# The IF() function:

The IF() function checks for a specific condition. If the condition is met, then one action is taken; if the condition is not met, then a different action is taken. For example, you may be reviewing a set of tutorial marks. If a student's average mark is below 50, then the cell value should be FAIL; so the condition you are checking is whether or not the average result is below 50. If this condition is not met (that is, the average result is 50 or more), then the cell value should be PASS.

If the true or false condition is to be text and not a value, the text has to be enclosed in double quotes.

**=IF(A3=10,“Yes”, “No”)**

Listed below are the comparative operators that can be used in logical functions.

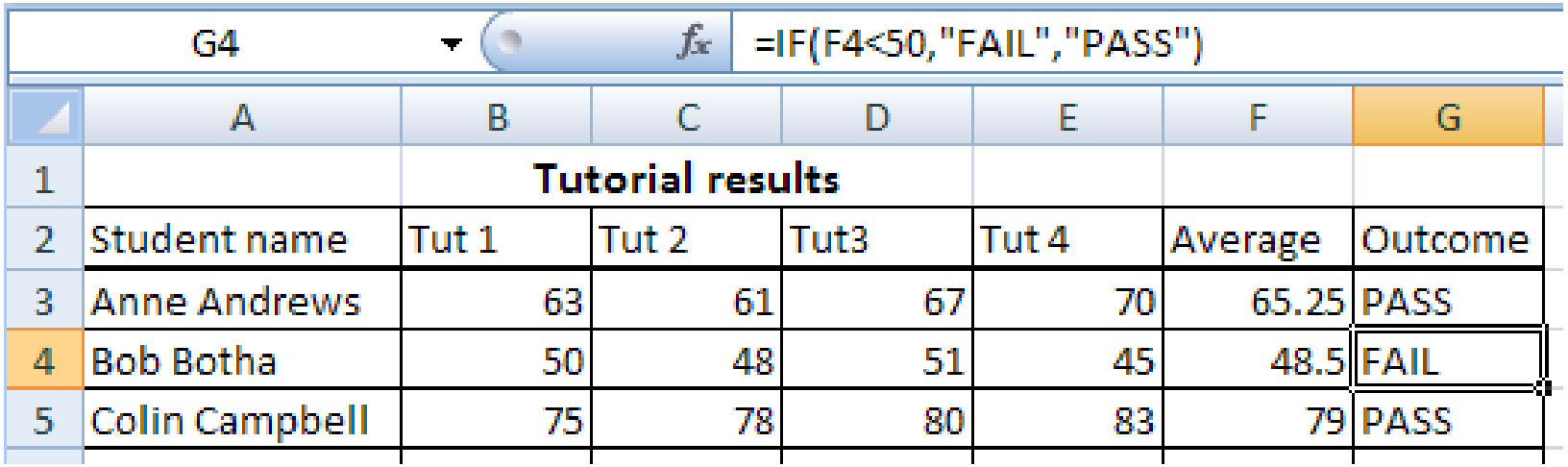
| | |
|---|---|
| = | Equal To |
| < | Less Than |
| > | Greater Than |
| <= | Less than or equal to |
| >= | Greater than or equal to |
| <> | Not Equal to |

Let's see this in action:

The structure of an IF() function is:

**=IF (condition, result if true, result if false)**

Using English to describe our example as an IF statement*: IF the average mark is less than 50, then display the word **"FAIL"**, else display the word **"PASS".*** Now for a real worksheet example. Look at the formula bar in the screenshot below:




| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | | **Tutorial results** | | | | | |
| 2 | Student name | Tut 1 | Tut 2 | Tut3 | Tut 4 | Average | Outcome |
| 3 | Anne Andrews | 63 | 61 | 67 | 70 | 65.25 | PASS |
| 4 | Bob Botha | 50 | 48 | 51 | 45 | 48.5 | FAIL |
| 5 | Colin Campbell | 75 | 78 | 80 | 83 | 79 | PASS |

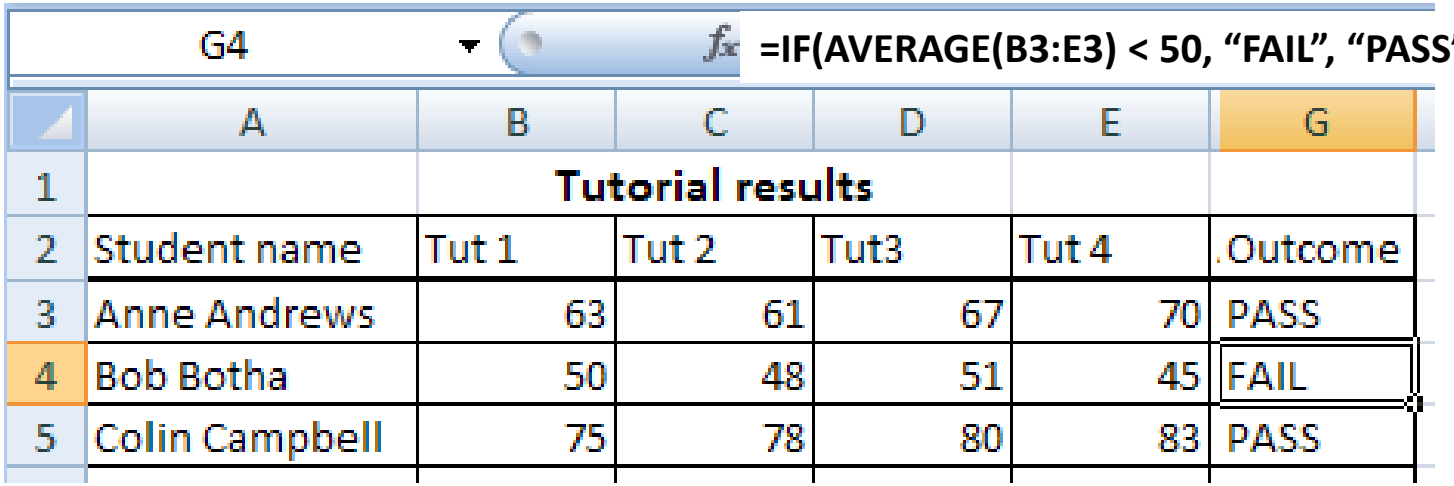
Do you follow how the formula in cell G4 was constructed? Because the average mark is stored in cell F4, we need to check whether the value in F4 is less than 50. If it is, then the active cell (G4) must display the word “Fail”. If the value in F4 is not less than 50, then the active cell must display the word “Pass”. That’s not really so complicated, is it?

# Nested functions:

- **You can include one function inside another.**

- In the example above, we first worked out the Average mark, and then the Pass/Fail outcome. But we could have done it all in a single step, by using the following formula in row 3:

**=IF(AVERAGE(B3:E3) < 50, “FAIL”, “PASS”)**




| | A | B | C | D | E | G |
|---|---|---|---|---|---|---|
| 1 | | **Tutorial results** | | | | |
| 2 | Student name | Tut 1 | Tut 2 | Tut3 | Tut 4 | Outcome |
| 3 | Anne Andrews | 63 | 61 | 67 | 70 | PASS |
| 4 | Bob Botha | 50 | 48 | 51 | 45 | FAIL |
| 5 | Colin Campbell | 75 | 78 | 80 | 83 | PASS |

# Example: **Enter values into the worksheet.**

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | Fname | Lname | Exam 1 | Exam 2 | Midterm | Final | Total Points | Average |
| 2 | John | Smith | 80 | 92 | 85 | 88 | | |
| 3 | Roberta | Jones | 73 | 88 | 82 | 93 | | |
| 4 | Michael | Stein | 62 | 95 | 85 | 76 | | |
| 5 | Alice | Benson | 100 | 92 | 84 | 98 | | |

**Calculate the total point and average of each student**

# ***Example:***

## NESTING =IF()'s

You may want to use an =IF() function again as part of the TRUE or FALSE part of the formula.

| If Average Score is | Then return |
|---|---|
| Greater than 89 | A |
| From 80 to 89 | B |
| From 70 to 79 | C |
| From 60 to 69 | D |
| Less than 60 | F |

You can use the following nested =IF() function:

**=IF(AverageScore>89,"A",IF(AverageScore>79,"B",IF(AverageScore>69,"C",IF(AverageScore>59,"D","F"))))**

## Using Other Functions with IFs

USE OF **IF** WITH **SUM**

For example if the =SUM() function is nested within an =IF() function, the condition of the =IF() function can be based on whether the total value in a range of cells is above or below a certain value.

| | A | B | C |
|---|---|---|---|
| 1 | Sales figures for Qrt1 1997 | | |
| 2 | | | |
| 3 | Date | Total Sales | |
| 4 | 01-Jan | 30000 | |
| 5 | 01-Feb | 25689 | |
| 6 | 01-Mar | 45689 | |
| 7 | | Good Sales | |
| 8 | | | |
| 9 | | | |

The following function would be used in cell B7.

**=IF(SUM(B4:B6)>9000, “Good Sales”, “Bad Sales”)**

# **AND** statement and **OR** statement

## =AND(logical1, logical2)

This logical function compares whether two cell match the condition required, if the cells meet the condition TRUE is inserted into the cell if not then FALSE is used.

| | A | B |
|---|---|---|
| 1 | | |
| 2 | 10 | |
| 3 | 20 | |
| 4 | 30 | |
| 5 | | TRUE |
| 6 | | |

The function in cell B5 is:

**=AND(A3=20,A4=30)**

# =OR(logical1, logical2)

This logical function compares whether one of two cells meets the condition required. If the cells meet the condition TRUE is inserted into the cell if not then FALSE is used.

| | A | B |
|---|---|---|
| 1 | | |
| 2 | 10 | |
| 3 | 30 | |
| 4 | 40 | |
| 5 | | FALSE |

The function in cell B5 is:

**=OR(A3=20,A4=30)**

# Using The =AND() and =OR() Function With =IF()s

B14

| | A | B |
|---|---|---|
| 1 | 10 | |
| 2 | 30 | |
| 3 | 40 | |
| 4 | IF | ok |
| 5 | AND | FALSE |
| 6 | OR | TRUE |
| 7 | IF+AND | Wrong |
| 8 | IF+OR | Correct |
| 9 | | |
| 10 | | |

| |
|---|
| IF(A1>5,"ok","bad") |
| AND(A1=10,A2=20,A3=40) |
| OR(A1=10,A2=20,A3=60) |
| IF(AND(A1=10,A2=20,A3=40),"Correct", "Wrong") |
| IF(OR(A1=10,A2=20,A3=40),"Correct", "Wrong") |

# Trigonometric Functions

**These include:** **SIN, COS** and **TAN** and their inverses **ASIN, ACOS and ATAN.**

All computer applications use radians not degrees for angles in trig functions.

$$\text{Radians}/2\pi = \text{Degrees}/360.$$

**Example:**

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Angle | 60 | Radians | =RADIANS(B1) |
| 2 | Sin | =SIN(RADIANS(B1)) | | =SIN(D1) |
| 3 | Cos | =COS(RADIANS(B1)) | | =COS(D1) |
| 4 | | | | |
| 5 | Degrees | =DEGREES(ASIN(B2)) | Radians | =ASIN(D2) |
| 6 | Radians | =RADIANS(B5) | Degrees | =DEGREES(D5) |
| 7 | | | | |

**Ans:**

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Angle | 60 | Radians | 1.047198 |
| 2 | Sin | 0.866025 | | 0.866025 |
| 3 | Cos | 0.5 | | 0.5 |
| 4 | | | | |
| 5 | Degrees | 60 | Radians | 1.047198 |
| 6 | Radians | 1.047198 | Degrees | 60 |

# Exponential Functions

(a) **=EXP(2)** returns *e*.*

(b) =**LN(5)** returns the natural logarithm of 5.

(c) =**LOG1 0(5),** =**LOG(5, I O )** and =**LOG(5)** all return the logarithm of 5 to base **10.**

(d)= **LOG(8,2)** returns the value **3**, which is the logarithm of **8** to base **2**.

| x= | 5 | |
|---|---|---|
| log | 0.69897 | |
| log10= | 0.69897 | |
| log(5,2) | 2.321928 | |
| Exp()5 | 148.4132 | |

# Rounding Function

Excel provides a number of functions which either truncate or round a value to a required number of digits or to a multiple of some number.

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | First Name | Last Name | Class Grades | | | | |
| 2 | Caroline | Tan | 3 | | | | |
| 3 | Don | Poole | 0 | | Average | 2.48 | AVERAGE (C2:C26) |
| 4 | Sam | Thangvelu | 4 | | Median | 3 | MEDIAN(C2:C26) |
| 5 | Carmel | Lim | 4 | | Mode | 3 | MODE(C2:C26) |
| 6 | Daphne | Liu | 4 | | | | |
| 7 | Victor | Tang | 2 | | Maximum Grade | 4 | MAX(C2:C26) |
| 8 | Dylan | Tiong | 4 | | Minimum Grade | 0 | MIN(C2:C26) |
| 9 | Shirley | Williams | 1 | | | | |
| 10 | Glen | Wright | 4 | | Number of students | 25 | COUNT(C2:C26) |
| 11 | Linda | Tan | 0 | | | | |

**SUMIF Function :**

**The general format is as follow:**

**=SUMIF(range , criteria , sum-range)**

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Date | Country | Name | Amount |
| 2 | 05/01/2011 | IN | Lim | 2 |
| 3 | 06/01/2011 | SG | Peter | 6 |
| 4 | 07/01/2011 | US | Lim | 8 |
| 5 | 05/01/2011 | AU | Peter | 3 |
| 6 | 06/01/2011 | DE | Lim | 4 |
| 7 | 07/01/2011 | CN | Peter | 6 |

Example 1: Sum the values of the cells D2 to D7, only if they are greater than 5

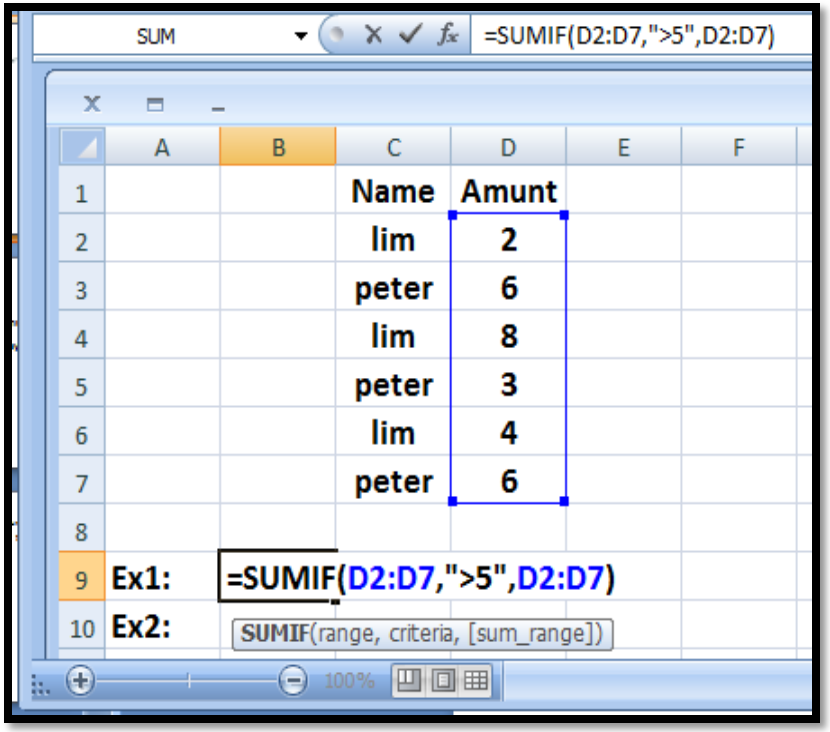
`=SUMIF(D2:D7,">5",D2:D7)` ; Result should be 20.

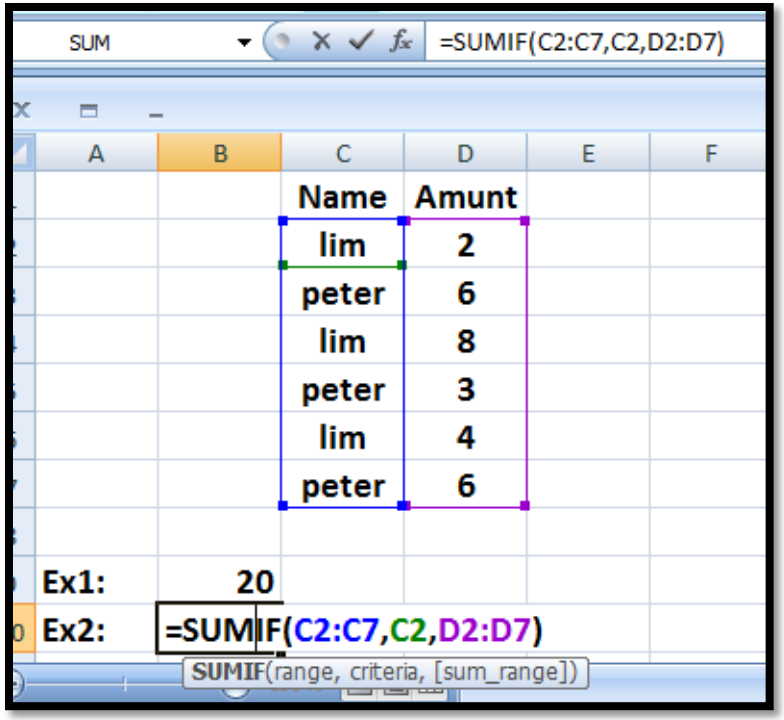
Example 2: Sum the values of the cells D2 to D7 if the value in cells C2 to C7 is "Lim" or equivalent to the value in cell C2.

`=SUMIF(C2:C7,"Lim" ,D2:D7)` ; Result should be 14.

or

`=SUMIF(C2:C7,C2 ,D2:D7)`



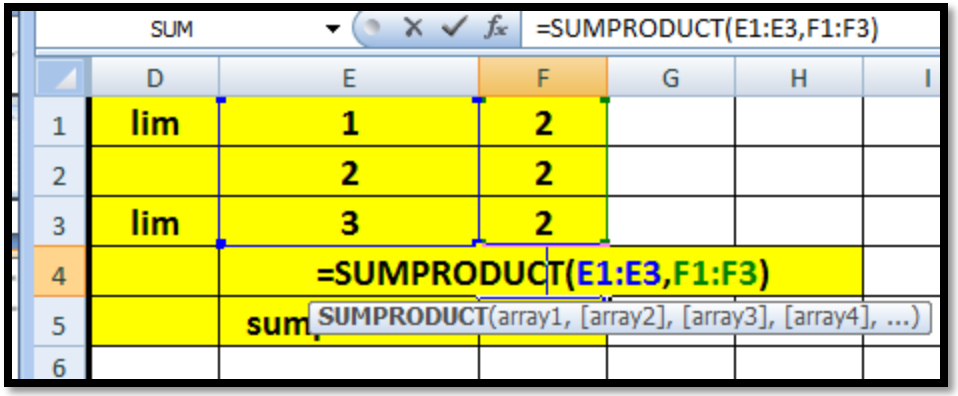
# SUMPRODUCT

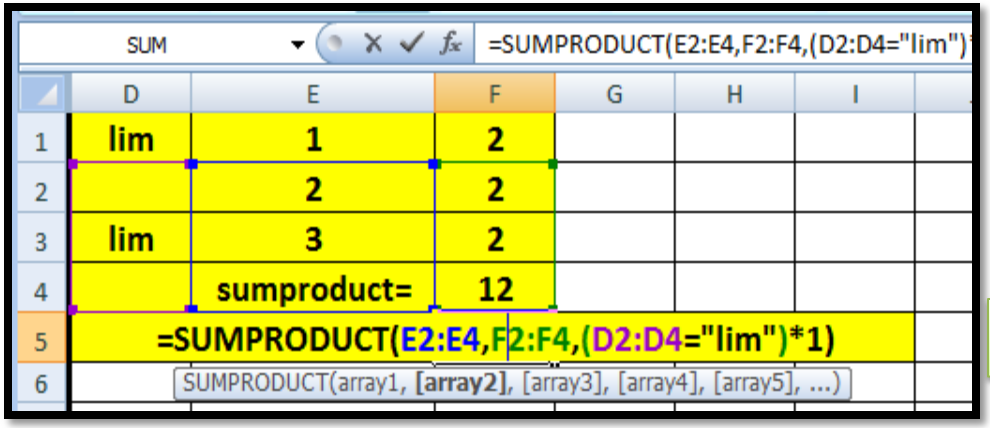
Let's say that you have a series of quantities in cells A1 to A5 and a series of unit prices in B1 to B5. With SUMPRODUCT you can calculate total sales with this formula:

```
=SUMPRODUCT(A1:A5,B1:B5)
```

Basically SUMPRODUCT sums A1 multiplied by B1 plus A2 multiplied by B2 and so on. But you could also apply specific conditions to it.

```
=SUMPRODUCT(A1:A5,B1:B5,  (C1:C5="Lim")*1)
```




**With condition**

**A number of errors can arise with formulas and functions. When this happens, Excel displays one of these error values. See next slid.**

# DIV/O! Division by zero.

# NAME? **A formula contains an undefined variable or** function name, or a space between the name of a function and the opening parenthesis.

**# N/A No value is available.**

# NULL! **A result has no value.**

# NUM! Numeric overflow;

**e.g. a cell with =SQRT(Zl) when Z1 has a** negative value

# REF! Invalid cell reference.

# VALUE! Invalid argument type;

**e.g. a cell with =LN(Zl) when Z1 contains text.**