

# Advanced Excel

## Microsoft Excel 2010

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## **Powerful tools in Excel**

Not only will Excel add and subtract, but it can make words or sentences and make workbooks with calculations easier to read.

### **Count vs. Counta vs. Countif**

Count - Counts the number of cells that contain numbers and numbers within the list of arguments. Use COUNT to get the number of entries in a number field in a range or array of numbers.

Counta - Counts the number of cells that are not empty and the values within the list of arguments. Use COUNTA to count the number of cells that contain data in a range or array.

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

### **Examples**

Suppose A3:A6 contain "apples", "oranges", "peaches", "apples", respectively:

COUNTIF(A3:A6,"apples") equals 2

Suppose B3:B6 contain 32, 54, 75, 86, respectively:

COUNTIF(B3:B6,">55") equals 2

### **Trim**

Removes all spaces from text except for single spaces between words. Use TRIM on text that you have received from another application that may have irregular spacing. This is especially useful when doing text matching.

### **Example**

TRIM(" First Quarter Earnings ") = "First Quarter Earnings"

### **Concatenation**

Sometimes, a number is best placed within a sentence on a spreadsheet. To do this, use the "&" symbol to add strings and numbers together.

### **Example:**

- In A1 Type 2
- In A2 Type 2

- In A3 Type =A1+A2
- In A4 Type ="The quantity" & A1 & "+" & A2 & "=" & A3

## **Ceiling, Floor**

These functions make round up (ceiling) or down (floor) depending how they are called.

### **Example**

How many cars are needed if each car can fit 4 people and we have 23 people?

### **Example**

How many dollars do we have if we have 235 pennies?

## **Today**

Gives the current date. This field is updated every time the spreadsheet is updated (like on load).

## **Lookup**

A vector is a range of only one row or one column. The vector form of LOOKUP looks in a one-row or one-column range (known as a vector) for a value and returns a value from the same position in a second one-row or one-column range. Use this form of the LOOKUP function when you want to specify the range that contains the values you want to match.

### **Example**

	A	B	C
1	<b>Frequency</b>	<b>Color</b>	
2	4.14234	red	
3	4.19342	orange	
4	5.17234	yellow	
5	5.77343	green	
6	6.38987	blue	
7	7.31342	violet	
8			

LOOKUP(4.91,A2:A7,B2:B7) equals "orange"

LOOKUP(5.00,A2:A7,B2:B7) equals "orange"

LOOKUP(7.66,A2:A7,B2:B7) equals "violet"

LOOKUP(7.66E-14,A2:A7,B2:B7) equals #N/A, because 7.66E-14 is less than the smallest value in the lookup\_vector A2:A7

## Vlookup

Searches for a value in the leftmost column of a table, and then returns a value in the same row from a column you specify in the table. Use VLOOKUP instead of HLOOKUP when your comparison values are located in a column to the left of the data you want to find.

## Example

	A	B	C	D
1	<b>Air at 1 atm pressure</b>			
2	<b>Density</b>	<b>Viscosity</b>	<b>Temp</b>	
3	<b>(kg/cubic m)</b>	<b>(kg/m*s)*1E+05</b>	<b>(degrees C)</b>	
4	0.457	3.55	500	
5	0.525	3.25	400	
6	0.616	2.93	300	
7	0.675	2.75	250	
8	0.746	2.57	200	
9	0.835	2.38	150	
10	0.946	2.17	100	
11	1.09	1.95	50	
12	1.29	1.71	0	

VLOOKUP (1, A4:C12, 1) equals 0.946

VLOOKUP (1, A4:C12, 2) equals 2.17

VLOOKUP (1, A4:C12, 3) equals 100

VLOOKUP (.746, A4:C12, 3) equals 200

VLOOKUP (0.1, A4:C12, 2) equals #N/A, because 0.1 is less than the smallest value in column A

VLOOKUP (2, A4:C12, 2) equals 1.71

## Left, Right, Mid

### Left

LEFT returns the first character or characters in a text string, based on the number of characters you specify.

### Right

RIGHT returns the last character or characters in a text string, based on the number of characters you specify.

### Mid

MID returns the characters from the middle of a text string, given a starting position and length.

	A	B	C
1	The quick brown fox	The qui	=LEFT(A1, 7)
2	The quick brown fox	own fox	=RIGHT(A2, 7)
3	The quick brown fox	quick b	=MID(A3, 5, 7)
4			
5			

## Referencing Cells in Excel

We are quite familiar with referencing particular cells in Excel. When we copy formulas, the cell references change with the new cell location. What if we didn't want to change the location of the cell? We can tell Excel to use an absolute reference. This is denoted by putting a \$ in front of both the column and the row.

### Example

Compound	
Interest	5%
\$1,000.00	\$ 50.00
\$1,050.00	\$ 52.50
\$1,102.50	\$ 55.13
\$1,157.63	\$ 57.88
\$1,215.51	\$ 60.78
\$1,276.28	\$ 63.81
\$1,340.10	\$ 67.00
\$1,407.10	\$ 70.36
\$1,477.46	\$ 73.87
\$1,551.33	\$ 77.57
\$1,628.89	\$ 81.44
\$1,710.34	\$ 85.52
\$1,795.86	\$ 89.79

### Now what happens if we want 5% and 6%?

Copying the formula over creates a mess because it is looking at the 5% interest column! To make sure that it is only looking at the Money column, put a \$ in front of the column. Now the formula will always look in the right place as the formula is being copied to the right.

### Subtotals

Returns a subtotal in a list or database. It is generally easier to create a list with subtotals using the Subtotals command (Data menu). Once the subtotal list is created, you can modify it by editing the SUBTOTAL function.

### Example

Open ListSort.xls in Beyond the Basics of Excel

- Add a subtotal to the list on bundles and trees
- Use the filter function

### Note:

SUBTOTAL will ignore any hidden rows that result from a list being filtered. This is important when you want to subtotal only the visible data that results from a list that you have filtered.

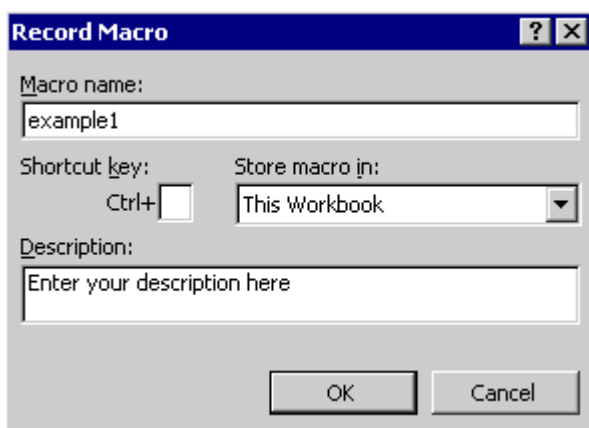
## Macros

Macros are simply small programs written in Visual Basic that do specific tasks. These macros can be created or downloaded and incorporated into a spreadsheet.

### **In the View Tab of the Ribbon, Click on the Macros dropdown and Record New Macro**

Gets to the macro menu

- Macros... Alt+F8  
Shows the macros in the workbook.
- Record New Macro...  
Allows a person to create macros even if you don't know the language
- Visual Basic Editor Alt+F11  
This shows the language and commands used to create the macro



To Stop a Macro

Macro Window

## **Hello World**

The first program customarily written by a new programmer is "Hello World!". This program simply prints out Hello World. To do this using Excel macros,

- In the View Tab of the Ribbon, Click on the Macros dropdown and Record New MacroNew Macro
  - Name
  - Shortcut (ctrl and/or shift)
  - Store macro in...
  - Description (help others)
- Enter in these commands



- Name – HelloWorld
  - Shortcut – ctrl+w
  - Store macro in... (This workbook)
  - Description (Print out Hello World – First program)
- Click OK
- New Form comes up with a stop button
- Type in Hello World! and click on the stop button.
- Test it – in various places

## Hello World (part 2)

It goes back to the same spot, regardless of where you start. To make it relative, click on the red arrow right next to the stop button. Follow the steps above and try again. Did it work?

## Looking at the code

The commands that are used to create the Hello World should look like the following:

```
Sub HelloWorld2()
'
' HelloWorld2 Macro
' Macro recorded 11/1/2003 by Don Bremer
'
' Keyboard Shortcut: Ctrl+w
'
    ActiveCell.FormulaR1C1 = "Hello World"
    ActiveCell.Offset(1, 0).Range("A1").Select
End Sub
```

The ' marks represent comments and are not read by the computer.

## Structures of programming

There are actually 3 structures to any programming language. They are:

- Statement
- Loop
- Logical

To make a loop in a macro with a known number of times through, we can use the for command. We can change the commands of the macro to read:

```
For i = 1 To 5
    ActiveCell.FormulaR1C1 = "Hello World"
```

```

    ActiveCell.Offset(1, 0).Range("A1").Select
Next

```

This will write “Hello World” on the cell, move down one cell, and write “Hello World” again. Try this....

Logicals will ask a question. Depending on the answer, it will do a set of commands. Take for example the last “Hello World” example. Instead of having it say “Hello World” all 5 times, what if we have it say “Goodbye Cruel World!” on the last loop. We can do that using the conditional (or if) statement:

```

For i = 1 To 5
    If i = 5 Then
        ActiveCell.FormulaR1C1 = "Goodbye Cruel World!"
    Else
        ActiveCell.FormulaR1C1 = "Hello World"
    End If
Next

    ActiveCell.Offset(1, 0).Range("A1").Select
Next

```

### **Sort Worksheets using Macros**

In this exercise, we will create a macro from scratch. This macro can then be called from another.

- Start a new workbook
- In the View Tab of the Ribbon, Click on the Macros dropdown and Record New Macro
- Type in the code below:

```

Sub SortSheets()

Dim SheetCount As Integer
Dim i As Integer
Dim j As Integer

    SheetCount = Worksheets.Count

    If SheetCount = 1 Then
        Exit Sub
    End if

    For i = 1 To SheetCount - 1
        For j = i + 1 To SheetCount
            If Worksheets(j).Name < Worksheets(i).Name Then

```

```

        Worksheets(j).Move Before:=Worksheets(i)
    End If
Next j
Next i

```

End Sub

- Create another macro that calls this macro by writing:

```

Sub Caller()

    ' MsgBox shows something on the screen in a window
    MsgBox ("Preparing to Sort Sheets")
    ' Our macro
    SortSheets

    MsgBox ("Sheets Sorted")

End Sub

```

## **Pivot Tables**

A PivotTable report is an interactive table that you can use to quickly summarize large amounts of data. You can rotate its rows and columns to see different summaries of the source data, filter the data by displaying different pages, or display the details for areas of interest. You can start a Pivot table by opening the Pivot Table toolbar and clicking on the wizard.

### **Example**

- Sorting Lists from class 2 of Excel
- Northwind database in access

## **Breaking the screen into frames**

Selecting the tabs on the top slider and the bottom slider will allow the user to open up 4 different panes that can be in 4 separate sections of the worksheet.

## **Common Error Types**

Error	Description
#NULL!	The formula contains a null (probably as a reference). Is your formula complete?
#DIV/0	The formula contains a division by 0. Are two pieces the same value? Is your formula correct?
#VALUE!	A textual value of a cell or an incorrect argument has been used in the calculation. While there are other possibilities for receiving this error, these two are the most common.
#REF!	The value in the referenced cell is no longer available in the formula. The cells, rows, or columns may have been deleted that were used in the formula.
#NAME?	A formula is not entered correctly. The defined name used may not exist, has been deleted or misspelled, or the quotes around text may have been omitted.
#NUM!	There is a problem with a number. Excel cannot interpret it because it is too small or too big or may not exist. Check for incorrect argument types in a function.
#N/A	<p>This can signify several problems, depending on the formula.</p> <ul style="list-style-type: none"> <li>• No value was available (as in a lookup function).</li> <li>• It is being used as a placeholder when data is not yet available.</li> <li>• Charting features ignore this, so it is often used when you are charting data. To leave the cells empty would distort the chart, so use #N/A to prevent a 0 value.</li> </ul>

### **Transpose (Matrices)**

Say you have a column of numbers/letter and want them to become columns themselves. You can do this by transposing the matrix.

- Select the column
- Copy to the clipboard
- Go to the new location
- Go to Paste Special...
- Paste while checking the Transpose checkbox

### **Example**

Abe  
Ben  
Carl  
Dave

Edward

Can become....

Abe      Ben      Carl      Dave      Edward

### **Breaking apart formulas**

Remember the Quadratic Formula in Algebra?

$$ax^2 + bx + c = 0$$

has the solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} .$$

Program this? Yick! It might be easier to break it apart to get the answer:

A1: a

A2: b

A3: c

Now break apart the formula:

A5: -A2

A6: ((A2^2)-(4\*A1\*A3))^0.5

A7: 2\*A1

Answers:

A8: (A5-A6)/A7

A9: (A5+A6)/A7

## Text to Columns

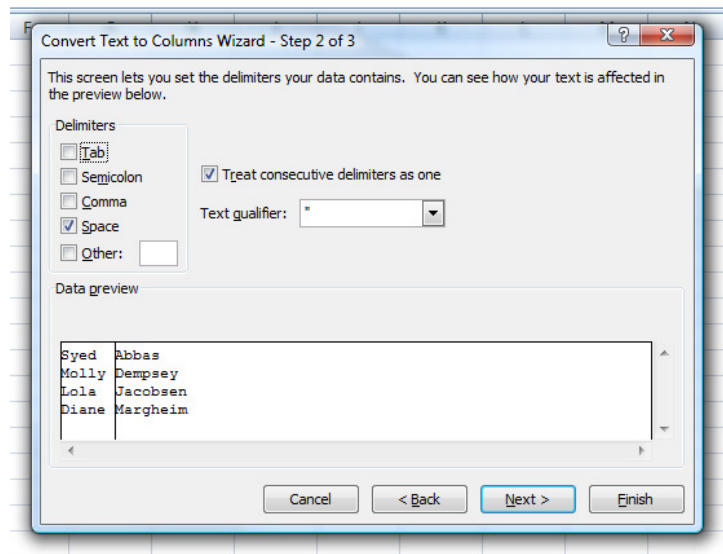
Use this method if your names have a delimited format, such as "First\_name Last\_name" (where the space between First\_name and Last\_name is the delimiter) or "Last\_name, First\_name" (where the comma is the delimiter).

	A6	
	A	B
1	Syed Abbas	
2	Molly Dempsey	
3	Lola Jacobsen	
4	Diane Margheim	
5		
6		
7		

1. Select the range of data that you want to convert.
2. On the **Data** tab, in the **Data Tools** group, click **Text to Columns**.

3. In Step 1 of the Convert Text to Columns Wizard, click **Delimited**, and then click **Next**.

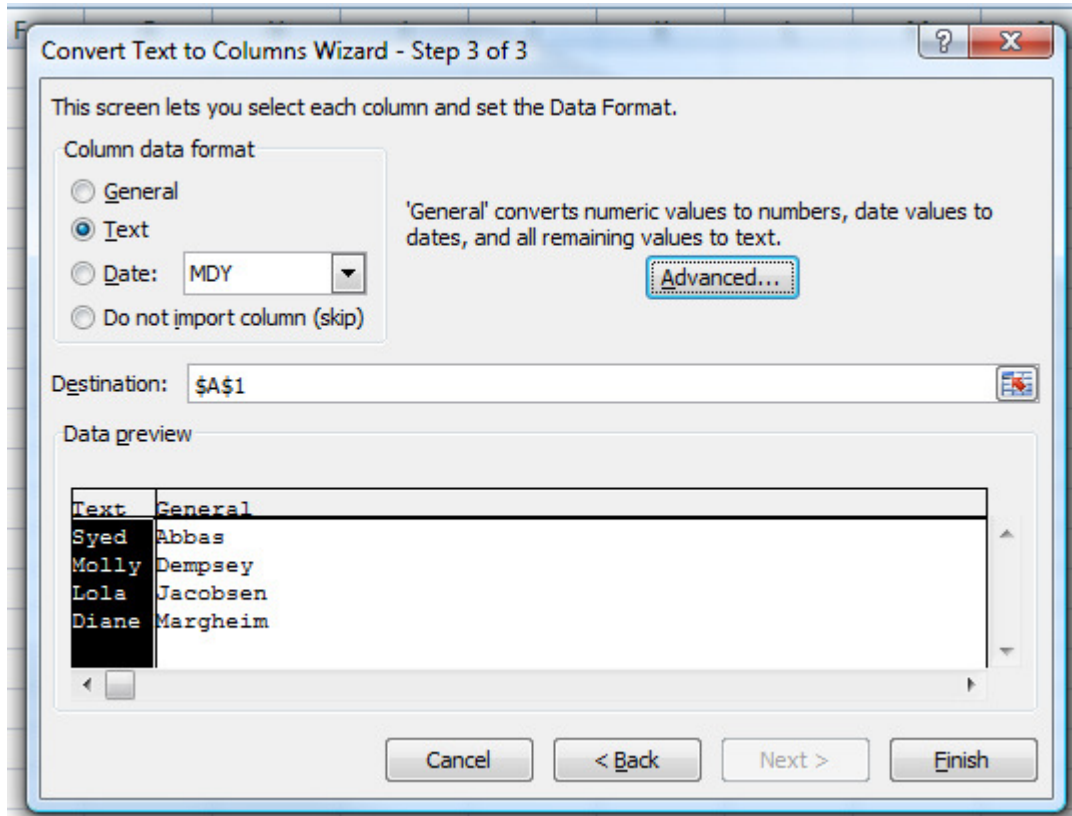
4. In Step 2, select the **Space** check box, and then clear the other check boxes under **Delimiters**.



5. Click Next.
6. In Step 3, click a column in the Data preview box, and then click Text under Column data format.

Repeat this step for each column in the Data preview box.

7. If you want to insert the separated content into the columns next to the full name, click the icon to the right of the Destination box, and then select the cell next to the first name in the list (B2, in this example).



8. Click the icon to the right of the Convert Text to Columns Wizard.

## Remove Duplicates

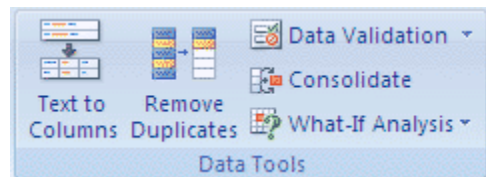
When you remove duplicate values, only the values in the range of cells or table are affected. Any other values outside the range of cells or table are not altered or moved.

**Caution** Because you are permanently deleting data, it's a good idea to copy the original range of cells or table to another worksheet or workbook before removing duplicate values.

1. Select the range of cells, or make sure that the active cell is in a table.
2. On the **Data** tab, in the **Data Tools** group, click **Remove Duplicates**.

3. Do one or more of the following:

- Under **Columns**, select one or more columns.
- To quickly select all columns, click **Select All**.
- To quickly clear all columns, click **Unselect All**.



If the range of cells or table contains many columns and you want to only select a few columns, you may find it easier to click **Unselect All**, and then under **Columns**, select those columns.

4. Click **OK**.

A message is displayed indicating how many duplicate values were removed and how many unique values remain, or if no duplicate values were removed.

5. Click **OK**.

## Naming Ranges

A Named Range is way to describe your formulas. So you don't have to have this in a cell:

= SUM(B2:B4)

You can replace the cell references between the round brackets. You replace them with a descriptive name, all of your own. So you could have this, instead:

= SUM(Monthly\_Totals)

Behind the Monthly\_Totals, though, Excel is hiding the cell references. We'll see how it works, now.

Open up Excel 2007, and create the spreadsheet below:



B5		
	A	B
1		Monthly_Totals
2		124
3		234
4		344
5	Results	702
6		

Select the Monthly Totals from B2:B4 and where it says B2 on the formula bar, type "Monthly\_Totals"

B2		
	A	B
1		Monthly_Totals
2		124
3		234
4		344
5	Results	

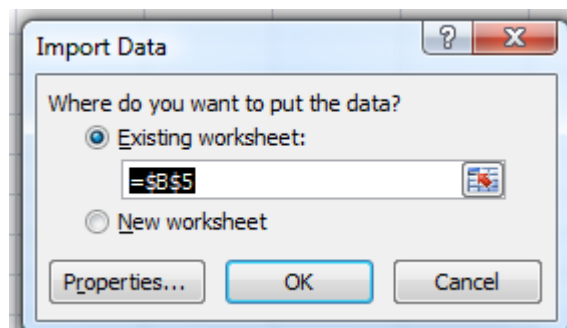
Get External Data		
Monthly_Totals		
	A	B
1		Monthly_Totals
2		124
3		234
4		344
5	Results	

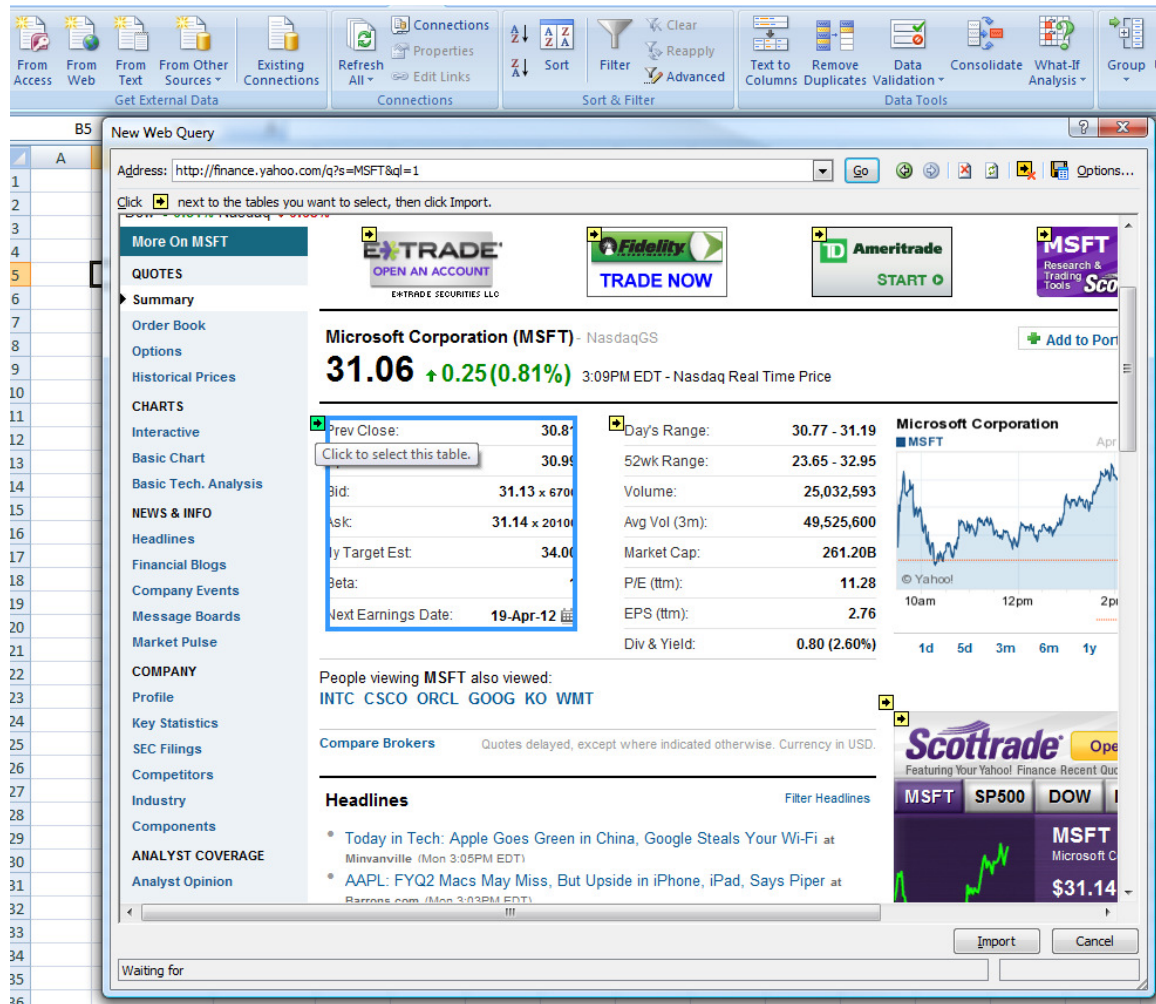
Now you can refer to that range as Monthly\_Totals, no matter how big it is.

= SUM(Monthly\_Totals)

### **Grab Information from Web**

1. Go to the Data Tab and select "From Web"
2. In the Browser that appears, maneuver to the web page you would like to grab
3. When you put your cursor over a "table" of data, it will be outlined with a yellow arrow next to it.
4. Click on the yellow arrow, it will turn into a green checkbox
5. Click on the import button on the lower right side of the new browser
6. Tell it where to place the data
7. Click OK



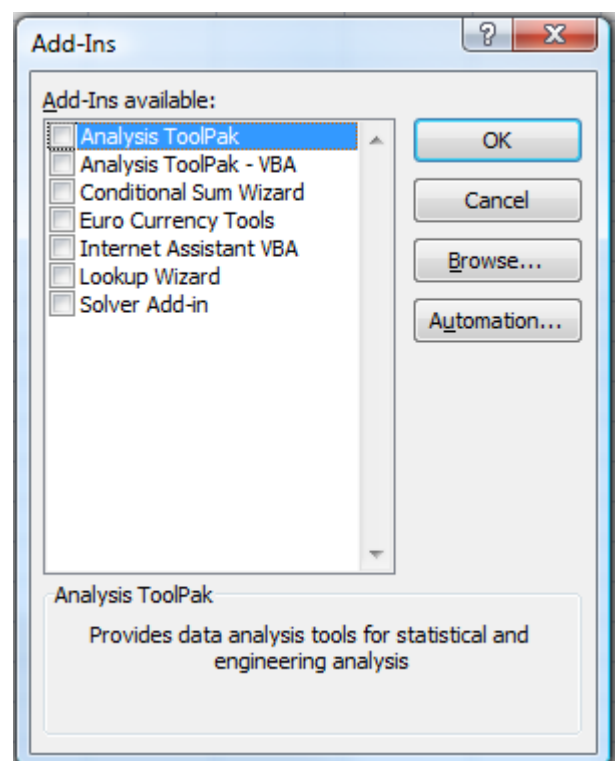


## Statistics

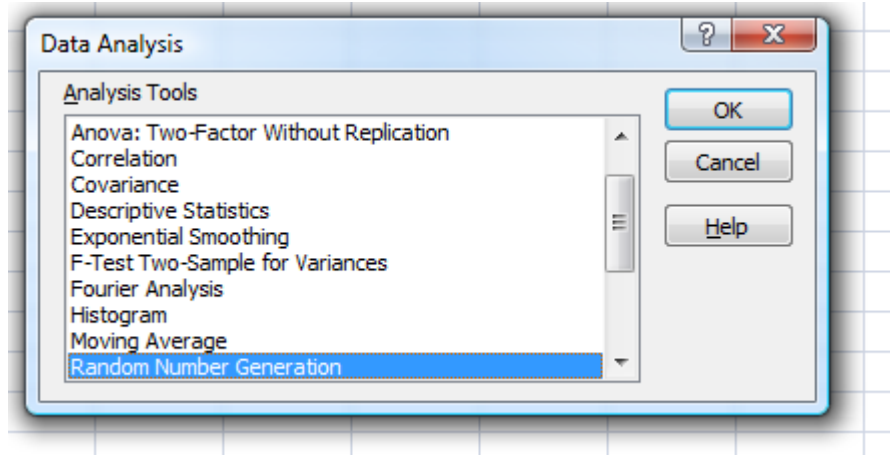
Even though it seems that the makers of Excel put the kitchen sink in and ready to go – not everything is visible. There is another statistical package that is an Add-In if you want to go even further.

**Office Button->Add-Ins->Manage Excel Add-ins (Go...)**

Select on Analysis ToolPak and click OK.



A new item appears under data called “Data Analysis”. When the item is selected, it shows the different things you can do:



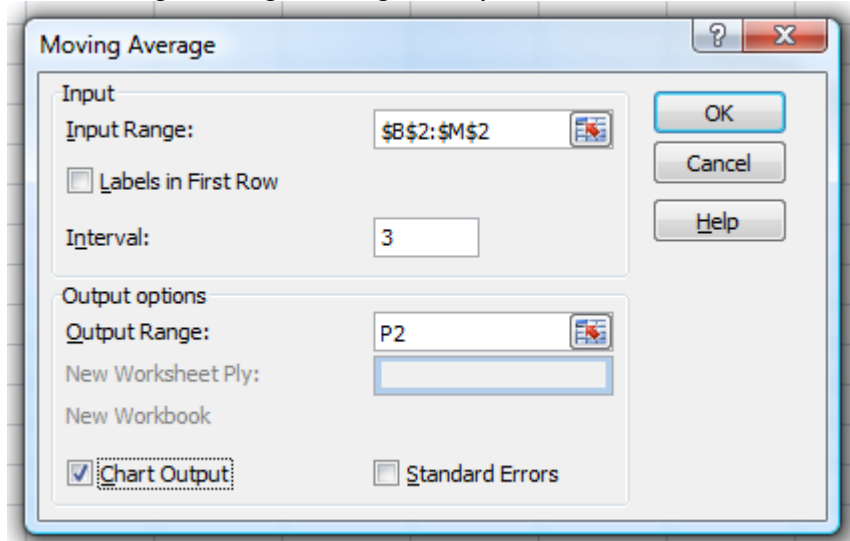
Moving Average example:

The following illustration shows a summary of Contoso Pharmaceutical's inventory for their 10 best-selling products from last year. This report shows a large variance in the ending inventory quantities from month to month, indicating both shortages and stagnant product — neither of which is good for business. With a few simple steps, you can use this information to manage your inventory levels more precisely this year.

Prod_ID	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1176	96	10	10	72	72	60	60	14	2	93	94	26
401	19	11	4	47	47	69	52	13	13	56	64	75
1482	78	11	7	46	5	30	30	19	9	100	90	74
1548	96	11	0	99	99	74	74	18	1	73	18	74
1406	48	13	65	99	99	46	46	16	16	94	33	58
1517	3	13	13	26	26	92	92	10	1	44	18	47
301	15	15	32	55	55	17	8	46	8	59	69	84
303	32	18	41	65	65	11	11	50	1	72	43	51
688	46	18	0	-20	26	75	75	15	1	23	99	49
786	43	18	65	94	92	85	85	35	3	82	91	23

The Moving Average analysis tool projects values in the forecast period, based on the average value of the variable over a specific number of preceding periods. A moving average provides trend information that a simple average of all historical data would mask. This example uses the data for Contoso product 1176 to predict a target inventory level for the new fiscal year.

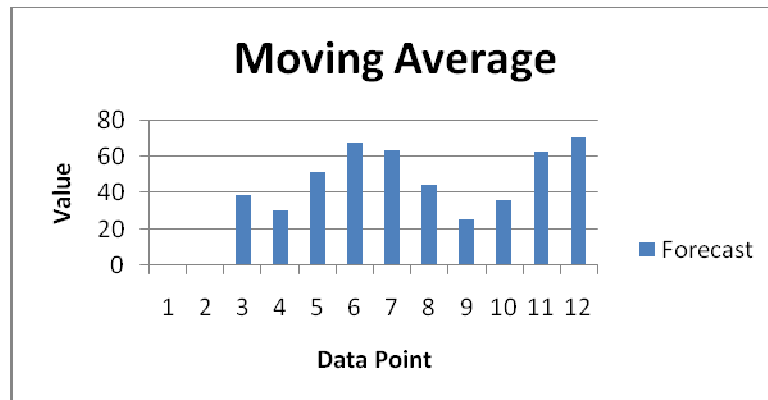
1. On the Tools menu, click Data Analysis.
2. In the Data Analysis dialog box, click Moving Average, and then click OK.
3. The Moving Average dialog box opens.



4. In the Input Range box, enter a single row or column of data. This example uses the row of data from product 1176 on the Contoso top-10 products report.
5. In the Interval box, enter the number of values that you want to include in the moving average. In this example, enter 3, the default interval.

**NOTE** The interval is the number of data points used to calculate the moving average. The larger the interval, the smoother the moving average line; the smaller the interval, the more the moving average is affected by individual data point fluctuations.

6. In the Output Range box, enter the cell address where you want the results to start.
7. Select the Chart Output check box to see a graph comparing the actual and forecasted inventory levels.
8. Click OK.



## Linest

Returns statistics that describe a linear trend matching known data points, by fitting a straight line using the least squares method.

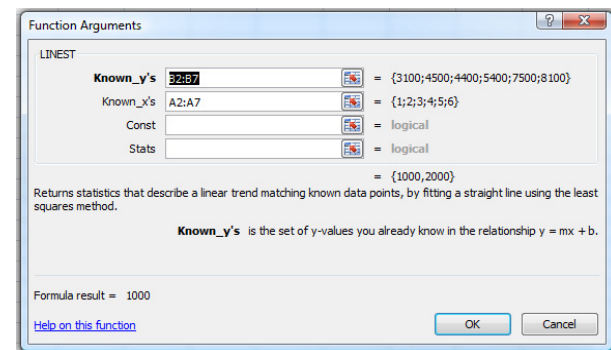
The equation for the line is:

$$y = mx + b$$

### Example 1

Take for example the linear regression of sales per month

Month	Sales
1	3100
2	4500
3	4400
4	5400
5	7500
6	8100



Answer: 1000

What is the sales on the 9<sup>th</sup> month?

$$\text{Sales} = 1000 * 9 = 9000$$

### Example 2 – Multiple Linear Regression (the world is not linear)

Suppose a commercial developer is considering purchasing a group of small office buildings in an established business district.

The developer can use multiple linear regression analysis to estimate the value of an office building in a given area based on the following variables.

VARIABLE	REFERS TO THE
y	Assessed value of the office building
x1	Floor space in square feet
x2	Number of offices
x3	Number of entrances
x4	Age of the office building in years

This example assumes that a straight-line relationship exists between each independent variable (x1, x2, x3, and x4) and the dependent variable (y), the value of office buildings in the area.

The developer randomly chooses a sample of 11 office buildings from a possible 1,500 office buildings and obtains the following data. "Half an entrance" means an entrance for deliveries only.

Floor space (x1)	Offices (x2)	Entrances (x3)	Age (x4)	Assessed value (y)
2310	2	2	20	142,000
2333	2	2	12	144,000
2356	3	1.5	33	151,000
2379	3	2	43	150,000
2402	2	3	53	139,000
2425	4	2	23	169,000
2448	2	1.5	99	126,000
2471	2	2	34	142,900
2494	3	3	23	163,000
2517	4	4	55	169,000
2540	2	3	22	149,000

## Formula

=LINEST(E2:E12,A2:D12,TRUE,TRUE)

**NOTE:** The formula in the example must be entered as an array formula. After copying the example to a blank worksheet, select the range A14:E18 starting with the formula cell. Press F2, and then press CTRL+SHIFT+ENTER. If the formula is not entered as an array formula, the single result is -234.2371645.

When entered as an array, the following regression statistics are returned. Use this key to identify the statistic you want.

	A	B	C	D	E	F
1	$m_n$	$m_{n-1}$	...	$m_2$	$m_1$	$b$
2	$se_n$	$se_{n-1}$	...	$se_2$	$se_1$	$se_b$
3	$r^2$	$se_y$				
4	F	$df$				
5	$ss_{reg}$	$ss_{resid}$				

The multiple regression equation,  $y = m_1 \cdot x_1 + m_2 \cdot x_2 + m_3 \cdot x_3 + m_4 \cdot x_4 + b$ , can now be obtained using the values from row 14:

$$y = 27.64 \cdot x_1 + 12,530 \cdot x_2 + 2,553 \cdot x_3 - 234.24 \cdot x_4 + 52,318$$

The developer can now estimate the assessed value of an office building in the same area that has 2,500 square feet, three offices, and two entrances and is 25 years old, by using the following equation:

$$y = 27.64 \cdot 2500 + 12530 \cdot 3 + 2553 \cdot 2 - 234.24 \cdot 25 + 52318 = \$158,261$$

Or you can copy the following table to cell A21 of the example workbook.

FLOOR SPACE (X1)	OFFICES (X2)	ENTRANCES (X3)	AGE (X4)	ASSESSED VALUE (Y)
2500	3	2	25	52317.83051

Assessed Value Y

$$=D14 \cdot A22 + C14 \cdot B22 + B14 \cdot C22 + A14 \cdot D22 + E14$$