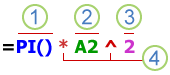
**Overview of formulas**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

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 (function: A prewritten formula that takes a value or values, performs an operation, and returns a value or values. Use functions to simplify and shorten formulas on a worksheet, especially those that perform lengthy or complex calculations.)](javascript:AppendPopup(this,'IDH_xldefFunction_1')), references, [operators (operator: A sign or symbol that specifies the type of calculation to perform within an expression. There are mathematical, comparison, logical, and reference operators.)](javascript:AppendPopup(this,'ofdefOperator_2')), and [constants (constant: A value that is not calculated and, therefore, does not change. For example, the number 210, and the text "Quarterly Earnings" are constants. An expression, or a value resulting from an expression, is not a constant.)](javascript:AppendPopup(this,'ofConstant_3')).



Parts of a formula

Callout 1Functions: The PI() function returns the value of pi: 3.142...

Callout 2References: A2 returns the value in cell A2.

Callout 3Constants: Numbers or text values entered directly into a formula, such as 2.

Callout 4Operators: The ^ (caret) operator raises a number to a power, and the \* (asterisk) operator multiplies.

**Using constants in formulas**

A constant is a value that is not calculated. For example, the date 10/9/2008, the number 210, and the text "Quarterly Earnings" are all constants. An expression, or a value resulting from an expression, is not a constant. If you use constant values in the formula instead of references to the cells (for example, =30+70+110), the result changes only if you modify the formula yourself.

**Using calculation operators in formulas**

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 oper

|  |  |  |
| --- | --- | --- |
| **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 |

ators, the result is a logical value either TRUE or FALSE.

**Text concatenation operator**

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

|  |  |  |
| --- | --- | --- |
| **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 on 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.

|  |  |
| --- | --- |
| **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 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.

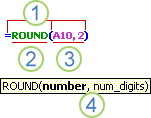
=(B4+25)/SUM(D5:F5)

**Using functions and nested functions in formulas**

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 syntax of functions**

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



Structure of a function

Callout 1Structure. 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.

Callout 2Function name. For a list of available functions, click a cell and press SHIFT+F3.

Callout 3Arguments. Arguments can be numbers, text, logical values such as TRUE or FALSE, [arrays (array: Used to build single formulas that produce multiple results or that operate on a group of arguments that are arranged in rows and columns. An array range shares a common formula; an array constant is a group of constants used as an argument.)](javascript:AppendPopup(this,'xldefArray_4')), error values such as #N/A, or [cell references (cell reference: The set of coordinates that a cell occupies on a worksheet. For example, the reference of the cell that appears at the intersection of column B and row 3 is B3.)](javascript:AppendPopup(this,'xldefCellReference_5')). The argument you designate must produce a valid value for that argument. Arguments can also be [constants (constant: A value that is not calculated and, therefore, does not change. For example, the number 210, and the text "Quarterly Earnings" are constants. An expression, or a value resulting from an expression, is not a constant.)](javascript:AppendPopup(this,'ofConstant_6')), formulas, or other functions.

Callout 4Argument 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.

**Entering functions**

When you create a formula that contains a function, the **Insert Function** dialog box helps you enter worksheet functions. As you enter a function into the formula, the **Insert Function** dialog box displays the name of the function, each of its arguments, a description of the function and each argument, the current result of the function, and the current result of the entire formula.

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, arguments, and names that match the letters or trigger. You can then insert an item in the drop-down list into the formula.

**Nesting functions**

In certain cases, you may need to use a function as one of the [arguments (argument: The values that a function uses to perform operations or calculations. The type of argument a function uses is specific to the function. Common arguments that are used within functions include numbers, text, cell references, and names.)](javascript:AppendPopup(this,'IDH_xldefArgument_7')) of another function. For example, the following formula uses a nested AVERAGE function and compares the result with the value 50.

Nested functions

Callout 1The AVERAGE and SUM functions are nested within the IF function.

**Valid returns**   When a nested function is used as an argument, it must return the same type of value that the argument uses. For example, if the argument returns a TRUE or FALSE value, then the nested function must return a TRUE or FALSE. If it doesn't, Microsoft Excel displays a #VALUE! error value.

**Nesting level limits**   A formula can contain up to seven levels of nested functions. When Function B is used as an argument in Function A, Function B is a second-level function. For instance, the AVERAGE function and the SUM function are both second-level functions because they are arguments of the IF function. A function nested within the AVERAGE function would be a third-level function, and so on.

**Using references in formulas**

A reference identifies a cell or a range of cells on a worksheet and tells Microsoft Excel where to look for the values or data you want to use in a formula. With references, you can use data contained in different parts of a worksheet in one formula or use the value from one cell in several formulas. You can also refer to cells on other sheets in the same workbook, and to other workbooks. References to cells in other workbooks are called links or [external references (external reference: A reference to a cell or range on a sheet in another Excel workbook, or a reference to a defined name in another workbook.)](javascript:AppendPopup(this,'IDH_xldefExternalReference_8')).

**The A1 reference style**

**The default reference style**   By default, Excel uses the A1 reference style, which refers to columns with letters (A through XFD, for a total of 16,384 columns) and refers to rows with numbers (1 through 1,048,576). These letters and numbers are called row and column headings. To refer to a cell, enter the column letter followed by the row number. For example, B2 refers to the cell at the intersection of column B and row 2.

|  |  |
| --- | --- |
| **To refer to** | **Use** |
| The cell in column A and row 10 | A10 |
| The range of cells in column A and rows 10 through 20 | A10:A20 |
| The range of cells in row 15 and columns B through E | B15:E15 |
| All cells in row 5 | 5:5 |
| All cells in rows 5 through 10 | 5:10 |
| All cells in column H | H:H |
| All cells in columns H through J | H:J |
| The range of cells in columns A through E and rows 10 through 20 | A10:E20 |

**Making a reference to another worksheet**   In the following example, the AVERAGE worksheet function calculates the average value for the range B1:B10 on the worksheet named Marketing in the same workbook.



Reference to a range of cells on another worksheet in the same workbook

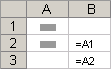
Callout 1Refers to the worksheet named Marketing

Callout 2Refers to the range of cells between B1 and B10, inclusively

Callout 3Separates the worksheet reference from the cell range reference

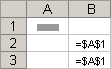
**The difference between absolute, relative and mixed references**

**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.



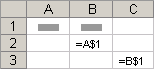
Copied formula with relative reference

**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.



Copied formula with absolute reference

**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.



Copied formula with mixed reference

**The 3-D reference style**

**Conveniently referencing multiple worksheets**  If you want to analyze data in the same cell or range of cells on multiple worksheets within the workbook, use a 3-D reference. A 3-D reference includes the cell or range reference, preceded by a range of worksheet names. Excel uses any worksheets stored between the starting and ending names of the reference. For example, =SUM (Sheet2:Sheet13!B5) adds all the values contained in cell B5 on all the worksheets between and including Sheet 2 and Sheet 13.

* You can use 3-D references to refer to cells on other sheets, to define names, and to create formulas by using the following functions: SUM, AVERAGE, AVERAGEA, COUNT, COUNTA, MAX, MAXA, MIN, MINA, PRODUCT, STDEV, STDEVA, STDEVP, STDEVPA, VAR, VARA, VARP, and VARPA.
* 3-D references cannot be used in [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.)](javascript:AppendPopup(this,'IDH_xldefArrayFormula_9')).
* 3-D references cannot be used with the intersection [operator (operator: A sign or symbol that specifies the type of calculation to perform within an expression. There are mathematical, comparison, logical, and reference operators.)](javascript:AppendPopup(this,'ofdefOperator_10')) (a single space) or in formulas that use [implicit intersection (implicit intersection: A reference to a range of cells, instead of a single cell, that is calculated like a single cell. If cell C10 contains the formula =B5:B15\*5, Excel multiplies the value in cell B10 by 5 because cells B10 and C10 are in the same row.)](javascript:AppendPopup(this,'IDH_xldefImplicitIntersection_11')).

**What happens when you move, copy, insert, or delete worksheets**   The following examples explain what happens when you move, copy, insert, or delete worksheets that are included in a 3-D reference. The examples use the formula =SUM(Sheet2:Sheet6!A2:A5) to add cells A2 through A5 on worksheets 2 through 6.

* **Insert or copy**   If you insert or copy sheets between Sheet2 and Sheet6 (the endpoints in this example), Microsoft Excel includes all values in cells A2 through A5 from the added sheets in the calculations.
* **Delete**   If you delete sheets between Sheet2 and Sheet6, Excel removes their values from the calculation.
* **Move**   If you move sheets from between Sheet2 and Sheet6 to a location outside the referenced sheet range, Excel removes their values from the calculation.
* **Move an endpoint**   If you move Sheet2 or Sheet6 to another location in the same workbook, Excel adjusts the calculation to accommodate the new range of sheets between them.
* **Delete an endpoint**   If you delete Sheet2 or Sheet6, Excel adjusts the calculation to accommodate the range of sheets between them.

**The R1C1 reference style**

You can also use a reference style where both the rows and the columns on the worksheet are numbered. The R1C1 reference style is useful for computing row and column positions in [macros (macro: An action or a set of actions that you can use to automate tasks. Macros are recorded in the Visual Basic for Applications programming language.)](javascript:AppendPopup(this,'ofdefMacro_12')). In the R1C1 style, Excel indicates the location of a cell with an "R" followed by a row number and a "C" followed by a column number.

|  |  |
| --- | --- |
| **Reference** | **Meaning** |
| R[-2]C | A [relative reference (relative reference: In a formula, the address of a cell based on the relative position of the cell that contains the formula and the cell referred to. If you copy the formula, the reference automatically adjusts. A relative reference takes the form A1.)](javascript:AppendPopup(this,'xldefRelativeReference_13')) to the cell two rows up and in the same column |
| R[2]C[2] | A relative reference to the cell two rows down and two columns to the right |
| R2C2 | An [absolute reference (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.)](javascript:AppendPopup(this,'ofAbsoluteCellReference_14')) to the cell in the second row and in the second column |
| R[-1] | A relative reference to the entire row above the active cell |
| R | An absolute reference to the current row |

When you record a macro, Excel records some commands by using the R1C1 reference style. For example, if you record a command such as clicking the **AutoSum** button to insert a formula that adds a range of cells, Excel records the formula by using R1C1 style, not A1 style, references.

You can turn the R1C1 reference style on or off by setting or clearing the **R1C1 reference style check box** under **Working with formulas** in the **Formulas** category of the **Excel Settings** under the **File** menu.

**Using names in formulas**

You can create defined [names (name: A word or string of characters that represents a cell, range of cells, formula, or constant value. Use easy-to-understand names, such as Products, to refer to hard to understand ranges, such as Sales!C20:C30.)](javascript:AppendPopup(this,'IDH_xldefName_15')) to represent cells, ranges of cells, formulas, [constant (constant: A value that is not calculated and, therefore, does not change. For example, the number 210, and the text "Quarterly Earnings" are constants. An expression, or a value resulting from an expression, is not a constant.)](javascript:AppendPopup(this,'ofConstant_16')) values, or Excel tables. A name is a meaningful shorthand that makes it easier to understand the purpose of a [cell reference (cell reference: The set of coordinates that a cell occupies on a worksheet. For example, the reference of the cell that appears at the intersection of column B and row 3 is B3.)](javascript:AppendPopup(this,'xldefCellReference_17')), [constant (constant: A value that is not calculated. For example, the number 210 and the text "Quarterly Earnings" are constants. An expression, or a value resulting from an expression, is not a constant.)](javascript:AppendPopup(this,'IDH_qudefConstant_18')), [formula (formula: A sequence of values, cell references, names, functions, or operators in a cell that together produce a new value. A formula always begins with an equal sign (=).)](javascript:AppendPopup(this,'xldefFormula_19')), or [table (table: A collection of data about a particular subject that is stored in records (rows) and fields (columns).)](javascript:AppendPopup(this,'qudefTable_20')), 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 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 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 you insert an Excel table, but you can change the name to make it more meaningful.

**Creating and entering names**

You create 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.)](javascript:AppendPopup(this,'ofAbsoluteCellReference_21')).

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 **Formula** tab.

**Using array formulas and array constants**

An array formula can perform multiple calculations and then return either a single result or multiple results. Array formulas act on two or more sets of values known as array arguments. Each array argument must have the same number of rows and columns. You create array formulas in the same way that you create other formulas, except you press CTRL+SHIFT+ENTER to enter the formula. Some of the built-in functions are array formulas, and must be entered as arrays to get the correct results.

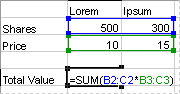
Array constants can be used in place of references when you don't want to enter each constant value in a separate cell on the worksheet.

**Using an array formula to calculate single and multiple results**

When you enter an [array formula (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.)](javascript:AppendPopup(this,'IDH_xldefArrayFormula_22')), Microsoft Excel automatically inserts the formula between { } (braces).

**To calculate a single result**   This type of array formula can simplify a worksheet model by replacing several different formulas with a single array formula.

For example, the following calculates the total value of an array of stock prices and shares, without using a row of cells to calculate and display the individual values for each stock.



Array formula that produces a single result

When you enter the formula ={SUM(B2:D2\*B3:D3)} as an array formula, it multiples the Shares and Price for each stock, and then adds the results of those calculations together.

**To calculate multiple results**   Some worksheet functions return arrays of values, or require an array of values as an argument. To calculate multiple results with an array formula, you must enter the array into a range of cells that has the same number of rows and columns as the array arguments.

For example, given a series of three sales figures (in column B) for a series of three months (in column A), the TREND function determines the straight-line values for the sales figures. To display all of the results of the formula, it is entered into three cells in column C (C1:C3).

Array formula that produces multiple results

Array formula that produces multiple results

When you enter the formula =TREND(B1:B3,A1:A3) as an array formula, it produces three separate results (22196, 17079, and 11962), based on the three sales figures and the three months.

**Create a simple formula with constants and calculation operators**

The following formulas contain [operators (operator: A sign or symbol that specifies the type of calculation to perform within an expression. There are mathematical, comparison, logical, and reference operators.)](javascript:AppendPopup(this,'ofdefOperator_4')) and [constants (constant: A value that is not calculated and, therefore, does not change. For example, the number 210, and the text "Quarterly Earnings" are constants. An expression, or a value resulting from an expression, is not a constant.)](javascript:AppendPopup(this,'ofConstant_5')).

|  |  |
| --- | --- |
| **Example formula** | **What it does** |
| =128+345 | Adds 128 and 345 |
| =5^2 | Squares 5 |

1. Click the cell in which you want to enter the formula.
2. Type **=** (an equal sign).
3. Enter the formula.
4. Press ENTER.

**Create a formula with functions**

The following formulas contain [functions (function: A prewritten formula that takes a value or values, performs an operation, and returns a value or values. Use functions to simplify and shorten formulas on a worksheet, especially those that perform lengthy or complex calculations.)](javascript:AppendPopup(this,'IDH_xldefFunction_6')).

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

1. Click the cell in which you want to enter the formula.
2. To start the formula with the function, click **Insert Function** Button imageon the [formula bar (formula bar: A bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts. Displays the constant value or formula stored in the active cell.)](javascript:AppendPopup(this,'xldefFormulaBar_7')) Formula bar.
3. Select the function 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 (argument: The values that a function uses to perform operations or calculations. The type of argument a function uses is specific to the function. Common arguments that are used within functions include numbers, text, cell references, and names.)](javascript:AppendPopup(this,'IDH_xldefArgument_8')). To enter cell references as an argument, click **Collapse Dialog** Button image(which temporarily hides the dialog box), select the cells on the worksheet, and then press **Expand Dialog** Button image.
5. When you complete the formula, press ENTER.

**Create a formula with nested functions**

Nested functions use a function as one of the arguments of another function. You can nest up to 64 levels of functions. The following formula sums a set of numbers (G2:G5) only if the average of another set of numbers (F2:F5) is greater than 50. Otherwise it returns 0.

Nested functions

Callout 1The AVERAGE and SUM functions are nested within the IF function.

1. Click the cell in which you want to enter the formula.
2. To start the formula with the function, click **Function Wizard** Button imageon the [formula bar (formula bar: A bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts. Displays the constant value or formula stored in the active cell.)](javascript:AppendPopup(this,'xldefFormulaBar_9')) Formula bar.
3. Select the function 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 (argument: The values that a function uses to perform operations or calculations. The type of argument a function uses is specific to the function. Common arguments that are used within functions include numbers, text, cell references, and names.)](javascript:AppendPopup(this,'IDH_xldefArgument_10')).
   * To enter cell references as an argument, click **Collapse Dialog Button image**next to the argument you want (which temporarily hides the dialog box), select the cells on the worksheet, and then press **Expand Dialog** Button image.
   * To enter another function as an argument, enter the function in the argument box that you want. For example, you can add SUM(G2:G5) in the **Value\_if\_true** edit box of the IF function.
   * The parts of the formula displayed in the **Function Arguments** dialog box reflect the function that you selected in the previous step. For example, if you clicked IF, **Function arguments** displays the arguments for the IF function.

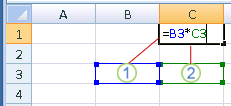
ms-help://MS.EXCEL.12.1033/EXCEL/content/TopPageIcon_CLV.gif [Top of Page](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10081867.htm#backtotop)

**Create a formula with references and names**

The following formulas contain [relative references (relative reference: In a formula, the address of a cell based on the relative position of the cell that contains the formula and the cell referred to. If you copy the formula, the reference automatically adjusts. A relative reference takes the form A1.)](javascript:AppendPopup(this,'xldefRelativeReference_11')) to and [names (name: A word or string of characters that represents a cell, range of cells, formula, or constant value. Use easy-to-understand names, such as Products, to refer to hard to understand ranges, such as Sales!C20:C30.)](javascript:AppendPopup(this,'IDH_xldefName_12')) 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.

|  |  |
| --- | --- |
| **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 a cell named Liability from a cell named Asset |

1. Click the cell in which you want to enter the formula.
2. In the [formula bar (formula bar: A bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts. Displays the constant value or formula stored in the active cell.)](javascript:AppendPopup(this,'xldefFormulaBar_13')) 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.



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

Callout 2The 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, then the reference is to a [named (name: A word or string of characters that represents a cell, range of cells, formula, or constant value. Use easy-to-understand names, such as Products, to refer to hard to understand ranges, such as Sales!C20:C30.)](javascript:AppendPopup(this,'IDH_xldefName_14')) range.

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

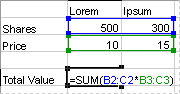
1. Press ENTER.

**Create an array formula that calculates a single result**

You can use an array formula to perform several calculations to generate a single result. This type of array formula can simplify a worksheet model by replacing several different formulas with a single array formula.

1. Click the cell in which you want to enter the array formula.
2. Type the array formula.

For example, the following calculates the total value of an array of stock prices and shares, without using a row of cells to calculate and display the individual values for each stock.



Array formula that produces a single result

When you enter the formula {=SUM(B2:C2\*B3:C3)} as an array formula, it multiples the Shares and Price for each stock, and then adds the results of those calculations together to get a total value of 9500.

1. Press CTRL+SHIFT+ENTER.

Microsoft Office Excel automatically inserts the formula between { } (braces).

**Important**  When you edit the array formula, the braces ({ }) do not appear in the array formula, and you must press CTRL+SHIFT+ENTER again.

**Create an array formula that calculates multiple results**

Some worksheet functions return arrays of values, or require an array of values as an argument. To calculate multiple results with an array formula, you must enter the array into a range of cells that has the same number of rows and columns as the array arguments have.

1. Select the range of cells in which you want to enter the array formula.
2. Type the array formula.

For example, given a series of three sales figures (column B) for a series of three months (column A), the TREND function determines the straight-line values for the sales figures. To display all of the results of the formula, it is entered into three cells in column C (C1:C3).

Array formula that produces multiple results

Array formula that produces multiple results

When you enter the formula =TREND(B1:B3,A1:A3) as an array formula, it produces three separate results (22196, 17079, and 11962), based on the three sales figures and the three months.

1. Press CTRL+SHIFT+ENTER.

Excel automatically inserts the formula between { } (braces).

**Important**  When you edit the array formula, the braces ({ }) do not appear in the array formula, and you must press CTRL+SHIFT+ENTER again.

**Delete a formula**

1. Click the cell that contains the formula.
2. Press DELETE.

**Learn tips and tricks about creating formulas**

**Quickly copy formulas**   You can quickly enter the same formula into a range of cells. Select the range 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 (relative reference: In a formula, the address of a cell based on the relative position of the cell that contains the formula and the cell referred to. If you copy the formula, the reference automatically adjusts. A relative reference takes the form A1.)](javascript:AppendPopup(this,'xldefRelativeReference_15')).

**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, Excel displays below the cell a dynamic drop down list of valid functions, arguments, and names that match the letters or trigger. You can then insert an item in the drop-down list into the formula.

**Use Function tooltips**   If you are familiar with the [arguments (argument: The values that a function uses to perform operations or calculations. The type of argument a function uses is specific to the function. Common arguments that are used within functions include numbers, text, cell references, and names.)](javascript:AppendPopup(this,'IDH_xldefArgument_16')) of a function, you can use the function tooltip 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.

**Avoid common errors when creating formulas**

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

|  |  |
| --- | --- |
| **Make sure that you…** | **More information** |
| **Match all open and close parentheses** | Make sure that all parentheses are part of a matching pair. When you create a formula, Microsoft Office Excel displays parentheses in color as they are entered. |
| **Use a colon to indicate a range** | 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 the range. |
| **Enter all required arguments** | Some [functions (function: A prewritten formula that takes a value or values, performs an operation, and returns a value or values. Use functions to simplify and shorten formulas on a worksheet, especially those that perform lengthy or complex calculations.)](javascript:AppendPopup(this,'IDH_xldefFunction_17')) have required [arguments (argument: The values that a function uses to perform operations or calculations. The type of argument a function uses is specific to the function. Common arguments that are used within functions include numbers, text, cell references, and names.)](javascript:AppendPopup(this,'IDH_xldefArgument_18')). Also, make sure that you have not entered too many arguments. |
| **Nest no more than seven functions** | You can enter, or nest, no more than seven 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 nonalphabetical character, you must enclose its name within single quotation marks ( ' ). |
| **Include the path to external workbooks** | Make sure that each [external reference (external reference: A reference to a cell or range on a sheet in another Excel workbook, or a reference to a defined name in another workbook.)](javascript:AppendPopup(this,'IDH_xldefExternalReference_19')) contains a workbook name and the path to the workbook. |
| **Enter numbers without formatting** | Do not format numbers as you enter them in formulas. For example, even if the value that you want to enter is $1,000, enter **1000** in the formula. |

**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**.

1. 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 (formula bar: A bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts. Displays the constant value or formula stored in the active cell.)](javascript:AppendPopup(this,'xldefFormulaBar_4')) Formula bar, select the reference that you want to change.
   * Press F4 to switch between the combinations.

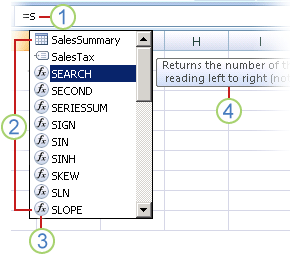
The following table summarizes how a reference type updates if a formula that contains the reference is copied two cells down and two cells to the right.

|  |  |  |
| --- | --- | --- |
| **For a formula being copied:** | **If the reference is:** | **It changes to:** |
| Formula being copied | $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 |

 You can also copy formulas into adjacent cells by using the [fill handle (fill handle: The small black square in the lower-right corner of the selection. When you point to the fill handle, the pointer changes to a black cross.)](javascript:AppendPopup(this,'XldefFillHandle_5')) 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.

**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.



Callout 1Type the = (equal sign) and beginning letters or a display trigger to start Formula AutoComplete.

Callout 2As you type, a scrollable list of valid items is displayed with the closest match highlighted.

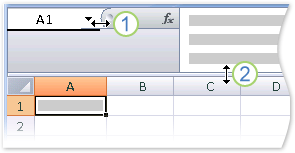
Callout 3Icons represent the type of entry, such as a function or table reference.

Callout 4Detailed ScreenTips help you make the best choice.

**Resize the formula or name box in the formula bar**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

To make it easier to view and edit a long [formula (formula: A sequence of values, cell references, names, functions, or operators in a cell that together produce a new value. A formula always begins with an equal sign (=).)](javascript:AppendPopup(this,'xldefFormula_1')) or large amount of text in a cell, you can adjust the size of the formula box in the [formula bar (formula bar: A bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts. Displays the constant value or formula stored in the active cell.)](javascript:AppendPopup(this,'xldefFormulaBar_2')). To accommodate long [names (name: A word or string of characters in Excel that represents a cell, range of cells, formula, or constant value.)](javascript:AppendPopup(this,'IDH_qudefName_3')), you can also resize the [name box (Name box: Box at left end of the formula bar that identifies the selected cell, chart item, or drawing object. To name a cell or range, type the name in the Name box and press ENTER. To move to and select a named cell, click its name in the Name box.)](javascript:AppendPopup(this,'XlNameBox_4')) in the formula bar. The worksheet and formula bar work in tandem so that contents of both do not overlap.



Callout 1Adjust the width of the name box left or right.

Callout 2Adjust the height of the formula box up or down.

**Resize the formula box**

Do one or more of the following:

* To switch between expanding the formula box to three or more lines or collapsing it to one line, click the chevron button Chevron Buttonat the end of the formula bar. You can also press CTRL+SHIFT+U.
* To precisely adjust the height of the formula box, hover over the bottom of the formula box until the pointer changes to a vertical double arrow Vertical double arrow, drag the vertical double arrow up or down to where you want it, and then either click the vertical double arrow or press ENTER.
* To automatically fit the formula box to the number of lines of text in the active cell up to the maximum height, hover over the formula box until the pointer changes to a vertical double arrow Vertical double arrow, and then double-click the vertical double arrow.
* You can resize the formula box to a maximum size so that only one worksheet row is visible.
* When you resize the formula box, the active cell always stays visible on the worksheet.
* A scroll bar in the formula box means that there is more text to view. To activate the scroll bars, click the cell or the formula box.
* By default, when you enter text in a cell, it is one line of text with no line breaks, but the text wraps when displayed in the formula bar. If you manually insert a line break in the cell by pressing ALT+ENTER, the line break also displays in the formula bar.

**Resize the name box**

* To adjust the width of the name box either smaller or larger, hover between the name box and the formula box until the pointer changes to a horizontal double arrow Horizontal double arrow, drag the horizontal double arrow left or right to where you want it, and then either click the horizontal double arrow or press ENTER.

**Note**   The maximum width of the name box is half of the width of the worksheet.

**Logical functions**

|  |  |
| --- | --- |
| **Function** | **Description** |
| [AND](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10069828.htm) | Returns TRUE if all of its arguments are TRUE |
| [FALSE](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10062401.htm) | Returns the logical value FALSE |
| [IF](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10069829.htm) | Specifies a logical test to perform |
| [IFERROR](ms-help://MS.EXCEL.12.1033/EXCEL/content/HA01231765.htm) | Returns a value you specify if a formula evaluates to an error; otherwise, returns the result of the formula |
| [NOT](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10062402.htm) | Reverses the logic of its argument |
| [OR](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10062403.htm) | Returns TRUE if any argument is TRUE |
| [TRUE](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10062404.htm) | Returns the logical value TRUE |

**AND**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

Returns TRUE if all its arguments are TRUE; returns FALSE if one or more argument is FALSE.

**Syntax**

**AND**(**logical1**,logical2, ...)

**Logical1, logical2, ...**   are 1 to 255 conditions you want to test that can be either TRUE or FALSE.

**Remarks**

* The arguments must evaluate to logical values such as TRUE or FALSE, or the arguments must be [arrays (array: Used to build single formulas that produce multiple results or that operate on a group of arguments that are arranged in rows and columns. An array range shares a common formula; an array constant is a group of constants used as an argument.)](javascript:AppendPopup(this,'xldefArray_1')) or references that contain logical values.
* If an array or reference argument contains text or empty cells, those values are ignored.
* If the specified range contains no logical values, AND returns the #VALUE! error value.

**Example**

The example may be easier to understand if you copy it to a blank worksheet.

1. To switch between viewing the results and viewing the formulas that return the results, press CTRL+` (grave accent), or on the **Formulas** tab, in the **Formula Auditing** group, click the **Show Formulas** button.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | |  |  | | --- | --- | | **A** | **B** | | **Formula** | **Description (Result)** | | =AND(TRUE, TRUE) | All arguments are TRUE (TRUE) | | =AND(TRUE, FALSE) | One argument is FALSE (FALSE) | | =AND(2+2=4, 2+3=5) | All arguments evaluate to TRUE (TRUE) | |
| |  | | --- | |  | | **1** | | **2** | | **3** | | |  | | --- | | **A** | | **Data** | | 50 | | 104 | | **Formula** | **Description (Result)** | | =AND(1<A2, A2<100) | Because 50 is between 1 and 100 (TRUE) | | =IF(AND(1<A3, A3<100), A3, "The value is out of range.") | Displays the second number above, if it is between 1 and 100, otherwise displays a message (The value is out of range.) | | =IF(AND(1<A2, A2<100), A2, "The value is out of range.") | Displays the first number above, if it is between 1 and 100, otherwise displays a message (50) | |

**IF**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

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 evaluates to TRUE. Otherwise, the expression evaluates to FALSE. This argument can use any [comparison calculation operator](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10078886.htm).

**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.

**Remarks**

* Up to 64 IF functions can be nested as value\_if\_true and value\_if\_false arguments to construct more elaborate tests.
* When the value\_if\_true and value\_if\_false arguments are evaluated, IF returns the value returned by those statements.
* If any of the arguments to IF are [arrays (array: Used to build single formulas that produce multiple results or that operate on a group of arguments that are arranged in rows and columns. An array range shares a common formula; an array constant is a group of constants used as an argument.)](javascript:AppendPopup(this,'xldefArray_1')), every element of the array is evaluated when the IF statement is carried out.
* Microsoft Excel provides additional functions that can be used to analyze your data based on a condition. For example, to count the number of occurrences of a string of text or a number within a range of cells, use the [COUNTIF](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10069840.htm) and [COUNTIFS](ms-help://MS.EXCEL.12.1033/EXCEL/content/HA10047494.htm) worksheet functions. To calculate a sum based on a string of text or a number within a range, use the [SUMIF](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10062465.htm) and [SUMIFS](ms-help://MS.EXCEL.12.1033/EXCEL/content/HA10047504.htm) worksheet function.

**Example 1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | |  | | --- | | **A** | | **Data** | | 50 | | **Formula** | **Description (Result)** | | =IF(A2<=100,"Within budget","Over budget") | If the number above is less than or equal to 100, then the formula displays "Within budget". Otherwise, the function displays "Over budget" (Within budget) | | =IF(A2=100,SUM(B5:B15),"") | If the number above is 100, then the range B5:B15 is calculated. Otherwise, empty text ("") is returned () | |

**Example 2**.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | |  |  | | --- | --- | | **A** | **B** | | **Actual Expenses** | **Predicted Expenses** | | 1500 | 900 | | 500 | 900 | | 500 | 925 | | **Formula** | **Description (Result)** | | =IF(A2>B2,"Over Budget","OK") | Checks whether the first row is over budget (Over Budget) | | =IF(A3>B3,"Over Budget","OK") | Checks whether the second row is over budget (OK) | |

1. Example

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | |  | | --- | | **A** | | **Score** | | 45 | | 90 | | 78 | | **Formula** | **Description (Result)** | | =IF(A2>89,"A",IF(A2>79,"B", IF(A2>69,"C",IF(A2>59,"D","F")))) | Assigns a letter grade to the first score (F) | | =IF(A3>89,"A",IF(A3>79,"B", IF(A3>69,"C",IF(A3>59,"D","F")))) | Assigns a letter grade to the second score (A) | | =IF(A4>89,"A",IF(A4>79,"B", IF(A4>69,"C",IF(A4>59,"D","F")))) | Assigns a letter grade to the third score (C) | |

In the preceding example, the second IF statement is also the value\_if\_false argument to the first IF statement. Similarly, the third IF statement is the value\_if\_false argument to the second IF statement. For example, if the first logical\_test (Average>89) is TRUE, "A" is returned. If the first logical\_test is FALSE, the second IF statement is evaluated, and so on.

The letter grades are assigned to numbers using the following key.

|  |  |
| --- | --- |
| **If Score is** | **Then return** |
| Greater than 89 | A |
| From 80 to 89 | B |
| From 70 to 79 | C |
| From 60 to 69 | D |
| Less than 60 | F |

**NOT**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

Reverses the value of its argument. Use NOT when you want to make sure a value is not equal to one particular value.

**Syntax**

**NOT**(**logical**)

**Logical**   is a value or expression that can be evaluated to TRUE or FALSE.

**Remark**

If logical is FALSE, NOT returns TRUE; if logical is TRUE, NOT returns FALSE.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | |  |  | | --- | --- | | **A** | **B** | | **Formula** | **Description (Result)** | | =NOT(FALSE) | Reverses FALSE (TRUE) | | =NOT(1+1=2) | Reverses an equation that evaluates to TRUE (FALSE) | |

**OR**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

Returns TRUE if any argument is TRUE; returns FALSE if all arguments are FALSE.

**Syntax**

**OR**(**logical1**,logical2,...)

**Logical1,logical2,...**   are 1 to 255 conditions you want to test that can be either TRUE or FALSE.

**Remarks**

* The arguments must evaluate to logical values such as TRUE or FALSE, or in [arrays (array: Used to build single formulas that produce multiple results or that operate on a group of arguments that are arranged in rows and columns. An array range shares a common formula; an array constant is a group of constants used as an argument.)](javascript:AppendPopup(this,'xldefArray_1')) or references that contain logical values.
* If an array or reference argument contains text or empty cells, those values are ignored.
* If the specified range contains no logical values, OR returns the #VALUE! error value.
* You can use an OR array formula to see if a value occurs in an array. To enter an array formula, press CTRL+SHIFT+ENTER.

**Example**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | |  |  | | --- | --- | | **A** | **B** | | **Formula** | **Description (Result)** | | =OR(TRUE) | One argument is TRUE (TRUE) | | =OR(1+1=1,2+2=5) | All arguments evaluate to FALSE (FALSE) | | =OR(TRUE,FALSE,TRUE) | At least one argument is TRUE (TRUE) | |

[Function reference](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10069840.htm) > [Statistical](ms-help://MS.EXCEL.12.1033/EXCEL/content/HP10069840.htm)

**COUNTIF**

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Counts the number of cells within a range that meet the given criteria.

**Syntax**

**COUNTIF**(**range**,**criteria**)

**Range**  is one or more cells to count, including numbers or names, arrays, or references that contain numbers. Blank and text values are ignored.

**Criteria**  is the criteria in the form of a number, expression, cell reference, or text that defines which cells will be counted. For example, criteria can be expressed as 32, "32", ">32", "apples", or B4.

**Remark**

* You can use the wildcard characters, question mark (?) and asterisk (\*), in criteria. A question mark matches any single character; an asterisk matches any sequence of characters. If you want to find an actual question mark or asterisk, type a tilde (~) before the character.

**Example 1: Common COUNTIF formulas**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | **5** | | |  |  | | --- | --- | | **A** | **B** | | **Data** | **Data** | | apples | 32 | | oranges | 54 | | peaches | 75 | | apples | 86 | | **Formula** | **Description (result)** | | =COUNTIF(A2:A5,"apples") | Number of cells with apples in the first column above (2) | | =COUNTIF(A2:A5,A4) | Number of cells with peaches in the first column above (1) | | =COUNTIF(A2:A5,A3)+COUNTIF(A2:A5,A2) | Number of cells with oranges and apples in the first column above (3) | | =COUNTIF(B2:B5,">55") | Number of cells with a value greater than 55 in the second column above (2) | | =COUNTIF(B2:B5,"<>"&B4) | Number of cells with a value not equal to 75 in the second column above (3) | | =COUNTIF(B2:B5,">=32")-COUNTIF(B2:B5,">85") | Number of cells with a value greater than or equal to 32 and less than or equal to 85 in the second column above (3) | |

**Example 2: COUNTIF formulas using wildcard characters and handling blank values**

The example may be easier to understand if you copy it to a blank worksheet.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | |  | | **1** | | **2** | | **3** | | **4** | | **5** | | **6** | | **7** | | |  |  | | --- | --- | | **A** | **B** | | **Data** | **Data** | | apples | Yes | |  |  | | oranges | NO | | peaches | No | |  |  | | Apples | YeS | | **Formula** | **Description (result)** | | =COUNTIF(A2:A7,"\*es") | Number of cells ending with the letters "es" in the first column above (4) | | =COUNTIF(A2:A7,"?????es") | Number of cells ending with the letters "les" and having exactly 7 letters in the first column above (2) | | =COUNTIF(A2:A7,"\*") | Number of cells containing text in the first column above (4) | | =COUNTIF(A2:A7,"<>"&"\*") | Number of cells not containing text in the first column above (2) | | =COUNTIF(B2:B7,"No") / ROWS(B2:B7) | The average number of No votes including blank cells in the second column above formatted as a percentage with no decimal places (33%) | | =COUNTIF(B2:B7,"Yes") / (ROWS(B2:B7) -COUNTIF(B2:B7, "<>"&"\*")) | The average number of Yes votes excluding blank cells in the second column above formatted as a percentage with no decimal places (50%) | |

**Note**    You can view the number as a percentage. Select the cell, and then on the **Sheet** tab in the **Number** group, click **Percentage Style** Button image.

**Charts**

**Available chart types**

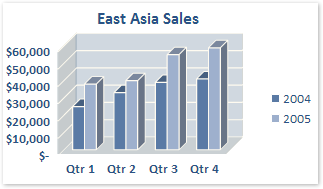
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Microsoft Office Excel 2007 supports numerous types of charts to help you display data in ways that are meaningful to your audience. When you want to create a chart or change an existing chart, you can choose from a wide range of chart subtypes available for each of the following chart types.

**Column charts**

Data that is arranged in columns or rows on a worksheet can be plotted in a column chart. Column charts are useful for showing data changes over a period of time or for illustrating comparisons among items.

In column charts, categories are typically organized along the horizontal axis and values along the vertical axis.



Column charts have the following chart subtypes:

* **Clustered column and clustered column in 3-D**  Clustered column charts compare values across categories. A clustered column chart displays values in 2-D vertical rectangles. A clustered column in 3-D chart displays only the vertical rectangles in 3-D format; it does not display the data in 3-D format.

**Note**   To present data in a 3-D format that uses three axes (horizontal, vertical, and depth axes) that you can modify, you should use the 3-D column chart subtype.

You can use a clustered column chart type when you have categories that represent:

* + Ranges of values (for example, item counts in a histogram).
  + Specific scale arrangements (for example, a Likert scale with entries, such as strongly agree, agree, neutral, disagree, strongly disagree).
  + Names that are not in any specific order (for example, item names, geographic names, or the names of people).
* **Stacked column and stacked column in 3-D**  Stacked column charts show the relationship of individual items to the whole, comparing the contribution of each value to a total across categories. A stacked column chart displays values in 2-D vertical stacked rectangles. A 3-D stacked column chart displays the vertical stacked rectangles in 3-D format; it does not display the data in 3-D format.

You can use a stacked column chart when you have multiple data series and when you want to emphasize the total.

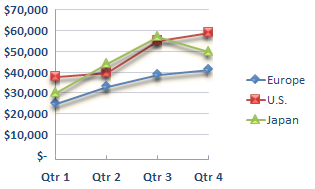
* **100% stacked column and 100% stacked column in 3-D**  These types of column charts compare the percentage each value contributes to a total across categories. A 100% stacked column chart displays values in 2-D vertical 100% stacked rectangles. A 3-D 100% stacked column chart displays the vertical 100% stacked rectangles in 3-D format; it does not display the data in 3-D format. You can use a 100% stacked column chart when you have three or more data series and you want to emphasize the contributions to the whole, especially if the total is the same for each category.
* **3-D column**  3-D column charts use three axes that you can modify (a horizontal axis, a vertical axis, and a depth axis) and they compare [data points (data points: Individual values plotted in a chart and represented by bars, columns, lines, pie or doughnut slices, dots, and various other shapes called data markers. Data markers of the same color constitute a data series.)](javascript:AppendPopup(this,'grdefDataPoints_1')) along the horizontal and the depth axes.

You can use a 3-D column chart when you want to compare data across the categories and across the series equally.

* **Cylinder, cone, and pyramid**  Cylinder, cone, and pyramid charts are available in the same clustered, stacked, 100% stacked, and 3-D chart types that are provided for rectangular column charts, and they show and compare data exactly the same way. The only difference is that these chart types display cylinder, cone, and pyramid shapes instead of rectangles.

**Line charts**

Data that is arranged in columns or rows on a worksheet can be plotted in a line chart. Line charts can display continuous data over time, set against a common scale, and are therefore ideal for showing trends in data at equal intervals. In a line chart, category data is distributed evenly along the horizontal axis, and all value data is distributed evenly along the vertical axis.



You should use a line chart if your category labels are text, and are representing evenly spaced values such as months, quarters, or fiscal years. This is especially true if there are multiple series—for one series, you should consider using a category chart. You should also use a line chart if you have a few evenly spaced numerical labels, especially years. If you have more than ten numerical labels, use a scatter chart instead.

Line charts have the following chart subtypes:

* **Line and line with markers**  Displayed with or without markers to indicate individual data values, line charts are useful to show trends over time or ordered categories, especially when there are many data points and the order in which they are presented is important. If there are many categories or the values are approximate, you should use a line chart without markers.
* **Stacked line and stacked line with markers**  Displayed with or without markers to indicate individual data values, stacked line charts are useful to show the trend of the contribution of each value over time or ordered categories. If there are many categories or the values are approximate, you should use a stacked line chart without markers.

**Tip**  For a better presentation of this type of data, you may want to consider using a stacked area chart instead.

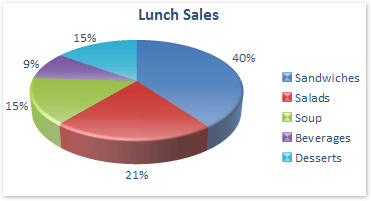
* **100% stacked line and 100% stacked line with markers**  Displayed with or without markers to indicate individual data values, 100% stacked line charts are useful to show the trend of the percentage each value contributes over time or ordered categories. If there are many categories or the values are approximate, you should use a 100% stacked line chart without markers.

**Tip**   For a better presentation of this type of data, you may want to consider using a 100% stacked area chart instead.

* **3-D line**  3-D line charts show each row or column of data as a 3-D ribbon. A 3-D line chart has horizontal, vertical, and depth axes that you can modify.

**Pie charts**

Data that is arranged in one column or row only on a worksheet can be plotted in a pie chart. Pie charts show the size of items in one [data series (data series: Related data points that are plotted in a chart. Each data series in a chart has a unique color or pattern and is represented in the chart legend. You can plot one or more data series in a chart. Pie charts have only one data series.)](javascript:AppendPopup(this,'xldefDataSeries_2')), proportional to the sum of the items. The [data points (data points: Individual values plotted in a chart and represented by bars, columns, lines, pie or doughnut slices, dots, and various other shapes called data markers. Data markers of the same color constitute a data series.)](javascript:AppendPopup(this,'grdefDataPoints_3')) in a pie chart are displayed as a percentage of the whole pie.



Consider using a pie chart when:

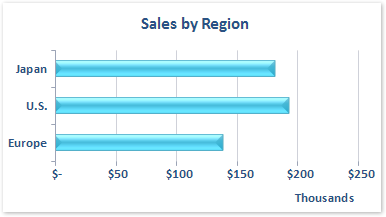
* You only have one data series that you want to plot.
* None of the values that you want to plot are negative.
* Almost none of the values that you want to plot are zero values.
* You don't have more than seven categories.
* The categories represent parts of the whole pie.

Pie charts have the following chart subtypes:

* **Pie and pie in 3-D**  Pie charts display the contribution of each value to a total in a 2-D or 3-D format. You can manually pull out the slices of a pie chart to emphasize them.
* **Pie of pie and bar of pie**  Pie of pie or bar of pie charts display pie charts with user-defined values extracted from the main pie chart and combined into a second pie or into a stacked bar. These chart types are useful when you want to make small slices in the main pie easier to see.
* **Exploded pie and exploded pie in 3-D**  Exploded pie charts display the contribution of each value to a total while emphasizing individual values. Exploded pie charts can be displayed in 3-D format. Because you cannot move the slices of an exploded pie individually, you may want to consider using a pie or pie in 3-D chart instead. You can then pull out the slices manually.

**Bar charts**

Data that is arranged in columns or rows on a worksheet can be plotted in a bar chart. Bar charts illustrate comparisons among individual items.



Consider using a bar chart when:

* The axis labels are long.
* The values that are shown are durations.

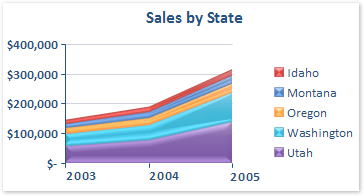
Bar charts have the following chart subtypes:

* **Clustered bar and clustered bar in 3-D**   Clustered bar charts compare values across categories. In a clustered bar chart, the categories are typically organized along the vertical axis, and the values along the horizontal axis. A clustered bar in 3-D chart displays the horizontal rectangles in 3-D format; it does not display the data in 3-D format.
* **Stacked bar and stacked bar in 3-D**  Stacked bar charts show the relationship of individual items to the whole. A stacked bar in 3-D chart displays the horizontal rectangles in 3-D format; it does not display the data in 3-D format.
* **100% stacked bar and 100% stacked bar in 3-D**  This type of chart compares the percentage each value contributes to a total across categories. A 100% stacked bar in 3-D chart displays the horizontal rectangles in 3-D format; it does not display the data in 3-D format.
* **Horizontal cylinder, cone, and pyramid**  Horizontal cylinder, cone, and pyramid charts are available in the same clustered, stacked, and 100% stacked chart types that are provided for rectangular bar charts, and they show and compare data exactly the same way. The only difference is that these chart types display cylinder, cone, and pyramid shapes instead of horizontal rectangles.

**Area charts**

Data that is arranged in columns or rows on a worksheet can be plotted in an area chart. Area charts emphasize the magnitude of change over time, and can be used to draw attention to the total value across a trend. For example, data that represents profit over time can be plotted in an area chart to emphasize the total profit.

By displaying the sum of the plotted values, an area chart also shows the relationship of parts to a whole.



Area charts have the following chart subtypes:

* **Area and area in 3-D**  Area charts display the trend of values over time or categories. An area chart in 3-D displays the same but presents the areas in a 3-D format; it does not display the data in 3-D format. To present data in a 3-D format that uses three axes (horizontal, vertical, and depth axes) that you can modify, you should use the 3-D area chart subtype. As a general rule, you should consider using a line chart instead of a non-stacked area chart.
* **Stacked area and stacked area in 3-D**  Stacked area charts display the trend of the contribution of each value over time or categories. A stacked area chart in 3-D displays the same but presents the areas in a 3-D format; it does not display the data in 3-D format. To present data in a 3-D format that uses three axes (horizontal, vertical, and depth axes) that you can modify, you should use the 3-D area chart subtype.
* **100% stacked area and 100% stacked area in 3-D**  100% stacked area charts display the trend of the percentage each value contributes over time or categories. A 100% stacked area chart in 3-D displays the same but presents the areas in a 3-D format; it does not display the data in 3-D format. To present data in a 3-D format that uses three axes (horizontal, vertical, and depth axes) that you can modify, you should use the 3-D area chart subtype.
* **3-D area**  3-D area charts display the trend of values over time or categories by using three axes (horizontal, vertical, and depth axes) that you can modify.

**XY (scatter) charts**

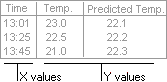
Data that is arranged in columns and rows on a worksheet can be plotted in an xy (scatter) chart. Scatter charts show the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.

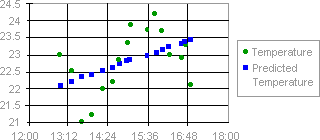
A scatter chart has two value axes, showing one set of numerical data along the horizontal axis (x-axis) and another along the vertical axis (y-axis). It combines these values into single data points and displays them in uneven intervals, or clusters. Scatter charts are commonly used for displaying and comparing numeric values, such as scientific, statistical, and engineering data.

Consider using a scatter chart when:

* You want to change the scale of the horizontal axis.
* You want to make that axis a logarithmic scale.
* Values for horizontal axis are not evenly spaced.
* There are many data points on the horizontal axis.
* You want to effectively display worksheet data that includes pairs or grouped sets of values and adjust the independent scales of a scatter chart to reveal more information about the grouped values.
* You want to show similarities between large sets of data instead of differences between data points.
* You want to compare large numbers of data points without regard to time—the more data that you include in a scatter chart, the better the comparisons that you can make.

To arrange data on a worksheet for a scatter chart, you should place the x values in one row or column, and then enter the corresponding y values in the adjacent rows or columns.





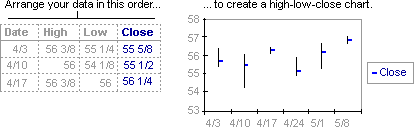
Scatter charts have the following chart subtypes:

* **Scatter with only markers**  This type of chart compares pairs of values. Use a scatter chart without lines when you have data in a specific order.
* **Scatter with smooth lines and scatter with smooth lines and markers**  This type of chart can be displayed with or without a smooth curve connecting the data points. These lines can be displayed with or without markers. Use the scatter chart without markers if there are many data points.
* **Scatter with straight lines and scatter with straight lines and markers**  This type of chart can be displayed with or without straight connecting lines between data points. These lines can be displayed with or without markers.

**Stock charts**

Data that is arranged in columns or rows in a specific order on a worksheet can be plotted in a stock chart. As its name implies, a stock chart is most often used to illustrate the fluctuation of stock prices. However, this chart may also be used for scientific data. For example, you could use a stock chart to indicate the fluctuation of daily or annual temperatures. You must organize your data in the correct order to create stock charts.

The way stock chart data is organized in your worksheet is very important. For example, to create a simple high-low-close stock chart, you should arrange your data with High, Low, and Close entered as column headings, in that order.



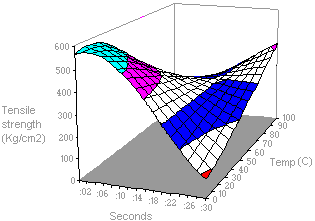
Stock charts have the following chart sub-types:

* **High-low-close**   The high-low-close chart is often used to illustrate stock prices. It requires three series of values in the following order: high, low, and then close.
* **Open-high-low-close**   This type of chart requires four series of values in the correct order (open, high, low, and then close).
* **Volume-high-low-close**   This type of chart requires four series of values in the correct order (volume, high, low, and then close). It measures volume by using two value axes: one for the columns that measure volume, and the other for the stock prices.
* **Volume-open-high-low-close**   This type of chart requires five series of values in the correct order (volume, open, high, low, and then close).

**Surface charts**

Data that is arranged in columns or rows on a worksheet can be plotted in a surface chart. A surface chart is useful when you want to find optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.

You can use a surface chart when both categories and data series are numeric values.



Surface charts have the following chart subtypes:

* **3-D surface**   3-D surface charts show trends in values across two dimensions in a continuous curve. Colors in a surface chart do not represent the data series; they represent the distinction between the values.
* **Wireframe 3-D surface**   Displayed without color, a 3-D surface chart is called a wireframe 3-D surface chart.

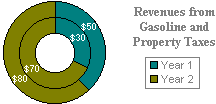
**Note**   Without color, a wireframe 3-D surface chart is not easy to read. You may want to use a 3-D surface chart instead.

* **Contour and wireframe contour**   Contour and wireframe contour charts are surface charts viewed from above. In a contour chart, colors represent specific ranges of values. A wireframe contour chart is displayed without color.

**Note**   Contour or wireframe contour chart are not easy to read. You may want to use a 3-D surface chart instead.

**Doughnut charts**

Data that is arranged in columns or rows only on a worksheet can be plotted in a doughnut chart. Like a pie chart, a doughnut chart shows the relationship of parts to a whole, but it can contain more than one [data series (data series: Related data points that are plotted in a chart. Each data series in a chart has a unique color or pattern and is represented in the chart legend. You can plot one or more data series in a chart. Pie charts have only one data series.)](javascript:AppendPopup(this,'xldefDataSeries_4')).



**Note**   Doughnut charts are not easy to read. You may want to use a stacked column or stacked bar chart instead.

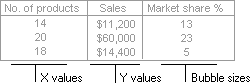
Doughnut charts have the following chart subtypes:

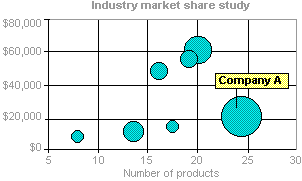
* **Doughnut**   Doughnut charts display data in rings, where each ring represents a data series. For example, in the previous chart, the inner ring represents gas tax revenues, and the outer ring represents property tax revenues.
* **Exploded Doughnut**  Much like exploded pie charts, exploded doughnut charts display the contribution of each value to a total while emphasizing individual values, but they can contain more than one data series.

**Bubble charts**

Data that is arranged in columns on a worksheet so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.

For example, you would organize your data as shown in the following example.



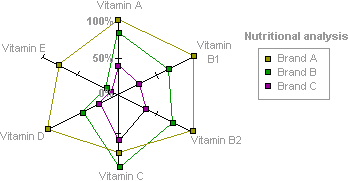


Bubble charts have the following chart subtypes:

* **Bubble and bubble with 3-D effect**  Bubble charts are similar to xy (scatter) chart, but they compare sets of three values instead of two. The third value determines the size of the bubble marker. You can choose a bubble or a bubble with a 3-D effect chart subtype.

**Radar charts**

Data that is arranged in columns or rows on a worksheet can be plotted in a radar chart. Radar charts compare the aggregate values of a number of [data series (data series: Related data points that are plotted in a chart. Each data series in a chart has a unique color or pattern and is represented in the chart legend. You can plot one or more data series in a chart. Pie charts have only one data series.)](javascript:AppendPopup(this,'xldefDataSeries_5')).



Radar charts have the following chart subtypes:

* **Radar and radar with markers**  With or without markers for individual data points, radar charts display changes in values relative to a center point.
* **Filled radar**  In a filled radar chart, the area covered by a data series is filled with a color.

**Create a chart**

[[Show All](javascript:AlterAllDivs('block');)Show All](javascript:AlterAllDivs('block');)

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

Creating a chart in Microsoft Office Excel is quick and easy. Excel provides a variety of chart types that you can choose from when you create a chart. For more information about the chart types that you can use, see [Available chart types](ms-help://MS.EXCEL.12.1033/EXCEL/content/HA01034607.htm).

For most charts, such as column and bar charts, you can plot the data that you arrange in rows or columns on a [worksheet (worksheet: The primary document that you use in Excel to store and work with data. Also called a spreadsheet. A worksheet consists of cells that are organized into columns and rows; a worksheet is always stored in a workbook.)](javascript:AppendPopup(this,'xldefWorksheet_1')) in a chart. Some chart types, however, such as pie and bubble charts, require a specific data arrangement.

1. On the worksheet, arrange the data that you want to plot in a chart.

|  |  |
| --- | --- |
| **For this chart** | **Arrange the data** |
| Column  Bar  Line  Area  Surface  Radar | In columns or rows, like:   |  |  | | --- | --- | | Lorem | Ipsum | | 1 | 2 | | 3 | 4 |   Or:   |  |  |  | | --- | --- | --- | | Lorem | 1 | 3 | | Ipsum | 2 | 4 | |
| Pie  Doughnut  (with one series) | In one column or row of data and one column or row of data labels, like:   |  |  | | --- | --- | | A | 1 | | B | 2 | | C | 3 |   Or:   |  |  |  | | --- | --- | --- | | A | B | C | | 1 | 2 | 3 | |
| Pie  Doughnut  (with more than one series) | In multiple columns or rows of data and one column or row of data labels, like:   |  |  |  | | --- | --- | --- | | A | 1 | 2 | | B | 3 | 4 | | C | 5 | 6 |   Or:   |  |  |  | | --- | --- | --- | | A | B | C | | 1 | 2 | 3 | | 4 | 5 | 6 | |
| XY (scatter)  Bubble | In columns, placing x values in the first column and corresponding y values and/or bubble size values in adjacent columns, like:   |  |  |  | | --- | --- | --- | | X | Y | Bubble size | | 1 | 2 | 3 | | 4 | 5 | 6 | |
| Stock | In columns or rows in the following order, using names or dates as labels:  high values, low values, and closing values  Like:   |  |  |  |  | | --- | --- | --- | --- | | Date | High | Low | Close | | 1/1/2002 | 46.125 | 42 | 44.063 |   Or:   |  |  | | --- | --- | | Date | 1/1/2002 | | High | 46.125 | | Low | 42 | | Close | 44.063 | |

1. Select the cells that contain the data that you want to use for the chart.

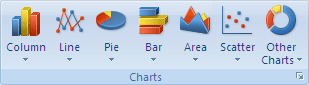
**Tip**  If you select only one cell, Excel automatically plots all cells containing data that directly surround that cell into a chart. If the cells that you want to plot in a chart are not in a continuous range, you can select nonadjacent cells or ranges as long as the selection forms a rectangle. You can also hide the rows or columns that you don't want to plot in the chart.

[[Show](javascript:ToggleDiv('divExpCollAsst_IDARJDTB'))How to select cells, ranges, rows, or columns](javascript:ToggleDiv('divExpCollAsst_IDARJDTB')%20%20%20%20%20%20%20%20)

|  |  |
| --- | --- |
| **To select** | **Do this** |
| A single cell | Click the cell, or press the arrow keys to move to the cell. |
| A range of cells | Click the first cell in the range, and then drag to the last cell, or hold down SHIFT while you press the arrow keys to extend the selection.  You can also select the first cell in the range, and then press F8 to extend the selection by using the arrow keys. To stop extending the selection, press F8 again. |
| A large range of cells | Click the first cell in the range, and then hold down SHIFT while you click the last cell in the range. You can scroll to make the last cell visible. |
| All cells on a worksheet | Click the **Select All** button.  Select All button  To select the entire worksheet, you can also press CTRL+A.  **Note**   If the worksheet contains data, CTRL+A selects the current region. Pressing CTRL+A a second time selects the entire worksheet. |
| Nonadjacent cells or cell ranges | Select the first cell or range of cells, and then hold down CTRL while you select the other cells or ranges.  You can also select the first cell or range of cells, and then press SHIFT+F8 to add another nonadjacent cell or range to the selection. To stop adding cells or ranges to the selection, press SHIFT+F8 again.  **Note**   You cannot cancel the selection of a cell or range of cells in a nonadjacent selection without canceling the entire selection. |
| An entire row or column | Click the row or column heading.  Worksheet showing row heading and column heading  Callout 1Row heading  Callout 2Column heading  You can also select cells in a row or column by selecting the first cell and then pressing CTRL+SHIFT+ARROW key (RIGHT ARROW or LEFT ARROW for rows, UP ARROW or DOWN ARROW for columns).  **Note**   If the row or column contains data, CTRL+SHIFT+ARROW key selects the row or column to the last used cell. Pressing CTRL+SHIFT+ARROW key a second time selects the entire row or column. |
| Adjacent rows or columns | Drag across the row or column headings. Or select the first row or column; then hold down SHIFT while you select the last row or column. |
| Nonadjacent rows or columns | Click the column or row heading of the first row or column in your selection; then hold down CTRL while you click the column or row headings of other rows or columns that you want to add to the selection. |
| The first or last cell in a row or column | Select a cell in the row or column, and then press CTRL+ARROW key (RIGHT ARROW or LEFT ARROW for rows, UP ARROW or DOWN ARROW for columns). |
| The first or last cell on a worksheet or in a Microsoft Office Excel table | Press CTRL+HOME to select the first cell on the worksheet or in an Excel list.  Press CTRL+END to select the last cell on the worksheet or in an Excel list that contains data or formatting. |
| Cells to the last used cell on the worksheet (lower-right corner) | Select the first cell, and then press CTRL+SHIFT+END to extend the selection of cells to the last used cell on the worksheet (lower-right corner). |
| Cells to the beginning of the worksheet | Select the first cell, and then press CTRL+SHIFT+HOME to extend the selection of cells to the beginning of the worksheet. |
| More or fewer cells than the active selection | Hold down SHIFT while you click the last cell that you want to include in the new selection. The rectangular range between the [active cell (active cell: The selected cell in which data is entered when you begin typing. Only one cell is active at a time. The active cell is bounded by a heavy border.)](javascript:AppendPopup(this,'xldefActiveCell_53')) and the cell that you click becomes the new selection. |

**Tip**  To cancel a selection of cells, click any cell on the worksheet.

1. On the **Insert** tab, in the **Charts** group, do one of the following:
   * Click the chart type, and then click a chart subtype that you want to use.
   * To see all available chart types, click a chart type, and then click **All Chart Types** to display the **Insert Chart** dialog box, click the arrows to scroll through all available chart types and chart subtypes, and then click the the ones that you want to use.



**Tip**  A ScreenTip displays the chart type name when you rest the mouse pointer over any chart type or chart subtype.

**Notes**

* The chart is placed on the worksheet as an [embedded chart (embedded chart: A chart that is placed on a worksheet rather than on a separate chart sheet. Embedded charts are beneficial when you want to view or print a chart or a PivotChart report with its source data or other information in a worksheet.)](javascript:AppendPopup(this,'xldefEmbeddedChart_2')). If you want to place the chart in a separate [chart sheet (chart sheet: A sheet in a workbook that contains only a chart. A chart sheet is beneficial when you want to view a chart or a PivotChart report separately from worksheet data or a PivotTable report.)](javascript:AppendPopup(this,'xldefChartSheet_3')), you can change its location.

[[Show](javascript:ToggleDiv('divExpCollAsst_IDA5KDTB'))How to change the location of a chart](javascript:ToggleDiv('divExpCollAsst_IDA5KDTB')%20%20%20%20%20%20%20%20)

* 1. Click the embedded chart or the chart sheet to select it and to display the chart tools.
  2. On the **Design** tab, in the **Location** group, click **Move Chart**.

Excel Ribbon Image

* 1. Under **Choose where you want the chart to be placed**, do one of the following:
     + To display the chart in a chart sheet, click **New sheet**.

**Tip**  If you want to replace the suggested name for the chart, you can type a new name in the **New sheet** box.

* + - To display the chart as an embedded chart in a worksheet, click **Object in**, and then click a worksheet in the **Object in** box.
* To quickly create a chart that is based on the default chart type, select the data that you want to use for the chart, and then press ALT+F1 or F11. When you press ALT+F1, the chart is displayed as an embedded chart; when you press F11, the chart is displayed on a separate chart sheet.
* If you use a specific chart type frequently when you create a chart, you may want to set that chart type as the default chart type. After you select the chart type and chart subtype in the **Insert Chart** dialog box, click **Set as Default Chart**.
* When you create a chart, the chart tools become available and the **Design**, **Layout**, and **Format** tabs are displayed. You can use the commands on these tabs to modify the chart so that it presents the data the way that you want. For example, use the **Design** tab to display the data series by row or by column, make changes to the source data of the chart, change the location of the chart, change the chart type, save a chart as a template, or select predefined layout and formatting options. Use the **Layout** tab to change the display of chart elements such as chart titles and data labels, use drawing tools, or add text boxes and pictures to the chart. Use the **Format** tab to add fill colors, change line styles, or apply special effects.

**Change the chart type of an existing chart**

[[Hide All](javascript:AlterAllDivs('none');)Hide All](javascript:AlterAllDivs('none');)

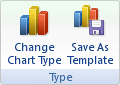
For most 2-D charts, you can change the chart type of the entire chart to give the chart a completely different look, or you can select a different chart type for any single [data series (data series: Related data points that are plotted in a chart. Each data series in a chart has a unique color or pattern and is represented in the chart legend. You can plot one or more data series in a chart. Pie charts have only one data series.)](javascript:AppendPopup(this,'xldefDataSeries_1')), which turns the chart into a combination chart. For bubble charts and most 3-D charts, you can only change the chart type of the entire chart.

Do one of the following:

* + To change the chart type of the entire chart, click the [chart area (chart area: The entire chart and all its elements.)](javascript:AppendPopup(this,'grdefChartArea_2')) or [plot area (plot area: In a 2-D chart, the area bounded by the axes, including all data series. In a 3-D chart, the area bounded by the axes, including the data series, category names, tick-mark labels, and axis titles.)](javascript:AppendPopup(this,'xldefPlotArea_3')) of the chart to display the chart tools.
  + To change the chart type of a single data series, click that data series.

**Tip**  This displays the chart tools, adding the **Design**, **Layout**, and **Format** tabs.

1. On the **Design** tab, in the **Type** group, click **Change Chart Type**.



1. In the **Change Chart Type** dialog box, do one of the following:
   * Click a chart type in the first box, and then click the chart subtype that you want to use in the second box.
   * If you saved a chart type as a template, click **Templates**, and then click the chart template that you want to use in the second box.

**Note**   You can only change the chart type of one data series at a time. To change the chart type of more than one data series in the chart, you must repeat all of the steps in this procedure for each data series.

**Tip**  If you use a specific chart type frequently when you create a chart, you may want to set that chart type as the default chart type. After you select the chart type and the chart subtype in the **Change Chart Type** dialog box, click **Set as Default Chart**.

**Create, apply, or remove a chart template**

To reuse a favorite chart type that you customized to meet your needs, you can save that chart as a chart template (\*.crtx) in the charts template folder.

Instead of re-creating the chart, you can simply apply the chart template. You can also apply other types of chart templates, such as templates, that are provided by your corporation or templates that you download from Office Online.

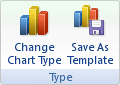
If you no longer need a specific chart template, you can remove it from the charts template folder or you can delete it from your computer.

**Save a chart as a chart template**

1. Click the chart that you want to save as a template.

**Tip**  This displays the **Chart Tools**, adding the **Design**, **Layout**, and **Format** tabs.

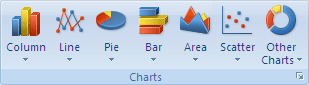
1. On the **Design** tab, in the **Type** group, click **Save Template**.



1. In the **Save in** box, make sure that the **Charts** folder is selected.
2. In the **File name** box, type an appropriate name for the chart template.

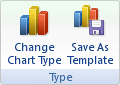
**Apply a chart template**

1. Do one of the following:
   * To create a new chart based on the template, on the **Insert** tab, in the **Charts** group, click any chart type, and then click **All Chart Types**.



**Tip**  You can also click the **Dialog Box Launcher** Button imagenext to **Charts** in the **Charts** group on the **Insert** tab.

* + To make a selected chart match a template, on the **Design** tab, in the **Type** group, click **Change Chart Type**.

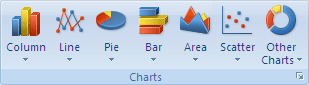


1. Click **Templates** in the first box, and then click the template that you want to use in the second box under **My Templates**.

**Note**   If a chart template is located in a folder other than the **Charts** folder, click **Manage Templates**, locate the chart template, and then copy or move it to the **Charts** folder under **Templates**.

**Remove or delete a chart template**

1. On the **Insert** tab, in the **Charts** group, click any chart type, and then click **All Chart Types**.



**Tip** You can also click the **Dialog Box Launcher** Button imagenext to **Charts** in the **Charts** group on the **Insert** tab.

1. Click **Manage Templates**.
2. Do one of the following:
   * To remove the chart template from the **Charts** folder, drag it to the folder where you want to store it.
   * To delete the chart template from your computer, right-click it, and then click **Delete**.

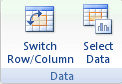
**Display hidden data and empty cells in a chart**

By default, data that is hidden in rows and columns in the worksheet is not displayed in a chart, and empty cells are displayed as gaps. You can, however, display the hidden data and change the way that the empty cells are displayed. Rather then displaying gaps, you can display empty cells as zero values, or you can span the gaps with a line.

1. Click a chart in which you want to display hidden data and empty cells.

**Tip**  This displays the **Chart Tools**, adding the **Design**, **Layout**, and **Format** tabs.

1. On the **Design** tab, in the **Data** group, click **Select Data**.



1. Click **Hidden and Empty Cells**, and then do one of the following:
   * To define how empty cells are displayed in the chart, click **Gaps**, **Zero**, or **Connect data points with line**.
   * To display hidden cells in the chart, select the **Show data in hidden rows and columns** check box.

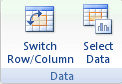
**Plot data series from worksheet rows or columns**

After you create a chart, you can easily change the way that worksheet rows and columns are plotted in the chart.

1. Click the chart that contains the data that you want to plot differently.

**Tip**  This displays the chart tools, adding the **Design**, **Layout**, and **Format** tabs.

1. On the **Design** tab, in the **Data** group, click **Switch Row/Column**.



**Note**   Clicking this button quickly switches between plotting the data series in the chart from worksheet rows or from columns.