



# Spreadsheet Methods 5N1977

## 7. Advanced Features and Functions

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## Function and Formula List

### STATISTICAL FUNCTIONS

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**NOTE:** See pages 23-26 for a shortcut list on all formula in this unit.

# 1. CREATE FORMULA USING A VARIETY OF BOTH ABSOLUTE AND RELATIVE CELL REFERENCING

## Relative Cell Reference

A relative cell reference consists of the column letter and row number which cross at the cells location for example **B2**, **G34** or a range **A2:B6**. It can be a single cell or a group of cells.

	A	B	C
1			
2	25	45	=A2+B2
3			

## Absolute Cell Reference

Absolute cell reference is also used in formula, functions and charts and identifies the fixed location of a cell or group of cells. Absolute cell referencing works in contrast to relative cell referencing, by making a cell absolute it is *prevented from changing* when the formula is auto filled i.e. copied and pasted to other cells, so it stays fixed on a specific cell or range.

To make a cell absolute use the dollar sign before the column and row **\$C\$6**.

	A	B	C	D
1				
2				
3				
4	<b>Internet Café</b>			
5				
6	Cost Per Hour:		€ 5	
7				
8	<b>Clients</b>	<b>Hours Booked</b>	<b>Cost per Client</b>	
9	John	10	=B9*\$C\$6	
10	Tom	6		
11	Walter	3		
12	Tony	8		
13	Mary	7		
14				
15				

**Note:** An easy way to apply the \$ symbol to a cell reference is to click on the cell reference and press the **F4** key on the keyboard.

## ROW OR COLUMN?

Absolute cell reference can also be used on *either* the column letter **or** the row number and does not have to be used on both. In the following example each client must pay according to the rate at €5. To ensure that the cell C6 is referred to as the formula is dragged down the cells using auto fill the row letter 6 must have absolute cell referencing to prevent it from changing to C7, C8, C9 and so on.

	A	B	C	D
1				
2				
3				
4	<b>Internet Café</b>			
5				
6	Cost Per Hour:		€ 5	
7				
8	<b>Clients</b>	<b>Hours Booked</b>	<b>Cost per Client</b>	
9	John	10	=C\$6*B9	
10	Tom	6		
11	Walter	3		
12	Tony	8		
13	Mary	7		
14				

The final formula should be =C\$6\*B9

Absolute Cell Referencing is usually used in conjunction with the **Auto Fill** feature (discussed in unit 2).

To recap an absolute cell reference is used when we want the computer to **always** look at a particular cell for information. We make a reference absolute by using the \$ symbol.

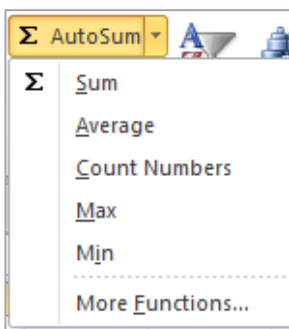
	A	B	C	D
1				
2				
3				
4	<b>Internet Café</b>			
5				
6	Cost Per Hour:		€ 5	
7				
8	<b>Clients</b>	<b>Hours Booked</b>	<b>Cost per Client</b>	
9	John	10	€ 50	
10	Tom	6	€ 30	
11	Walter	3	€ 15	
12	Tony	8	€ 40	
13	Mary	7	=B13*\$C\$6	
14				
15				

**Notes:**

**2. USE A SELECTION OF STATISTICAL FUNCTIONS FOR EXAMPLE MAXIMUM, MINIMUM, AVERAGE, MEDIAN, MODE, STANDARD DEVIATION, ABS, INT, SQRT, COUNT, COUNTIF**

**MAXIMUM FUNCTION**

This formula will return the **maximum** or highest number from the list of numbers in the cell range C1 to C10. This formula can be accessed from the **AutoSum** drop down menu as shown below.



=MAX(C1:C10)

B	C	D	E
	3		
	4		
	43		
	6		
	36		
	45		
	34		
	3		
	43		
	435		
	=MAX(C1:C10)		
	MAX(number1, [number2], ...)		

## MINIMUM FUNCTION

This formula will return the **minimum**/smallest number from the list of numbers in the cell range C1 to C10. This formula can be accessed from the **AutoSum** drop down menu.

**=MIN(C1:C10)**

C	D	E
3		
4		
43		
6		
36		
45		
34		
3		
43		
435		

=MIN(C1:C10)  
MIN(number1, [number2], ...)

## AVERAGE FUNCTION

The **average** formula is used to calculate the average of a list of numbers. This formula can be accessed from the AutoSum drop down menu.

**=AVERAGE(E2:E3)**

C	D	E
3		
4		
43		
6		
36		
45		
34		
3		
43		
435		

=AVERAGE(C1:C10)  
AVERAGE(number1, [number2], ...)

## MEDIAN FUNCTION

Returns the **median** number, which is the number in the middle of a given set of numbers. Or the Median is the "**middle number**" (in a sorted list of numbers).

**=MEDIAN(G4:G8)**

In this example the list would be sorted to 2, 7, 13, 15, 16 as there are 5 numbers on the list the middle number is the 3<sup>rd</sup> number 13.

For more information on the Median visit - **Math is Fun** <http://www.mathsisfun.com/median.html>.

2
7
15
13
16

=MEDIAN(G4:G8)  
MEDIAN(number1, [number2], ...)

## MODE FUNCTION

The **mode** function returns the most frequently occurring or repetitive value in a range of numbers.

**=MODE(J3:J8)**

For more information on the Mode visit **Math is Fun** <http://www.mathsisfun.com/mode.html>

13
2
7
15
13
16

=MODE(J3:J8)  
MODE(number1, [number2], ...)

## STANDARD DEVIATION FUNCTION

The **standard deviation** can be explained as 'a quantity expressing by how much the members of a group differ from the mean/average value for the group'. In short it is a measure of how spread out the numbers are from the mean or average.

This is closely linked to the average formula so we use it in the explanation.

**=STDEV(K12:K16)**

fx =STDEV(K12:K16)	
J	K
	11
	12
	13
	15
	17
<b>AVERAGE</b>	13.6
<b>STDEV</b>	2.408319

The average of the numbers in K12:K16 is 13.6 and the standard deviation from this average is 2.408319. This means that on average the numbers in the list are 2.408319 away from the average number of this list.

For more information on the Standard Deviation visit **Math is Fun**

<http://www.mathsisfun.com/data/standard-deviation.html>

or **Spreadsheet About.com**

<http://spreadsheets.about.com/od/excelfunctions/qt/2010-10-03-Excel-2007-Standard-Deviation-Function.htm>

## ABS FUNCTION

Returns the **absolute value** of a number; The absolute value of a number is the number without its sign (e.g. -minus).

**=ABS(C17)**

			-4.735
Absolute Value of a Number		=ABS(C17)	
		ABS(number)	

The result of ABS on this number is 4.735.

## INT FUNCTION

This formula will return the whole number, when a number with a decimal point is entered. The formula will always round down to the nearest **integer**/whole number.

**=INT(C10)**

			6.356
Round Down to nearest Whole Number		=INT(C21)	
		INT(number)	



3. USE THE SINGLE CONDITION IF FUNCTION WITH RELATIONAL OPERATORS FOR EXAMPLE

=, <, <=, >, >=, <>

Use the Single Condition IF Example 1 – Simple IF

The IF formula allows the comparison of values and produces an output which can be in a text/number format, in the following example the IF formula will show how many of the staff are due a promotion. We will use the number of years they have been in service for the company and compare this to the cell D5 (value of 5 years) which is the duration anyone needs to serve to gain promotion. This example uses **Absolute Cell Referencing**.

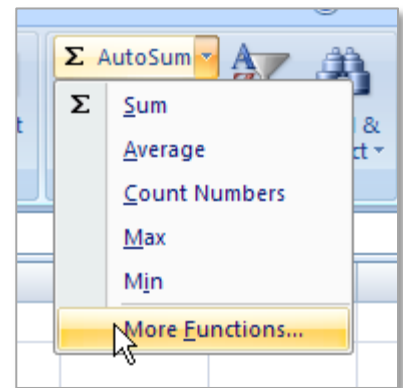
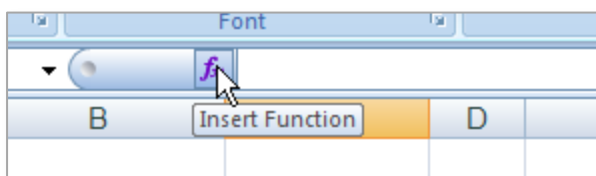
=IF(B9>=\$D\$7,\$E\$7,\$F\$7)

To use the IF function either one of two methods can be used, the formula into the cell as follows:

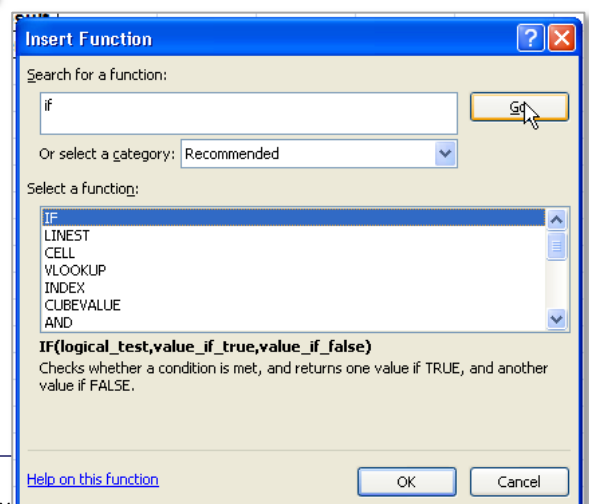
Employee Promotion		
Years	Positive Result	Negative Result
9	Promote Now	Promote Later
Employee	Years of Service	Result
9	John	=IF(B9>=\$D\$7,\$E\$7,\$F\$7)
10	James	Promote Later
11	Larry	Promote Later
12	Kate	Promote Now

OR alternatively use the **Insert Function** window to add the formula.

To access the **Insert Function** window go to **AutoSum (Sigma) > More Functions** or click on the **Insert Function** button on the formula bar (both options shown below).



This will open the **Insert Function** window. To find the **IF** formula function it may be necessary to search for it. Add **IF** to the search box and click on **Go**. Then click on the word **IF** and select the **OK** button. This will open the **Function Arguments** window as shown below.





In this example the **logical test** is if the years of service of John is greater than 5 years, to check this we use the comparison logical test of **B7>D\$5**.

Employee	Years of Service	Result
John	8	Promote Now
James	4	Promote Later
Larry	3	Promote Later
Kate	9	Promote Now

**Function Arguments**

IF

Logical\_test: B7>D\$5 = TRUE

Value\_if\_true: E\$5 = "Promote Now"

Value\_if\_false: F\$5 = "Promote Later"

Checks whether a condition is met, and returns one value if TRUE, and another value if FALSE.

**Value\_if\_false** is the value that is returned if Logical\_test is FALSE. If omitted, FALSE is returned.

Formula result = Promote Now

[Help on this function](#) [OK] [Cancel]

The **value if true** is set to the Positive Result 'Promote Now' or E5 and the **value if false** is set to the Negative Result 'Promote Later' or F5. In addition **Absolute Cell Reference** must be used to ensure the cells D5, E5 and F5 are not changed as the formula is dragged down using auto fill. This is applied as shown in the example.

## Related Operators of IF

The following operators can all be used in conjunction with the IF formula.

- = equal to
- > greater than
- < less than
- >= greater than or equal to
- <= less than or equal to
- <> not equal to

**HINT:** How to remember the difference between greater than and less than...

- < can be changed into 4 – so it is **less than 7**
- > can be changed into 7 – so it is **greater than 4**
- or
- < ess for Less

## Simple IF Condition Example 2

The **IF** function introduces the option of decision making into spreadsheets, to do this the formula tests a specified condition to see if it is True or False.

**=IF(LogicalTest, ValueIfTrue, ValueIfFalse)** IF THE RESULT OF THE LOGICAL TEST IS TRUE THE VALUEIFTRUE ACTION IS COMPLETED, IF THE RESULT IF FALSE THE VALUEIFFALSE ACTION IS CARRIED OUT.

**=IF(C2>=\$G\$1,"Pass","Fail")**

This simple IF function works by checking the logical test is true or false, if the student has got greater than or equal to 60% in their Marks out of 100 they will receive the true value a Pass which is the **ValueIfTrue** if they get less than 60% the receive the **ValueIfFalse** which is a Fail.

The screenshot shows an Excel spreadsheet with the following data:

B	C	D	E	F	G
Student Name	Marks out of 100	Results		Pass Mark	60%
Richard Byrne	90%	=IF(C2>=\$G\$1,"Pass","Fail")			
Pete Greene	83%				

The formula bar at the top shows: `=IF(C2>=$G$1,"Pass","Fail")`

**Note:** Words used in formula are included in **Inverted Commas** e.g. "Pass".

Both the **ValueIfTrue** and the **ValueIfFalse** actions can be a formula, a text statement, a numeric value or a blank cell (to show a blank cell for a ValueIfTrue or a ValueIfFalse include "" *empty inverted commas*).

**Notes:** Write down other examples of **Simple IF** you have covered in class.

#### 4. USE A NESTED IF FUNCTIONS WITH A LOGICAL OPERATOR AND, OR or NOT

##### Nested IF Function

If a question has more than two outcomes we can create a nested IF statement. Within a nested IF statement you can apply the IF formula up to 64 times. Each of the logical tests are applied one at a time, then the next IF's logical test is applied in place of the false value. The final logical tests value is added as the **false** value.

**=IF(B4>=0.8,"Distinction",IF(B4>=0.65,"Merit",IF(B4>=0.5,"Pass","Fail")))**

**Example:** When grading the FETAC assignments the grades are as follows:

Distinction	80-100%
Merit	65-79%
Pass	50-64%
Fail	0-49%

To check a list of grades for students in a spreadsheet we can use a nested IF function.

In the cell C4 we will create a simple IF function which will check the grade of Kathleen Lee's results. This function can then be auto filled to cell C8 to calculate each student's results.

	A	B	C
1	Relation Database Results Level 6 2010		
2			
3	Student Names	Module Results	FETAC Grade
4	Kathleen Lee	78%	
5	Mark O'Grady	65%	
6	Deirdre Monaghan	34%	
7	Thomas Gallagher	99%	
8	Kevin McKenna	74%	
9			

To create the function start with **=if(** this will show an **IF** function guide below the cell. In this question we will start at the highest result and work to the lowest result.

Module Results	FETAC Grade
78%	=if(
65%	IF(logical_test, [value_if_true], [value_if_false])
34%	

The first part of the function is a **logical test**, next the value if true for that logical test, to nest a second **IF** replace the value if false with another **IF** statement.

Module Results	FETAC Grade
78%	=if(B4>=0.8
65%	IF(logical_test, [value_if_true], [value_if_false])
34%	

The first logical test is the cell reference value compared against **B4>=0.80**. The **value if true** is set to the word “Distinction” which will appear as the result (the word is included in inverted commas because it is text).

The second logical test will compare the value in **B4** against 0.65 to check if it is greater than or equal to the value 0.65 (the decimal point is used as the value is in percentages). Continue to nest the IF statements inside the original IF statement, remember to close all brackets to ensure the function is correct.

Module Results	FETAC Grade
78%	=IF(B4>=0.8,"Distinction",IF(B4>=0.65,"Merit",IF(B4>=0.5,"Pass","Fail")))
65%	
34%	
99%	

IF(logical\_test, [value\_if\_true], [value\_if\_false])

The final result “Fail” is included as the **value if false** there is only one value if false and this is the final result. The value if false holds true for any other answers/options.

To check the results for the other students use the auto fill to drag the function down to cell C8.

Module Results	FETAC Grade
78%	Merit
65%	
34%	
99%	
74%	

**Notes:** Write another example of a Nested IF from class examples here.

## IF Function with a Logical Operator AND

With an IF statement we can also add an **AND** function. For example if we want to check that **EVERY** month our profit is over €100 we can use the following formula (we are checking Jan is over €100 AND Feb is over €100 AND March is over €100 AND April is over €100).

**=IF(AND(C18>100,C19>100,C20>100,C21>100),"Over Target","Below Target")**

The screenshot shows an Excel spreadsheet with the following data:

Month	Income
Jan	€98.00
Feb	€115.00
Mar	€106.00
Apr	€130.00

The formula bar shows: `=IF(AND(C18>100,C19>100,C20>100,C21>100),"Over Target","Below Target")`

The spreadsheet content includes a header "Simple IF with AND" in cell B1. Cell C1 is "Month" and C2 is "Income". Cell D1 contains the text "Income over €100 every month." Cell E1 contains the formula. A tooltip for the AND function is visible, showing the syntax: `AND(logical1, [logical2], [logical3], [logical4], [logical5], ...)`

In this example we have nested the AND function inside the logical test of the IF. It is important to know that this will only give the true value if **all** of the logical arguments evaluate to True. If only **one** from many logical tests inside the AND(...) evaluate to False and the rest are True, the AND Function will return the False value.

Here we have 4 logical tests, it is normal to have only 2 logical test but Excel 2007 & 2010 software the AND function can contain a maximum of 255 expressions (logical tests).

## IF Function with a Logical Operator OR

Within an IF statement we can also add an **OR** function. Let's now suppose we want to check that at least **ONE** member of a sales team met the company target of €18,000. To do this we use an **OR** logical function inside the **IF** logical test as shown here.

**=IF(OR(C27>=18000,C28>=18000,C29>=18000),"Target Reached","Target Missed")**

The screenshot shows an Excel spreadsheet with the following data:

Staff Members	Sales Target
Mary	€15,000.00
Thomas	€18,000.00
John	€17,200.00

The formula bar shows: `=IF(OR(C27>=18000,C28>=18000,C29>=18000),"Target Reached","Target Missed")`

The spreadsheet content includes a header "Simple IF with OR" in cell B24. Cell C24 is "Staff Members" and C25 is "Sales Target". Cell D24 contains the text "Months taraget is €18,000". Cell E24 contains the formula. Cell E28 contains the result "Target Reached".

Only one of the members of staff on the sales team has to reach the target of €18,000 for the **OR** function to succeed (see the sales target for Thomas in cell C28). In Excel 2007 & 2010 software the OR function can contain a maximum of 255 expressions (logical tests).

## IF Function with a Logical Operator NOT

The **NOT** function can also be used inside an IF statement there are two ways of using the not function. In the following example if the **Result** is not greater than the **Pass Mark** then a Fail is shown. There is only one logical test in the NOT function.

**=IF(NOT(C38>=D38),"Fail","Pass")**

E38		fx =IF(NOT(C38>=D38),"Fail","Pass")			
	A	B	C	D	E
35	Simple IF with NOT				
36					
37	Student	Exam	Result	Pass Mark	Pass or Fail?
38	Mary	English	45	70	Fail
39	Sinead	German	65	50	Pass
40	Ronan	Biology	79	60	Pass
41	Brian	Maths	45	40	Pass
42					

**Notes:** Write examples of IF statements with AND, OR or NOT logical tests.

## 5. USE A FINANCIAL FUNCTIONS FOR EXAMPLE DEPRECIATION OR NET PRESENT VALUE

### DEPRECIATION FUNCTION

The monetary value of an asset decreases over time due to use, wear and tear or obsolescence, this can be described as **depreciation**. There can be caused by a number of factors which affect depreciation such as market conditions and objects which could be affected by depreciation include premises, machinery, equipment and vehicles. Accounts estimate the decrease in value using the information regarding the useful life of the asset.

**=DB(cost,salvage,life,period,[month])**

Depreciation of an asset over time.

**=DB(\$E\$5,\$E\$6,\$E\$7,1)**

The DB function requires four arguments with the option of the month as a fifth arguments. These are:

<b>cost</b>	Purchase Price of the asset.
<b>salvage</b>	Disposal Value of the asset.
<b>life</b>	Number of years over which the asset is depreciated.
<b>period</b>	Year number.
<b>month (optional)</b>	Month number in that year. If the month is omitted it is assumed to be 12.

**Example** in this example the depreciation of a company van over 5 years is calculated for each year.

VLOOKUP    X ✓ fx    =DB(\$E\$5,\$E\$6,\$E\$7,1)					
	A	B	C	D	E
4					
5	Asset	Company Van		Purchase Price	€20,000.00
6				Disposal Price	€5,000.00
7				Expected Life (years):	5
8					
9	Year 1 Depreciation	=DB(\$E\$5,\$E\$6,\$E\$7,1)	after year 1		€15,160.00
10	Year 2 Depreciation	DB(cost, salvage, life, period, [month])	2		€11,491.28
11	Year 3 Depreciation	€2,780.89	Value after year 3		€8,710.39
12	Year 4 Depreciation	€2,107.91	Value after year 4		€6,602.48
13	Year 5 Depreciation	€1,597.80	Value after year 5		€5,004.68
14					

The sum of each of the **5 years depreciation** and the **disposal price** should be approximately the total value of the **purchase price**.

**NET PRESENT VALUE FUNCTION**

The NPV (Net Present Value) is a financial function that business analysts use to judge the viability of new projects or investments schemes with set or variable returns. **To calculate the NPV:** the present value of an investment based on expected income from that investment in future years minus the cost of the project. Net present value is calculated by dividing the expected income of a project in each future year by a term equal to one plus a discount rate raised to a power equal to the year. The totals for each year then are added together, and the initial cost of the project is subtracted from that sum to arrive at the net present value. The discount rate represents the time value of money: the amount that could be made by committing the money to other opportunities.

**=NPV(rate,value1,[value2],...)**      The NPV returns the net present value of an investment based on a discount rate and a series of future payments (negative values) and income (positive values).  
**=NPV(A39,A41,A42,A43,A44,A45)+A40**

The NPV function requires two arguments with the 254 additional arguments as optional. The arguments are:

<b>Rate</b>	The rate of discount over the length of one period.
<b>value1</b>	Value1 is required and any subsequent values are optional.
<b>value2</b>	There can be up to 254 arguments representing the payments and income.
The value arguments can be entered as a range. NPV uses the order of value1, value2, ... to interpret the order of cash flows. Be sure to enter your payment and income values in the correct sequence.	

**Example** in this example an annual discount rate of 0.08 is applied to an investment of €40,000, with five years' worth of returns.

A47		fx =NPV(A39,A41:A45)+A40		
	A	B	C	D
38	<b>Data</b>	<b>Description</b>		
39	0.08	Annual discount rate		
40	-€40,000.00	Initial cost of investment		
41	€8,000.00	Return from first year		
42	€9,200.00	Return from second year		
43	€10,000.00	Return from third year		
44	€12,000.00	Return from fourth year		
45	€14,500.00	Return from fifth year		
46	<b>Formula</b>	<b>Description</b>	<b>Live Result</b>	
47	€1,922.06	Net present value of this investment.		
48				



## 6. USE A LOOKUP FUNCTION FOR EXAMPLE THE VLOOKUP AND HLOOKUP FUNCTIONS

### VLOOKUP FUNCTION (VERTICAL LOOKUP)

A **VLOOKUP** function looks for a value in the leftmost column of a table, and then returns the value in the same **row** from a column specified. By default, the table must be **sorted in an ascending order** for the VLOOKUP to work. To use the VLOOKUP the data should be stored with the headings in the topmost row of the array.

**=VLOOKUP(lookup\_value,table\_array,col\_index\_num,range\_lookup)**

**=IF(NOT(C38>=D38),"Fail","Pass")**

<b>lookup_value</b>	The value to be found in the first column of the table.
<b>table_array</b>	The table of data, where the information is retrieved from.
<b>col_index_num</b>	The column <b>number</b> in the array where the matching value should be returned from.
<b>range_lookup</b>	Logical value to find the closet match <b>TRUE</b> . Logical value to find the exact match <b>FALSE</b> .

To create a VLOOKUP it is best to first **name the table\_array range** (see LO2 page 4 - this will mean the array is automatically absolutely cell referenced).

	A	B	C	D	E	F	G
19	<b>Order ID</b>	<b>Product</b>	<b>Unit Price</b>	<b>Quantity in Stock</b>			
20	10234	Samsung Noire	€99.00	45			
21	10235	Sony Ericsson F305	€99.00	51			
22	10245	Samsung Adidas MiCoach	€99.00	23			
23	10556	Motorola W230	€29.00	53		<b>ID Number</b>	10857
24	10857	Samsung J700	€59.00	35		<b>Product Name</b>	Samsung J700
25	11983	Samsung L700 Purple	€89.00	23		<b>Unit Price</b>	59
26	12576	Samsung Tocco Pink	€269.00	20		<b>Quantity in Stock</b>	35
27	12985	Sony Ericsson T303	€59.00	64			
28	19883	Nokia 5220	€119.00	31			

**Example** in this question there is a list of mobile phones and the relevant details for each phone, from cells A19:D28. This has been set to a named range **MobilePhone**. In cell G25 the VLOOKUP formula takes the mobile phone ID Number (cell G23) which is the **lookup\_value** and searches this number in the first column of the **table\_array** MobilePhone. When it finds the matching ID Number the corresponding information from the **col\_index\_num** column index number is displayed. The column index number is counted in numbers (not in column letters) in this the information from column 2 is displayed, the Product name. If FALSE is set as the **range\_lookup** an exact example match will be sought by the formula. If no exact match is found the formula the error #N/A is displayed which means no matching **lookup value** was found in the **table array**.

## HLOOKUP FUNCTION (HORIZONTAL LOOKUP)

A **HLOOKUP** function looks for a value in the top row of a table, and then returns the value in the same **column** from the row specified. To use the HLOOKUP the data should be stored with the headings in the leftmost column of the array.

**=HLOOKUP(lookup\_value,table\_array,row\_index\_num,range\_lookup)**

**=HLOOKUP(C41,MobilePhones,2,FALSE)**

To create a HLOOKUP it is best to first **name the table\_array range** (see LO2 page 4 - this will mean the array is automatically absolutely cell referenced).

	A	B	C	D	E
35	<b>Order ID</b>	10234	10235	10245	10556
36	<b>Phone Name</b>	Samsung Noire	Sony Ericsson F305	Samsung Adidas MiCoach	Motorola W230
37	<b>Unit Price</b>	€99.00	€99.00	€99.00	€29.00
38	<b>Qty in Stock</b>	45	51	23	53
39					
40					
41		<b>ID Number</b>	10245		
42					
43		<b>Product Name</b>	Samsung Adidas MiCoach		
44		<b>Unit Price</b>	€99.00		
45		<b>Quantity in Stock</b>	23		

**Example** in this question there is a list of mobile phones and the relevant details for each phone, from cells A35:E38. This has been set to a named range **MobilePhones**. In cell C43 the HLOOKUP formula takes the mobile phone ID Number (cell G41) which is the **lookup\_value** and searches this number in the top row of the **table\_array** MobilePhones. When it finds the matching ID Number the corresponding information from the **row\_index\_num** row index number is displayed. The row index number is counted in numbers in this example the information from row 2 is displayed, the Product name. If FALSE is set as the **range\_lookup** an exact match will be sought by the formula. If no exact match is found the formula the error #N/A is displayed which means no matching **lookup value** was found in the **table array**.

**Notes:** Write a note on the difference in the functions HLOOKUP and VLOOKUP here...

## LOOKUP FUNCTION

A **LOOKUP** function looks up a value either from a one-row or one-column range or from an array and returns a value from the same position in a second row or column range. The LOOKUP function has been included for backward compatibility and the VLOOKUP and HLOOKUP are more commonly used.

**=LOOKUP(lookup\_value,lookup\_vector,result\_vector)**

**=LOOKUP(G9,A6:A14,B6:B14)**

	A	B	C	D	E	F	G
5	<b>Order ID</b>	<b>Product</b>	<b>Unit Price</b>	<b>Quantity in Stock</b>			
6	10234	Samsung Noire	€99.00	45			
7	10235	Sony Ericsson F305	€99.00	51			
8	10245	Samsung Adidas MiCoach	€99.00	23			
9	10556	Motorola W230	€29.00	53		<b>ID Number</b>	10857
10	10857	Samsung J700	€59.00	35		<b>Product Name</b>	Samsung J700
11	11983	Samsung L700 Purple	€89.00	23		<b>Unit Price</b>	€59.00
12	12576	Samsung Tocco Pink	€269.00	20		<b>Quantity in Stock</b>	35
13	12985	Sony Ericsson T303	€59.00	64			
14	19883	Nokia 5220	€119.00	31			

**Example** in this example we have mobile phones listed by their **Order ID**, **Product Name**, **Unit Price** and **Quantity in Stock**. Using the **Lookup** function the **ID Number** can be used by searching the A column to find the **Product Name**.

Cell G9 is used to store the **ID Number** which value being searched for, this is known as the **lookup value**. The **Product Name** will be shown in G7 so the formula will go in here. The **lookup value** is found in the look up vector. In this example the **lookup vector** is the list of **Order ID** numbers (cell range A6 to A14). The **result vector** shows the list where the answer will come from **Product Names** cell range B2 to B11.

**Note:** A lookup will not work if the information is not **sorted** according to the result vector and if the lookup value is not on the list the lookup function will return the nearest lowest value.

### Task: LOOKUP Revision Questions

**Q 1** What are the **FIRST** two things that should be done to data **before** using a LOOKUP function?

**Q 2** Write an example of a LOOKUP formula here:

**Q 3** Name the three types of LOOKUPS:

- a.
- b.
- c.

**Q 4** Write an example of a VLOOKUP formula here:

## 7. PERFORM A CALCULATION USING DATE AND TIME FUNCTIONS FOR EXAMPLE NOW OR TODAY

There are a number of date functions available in Excel. Two commonly used functions take their date from the computer clock, which means that if your computer clock is showing the wrong date or time your formula will too. These functions are

### TODAY FUNCTION

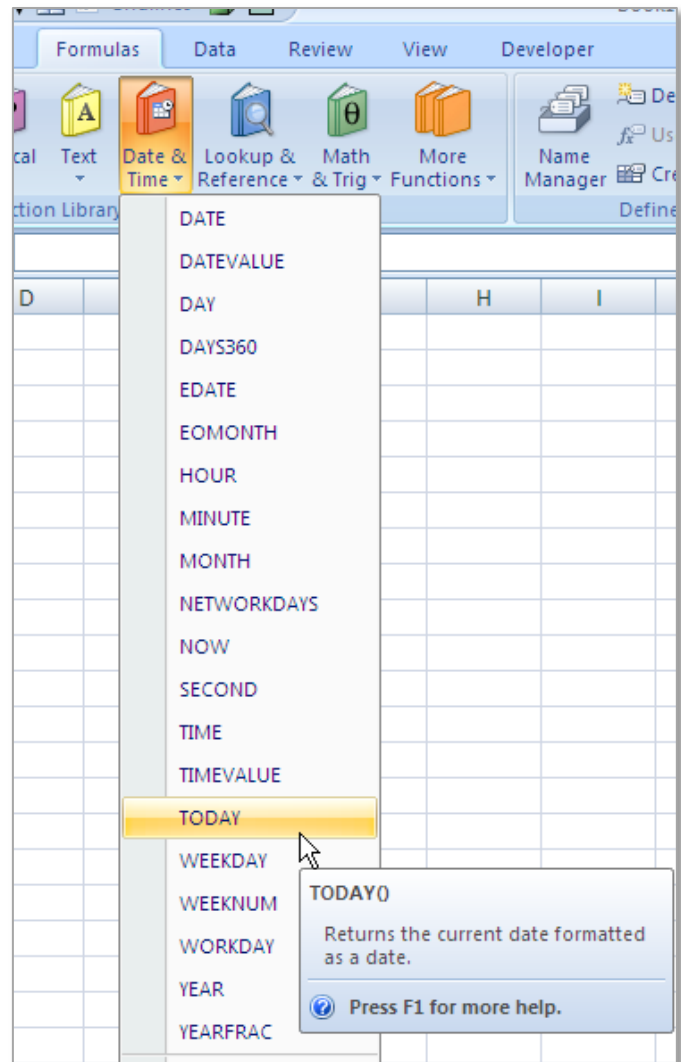
**=TODAY()** Displays the current date.

### NOW FUNCTION

**=NOW()** Displays the date and/or time depending on formatting.

For both of these functions there are no arguments, enter them into the required cells and they will display current date and time. These functions update when the worksheet is calculated i.e. when the worksheet is reopened.

To access common Date and Time functions go to the *formula* bar and click on the *Date & Time* button.



**Note:** Computers store dates as a number representing the number of full days since midnight January 1, 1900, plus the number of hours, minutes and seconds for the current day. This is called the serial number.

To view the serial number as a date you should format the number to the required date category format.

**Note:** The TODAY() and NOW() functions change only when the worksheet is calculated (a worksheet is recalculated each time it is opened). They are not updated continuously. The date and time used are taken from the computer's system clock.

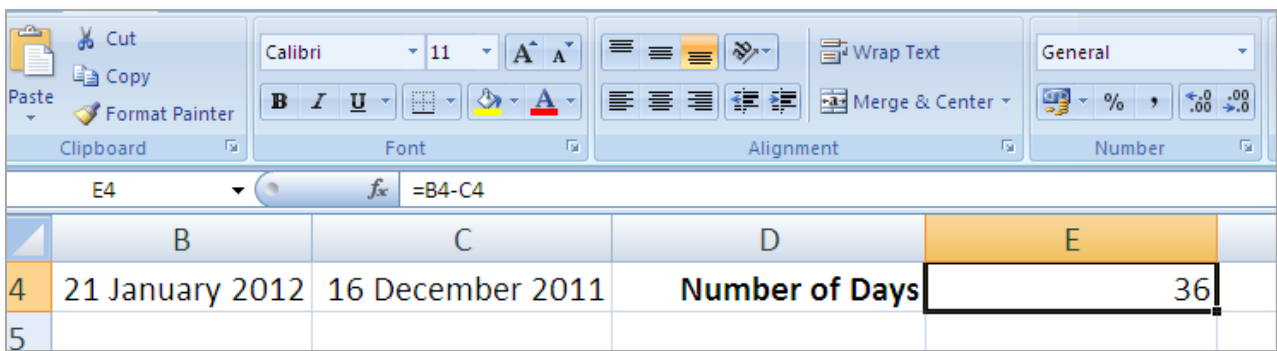
## Perform Calculations on Dates and Times

Calculations can be completed on dates and times because they are stored as a number.

To calculate the number of days between two dates in *Days*:

### TAKE TWO DATES FROM EACH OTHER

1. Type in two dates and set them both to date format.
2. Use a formula **=B4-C4** to take the largest date from the smallest date.
3. Ensure the formula cell **E4** is set to *General* format to allow the answer to be displayed as a number.



### MONTH FUNCTION

To calculate the difference between two dates in *Months* in the same year:

**=MONTH(Cell Ref)** TAKE TWO MONTHS FROM EACH OTHER

1. Type in two dates and set them both to date format. For this formula to work ensure the dates are both in the same year.
2. Use the formula **=MONTH(C4)-MONTH(B4)** to take the largest date from the smallest date.
3. Ensure the formula cell is set to *General* format to allow the answer to be displayed as a number.

### YEAR FUNCTION

To calculate the difference between two dates in *Years*:

**=YEAR(Cell Ref)** TAKE TWO YEARS FROM EACH OTHER

1. Type in two dates and set them both to date format.
2. Use the formula **=YEAR(C4)-YEAR(B4)** to take the largest date from the smallest date.
3. Ensure the formula cell is set to *General* format to allow the answer to be displayed as a number.

To calculate the difference between two dates in months from different years we use a combination of the above date formula.

## DIFFERENCE IN MONTHS BETWEEN DATES

**=(YEAR(Cell Ref)-YEAR(Cell Ref))\*12+MONTH(Cell Ref)-MONTH(Cell Ref)**

1. Type in two dates and set them both to date format.
2. Use the formula **=(YEAR(C4)-YEAR(B4))\*12+MONTH(C4)-MONTH(B4)**
3. Ensure the formula cell is set to *General* format to allow the answer to be displayed as a number.

This formula works by finding the number of years, multiplying this by 12 and adding the number of months.

D4		fx =(YEAR(A4)-YEAR(B4))*12+MONTH(A4)-MONTH(B4)				
	A	B	C	D	E	F
4	21 January 2012	16 October 2011	<b>Number of Months</b>	3		
5						
6						
7						

## WEEKDAY FUNCTION

**=WEEKDAY(Cell Ref)** RETURNS THE DAY OF THE WEEK IN A NUMBER

The WEEKDAY function returns the day of the week based on one date in a cell reference. Each day is represented as a number with the week starting on Sunday as 1, Monday as 2, etc.

D18		fx =WEEKDAY(A18)			
	A	B	C	D	
17					
18	13/01/2012	<b>Weekday as a Number</b>		6	
19	12/01/2012	<b>Weekday as a Number</b>		5	
20					

**Note:** If you wanted to display the day as the actual day 1 = Sunday, 2 = Monday, etc. you could add the use of a Nested IF formula or a Lookup.

## DATED IF FUNCTION

**=DATEDIF(StartDate, EndDate, Unit)** RETURNS THE NUMBER OF DAYS, MONTHS OR YEARS

The DATEDIF function can be used to calculate the number of days between dates.

1. The first cell reference is the final date.
2. The second cell reference is the most recent date.
3. The unit can used to find the number of days ("d"), number of months ("m") and number of years ("y").

	A	B	C	D
D14			=DATEDIF(B14,A14,"d")	
14	16 Dec 2011	08 Jan 1982	Days d	10934
15			Months m	359
16			Years y	29

**Note:** An interesting about thing about the DATEDIF function is that it is an undocumented function which means that while it works, it is not listed under the formula tab in Excel. Therefore it must be typed manually into a cell and not with the dialog box available for other functions.

## 8. REFERENCES:

### Maths is Fun

<http://www.mathsisfun.com/mode.html>

### Spreadsheet About.com

[http://spreadsheets.about.com/od/excelfunctions/qt/and\\_function.htm](http://spreadsheets.about.com/od/excelfunctions/qt/and_function.htm)

### Depreciation Formula

<http://www.excel-easy.com/examples/depreciation.html>

### NPV

<http://office.microsoft.com/en-ie/excel-help/npv-function-HP010342728.aspx>

## FUNCTION SHORTCUT LIST ACCORDING TO FUNCTION LIBRARY GROUPS



## Math &amp; Trig Functions

Function Name	Action	Example (single range)	Example (multiple ranges)
<b>SUM</b>	Add numbers in a range of cells or multiple ranges.	=SUM(B4:B15)	=SUM(B4:B15,E4:E15)
<b>ABS</b>	Returns the absolute value of a number; The absolute value of a number is the number without its sign (e.g. –minus).	=ABS(C17)	Not applicable to a range.
<b>INT</b>	This formula will return the whole number, when a number with a decimal point is entered (rounding down).	=INT(C10)	Not applicable to a range.
<b>SQRT</b>	This formula will return the <b>positive square root</b> of the cell number referenced.	=SQRT(C10)	Not applicable to a range.
<b>POWER</b>	Calculates the result of a number raised to a power. Can be used to calculate the radius of a circle.	=POWER(2,3)	2x2x2 is 2 <sup>3</sup>
<b>SUMIF</b>	Adds cell values in a range if they satisfy a given condition.	=SUMIF(A2:A7,">300",B2:B7)	Adds data in column B where the value in column A is greater than 300.





## Statistical Functions

Function Name	Action	Example (single range)	Example (multiple ranges)
<b>MAX</b>	Finds the highest number in a range of cells or multiple ranges.	=MAX(B4:B15)	=MAX(B4:B15,E4:E15)
<b>MIN</b>	Finds the lowest number in a range of cells or multiple ranges.	=MIN(B4:B15)	=MIN(B4:B15,E4:E15)
<b>AVERAGE</b>	Calculates the average of numbers in a range of cells or multiple ranges.	=AVERAGE(B4:B15)	=AVERAGE(B4:B15,E4:E15)
<b>MEDIAN</b>	Returns the median number, which is the number in the middle of a given set of numbers.	=MEDIAN(G4:G8)	=MEDIAN(G4:G8,I4:I8)
<b>MODE</b>	The <b>mode</b> function returns the most frequently occurring or repetitive value in a range of numbers.	=MODE(J3:J8)	=MODE(J3:J8,K3:K5)
<b>STDEV</b>	A measure of how spread out the numbers are from the mean or average.	=STDEV(K12:K16)	=STDEV(K12:K16,L10:L15)
<b>COUNT</b>	Counts the number of cells containing numbers in a range of cells or multiple ranges.	=COUNT(B4:B15)	=COUNT(B4:B15,E4:E15)
<b>COUNTIF</b>	Count the number of cells in the range which contain a certain criteria.	=COUNTIF(C4:C11,"Computer") =COUNTIF(C4:C11,A14)	Counts the number of cells that contain the word "Computer" in the range C4:C11.
<b>COUNTA</b>	Counts the number of cells containing numbers or text in a range of cells or multiple ranges.	=COUNTA(B4:B15)	=COUNTA(B4:B15,E4:E15)



## Financial Functions

Function Name	Action	Example (single range)	Example (multiple ranges)
<b>DB</b>	Calculates the depreciation of an asset over a number of years, using the declining balance method.	=DB(\$E\$1,\$E\$2,\$E\$3,1)	E1 is Purchase Price E2 is Disposal Price E3 is Expected Life 1 (last argument) number of years.
<b>NPV</b>	The NPV returns the net present value of an investment based on a discount rate and a series of future payments (negative values) and income (positive values).	=NPV(A39,A41,A42,A43,A44,A45)+A40	See page 15.



## Logical Functions

Function Name	Action	Example
<b>IF</b>	The IF formula allows the comparison of values and produces an output which can be in a text/number format.	=IF(B9>=\$D\$7,\$E\$7,\$F\$7) =IF(C2>=\$G\$1,"Pass","Fail")
<b>NESTED IF</b>	Like an IF statement and in addition to this, if a question has more than two outcomes we can create a nested IF statement.	=IF(B4>=0.8,"Distinction",IF(B4>=0.65,"Merit",IF(B4>=0.5,"Pass","Fail")))
<b>IF AND</b>	Inside an IF function an AND function can be used to compare two logical tests or criteria.	=IF(AND(C18>100,C19>100,C20>100,C21>100),"Over Target","Below Target")
<b>IF OR</b>	Inside an IF function an OR function can be used to check one logical test or another one is correct.	=IF(OR(C27>=18000,C28>=18000,C29>=18000),"Target Reached","Target Missed")
<b>IF NOT</b>	Used inside an IF function the NOT function can be used to check that a criteria is not true.	=IF(NOT(C38>=D38),"Fail","Pass")



## Lookup & Reference

Function Name	Action	Example
VLOOKUP	Looks up data vertically across columns and returns a corresponding value based on a lookup value and the row specified.	=IF(NOT(C38>=D38),"Fail","Pass")
HLOOKUP	Looks up data horizontally down columns and returns a corresponding value based on a lookup value and the column specified.	=HLOOKUP(C41,MobilePhones,2,FALSE)
LOOKUP	Looks up a value either from a one-row or one-column range or from an array and returns a value from the same position in a second row or column range.	=LOOKUP(G9,A6:A14,B6:B14)



## Date & Time

Function Name	Action/Explanation	Example
TODAY	Inserts today's date into the cell, ensure to format the cell to display the date appropriately. Remember if a date shows as a number this is the serial number of the date. No arguments are required for this function.	=TODAY()
NOW	Display the time and/or the date, depending on the cell formatting chosen. No arguments are required for this function.	=NOW()
MONTH	Takes the month from a date formatted cell and represents it as a number. This function is usually used alongside other date functions.	=MONTH(C4)-MONTH(C5)
YEAR	Used to take the year from a date formatted cell and represents it as a number. This function is usually used alongside other date functions.	=YEAR(C4)-YEAR(C5)
WEEKDAY	Returns the day of the week as a number. With 1 = Sunday, 2 = Monday, etc. Can be used alongside a nested IF to show the day of the week.	=WEEKDAY(C18)
DATEDIF	Returns the number of days, months or years between two dates, using the Units d, m or y.	=DATEDIF(B14,A14,"d")