



See <https://staff.brighton.ac.uk/is/training/Pages/Excel/formulae.aspx> for videos and exercises to accompany this quick reference card.

## Formulae & Functions Basics

When building a formula:

- All formulae and functions begin with =
- Use your mouse to select a cell or range of cells to be used in a formula
- The operators for building formulae are:
 

+	Add	*	Multiply
-	Subtract	/	Divide
- **BODMAS** rules apply to arithmetic (**B**rackets **O**ver **D**ivision, then **M**ultiplication, then **A**ddition, then **S**ubtraction).
- Avoid typing variables (such as tax rates) in formulae; instead type the variable in a separate cell and refer to that cell in the formula
- To repeat a formulae down a column, build the formula in the first cell of the column, then use autofill to copy the formula down the column.

Functions follow the format =name(arguments) where:

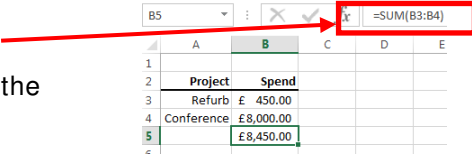
- name = the name of the function (e.g. SUM, VLOOKUP)
- arguments =the cell or range references containing the values used in the function

Where a function contains more than one argument, each argument must be separated by a , (comma).

## Checking for formulae

If you are using a spreadsheet set up by someone else, before typing data into a cell, check whether the cell contains a formula.


If a cell contains a formula, the cell will usually show the result of the formula. The formula itself can be seen in the formula bar.

- Click on the cell to select it. 
- The formula bar will display the content of the selected cell.
- If the cell does contain a formula, double click on the cell. This will colour any cells on the current worksheet that feed into that formula, to help you work out what that formula does and how it works.
- Always press ESC to stop checking/editing a cell containing a formula. This guarantees that you will leave the formula as you found it.

Do **NOT** click your mouse elsewhere on the sheet to stop checking as this may break the formula.

### How to check which cells on a sheet contain formulae

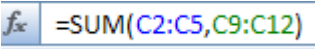
There is a way to show all formulae on a worksheet before you start using it:

- On the **Formulas** tab, click on the **Show Formulas** icon  Show Formulas
- Any cells with formulae will show the formula instead of the result
- To switch this off, go back to the **Formulas** tab and click on the **Show Formulas** icon

The shortcut for this is **CTRL `**

## How to check what a formula is doing

Use this technique to check that your formulae are doing what you think:

- Click on the cell containing the formula.
- Click once on the formula in the formula bar. 
- The cells used in the formula will be colour coded within the sheet, making it easy to spot mistakes.


## Building a formula to add

- Click in the cell where the result of the formula will appear
- Type =
- Click on the first cell containing data to be included in the sum
- Type +
- Click on the next cell containing data to be included in the sum
- Repeat steps 4 and 5 as required.
- Press **ENTER** on the keyboard.

hours	Rate	Gross Pay
43	35.60	1530.8
35	32.10	1123.5
28	12.50	350
15.5	32.40	502.2
22.5	10.25	230.625
40	10.25	410
		=E8+E9+E10+E11+E12+E13

## Autosum to add row or column totals

This only works where the total is to appear at the end of the column or row of data. This technique will not work across worksheets.

- Select the range of cells to add up
- On the **Home** tab, click on the **Autosum**  AutoSum icon

The total will be put in the cell at the end of the selected cells.

	Auckland	Dublin
	1,050,254	1,547,000
	1,524,294	1,685,548
	3,521,487	2,985,448
	6,096,035	

## Building a formula to subtract

- Click in the cell where the result of the formula will appear
- Type =
- Click on the first cell containing data to be included in the calculation
- Type -
- Click on the next cell containing data to be included in the calculation
- Press **ENTER** on the keyboard.

	A	B	C	D	E	F	G
6							
7	First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net pay
8	Angelo	Marcuzzo	43	35.60	1530.8	306.16	=E8-F8
9	Riley	Griffin	35	32.10	1123.5	224.7	
10	Coloeta	O'Connor	28	12.50	350	70	

## Building a formula to multiply or divide

- Click in the cell where the result of the formula will appear
- Type =
- Click on the first cell containing data to be included in the calculation
- Type \* to multiply or / to divide
- Click on the next cell containing data to be included in the calculation
- Press **ENTER** on the keyboard.




	A	B	C	D	E
6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	=C8*D8
9	Riley	Griffin	35	32.10	

## Useful keyboard Shortcuts


Using your keyboard to navigate saves time when building formulae.

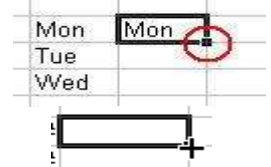
CTRL + Arrow keys	Jump to the beginning, end, top or bottom of a set of data.
CTRL + SHIFT + Down arrow	Select an entire column
CTRL + SHIFT + Right arrow	Select an entire row
CTRL+A	Select all data (one cell in data set must be selected)
CTRL + SHIFT + *	Selects an entire data table

## Use insert function (formula builder) to make formulae easier

- Start to type your formula until the first bracket e.g. =VLOOKUP(
- On the formula bar, click on the function button 
- The pop-up window splits the formula into its arguments
- To select cells to add them to the formula click on the  icon to jump back to the worksheet. To return to the formula builder after selecting cells click on the  icon again.

## Autofill to copy formula to other cells

- Select the cell(s) you want to copy. The fill handle will appear at the bottom right of the selection
- Point at the fill handle until it becomes a cross.
- Click and drag to copy the data **OR** Double-click to autofill all rows
- Click on  to change the type of fill (series, copy, formula only etc.)
- **Always** double-click on some of the newly populated cells to check that the copied formula is still doing what you expect.



If your copied formula is not behaving as it should, it is likely that your original formula references a single cell that should be used in all of the formula. In this case, you will need to make the cell reference absolute. See [Absolute references for common variables](#) for more information.

## Relative cell references

When you use the autofill technique to copy a formula down a column or across a row, Excel will automatically update the cell references in the formula, relative to where the copied formula sits.

Cell reference	Copied down the column...	Copied across the row...
A2	...becomes A3	...becomes B2
A3	...becomes A4	...becomes B3
A4	...becomes A5	...becomes B4

## Absolute references for common variables

Avoid typing variables (such as tax rates) in formulae; instead type the variable in a separate cell and refer to that cell in the formula.

The advantage of this is that, should the variable change, you only need update one cell and all formulae referencing that cell will updated automatically.

The disadvantage is that if you copy a formula that references that variable cell, your formula will not work properly unless you make the reference to the variable cell absolute (instead of [relative](#))

There are 2 ways to make a formula absolute (which you choose is up to you):

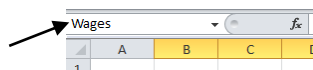
- Naming the variable cell
- Using \$ signs to indicate that a cell reference is absolute

## Name cells or ranges for easier to read formulas

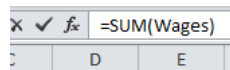
This technique has the advantage that formulae become easier to read.

The disadvantage is not many people understand the technique.

- Select the cell or range you want to name
- Click in the **Name** box (left of the formula bar)
- Type the name and press ENTER



To use, simply type the name wherever you would use a cell or range reference in a formula. e.g. =SUM(Wages)



## \$\$ signs to make a cell reference absolute

The alternative to naming a cell is to use dollar signs within the cell reference to make the cell reference for the variable value absolute. A quick way to do this:

- Click on the cell containing the formula
- Click once on the cell reference in the formula bar
- Press F4 to add 2 dollar signs to your cell reference. Eg D2 will become \$D\$2.

*You can type the dollar signs in manually.*

## Mixed cell references

When copying formulae to other cells, sometimes you only want to anchor the column letter or row number of a cell reference within the original formula. This is achieved by changing the position of the dollar signs mentioned above. A quick way to do this:

- Click on the cell containing the formula
- Click once on the cell reference in the formula bar
- Press F4 until the cell reference meets your requirements (see below)

## Relative v absolute v mixed cell references

This table shows how the different \$ sign positions affect the cell references in a formula when copied:

Original cell reference...	...when copied becomes	Effect
D2	E4	Both the column and the row coordinates change as the formula is copied
\$D2	\$D4	The column coordinate is fixed, but the row coordinate changes
D\$2	E\$2	The column coordinate changes, but the row coordinate is fixed.
\$D\$2	\$D\$2	Both the column and row coordinates remain fixed

Function	Used for	Format	Example	Tips
<b>SUM</b>	Add values in a range of cells	<b>=SUM(range of cells to add)</b>	<b>=SUM(A1:A10)</b>	
<b>AVERAGE</b>	Average the values in a range of cells	<b>=AVERAGE(range of cells to average)</b>	<b>=AVERAGE(A1:A10)</b>	
<b>MAX</b>	Find the highest value in a range of cells	<b>=MAX(range of cells)</b>	<b>=MAX(A1:A10)</b>	
<b>MIN</b>	Find the lowest value in a range of cells	<b>=MIN(range of cells)</b>	<b>=MIN(A1:A10)</b>	
<b>IF</b>	Display different information depending on the outcome of a condition test	<b>=IF(condition test, what to display if outcome is true, what to display if outcome is false)</b>	<b>=IF(A1&gt;20, "Great!","Oops!")</b> or <b>=IF(A1&gt;20, A1*E1,A1)</b>	
<b>AND</b>	Test that more than one condition is true.  Test result is TRUE only if all conditions are met.	<b>=AND(condition test 1, condition test 2, ...)</b>	<b>=AND(A1&gt;20,B1="Gold")</b>	TRUE and FALSE are the only possible answers. To change the content of a cell as the result of an AND function, use the AND function as the condition test in an IF statement
<b>OR</b>	Test that more than one condition is true.  Test result is TRUE if any of the conditions are met.	<b>=OR(condition test 1, condition test 2, ...)</b>	<b>=OR(A1&gt;20,B1="Gold")</b>	
<b>COUNT</b>	Count numerical cells	<b>=COUNT(range of cells to count)</b>	<b>=COUNT(A1:A10)</b>	<i>COUNT does not count cells containing text, use COUNTA for this</i>
<b>COUNTA</b>	Count cells	<b>=COUNTA(range of cells to count)</b>	<b>=COUNTA(A1:A10)</b>	
<b>COUNTBLANK</b>	Count empty cells	<b>=COUNTBLANK(range of cells to count)</b>	<b>=COUNTBLANK(A1:A10)</b>	
<b>COUNTIF</b>	Count cells that meet a certain condition	<b>=COUNTIF(range of cells to count,criteria to satisfy)</b>	<b>=COUNTIF(A1:A10,"&gt;20")</b> <i>Counts all cells containing a value greater than 20</i>	
<b>COUNTIFS</b>	Count cells only if multiple conditions are met	<b>=COUNTIFS( range of cells for criteria check 1, criteria 1 to satisfy, range of cells for criteria check 2, criteria 2 to satisfy,...)</b>	<b>=COUNTIFS(A1:A10,"Gold",B1:B10,"&gt;20")</b> <i>Counts number of rows where column A contains the word Gold AND column B is greater than 20</i>	<i>Can use pivot table instead.</i>

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