



This tutorial was adapted from a tutorial by



see its complete version at

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

Excel 2003 – Tutorial III

Functions & Formulas Fundamentals

- Formula Definition
- Formula Syntax
- Formula Bar
- Function Definition
- Function Syntax
- Arguments
- Operators
- Operator Order
- Function Wizards
- Entering Multiple Formulas All At Once
- Editing & Deleting Formulas

Errors in Formulas

Excel Functions Overview

- Statistical Functions Overview
- Math Functions Overview
- Information Functions Overview
- Overview of Logical Functions

Additional Readings

- Text to Speech

Functions & Formulas Fundamentals

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

Formula Definition

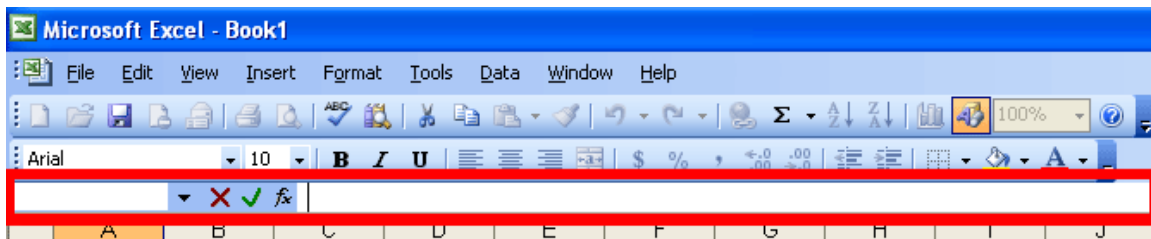
A formula allows you to calculate and analyze data in your worksheet. Formulas perform calculations such as addition or multiplication; formulas can also combine values.

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; select from the **Menu** bar, **View > Formula**.



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 / Range | 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 |

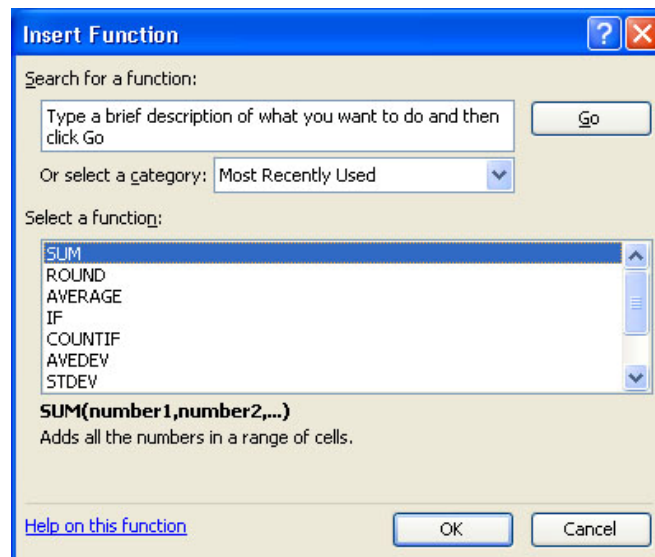
Notice that percent has the highest precedence, multiplication and division have same order of precedence, also addition and subtraction have same order of precedence.

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.

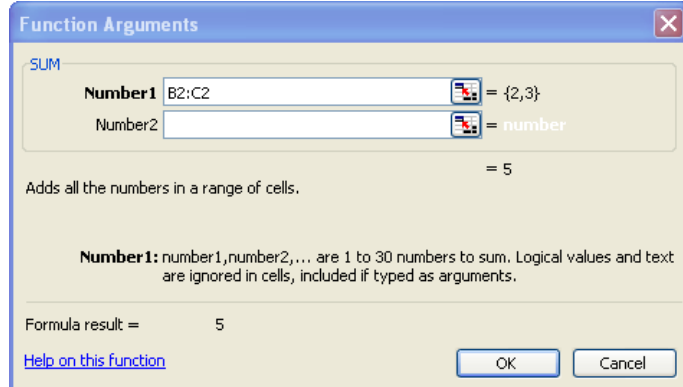
Function Wizard

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 **Formula** 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 list below. As each function name is highlighted a description and example is provided below the two boxes.
4. Click **OK** to select a function



5. The next window allows you to choose the cells that contain the arguments of the function. In this example, cell B2 and C2 are selected to compute their sum. The values of the cells B2, and C2 are respectively 2, and 3. **Excel** identifies the range of the cells in the function to (B2:C2). In the lower part of the **Function Argument** dialogue box you can see the **Formula result**.



6. Click the **OK** button.


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, 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, click on the cell that contains the formula, and press the **DELETE** key on your keyboard. If you need to alter the formula, follow these steps:

- 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 function arguments. Change the appropriate argument(s) and click **OK**.

Errors in Formulas

When a formula is prevented to run normally, **Excel** will notify you with an error message. Each error message helps users identify the problem they are facing. The following table lists common **Excel** errors that you might face.

| 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! | <i>Excel</i> 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 | Function Description |
|------------------------------|---|
| AVERAGE(range) | Calculates the mean (arithmetic average) of a range of cells |
| COUNT(range) | Counts the number of values (cells containing numbers in a range) |
| COUNTIF(range, value) | Counts the number of cells that are the same as a specified value. |
| MAX(range) | Returns the maximum value of a data set. |
| MIN(range) | Returns the minimum value of a data set. |
| MODE(range) | Returns the most frequently occurring, or repetitive, value in a range of data. |
| STDEV(range) | Calculates the standard deviation of a sample. |

Given that:

- **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:

1. Sum
2. Round
3. Ceiling
4. Floor

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

1. Sum Function

- Adds the numbers in a range or multiple ranges of cells.
- Written as: **Sum (number1, number2...)**
- **Number1, Number2..:** are written as a number, a reference to a cell, or to a range of cells for which you want the total value or sum.

2. Round Function

- Rounds a number to a specified number of digits.
- Written as: **Round (number, num_digits)**
- **Number:** The value you want to round.
- **Num_digits:** The number of decimal places you want to round.

3. Ceiling Function

- Returns number rounded up, away from zero, to the nearest multiple you specify.
- Written as: **Ceiling (number, significance)**
- **Number:** The value you want to round
- **Significance:** The multiple you want to round to

4. Floor Function

- Rounds number down, toward zero, to the nearest multiple you specify.
- Written as: **Floor (number, significance)**
- **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 most useful function is:

IsNumber Function

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

1. AND
2. OR
3. NOT
4. IF

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

2. 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...)**
- **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.

3. NOT Function

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

4. 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)**
 - 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 |

Note: Nested IF () Function


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

Text to Speech

To hear the text in your worksheet:

1. Show the **Text to Speech** toolbar by selecting from the **Menu** bar, **View > Toolbars > Text to Speech**
2. Highlight the cells you want to convert to speech
3. Press on **speak cells** button  found on the **Text to Speech** toolbar
