

# **Excel Formulas**

Formulas are instructions that you enter so that Excel will perform calculations. In Excel, you create formulas by preceding the calculation with an equal sign (=).

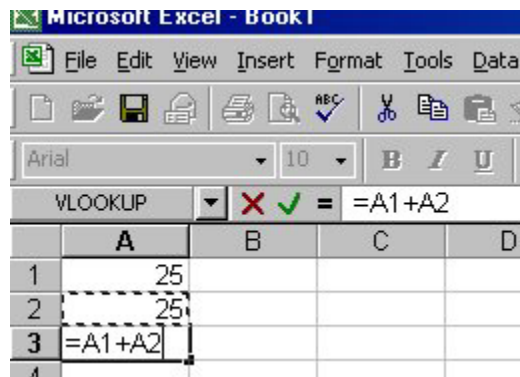
### **Operators Used in Formulas**

When you are building formulas, use:

- + for addition
- for subtraction
- \* for multiplication
- / for division
- ^ For exponents
- & Concatenation

### **Using Cell References**

When entering formulas, always use cell references rather than actual cell values to write your formulas. In the example below, to add the values in cells A1 and A2, we use the formula =A1+A2 rather than = 25 + 25. That way, if the values in A1 or A2 ever change, the formula will automatically recalculate the correct result.



### **Order of Operations**

The order of operations is the specific sequence that Excel uses in performing calculations.

1. **Parentheses:** computations enclosed in parentheses are first priority.
2. **Exponents:** Computations involving exponents are performed next.
3. **Multiplication and Division:** These are equal with regard to the order they are performed, so they are performed "left to right".
4. **Addition and Subtraction:** Also performed from left to right.

What would the results be for the following two formulas, if A1 and B1 were both equal to 6?

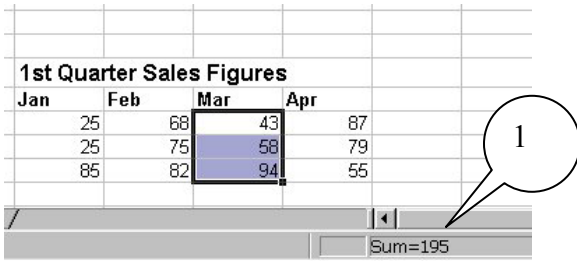
$$=(A1+B1)/2$$

$$=A1+B1/2$$

## Auto-Calculate

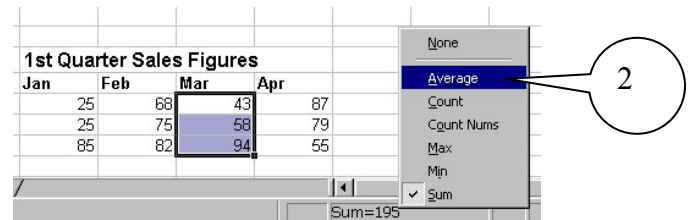
Excel's status bar provides constant information about your open workbook. One portion of the status bar displays the results of Auto calculate. Auto-calculate is only a temporary display, and is not saved in your worksheet.

1. If you select a range of numbers, the status bar will display the results of a calculation using those numbers. The default calculation is sum.
2. You can change the type of calculation by right clicking on the status bar and selecting another type of calculation.



1st Quarter Sales Figures				
Jan	Feb	Mar	Apr	
25	68	43	87	
25	75	58	79	
85	82	94	55	

Sum=195



1st Quarter Sales Figures				
Jan	Feb	Mar	Apr	
25	68	43	87	
25	75	58	79	
85	82	94	55	

Sum=195

- None
- Average
- Count
- Count Nums
- Max
- Min
- Sum

## Excel's Built-In Functions

Excel provides over 200 built-in formulas called functions. Functions can speed up your work and allow you to perform some calculations that are otherwise impossible.

The typical structure of a function:

**=Function Name(Arguments)**

example      **=Sum(B1:B10)**

If a function contains multiple arguments, use commas to separate them.

## Ways to Enter Functions into your Spreadsheet

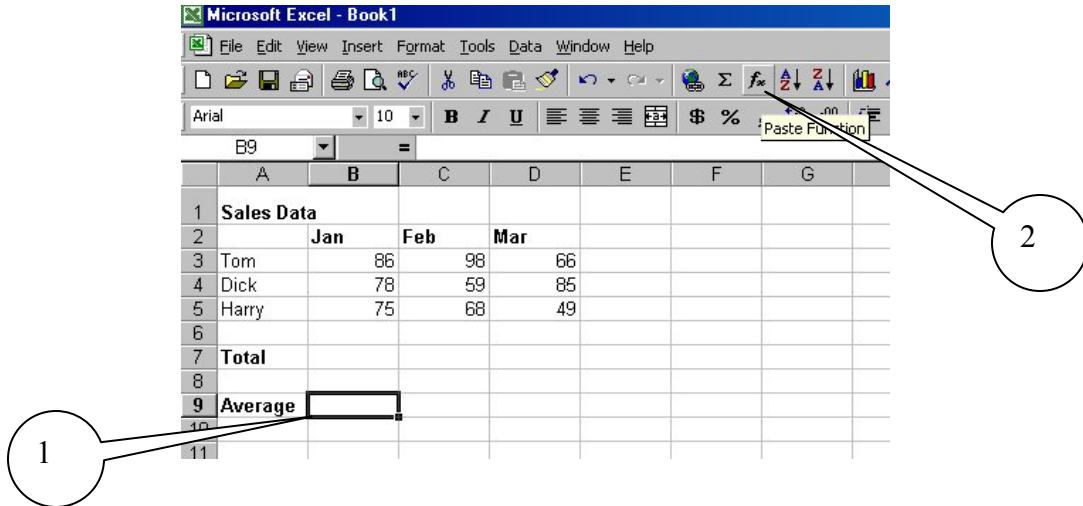
Manually: If you know the exact function name and arguments, you can type them directly into your formula. With simple functions, this may be the most efficient method.

Using Paste Function: Excel's paste function wizard walks you through the steps for creating your function, and provides the results of the formula as you enter it. Using paste function ensures that your formula is spelled correctly and has the correct number of arguments in the correct order.

## Using Paste Function

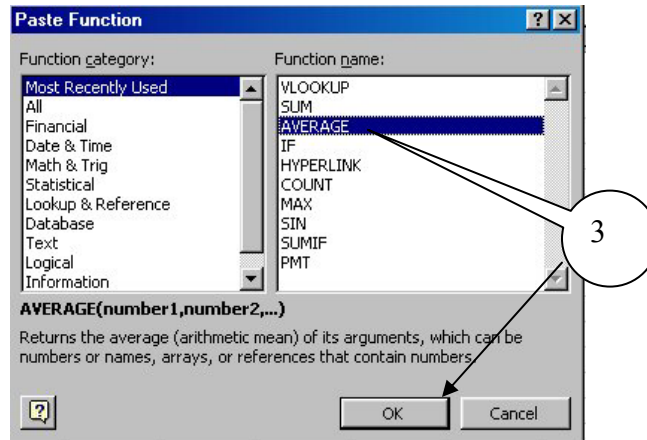
To calculate the average of the January sales data (B3:B5) in the example below using paste function:

1. Select the cell where you wish the result of the calculation to appear (in the example, cell B9)
2. On the standard toolbar, click on the paste function button.



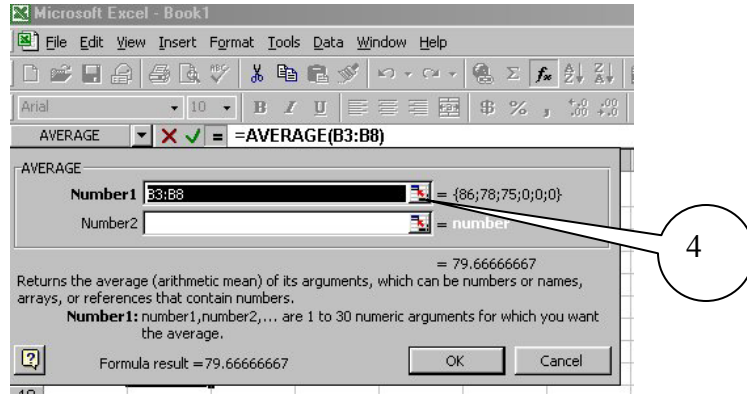
In the Paste Function window, you will select the function that you wish to use. The functions are divided into categories, which are listed in the left pane of this window. Select the category you wish to search on the left side of the screen, and scroll on the right to locate the function name.

3. Select the function name you wish to use and click OK.

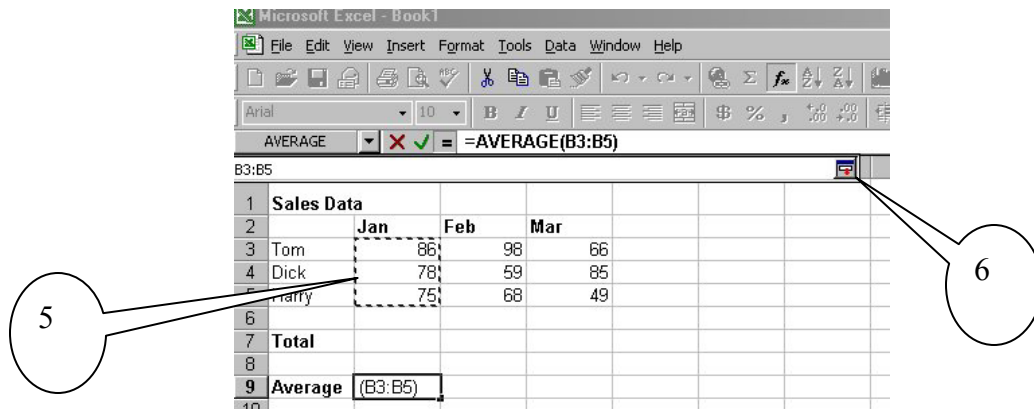


In the next window, Excel will “guess” at the range you wish to include in your formula.

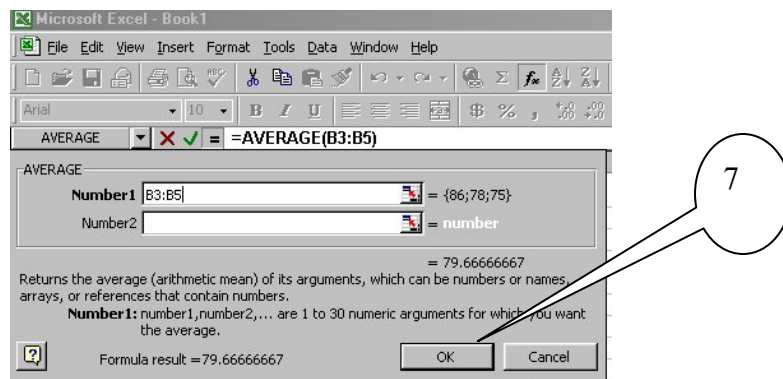
4. If the range is incorrect, or you wish to double-check it, click on the button with the red arrow to roll the window out of the way.



5. Back in your spreadsheet, you can select the correct range by clicking and dragging.
6. Once the range is correct, click the red arrow again to roll the paste function window back down.



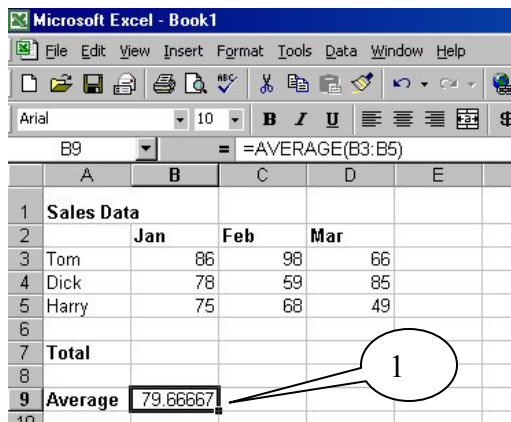
7. Back in the paste function window, Excel will display the new range, and the result of the calculation. If this is correct, click OK.



## Copying Formulas

Once you have created a formula, you do not need to recreate it for all the adjacent cells.

1. If you observe the lower right corner of the active cell, you will see a small black square. This is the fill handle.
2. Using your mouse, point to the fill handle, until the mouse pointer changes to a small black cross.
3. Click and drag using the fill handle, to copy the formula into the adjacent cells.



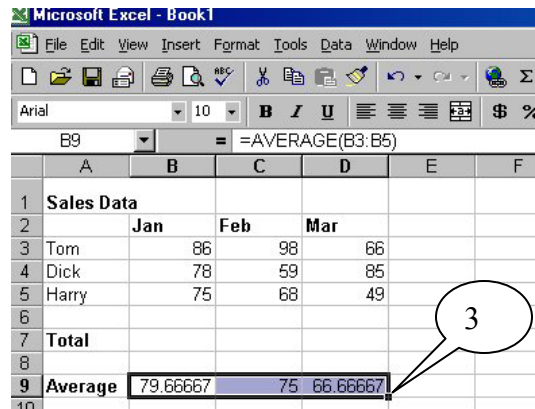
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File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

B9 =AVERAGE(B3:B5)

	A	B	C	D	E
1	Sales Data				
2		Jan	Feb	Mar	
3	Tom	86	98	66	
4	Dick	78	59	85	
5	Harry	75	68	49	
6					
7	Total				
8					
9	Average	79.66667			



Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

B9 =AVERAGE(B3:B5)

	A	B	C	D	E	F
1	Sales Data					
2		Jan	Feb	Mar		
3	Tom	86	98	66		
4	Dick	78	59	85		
5	Harry	75	68	49		
6						
7	Total					
8						
9	Average	79.66667	75	66.66667		

## Absolute vs. Relative Cell References

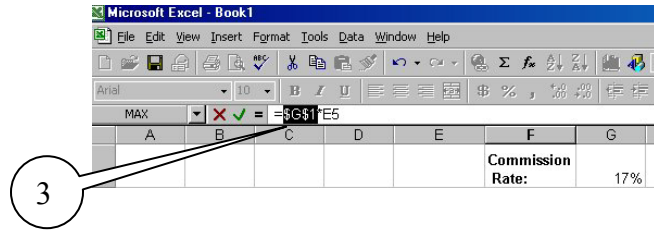
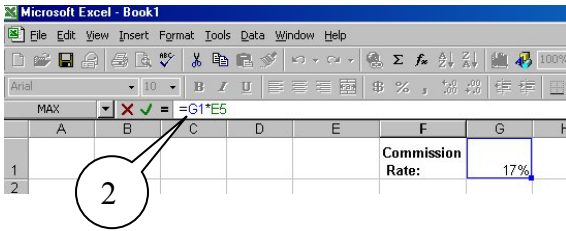
When Excel copies the formula above, it will adjust the cell references to reflect its new location, so that the formula in column B refers to B3:B6, and the formula in column C refers to C3:C6. This is because the original formula was “relative”.

At times, you will want to copy a formula so that some or all of it is unchanging. This is accomplished using an absolute reference.

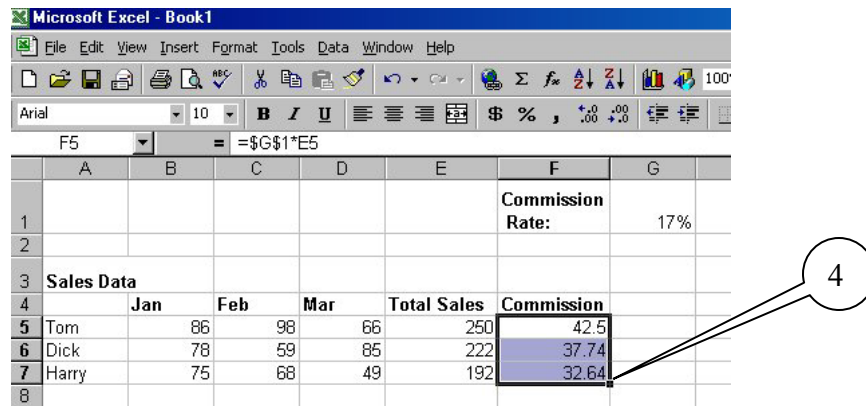
In the next example, we will calculate the commission for each salesperson by multiplying their total sales by the commission rate (G1). If we use relative references, when we copy the formula, the salesperson's sales figures will be adjusted (which we want), but so will the commission rate, which must stay the same for each calculation.

To calculate commission in this example, we will multiply the total sales for each salesperson by the commission rate (for Tom, the formula would be =E5\*G1).

1. Create the formula as you normally would (In F5, type =E5\*G1 and press enter).
2. Select the cell that contains the formula (F5), and in the formula bar, click on the part of the formula that you wish to make absolute (G1). You should see your flashing cursor in the formula bar.
3. Use the F4 key on your keyboard to toggle through the 4 possible choices of absolute and relative references. When you have the formula you want, press enter.



4. Copy the new “absolute” formula using the fill handle, and observe that the cell reference G1 is unchanged.



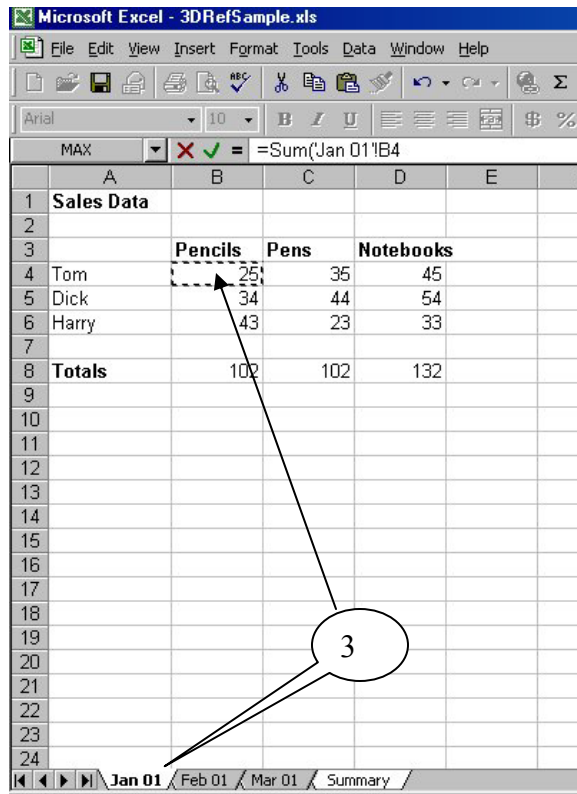
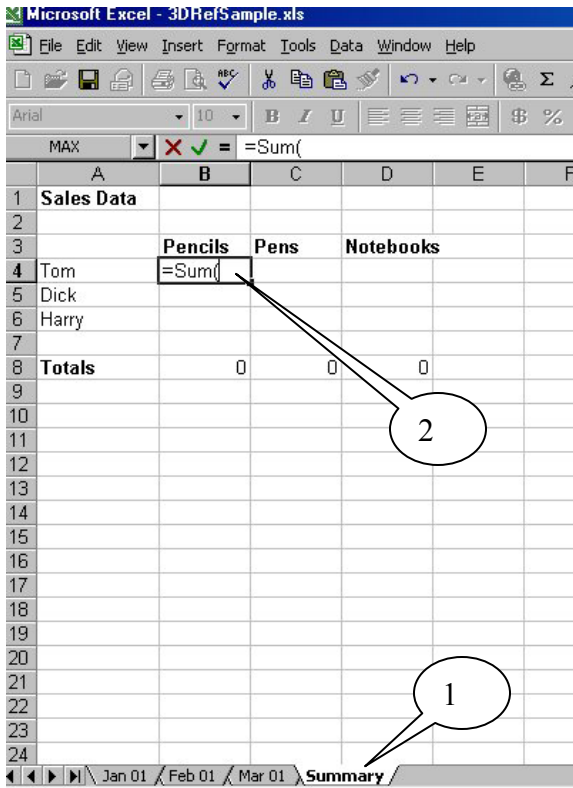
Cell Reference	Behavior when copied to a new location:
G1	Both the column and row reference will be adjusted to reflect the new location.
\$G\$1	Completely absolute: both the column and row reference will be unchanged.
G\$1	The column reference will be adjusted but the row will be unchanged.
\$G1	The Column reference will be unchanged but the row reference will adjust to the new location.

### 3-D References

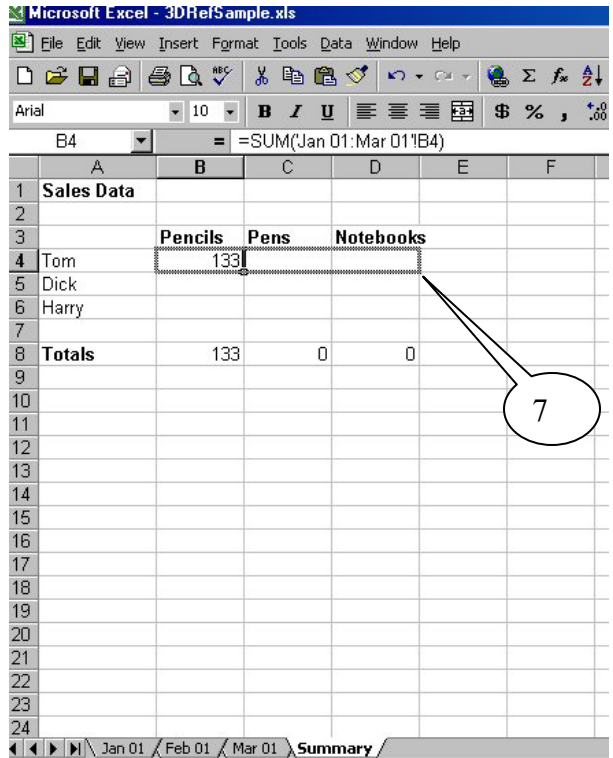
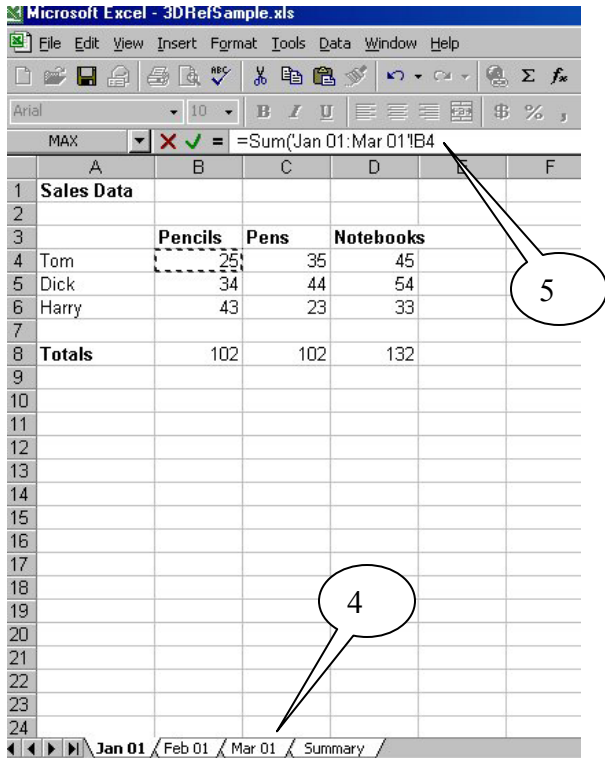
A 3-D reference is a range that spans two or more sheets in a workbook. You may wish to have a summary sheet that totals values contained in two or more other sheets in the workbook. This can be written as a 3-D reference provided that the values to be totaled all reside in the same cell on each sheet.

In the example below, we will create a formula on the summary sheet of the workbook that sums the January, February and March sales data. The January, Feb, March and summary sales worksheets are set up as an exact match. Tom's sales figures for pencils are in the same cell for January (B4) as they are for February, March, and the summary sheet.

1. Navigate to the summary sheet, and select cell B4. This is where we will write our first formula.
2. In cell B4, begin the formula by typing =Sum(  
3. Select the sheet tab for the Jan 01 sheet, and click in cell B4 for that sheet.



4. Hold the shift key down, and select the sheet tab for Mar 01. Release the shift key.
5. You may wish to observe the formula bar which should read: =Sum('Jan 01:Mar 01'!B4)
6. Press the enter key to accept the formula. (Excel will add the closing parenthesis for you.)
7. You may now copy that formula into adjoining cells on the summary sheet to complete the summary information.



## ***A Sampling of Advanced Formulas***

### ***If***

**=If(condition,value if true,value if false)**

Example:

=If(F5>75,"Pass","Fail")

=If(F5>75,F5\*CommissionRate,0)

### ***Nested If:***

**=If(condition,value if true,If(condition, value if true, value if false))**

Example:

=If(F5>89,"A",If(F5>79,"B",If(F5>69,"C",If(F5>59"D","F"))))

### ***VLookUp***

**=VLookUp(lookup value,table array,ColumnIndex,RangeLookUp)**

**LookUp Value** = value you wish to look up

**Table array** = Name of range that contains lookup table

**Column Index** = column number containing value you wish reported

**Range lookup**(optional) = True or False, true is exact match

## **Round**

**=Round(value,#digits)**

Examples:

=Round(123.457,2)	123.46
=Round(123.457,1)	123.50
=Round(123.457,0)	123.00
=Round(123.457,-1)	120.00
=Round(123.457,-2)	100.00
=Round(123.457,-3)	0

## ***IsError***

**=IsError(formula in question)**

This formula will generally return “true” or “false” depending on whether it finds an error. If you combine it with an If statement, you can have it return any info you like, as in this example:

**=If(IsError(Average(B3:B12)),”no data”,Average(B3:B12))**