



Information Technology Services

Excel Formulas & Functions

Tips & Techniques

Excel makes use of **formulas** (mathematical expressions that you create) and **functions** (mathematical expressions already available in Excel) to dynamically calculate results from data in your worksheets.

Constructing a formula

- To start **entering a formula in a cell**, click in that cell and then type the formula. Type **return** or **tab** to move to the next cell when you have finished entering the formula.
- All formulas begin with the = symbol.
- All formulas use the following **mathematical operators**:
 - * *multiplication*
 - / *division*
 - + *addition*
 - - *subtraction*
- **Formulas containing numbers** will produce a result that will not ever change.
 - *The formula =3*8 produces the result 24.*
- However, **a formula containing cell references** produces a result that may change if the data in those cells changes.
 - *The formula =C3+D3 will produce a result based upon the data in cells C3 and D3.*

	A	B	C
1			
2		=C3+D3	
3			
4			

Using the order of mathematical operations

All formulas utilize the standard mathematical order of operations when calculating results.

- If a part of a formula is in parentheses, that part will always be calculated before the rest of the formula.
 - *The formula $= (B2 * C2) - A3$ will subtract data in cell A3 from the multiplied product of cells B2 and C2.*
- After expressions in parentheses, Excel will calculate your formula using the math operators in the following order
 - *Multiplication*
 - *Division*
 - *Addition*
 - *Subtraction*
- In other words, Excel will begin to parse your formula starting with any **multiplication** and **division**. Once this is complete, Excel will **add** and **subtract** the remainder of your formula.

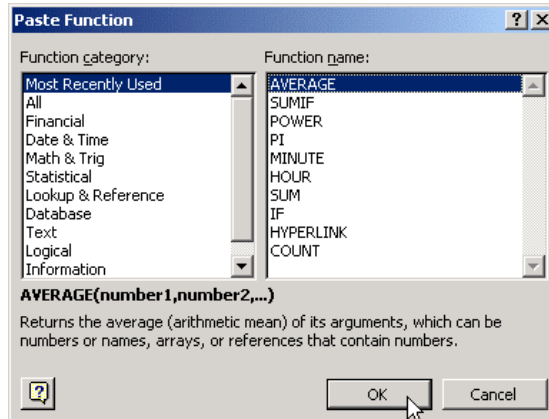
Inserting a function

Each of Excel's functions is a predefined formula, and most act on a range of cells that you select. (Excel refers to each range of cells in the function as an **argument**.) Although a few functions do not use arguments, most have one or more and some complex functions use as many as 3 or 4 arguments. Excel provides a **Paste Function** window to simplify the process of inserting functions into your worksheets and eliminate the need to remember the exact syntax of each function.

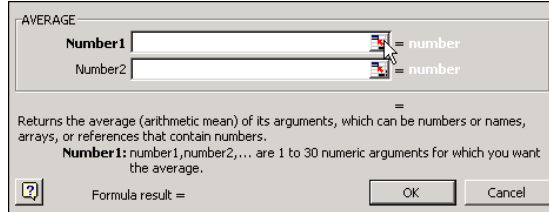
- Select the cell into which you want to insert a function.
- From the **Insert** menu, choose **Function**. Alternatively, you can click on the **Paste Function** button on the standard toolbar.



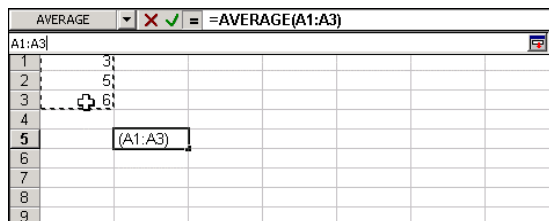
- In the **Paste Function** window, click on the **function category** containing the function you want. Next, click on the **name** of the function you wish to insert. Once you have selected a function, click **OK**.



- Next, Excel will display a **syntax window** to help you construct the function. From this window, first click on the **collapse button** (labeled with a red arrow) to the right of the box labeled **Number1** or **Value1** (depending on the function you chose to insert).



- Drag to select the range of cells to be included as the function's first argument. Type **enter**.



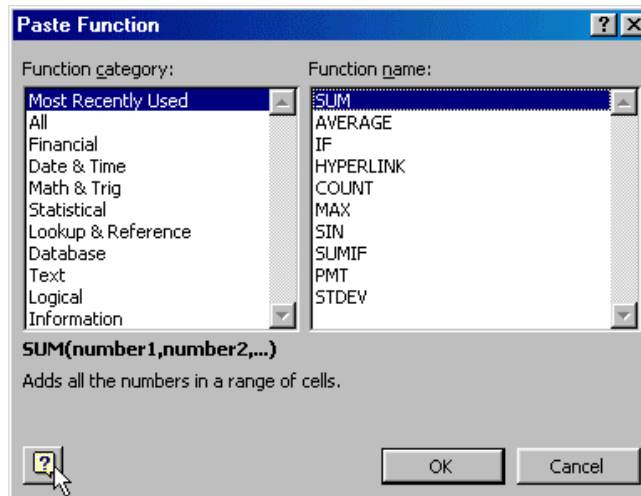
- To insert additional arguments into the function, follow this process using the other **Number** boxes in the **syntax window**.
- When you have finished, click **OK** in the **syntax window** to insert the function into your worksheet.

Searching for help on functions

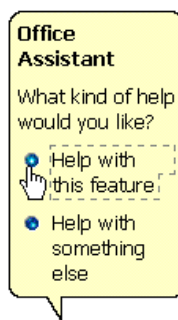
From the Paste Function window, Excel offers help on a function that you have selected as well as help finding the function that will perform a task you describe.

Getting help on a specific function

- To get help on a specific function, click on the function's name at the right of the **Paste Function** window and then click on the **Help** button at the window's lower left.

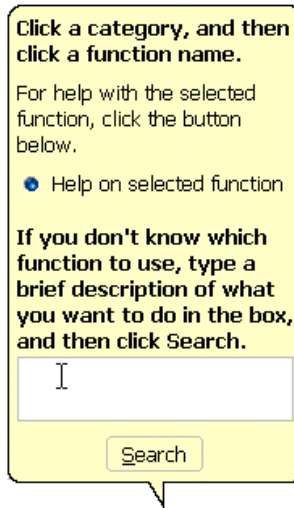


- Click on **Help with this feature** in the yellow callout box that appears, and then click on **Help on selected function** in the callout box that appears next. Excel will display its Help topic on the function that you selected.



Finding a function

- From the **Paste Function** window, click on the **Help** button in the lower left corner, and then click on **Help with this feature** in the yellow callout box that appears.
- In the box at the bottom of the next yellow callout box, type a description of the calculation you wish to perform. Click on **Search**.







- Excel will display a list of functions that may meet your criteria in the Recommended list at the right of the **Paste Function** window. To learn more about one of these functions, click on its name and then click **Help on selected function**.

Using functions with external data

Although most functions utilize data on the same worksheet, you can also use data on other worksheets or in other. In this way, you can consolidate data from multiple sources into an executive summary.

- Before beginning, **open any workbooks** that contain data to be used in your function.
- Select the cell into which you want to insert a function.
- Open the **Paste Function** window, click on the **name** of the function you wish to insert, and click **OK**.
- Collapse the gray **syntax window**, using the **collapse button** (labeled with a red arrow).
- Navigate so that the worksheet or workbook containing your data is **visible on your screen**.
- Drag to select the range of cells to be included as the function's first argument. Type **enter**.

AVERAGE    =AVERAGE(expenses!D5:D15)				
expenses!D5:D15 				
1	Smith-Wesson Associates			
2				
3	Month	Ad Expenses	Facility Overhead	Total Expenses
4	January	\$11,832.00	\$3,500.00	\$15,332.00
5	February	\$12,322.00	\$3,500.00	\$15,822.00
6	March	\$10,983.00	\$3,500.00	\$14,483.00
7	April	\$15,433.00	\$3,500.00	\$18,933.00
8	May	\$55,894.00	\$3,500.00	\$59,394.00
9	June	\$12,056.00	\$3,500.00	\$15,556.00
10	July	\$13,569.00	\$3,500.00	\$17,069.00
11	August	\$5,525.69	\$3,500.00	\$9,025.69
12	September	\$11,390.00	\$3,500.00	\$14,890.00
13	October	\$12,540.00	\$3,500.00	\$16,040.00
14	November	\$13,211.00	\$3,500.00	\$16,711.00
15	December	\$14,435.00	\$3,500.00	\$17,935.00
16				

- Excel will insert the reference to the cells that you selected (including the name of the external worksheet and workbook) into your function. Click **OK** to finish your function.

Tip: Naming external data ranges

When you select a range of cells on an external worksheet, Excel will add the name of your external worksheet to the cell range reference that it creates. In the example above, Excel refers to the selected cells (from the **expenses** worksheet) as **expenses!D5:D15**. If those cells were in an external workbook, the name of that workbook would preface the worksheet name. In general, references to external data look like this:

[workbook name.xls]worksheet name!C1:C34

Tip: Using external data in formulas

Use this technique to insert external data in your formulas, as well. When creating a formula, navigate to the external worksheet containing your and click to select that cell's data for use in your formula. Excel will automatically insert the correct cell reference (including the worksheet and workbook names) into your formula.

Function Cheat Sheet

Functions	Description	Syntax	Example
Functions without arguments			
Rand	Generates a random number between 0 and 1	=Rand()	=Rand()*3; (generates a random number between 0 and 3)
Pi	Generates the value of pi to 14 decimal places	=Pi()	=Pi()
Functions with 1 argument			
Average	Produces the average of the data in a range of cells	=average(Cx:Cy)	=average(C1:C12)
Max	Produces the greatest value in a column of cells	=max(Cx:Cy)	=max(C1:C12)
Hour	Returns the number of hours past midnight for the specified time	=hour(Cx) =hour(time)	=hour(A34) =hour(1:35 PM)
Minute	Returns the number of minutes past the hour for the specified time	=minute (Cx) =minute (time)	=minute(A34) =minute(1:35 PM)
Sqrt	Produces the square root of its argument	=sqrt(Cx) =sqrt(number)	=sqrt(Cx) =sqrt(9)
Functions with 2 arguments			
Round	Rounds a value to a specified digit to the left or right of the decimal point	=round(Cx, number) =round (value, number)	=round(A22, 2); (rounds to 2 decimal places) =round (123.45,0); (rounds to 0 decimal places)
Countif	Counts the number of cells in a range that meet a specified criteria	=countif(Cx:Cy, ">criteria")	=countif(C1:C12, ">150")

Functions	Description	Syntax	Example
Functions with 3 arguments			
If	Provides the basis for a decision; if condition is met, one answer is returned; if condition is not met, another answer is returned	=if(condition,"answer1","answer2")	=if(A1>0,"yes","no"); if the value of A1 is positive, Excel returns the answer "yes"; otherwise, Excel returns the answer "no"
Sumif	Produces the sum of the cells in a range if any cells in a second range meet a selection criterion	=sumif(Cx:Cy,criterion,Dx:Dy) Cx:Cy: the range of cells to meet the criterion Dx:Dy: the range of cells from which sum will be calculated	=sumif(C1:C12, >150,D1:D12)
Functions with one or more arguments			
And	Returns a logical TRUE response if all of its arguments are true; otherwise returns false	=and(condition 1,condition2, condition3...)	=and(A1>0,A2>1,A3>3)
Or	Returns a logical TRUE response if one or more arguments are true; otherwise returns false	=or(condition1, condition2, condition3...)	=or(A1>70,A1<80)
Sum	Totals the data in a column of cells	=sum(Cx:Cy,Dx ,Dy)	=sum(C1:C12)

Referencing a range of cells....

- In other worksheets: **worksheet!A1:D4**
- In other workbook: **c:\my documents\[test.xls]Sheet1!A2:A5**
- Across several worksheets: **sheet1:sheet5!A12**