

Make sure that you...	More information
range	the range.
Enter all required arguments	Some functions have required arguments. Also, make sure that you have not entered too many arguments.
Enter the correct type of arguments	Some functions, such as SUM, require numerical arguments. Other functions, such as REPLACE, require a text value for at least one of their arguments. If you use the wrong type of data as an argument, Excel may return unexpected results or display an error.
Nest no more than 64 functions	You can enter, or nest, no more than 64 levels of functions within a function.
Enclose other sheet names in single quotation marks	If the formula refers to values or cells on other worksheets or workbooks, and the name of the other workbook or worksheet contains a non-alphabetical character, you must enclose its name within single quotation marks (').
Place an exclamation point (!) after a worksheet name when you refer to it in a formula	For example, to return the value from cell D3 in a worksheet named Quarterly Data in the same workbook, use this formula: ='Quarterly Data'!D3.
Include the path to external workbooks	<p>Make sure that each external reference contains a workbook name and the path to the workbook.</p> <p>A reference to a workbook includes the name of the workbook and must be enclosed in brackets ([]). The reference must also contain the name of the worksheet in the workbook.</p> <p>If the workbook that you want to refer to is not open in Excel, you can still include a reference to it in a formula. You provide the full path to the file, such as in the following example: =ROWS('C:\My Documents\[Q2 Operations.xlsx]Sales'!A1:A8). This formula returns the number of rows in the range that includes cells A1 through A8 in the other workbook (8).</p>
Enter numbers without formatting	Do not format numbers when you enter them in formulas. For example, if the value that you want to enter is \$1,000, enter 1000 in the formula. If you enter a comma as part of a number, Excel treats it as a separator character. If you want numbers displayed so that they show thousands or millions separators, or currency symbols, format the cells after you enter the numbers.

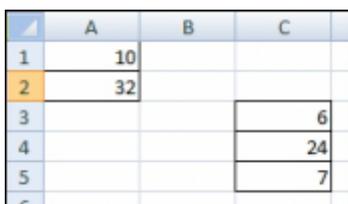
Excel 2007: Basic Functions

- **Correct an error value**

If a formula cannot correctly evaluate a result, Excel displays an error value, such as #####, #DIV/0!, #N/A, #NAME?, #NULL!, #NUM!, #REF!, and #VALUE!. Each error type has different causes, and different solutions.

The following table contains links to articles that describe these errors in detail, and a brief description to get you started.

Link to in-depth article	Description
Correct a ##### error	Excel displays this error when a column is not wide enough to display all the characters in a cell, or a cell contains negative date or time values.
Correct a #DIV/0! error	Excel displays this error when a number is divided either by zero (0) or by a cell that contains no value.
Correct a #N/A error	Excel displays this error when a value is not available to a function or formula.
Correct a #NAME? error	This error is displayed when Excel does not recognize text in a formula. For example, a range name or the name of a function may be spelled incorrectly.
Correct a #NULL! error	Excel displays this error when you specify an intersection of two areas that do not intersect (cross). The intersection operator is a space character that separates references in a formula. For example, the areas A1:A2 and C3:C5 do not intersect, so entering the formula =SUM(A1:A2 C3:C5) returns the #NULL! error.
Correct a #NUM! error	Excel displays this error when a formula or function contains invalid numeric values.
Correct a #REF! error	Excel displays this error when a cell reference is not valid. For example, you may have deleted cells that were referred to by other formulas, or you may have pasted cells that you moved on top of cells that were referred to by other formulas.
Correct a #VALUE! error	Excel can display this error if your formula includes cells that contain different data types. If smart tags are turned on and you position the mouse pointer over the smart tag, the ScreenTip displays "A value used in the formula is of the wrong data type." You can typically fix this problem by making minor changes to your formula.



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Protect or audit formulas

For security or privacy reasons, you may want to hide a formula from users of your worksheet. Or you may be auditing formulas and you need to see some or all of the formulas on the worksheet.

• Switch between displaying formulas and their values on a worksheet

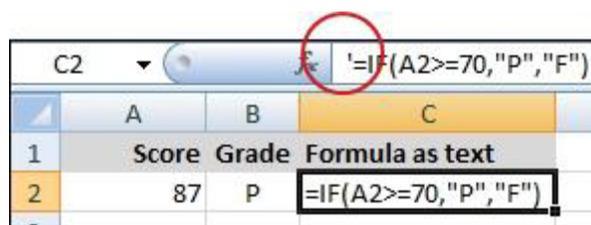
You can easily inspect all the formulas on a worksheet at the same time by switching between a view that shows formulas in their cells and the default view that shows the values of formulas in their cells. This affects all formulas on the worksheet.

1. Press CTRL + ` (grave accent).
2. To switch back, press CTRL + ` again.

• Copy a formula to another cell to be displayed as text

You can "comment" a formula by copying it to an adjacent cell and inserting an apostrophe at the beginning of the formula (commenting is a practice that is widely used in programming to explain the purpose of one or more lines of code). An apostrophe at the beginning of a cell forces Excel to recognize its contents as a text string and, in the case of a formula, removes its functionality.

The following picture shows a cell (C2) containing a formula that is preceded by an apostrophe. The formula uses the IF function to evaluate the value in cell A2 (87), and determine if it passes a test (≥ 70). The actual formula is contained in cell B2 and displays "P" because the value passes the test that is specified in the formula.



The screenshot shows an Excel spreadsheet with the following data:

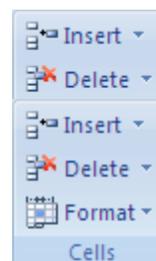
	A	B	C
1	Score	Grade	Formula as text
2	87	P	=IF(A2>=70,"P","F")

The formula bar for cell C2 shows the formula: `'=IF(A2>=70,"P","F")`. The apostrophe at the beginning of the formula is circled in red.

• Prevent a formula from being displayed in the formula bar

CAUTION: This procedure also prevents the formula from being edited.

1. Select the range of cells whose formulas you want to hide. You can also select nonadjacent ranges or the entire sheet.
2. On the **Home** tab, in the **Cells** group, click **Format**, click **Format Cells**, and then click the **Protection** tab.
3. Select the **Hidden** check box.
4. Click **OK**.
5. On the **Home** tab, in the **Cells** group, click **Format**, and then click **Protect Sheet**.
6. Make sure that the **Protect worksheet and contents of locked cells** check box is selected.



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- **Show formulas that were previously hidden by removing protection**

1. On the **Review** tab, in the **Changes** group, click **Unprotect Sheet**.



2. Select the range of cells whose formulas you want to unhide.
3. On the **Home** tab, in the **Cells** group, click **Format**, click **Format Cells**, and then click the **Protection** tab.
4. Clear the **Hidden** check box.

- **Recalculate a worksheet or workbook manually by using keyboard shortcuts**

To	Press
Recalculate formulas that have changed since the last calculation, and formulas dependent on them, in all open workbooks. If a workbook is set for automatic recalculation, you do not need to press F9 for recalculation.	F9
Recalculate formulas that have changed since the last calculation, and formulas dependent on them, in the active worksheet.	SHIFT+F9
Recalculate all formulas in all open workbooks, regardless of whether they have changed since last time or not.	CTRL+ALT+F9
Recheck dependent formulas, and then recalculate all formulas in all open workbooks, regardless of whether they have changed since last time or not.	CTRL+SHIFT+ALT+F9

- **Learn about calculating workbooks that were created in an earlier version of Excel**

To ensure that older workbooks are calculated correctly, Excel behaves differently when you first open an old workbook than when you open a workbook created in the current version.

When you open a workbook created in the current version, Excel recalculates only the formulas that depend on cells that have changed.

When you use open a workbook that was created in a earlier version of Excel, all of the formulas in the workbook — those that depend on cells that have changed and those that do not — are recalculated. This ensures that the workbook is fully optimized for the current Excel version.

Because complete recalculation can take longer than partial recalculation, opening a workbook that was not previously saved in the current Excel version can take longer than usual. Once you save the workbook in the current version, it will open faster.

Excel 2007: Basic Functions

Create or change a cell reference

A cell reference refers to a cell or a range of cells on a worksheet and can be used in a formula so that Microsoft Office Excel can find the values or data that you want that formula to calculate.

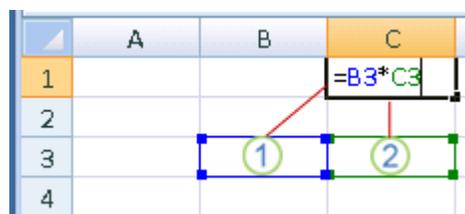
In one or several formulas, you can use a cell reference to refer to:

- ↓ Data from one cell on the worksheet.
- ↓ Data that is contained in different areas of a worksheet.
- ↓ Data in cells on other worksheets in the same workbook.

• Create a cell reference on the same worksheet

1. Click the cell in which you want to enter the formula.
2. In the formula bar  , type = (equal sign).
3. Do one of the following:
 - **Cell reference** To create a reference, select a cell or range of cells on the same worksheet.

Cell references and the borders around the corresponding cells are color-coded to make it easier to work with them.



1 The first cell reference is B3, the color is blue, and the cell range has a blue border with square corners.

2 The second cell reference is C3, the color is green, and the cell range has a green border with square corners.

You can drag the border of the cell selection to move the selection, or drag the corner of the border to expand the selection.

- **Defined name** To create a reference to a defined name, do one of the following:
 - Type the name.
 - Press F3, select the name in the **Paste name** box, and then click **OK**.

NOTE: If there is no square corner on a color-coded border, the reference is to a named range.

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4. Do one of the following:

- If you are creating a reference in a single cell, press ENTER.
- If you are creating a reference in an array formula, press CTRL+SHIFT+ENTER.

The reference can be a single cell or a range of cells, and the array formula can be one that calculates single or multiple results.

• Create a cell reference to another worksheet

You can refer to cells that are on other worksheets by appending the name of the worksheet followed by an exclamation point (!) to the start of the cell reference. In the following example, the worksheet function named **AVERAGE** calculates the average value for the range B1:B10 on the worksheet named Marketing in the same workbook.

=AVERAGE(Marketing!B1:B10)

- 1 Refers to the worksheet named Marketing
- 2 Refers to the range of cells between B1 and B10, inclusively
- 3 Separates the worksheet reference from the cell range reference

1. **Click the cell** in which you want to enter the formula.
2. In the formula bar , type = (equal sign).
3. **Click the tab** for the worksheet to be referenced.
4. **Select the cell or range of cells** to be referenced.

NOTE: If the name of the other worksheet contains non-alphabetical characters, you must enclose the name (or the path) within single quotation marks (').

• Create a cell reference by using the Link Cells command

Alternatively, you can copy and paste a cell reference and then use the **Link Cells** command to create a cell reference. You may want to use this command to:

- Easily display important information in a more prominent position. Let's say that you have a workbook with a number of worksheets, and on each worksheet is a cell that displays summary information about the other cells on that worksheet. To make these summary cells more prominent, you can create a cell reference to them on the first worksheet of the workbook, which enables you to see summary information about the whole workbook on the first worksheet.

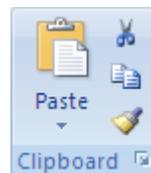
Excel 2007: Basic Functions

- Make it easier to create cell references between worksheets and workbooks. The Link Cells command automatically pastes the correct syntax for you.

1. Click the cell that contains the data you want to link to.
2. On the Home tab, in the Clipboard group, click Copy .

Keyboard shortcut You can also press CTRL+C.

3. Click the cell that you want to link from.
4. On the **Home** tab, in the **Clipboard** group, click **Paste** . By default, the **Paste Options** button appears when you paste copied data.
5. Click the **Paste Options** button, and then click **Link Cells**.



- **Change a cell reference to another cell reference**

1. **Double-click the cell** that contains the formula that you want to change. Excel highlights each cell or range of cells with a different color.
2. Do one of the following:
 - To move a cell or range reference to a different cell or range, drag the color-coded border of the cell or range to the new cell or range.
 - To include more or fewer cells in a reference, drag a corner of the border.
 - In the formula bar  , select the reference in the formula, and then type a new reference.
 - Press F3, select the name in the **Paste name** box, and then click **OK**.
3. Press ENTER, or, for an array formula, press CTRL+SHIFT+ENTER.

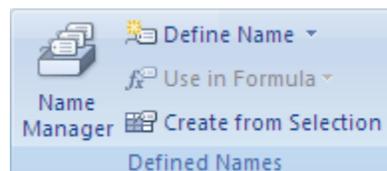
- **Change a cell reference to a named range**

Frequently, if you have defined a name to a cell reference after you have entered a cell reference in a formula, you may want to update the existing cell references to the defined names.

1. Do one of the following:
 - Select the range of cells that contains formulas in which you want to replace cell references with defined names.
 - Select a single, empty cell to change the references to names in all formulas on the worksheet.

2. On the **Formulas** tab, in the **Defined Names** group, click the **arrow next to Define Name**, and then click **Apply Names**.

3. In the Apply names box, click one or more names, and then click OK.



Excel 2007: Basic Functions

Define and use names in formulas

By using names, you can make your formulas much easier to understand and maintain. You can define a name for a cell range, function, constant, or table. Once you adopt the practice of using names in your workbook, you can easily update, audit, and manage these names.

A name is a meaningful shorthand that makes it easier to understand the purpose of a cell reference, constant, formula or table, each of which may be difficult to comprehend at first glance. The following information shows common examples of names and how they can improve clarity and understanding.

Example Type	Example with no name	Example with a name
Reference	=SUM(C20:C30)	=SUM(FirstQuarterSales)
Constant	=PRODUCT(A5,8.3)	=PRODUCT(Price,WASalesTax)
Formula	=SUM(VLOOKUP(A1,B1:F20,5,FALSE), -G5)	=SUM(Inventory_Level,-Order_Amt)
Table	C4:G36	=TopSales06

- **Types of names**

There are several types of names that you can create and use.

Defined name A name that represents a cell, range of cells, formula, or constant value. You can create your own defined name, and Microsoft Office Excel sometimes creates a defined name for you, such as when you set a print area.

Table name A name for an Excel table, which is a collection of data about a particular subject that is stored in records (rows) and fields (columns). Excel creates a default Excel table name of Table1, Table2, and so on, each time that you insert an Excel table, but you can change a table's name to make it more meaningful. For more information about Excel tables, see Using structured references with Excel tables.

The scope of a name

All names have a scope, either to a specific worksheet (also called the local worksheet level) or to the entire workbook (also called the global workbook level). The scope of a name is the location within which the name is recognized without qualification. For example:

- If you have defined a name, such as Budget_FY08, and its scope is Sheet1, that name, if not qualified, is recognized only in Sheet1, but not in other sheets without qualification.

To use a local worksheet name in another worksheet, you can qualify it by preceding it with the worksheet name, as the following example shows:

Sheet1!Budget_FY08

- If you have defined a name, such as Sales_Dept_Goals, and its scope is the workbook, that name is recognized for all worksheets in that workbook, but not for any other workbook.

A name must always be unique within its scope. Excel prevents you from defining a name that is not unique within its scope. However you can use the same name in different scopes. For example, you

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can define a name, such as GrossProfit that is scoped to Sheet1, Sheet2, and Sheet3 in the same workbook. Although each name is the same, each name is unique within its scope. You might do this to ensure that a formula that uses the name, GrossProfit, is always referencing the same cells at the local worksheet level.

You can even define the same name, GrossProfit, for the global workbook level, but again the scope is unique. In this case, however, there can be a name conflict. To resolve this conflict, by default Excel uses the name that is defined for the worksheet because the local worksheet level takes precedence over the global workbook level. If you want to override the precedence and you want to use the workbook name, you can disambiguate the name by prefixing the workbook name as the following example shows:

WorkbookFile!GrossProfit

You can override the local worksheet level for all worksheets in the workbook, with the exception of the first worksheet, which always uses the local name if there is a name conflict and cannot be overridden.

- **Defining and entering names**

You define a name by using the:

Name box on the formula bar This is best used for creating a workbook level name for a selected range.

Create a name from selection You can conveniently create names from existing row and column labels by using a selection of cells in the worksheet.

New Name dialog box This is best used for when you want more flexibility in creating names, such as specifying a local worksheet level scope or creating a name comment.

NOTE: By default, names use absolute cell references (absolute cell reference: In a formula, the exact address of a cell, regardless of the position of the cell that contains the formula. An absolute cell reference takes the form \$A\$1.).

You can enter a name by:

Typing Typing the name, for example, as an argument to a formula.

Using Formula AutoComplete Use the Formula AutoComplete drop-down list, where valid names are automatically listed for you.

Selecting from the Use in Formula command Select a defined name from a list available from the **Use in Formula** command in the **Defined Names** group on the **Formulas** tab.

- **Learn about syntax rules for names**

The following is a list of syntax rules that you need to be aware of when you create and edit names.

Valid characters The first character of a name must be a letter, an underscore character (_), or a backslash (\). Remaining characters in the name can be letters, numbers, periods, and underscore characters.

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NOTE: You cannot use the uppercase and lowercase characters "C", "c", "R", or "r" as a defined name, because they are all used as a shorthand for selecting a row or column for the currently selected cell when you enter them in a Name or Go To text box.

Cell references disallowed Names cannot be the same as a cell reference, such as Z\$100 or R1C1.

Spaces are not valid Spaces are not allowed as part of a name. Use the underscore character (_) and period (.) as word separators, such as, Sales_Tax or First.Quarter.

Name length A name can contain up to 255 characters.

Case sensitivity Names can contain uppercase and lowercase letters. Excel does not distinguish between uppercase and lowercase characters in names. For example, if you created the name Sales and then create another name called SALES in the same workbook, Excel prompts you to choose a unique name.

• Define a name for a cell or cell range on a worksheet

1. Select the cell, range of cells, or nonadjacent selection that you want to name.
2. Click the **Name** box at the left end of the formula bar



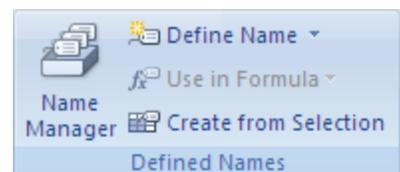
3. Type the name that you want to use to refer to your selection. Names can be up to 255 characters in length.
4. Press ENTER.

NOTE: You cannot name a cell while you are changing the contents of the cell.

• Define a name by using a selection of cells in the worksheet

You can convert existing row and column labels to names.

1. Select the range that you want to name, including the row or column labels.
2. On the **Formulas** tab, in the **Defined Names** group, click **Create from Selection**.
3. In the **Create Names from Selection** dialog box, designate the location that contains the labels by selecting the **Top row**, **Left column**, **Bottom row**, or **Right column** check box.



NOTE: A name created by using this procedure refers only to the cells that contain values and does not include the existing row and column labels.

• Define a name by using the New Name dialog box

1. On the **Formulas** tab, in the **Defined Names** group, click **Define Name**.

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2. In the **New Name dialog box**, in the **Name box**, type the name that you want to use for your reference.
3. To specify the scope of the name, in the **Scope drop-down list box**, select Workbook or the name of a worksheet in the workbook.
4. Optionally, in the **Comment box**, enter a descriptive comment up to 255 characters.
5. In the **Refers to box**, do one of the following:
 - To enter a cell reference, type the cell reference.

TIP: The current selection is entered by default. To enter other cell references as an argument, click Collapse Dialog  (which temporarily shrinks the dialog box), select the cells on the worksheet, and then click Expand Dialog .

- To enter a constant, type = (equal sign) and then type the constant value.
 - To enter a formula, type = and then type the formula.
6. To finish and return to the worksheet, click **OK**.

• Change a name

If you change a defined name or table name, all uses of that name in the workbook are also changed.

1. On the **Formulas tab**, in the **Defined Names group**, click **Name Manager**.
2. In the Name Manager dialog box, **click the name** that you want to change, and then click **Edit**.
3. In the Edit Name dialog box, in the Name box, **type the new name** for the reference.
4. In the Refers to box, **change the reference**, and then click **OK**.
5. In the Name Manager dialog box, in the Refers to box, change the cell, formula, or constant represented by the name.
 - To cancel unwanted or accidental changes, click Cancel , or press ESC.
 - To save changes, click Commit , or press ENTER.

• Delete one or more names

1. On the **Formulas tab**, in the **Defined Names group**, click **Name Manager**.
2. In the **Name Manager** dialog box, click the name that you want to change.
3. **Select one or more names** by doing one of the following:
 - To select a name, click it.

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- To select more than one name in a contiguous group, click and drag the names, or press SHIFT and click the mouse button for each name in the group.
 - To select more than one name in a noncontiguous group, press CTRL and click the mouse button for each name in the group.
4. Click **Delete**. You can also press DELETE.
 5. Click **OK** to confirm the deletion.

NOTE: The Close button only closes the Name Manager dialog box. It is not required to commit changes that have already been made.

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Excel specifications and limits

Worksheet and workbook specifications and limits

Feature	Maximum limit
Open workbooks	Limited by available memory and system resources
Worksheet size	1,048,576 rows by 16,384 columns
Column width	255 characters
Row height	409 points
Page breaks	1,026 horizontal and vertical
Total number of characters that a cell can contain	32,767 characters
Characters in a header or footer	255
Sheets in a workbook	Limited by available memory (default is 3 sheets)
Colors in a workbook	16 million colors (32 bit with full access to 24 bit color spectrum)
Named views in a workbook	Limited by available memory
Unique cell formats/cell styles	64,000
Fill styles	32
Line weight and styles	16
Unique font types	1,024 global fonts available for use; 512 per workbook
Number formats in a workbook	Between 200 and 250, depending on the language version of Excel that you have installed
Names in a workbook	Limited by available memory
Windows in a workbook	Limited by available memory
Panes in a window	4
Linked sheets	Limited by available memory
Scenarios	Limited by available memory; a summary report shows only the first 251 scenarios
Changing cells in a scenario	32
Adjustable cells in Solver	200
Custom functions	Limited by available memory
Zoom range	10 percent to 400 percent
Reports	Limited by available memory
Sort references	64 in a single sort; unlimited when using sequential sorts
Undo levels	100
Fields in a data form	32
Workbook parameters	255 parameters per workbook
Filter drop-down lists	10,000

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Calculation specifications and limits

Feature	Maximum limit
Number precision	15 digits
Smallest allowed negative number	-2.2251E-308
Smallest allowed positive number	2.2251E-308
Largest allowed positive number	9.999999999999999E+307
Largest allowed negative number	-9.999999999999999E+307
Largest allowed positive number via formula	1.7976931348623158e+308
Largest allowed negative number via formula	-1.7976931348623158e+308
Length of formula contents	8,192 characters
Internal length of formula	16,384 bytes
Iterations	32,767
Worksheet arrays	Limited by available memory
Selected ranges	2,048
Arguments in a function	255
Nested levels of functions	64
User defined function categories	255
Number of available worksheet functions	341
Size of the operand stack	1,024
Cross-worksheet dependency	64,000 worksheets that can refer to other sheets
Cross-worksheet array formula dependency	Limited by available memory
Area dependency	Limited by available memory
Area dependency per worksheet	Limited by available memory
Dependency on a single cell	4 billion formulas that can depend on a single cell
Linked cell content length from closed workbooks	32,767
Earliest date allowed for calculation	January 1, 1900 (January 1, 1904, if 1904 date system is used)
Latest date allowed for calculation	December 31, 9999
Largest amount of time that can be entered	9999:59:59

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Charting specifications and limits

Feature	Maximum limit
Charts linked to a worksheet	Limited by available memory
Worksheets referred to by a chart	255
Data series in one chart	255
Data points in a data series for 2-D charts	32,000
Data points in a data series for 3-D charts	4,000
Data points for all data series in one chart	256,000

PivotTable and PivotChart report specifications and limits

Feature	Maximum limit
PivotTable reports on a sheet	Limited by available memory
Unique items per field	1,048,576
Row or column fields in a PivotTable report	Limited by available memory
Report filters in a PivotTable report	256 (may be limited by available memory)
Value fields in a PivotTable report	256
Calculated item formulas in a PivotTable report	Limited by available memory
Report filters in a PivotChart report	256 (may be limited by available memory)
Value fields in a PivotChart report	256
Calculated item formulas in a PivotChart report	Limited by available memory
Length of the MDX name for a PivotTable item	32,767
Length for a relational PivotTable string	32,767

Shared workbook specifications and limits

Feature	Maximum limit
Users who can open and share a shared workbook at the same time	256
Personal views in a shared workbook	Limited by available memory
Days that change history is maintained	32,767 (default is 30 days)
Workbooks that can be merged at one time	Limited by available memory
Cells that can be highlighted in a shared workbook	32,767
Colors used to identify changes made by different users when change highlighting is turned on	32 (each user is identified by a separate color; changes made by the current user are highlighted with navy blue)
Excel tables in a shared workbook	0 (zero) NOTE A workbook that contains one or more Excel tables cannot be shared.

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Import or text files to Excel using Text Import Wizard

There are two ways to import data from a text file by using Microsoft Office Excel: You can open the text file in Excel, or you can import the text file as an external data range. To export data from Excel to a text file, use the Save As command.

There are two commonly used text file formats:

- Delimited text files (.txt), in which the TAB character (ASCII character code 009) typically separates each field of text.
- Comma separated values text files (.csv), in which the comma character (,) typically separates each field of text.

You can change the separator character that is used in both delimited and .csv text files. This may be necessary to make sure that the import or export operation works the way that you want it to.

Text Import Wizard

You can use Microsoft Office Excel to import data from a text file into a worksheet. The Text Import Wizard examines the text file that you are importing and helps you ensure that the data is imported in the way that you want.

NOTE: To start the Text Import Wizard, on the Data tab, in the Get External Data group, click From Text. Then, in the Import Text File dialog box, double-click the text file that you want to import.

- **Step 1 of 3**

Original data type If items in the text file are separated by tabs, colons, semicolons, spaces, or other characters, select **Delimited**. If all of the items in each column are the same length, select **Fixed width**.

Start import at row Type or select a row number to specify the first row of the data that you want to import.

File origin Select the character set that is used in the text file. In most cases, you can leave this setting at its default. If you know that the text file was created by using a different character set than the character set that you are using on your computer, you should change this setting to match that character set. For example, if your computer is set to use character set 1251 (Cyrillic, Windows), but you know that the file was produced by using character set 1252 (Western European, Windows), you should set **File Origin** to 1252.

Preview of file This box displays the text as it will appear when it is separated into columns on the worksheet.

- **Step 2 of 3 (Delimited data)**

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Delimiters Select the character that separates values in your text file. If the character is not listed, select the **Other** check box, and then type the character in the box that contains the cursor. These options are not available if your data type is Fixed width.

Treat consecutive delimiters as one Select this option if your data contains a delimiter of more than one character between data fields or if your data contains multiple custom delimiters.

Text qualifier Select the character that encloses values in your text file. When Excel encounters the text qualifier character, all of the text that follows that character and precedes the next occurrence of that character is imported as one value, even if the text contains a delimiter character. For example, if the delimiter is a comma (,) and the text qualifier is a quotation mark ("), "Dallas, Texas" is imported into one cell as **Dallas, Texas**. If no character or the apostrophe (') is specified as the text qualifier, "Dallas, Texas" is imported into two adjacent cells as "**Dallas** and **Texas**".

If the delimiter character occurs between text qualifiers, Excel omits the qualifiers in the imported value. If no delimiter character occurs between text qualifiers, Excel includes the qualifier character in the imported value. Hence, "Dallas Texas" (using the quotation mark text qualifier) is imported into one cell as "**Dallas Texas**".

Data preview Review the text in this box to verify that the text will be separated into columns on the worksheet as you want it.

Step 2 of 3 (Fixed width data)

Data preview Set field widths in this section. Click the preview window to set a column break, which is represented by a vertical line. Double-click a column break to remove it, or drag a column break to move it.

Step 3 of 3

Click the **Advanced** button to do one or more of the following:

- Specify the type of decimal and thousands separators that are used in the text file. When the data is imported into Excel, the separators will match those that are specified for your country/region in Regional Settings (Windows Control Panel).
- Specify that one or more numeric values may contain a trailing minus sign.

Column data format Click the data format of the column that is selected in the **Data preview** section. If you do not want to import the selected column, click **Do not import column (skip)**.

After you select a data format option for the selected column, the column heading under **Data preview** displays the format. If you select **Date**, select a date format in the **Date** box.

Choose the data format that closely matches the preview data so that Excel can convert the imported data correctly. For example:

- To convert a column of all currency number characters to the Excel Currency format, select **General**.
- To convert a column of all number characters to the Excel Text format, select **Text**.
- To convert a column of all date characters, each date in the order of year, month, and day, to the Excel Date format, select **Date**, and then select the date type of **YMD** in the **Date** box.

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Excel will import the column as **General** if the conversion could yield unintended results. For example:

- If the column contains a mix of formats, such as alphabetical and numeric characters, Excel converts the column to **General**.
- If, in a column of dates, each date is in the order of year, month, and date, and you select **Date** along with a date type of **MDY**, Excel converts the column to General format. A column that contains date characters must closely match an Excel built-in date or custom date formats.