

This tutorial was adapted from a tutorial by



see its complete version at

<http://www.fgcu.edu/support/office2000/excel/index.html>

## Excel 2002 – Tutorial III

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## Formulas & Functions Fundamentals

The following definitions are necessary to understand the basics of creating Excel formulas and functions.

### Formula Definition

A formula allows you to calculate and analyze data in your worksheet. Formulas perform calculations such as addition or multiplication; formulas can also combine values.

### Formula Syntax

Formula syntax is the structure or order of the formula elements. All formulas begin with an equal sign (=) in Excel followed by operands (the data to be calculated) and the operators. Operands can be values that don't change (constants), a range reference, a label, a name, or a worksheet function.

### Formula Bar

The formula bar is an area located at the top of the worksheet window that is used to enter or edit values or formulas in cells or charts. The formula bar displays the constant value or formula in the active cell. To display or hide the formula bar; click **Formula Bar** on the **View** menu.



### Function Definition

A *function* in Excel is a built-in formula that performs a mathematical operation or returns information specified by the formula. As with every formula created in Excel, each function starts with an equal (=) sign.

### Function Syntax

The syntax of a function begins with the function name, followed by an opening parenthesis, the arguments for the function separated by commas, and a closing parenthesis. If the function starts a formula, an equal sign (=) displays before the function name.

**Example:** =SUM (D2:F8)

In the above example, the function name is “SUM” and the argument for the function is the range “D2:F8”.

### Arguments

An argument is the reference behind the function. The reference can be any of the following type:

Argument Types	
Argument	Example
Numbers	1,2,3
Text	"January"
Logical Values	(True or False)
Cell References	B7 or B7:B20

### Operators

Operators are mathematical symbols that are broken into four categories

Keystroke Operators		
Arithmetic	Explanation	Example
+	Addition	2+3
-	Subtraction	5-1
*	Multiplication	7*3
/	Division	7/2
%	Percent	90%
^	Exponentiation	7^2
Comparison	Explanation	Example
=	Equal to	B1=D1
>	Greater than	B1>D1
<	Less than	B1<D1
>=	Greater than or equal to	B1>=D1
<=	Less than or equal to	B1<=D1
<>	Not equal to	B1<>D1
Text	Explanation	Example
&	Adjoins text or cell references	"Scott" & "Hi" produces "Scott Hi"
Reference	Explanation	Example
:	Includes cells of a column or row between the designated limits	B3 : B20
,	Separates arguments in a function	(B3, B20)

### Operator Order

Formulas are calculated left to right, using order of precedence, the parentheses have high order of precedence, i.e.: every thing inside them is evaluated first.


Excel performs operations in the order shown in the following table.

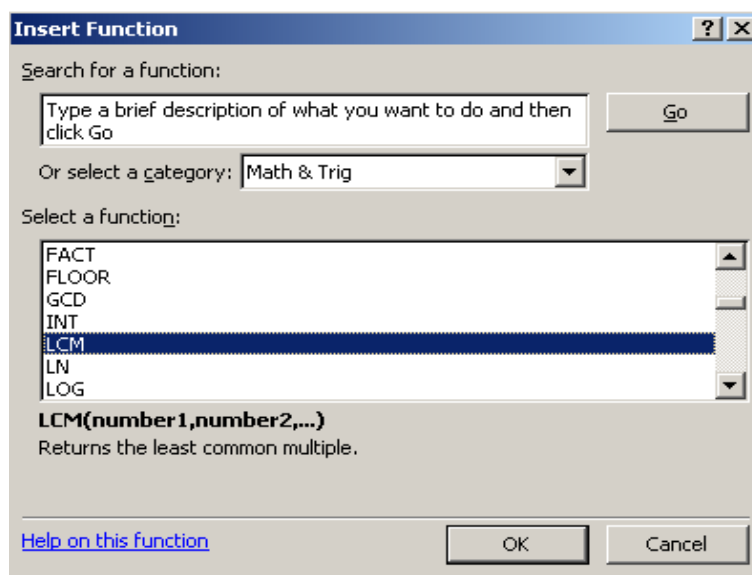
Excel's Operator Order		
Arithmetic	Operator Precedence	Example
1	%	Percent
2	^	Exponentiation
3	*, /	Multiplication, Division
4	+, -	Addition, Subtraction
5	&	Ampersand
6	>, >=, <, <=, =, <>	Comparisons

Notice that percent has the highest precedence, multiplication and division have same order of precedence, also addition and subtraction have same order of precedence. Excel performs all operations within sets of parentheses first, and you can use this to get exactly the order of operations you want. If multiple operations are encased in multiple sets of parentheses, the operations are performed from inside to outside, then follow the order of operations, and then left to right.

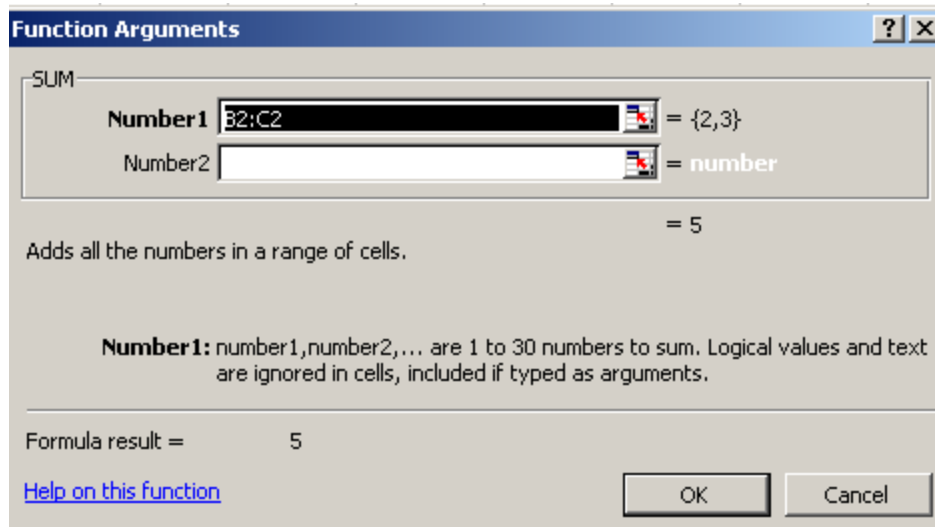
### *Function Wizard*

The function wizard is designed to help provide the necessary arguments and descriptions for the various Excel functions.

1. Select the cell in which you want the results of the function to display.
2. Click the Insert Function button  on the Standard toolbar or select **Function** from the **Insert** menu.
3. From the **Insert Function** dialog box, browse through the functions by selecting a Function category from the drop-down menu, and select the function from the Function choices below. As each function name is highlighted a description and example of use is provided below the two boxes.



3. Click **OK** to select a function
4. The next window allows you to choose the cells that contain the arguments of the function. In the example below, cell B2 and C2 were automatically selected for the sum function by Excel. The cell values {2, 3} are located to the right of the Number 1 field where the cell addresses are listed. If another set of cells, such as B5 and C5, needed to be added to the function, those cells would be added in the format “B5:C5” to the Number 2 field.



5. Click the **OK** button when all the cells for the function have been selected.

### Writing Multiple Copies of A Formula

Two methods are used to create copies of your formula quickly. One method uses **AutoFill** to copy a formula to several more cells (refer to Excel-I tutorial). Another method creates multiple copies when you enter the formula.

### **Entering Multiple Formulas All At Once**

To enter the same formula in several cells at once, follow these steps:


1. Select all the cells you want to enter the formula in .
2. Create your formula by whatever means you normally use, but don't press Enter when finished.
3. When the formula is complete, press **Ctrl+Enter**. The formula is entered in all the selected cells simultaneously.

### Editing & Deleting Formulas

You can also edit or delete any formula. To delete a formula, simply click on the cell that contains the formula, and press the **Delete** key on your keyboard. If you find you just need to alter the formula, do the following:

- 1) Click on the cell that contains the formula.
- 2) Click on the **Formula Bar** and make changes to your function.

If the formula uses a built- in Excel function:

- 1) Click on the cell that contains the function to select it
- 2) Click on the **Insert Function**  button on the formula bar to edit the arguments. Change the appropriate argument(s) and click **OK**.

### Absolute References

Calling cells by just their column and row labels (such as "A1") is called relative referencing. When a formula contains relative referencing and it is copied from one cell to another, Excel does not create an exact copy of the formula. It will change cell addresses relative to the row and column they are moved to. For example, if a simple addition formula in cell C1 " $=A1+B1$ " is copied to cell C2, the formula would change to " $=A2+B2$ " to reflect the new row.

### Relative References

To prevent the previous change, cells must be called by absolute referencing and this is accomplished by placing dollar signs "\$" within the cell addresses in the formula. Continuing the previous example, the formula in cell C1 would read " $=\$A\$1+\$B\$1$ " if the value of cell C2 should be the sum of cells A1 and B1. Both the column and row of both cells are absolute and will not change when copied, so C2 would also read " $=\$A\$1+\$B\$1$ ".

You can also specify one label to be absolute, example: \$A1, or A\$1.

## Errors in Formulas

When something prevents a formula from calculating, you will see an error message instead of a result.

Error Values		
Error	Meaning	How to Fix
####	The column is too narrow to display the result of calculation	Widen the column
#VALUE	Wrong type of argument or reference	Check operands and arguments
#DIV/0!	Data is attempting to divide by zero	Change the value or the cell reference so that the formula doesn't divide by zero

#NAME?	Formula is referencing an invalid name	Be sure the name still exists or correct the misspelling
#REF!	Excel can't locate the referenced cells(for example, the cells were deleted)	Click Undo to restore references and then change formula references
#NULL	Reference to intersection of two areas that do not intersect	Check for typing and reference errors

## Excel Functions Overview

### Statistical Functions Overview

Statistical functions are among the most widely used functions in Excel.

FUNCTION	WHAT IT DOES
<b>AVERAGE(range)</b>	Calculates the mean (arithmetic average) of a range of cells
<b>COUNT(range)</b>	Counts the number of values (cells containing numbers in a range)
<b>COUNTIF(range, value)</b>	Counts the number of cells that are the same as a specified value.
<b>MAX(range)</b>	Returns the maximum value of a data set.
<b>MIN(range)</b>	Returns the minimum value of a data set.
<b>MODE(range)</b>	Returns the most frequently occurring, or repetitive, value in a range of data.
<b>STDEV(range)</b>	Calculates the standard deviation of a sample or an entire deviation.

Where

**range** \_ Represents the set of values (number1, number2...)

**value** \_ The criteria upon which you want to evaluate; it can be a number (14), a cell reference (G5), an expression (E5>7), or text (“Victor”).

### Math Functions Overview

Math functions in Excel can be used to perform calculations as stand-alone functions or combined to create complex formulas. Excel has a great number of Math functions but the most commonly used ones are:

- **Sum**
- **Round**
- **Ceiling**
- **Floor**

You can use the Round ( ), Ceiling ( ), or Floor ( ) function to round a number to any number of digits you want.

### **Sum Function**

- Adds the numbers in a range or multiple ranges of cells.

- Written as:

**Sum (number1, number2...)**

Where

**Number** \_ The NUMBER arguments are 1 to 30 arguments for which you want the total value or sum.

**Number1** is written as a number, a reference to a cell, or to a range of cells.

### **Round Function**

- Rounds a number to a specified number of digits.

- Written as:

**Round (number, num\_digits)**

Where

- **Number** \_ The value you want to round.
- **Num\_digits** \_ The number of decimal places you want to round.

### **Ceiling Function**

- Returns number rounded up, away from zero, to the nearest multiple you specify.

- Written as:

**Ceiling (number, significance)**

Where

- **Number** \_ The value you want to round
- **Significance** \_ The multiple you want to round to

### **Floor Function**

- Rounds number down, toward zero, to the nearest multiple you specify.

- Written as:  
**Floor (number, significance)**

Where

- **Number** \_ The value you want to round.
- **Significance** \_ The multiple you want to round to

### Information Functions Overview

Information functions are generally made up of logical results and can be used in many business situations. Combined with other functions, the information functions can manage lists of data and provide feedback based on a logical result. The only function that could be useful for you is:

#### **IsNumber ( ) Function**

- Returns true if the value is a number.
- Written as:  
**ISNUMBER (value)**

Where

**Value** \_ this is the cell or range you want tested.

### Overview of Logical Functions

Logical functions test cells & ranges and can return only: True or False.

Commonly used logical functions are:

- **AND**
- **OR**
- **NOT**
- **IF**

#### **AND Function**

- Returns true if all the logical arguments are True.
- Returns False if one or more arguments is False.
- Written as:  
**AND (logical1, logical2 ...)**

Where

**Logical Value 1, 2 ...** \_ The test results in a logical TRUE or FALSE return. Up to 30 conditions can be tested together.

#### **OR Function**

- Returns False if all the logical arguments are False
- Returns True if one or more arguments is True

- Written as:  
**OR (logical1, logical2...)**

Where

**Logical Value 1, 2 ...** \_ These are the conditions to be met to test a logical true or false result. You can use up to 30 conditions within the formula.

### **NOT Function**

- Returns the opposite of the logical value
- Written as:  
**NOT (logical)**

Where

**Logical** \_ This is the value that can be evaluated with a True or False Condition. If True, NOT returns False, if False, NOT returns True.

### **IF ( ) Function**

- The IF ( ) function decides the contents of a cell on a spreadsheet based on whether a test condition is true or false.
- It returns a value if one condition is TRUE, and returns another value or result if the condition is FALSE.
- Written as:  
**IF (logical\_test, value\_if\_true, value\_if\_false)**

Where

- **Logical\_test** \_ Is any value or expression that can be evaluated to True or False.
- **VALUE IF TRUE** \_ Is the value returned if the logical\_test is True.
- **VALUE IF FALSE** \_ Is the value returned if the logical\_test is False

The operators in the logical\_test of the IF function may be:

= Equal to  
<> Not equal to  
> Greater than  
>= Greater than or equal to  
< Less than  
<= Less than or equal to

In addition to that, the logical\_test of an IF function can contain other logical functions like AND, OR, NOT, and other functions supported by Excel.

## Nested IF ( ) Function

If you wish to test more than one condition, you can nest an if ( ) function within another if ( ) function:

Written as::

**=if (logical\_test, result\_if\_true, if (logical\_test, result\_if\_true, if (logical\_test, result\_if\_true, result if false))**

Example: If (I am married, If (I get a child, I will send him/her to AUB)).

## Additional Readings

### Financial Functions Overview

Microsoft Excel contains excellent financial functions you can use to perform useful calculations, such as projecting the future value of investment or figuring the monthly loan payments. You can also use these functions to help you analyze your upcoming financial functions.

### Commonly Used Functions

Some of the more common Financial Functions used are:

- **Future Worth (FV)**
- **Annual Payment (PMT)**
- **Present Value (PV)**

### Future Worth (FV)

- Returns the future value of an investment based on periodic, constant payments and a constant interest rate.
- Written as:  
**FV (rate, nper, pmt, pv, type)**

Where

- **Rate** \_ The interest rate per period
- **Nper** \_ The number of payment periods in an annuity
- **Pmt** – The payment made per period. Typically containing principal and interest and does not change over the life of the loan.
- **Pv** \_ The present value that a series of payments is worth right now. If omitted, Excel assumes zero.
- **Type** \_ The timing of the payment. When the payments are due.

### Annual Payment (PMT)

- Calculates the loan payment for a loan based on constant payments and constant interest rates.

- Written as:  
**PMT (rate, nper, pv, fv, type)**

Where

- **Rate** \_ The interest rate of the loan.
- **Nper** \_ The number of total payments.
- **Pv** \_ The present value or the principal amount.
- **Fv** \_ The future value or cash balance you want to attain upon the last payment \_ for a loan it would be zero.
- **Type** \_ The payment timing \_ when the payments are due.

### Present Value (Pv)

- Returns the present value based on an investment.
- Written as:  
**PV (rate, nper, pmt, fv, type)**

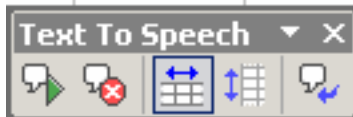
Where

- **Rate** \_ The interest rate of the loan.
- **Nper** \_ The number of total payments
- **Pmt** \_ The payment made each period. It must contain constant. Typically, it includes the principal and interest.
- **Fv** \_ The future value or cash balance you want to attain upon the last payment. For a loan it would be zero. For a future amount you want to attain with payments, it would be the total goal amount.
- **Type** \_ The payment timing \_ when the payments are due.

## Text to Speech

To hear the text in your worksheet:

- 1- Insert the “Text to Speech” toolbar. Go to: **View > Toolbars > Text to Speech**



- 2- Highlight the cells you want to convert to speech

- 3- Press on **speak cells** button  of the “Text to Speech” toolbar

## Tab Color

To change the tab color . Right click on the tab you want, and select “**Tab Color**”. From the color list that appears choose the color you want.



