
Introduction to:
Microsoft Excel
Part Two - Working with Functions

Introduction:

This resource looks closely at some of the 'Functions' available to you to support your development.

Please use the accompanying Excel Spreadsheets to allow interactions with these guidelines

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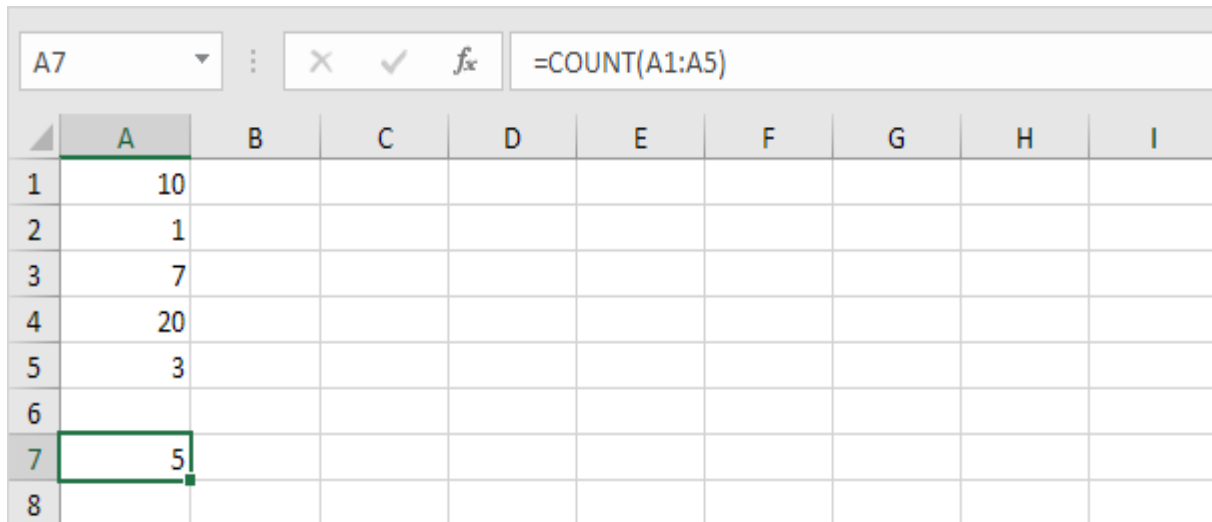
Please download the accompanying Excel spreadsheet to support the above

Chapter 1: Count and Sum Functions

The most used functions in Excel are the functions that count and sum. You can count and sum based on one criteria or multiple criteria.

Count

To count the number of cells that contain numbers, use the COUNT function.



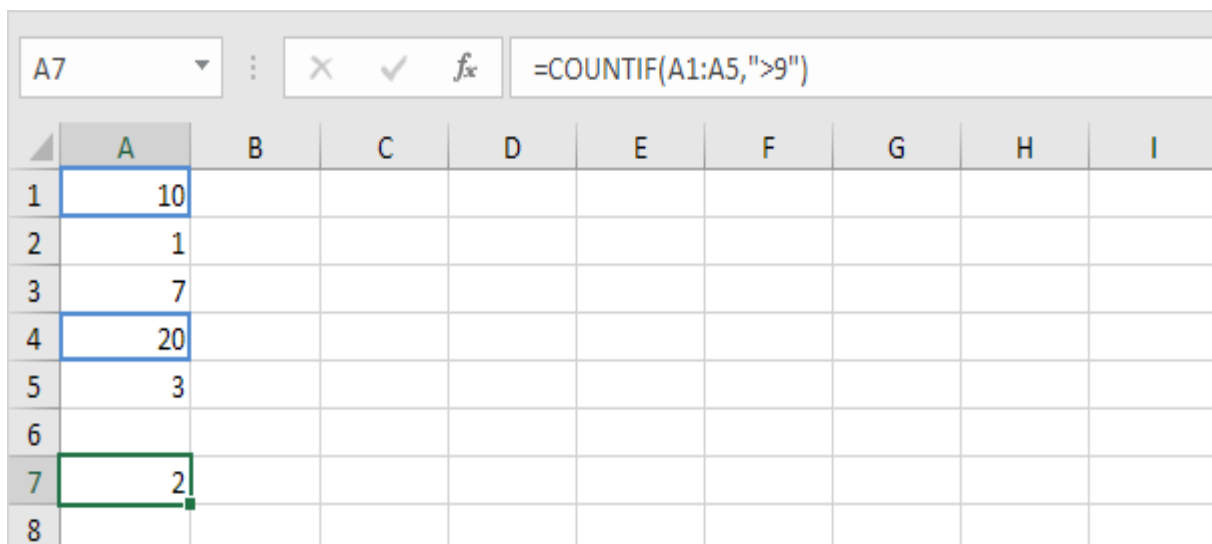
The screenshot shows an Excel spreadsheet with the following data in column A:

	A	B	C	D	E	F	G	H	I
1	10								
2	1								
3	7								
4	20								
5	3								
6									
7	5								
8									

The formula bar shows the formula `=COUNT(A1:A5)` and the result `5` is displayed in cell A7.

Countif

To count cells based on one criteria (for example, higher than 9), use the following COUNTIF function.



The screenshot shows an Excel spreadsheet with the following data in column A:

	A	B	C	D	E	F	G	H	I
1	10								
2	1								
3	7								
4	20								
5	3								
6									
7	2								
8									

The formula bar shows the formula `=COUNTIF(A1:A5, ">9")` and the result `2` is displayed in cell A7.

Countifs

To count cells based on multiple criteria (for example, green and higher than 9), use the following COUNTIFS function.

	A	B	C	D	E	F	G	H	I
1	red	10							
2	green	1							
3	red	7							
4	green	20							
5	red	3							
6									
7		1							
8									

Sum

To sum a range of cells, use the SUM function.

	A	B	C	D	E	F	G	H	I
1	10								
2	1								
3	7								
4	20								
5	3								
6									
7	41								
8									

Sumif

To sum cells based on one criteria (for example, higher than 9), use the following SUMIF function (two arguments).

	A	B	C	D	E	F	G	H	I
1		10							
2		1							
3		7							
4		20							
5		3							
6									
7		30							
8									

To sum cells based on one criteria (for example, green), use the following SUMIF function (three arguments, last argument is the range to sum).

	A	B	C	D	E	F	G	H	I
1	red	10							
2	green	1							
3	red	7							
4	green	20							
5	red	3							
6									
7		21							
8									

Sumifs

To sum cells based on multiple criteria (for example, blue and green), use the following SUMIFS function (first argument is the range to sum).

	A	B	C	D	E	F	G	H	I
1	blue	red	10						
2	yellow	green	1						
3	blue	red	7						
4	blue	green	20						
5	yellow	red	3						
6									
7			20						
8									

General note: in a similar way, you can use the AVERAGEIF and AVERAGEIFS function to average cells based on one or multiple criteria.

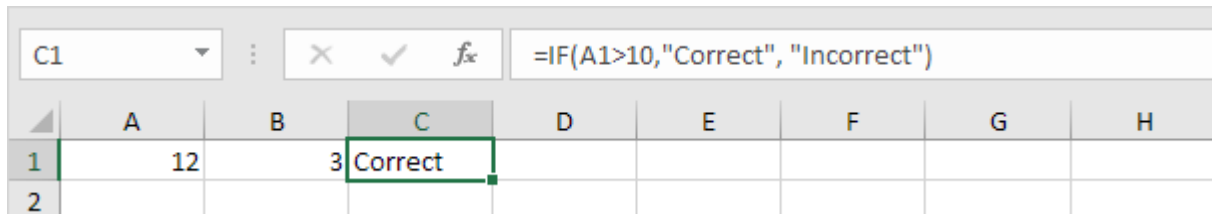
Chapter 2: Logical Functions

Learn how to use Excel's logical functions such as the IF, AND and OR function.

If Function:

The IF function checks whether a condition is met, and returns one value if TRUE and another value if FALSE.

1. Select cell C1 and enter the following function.



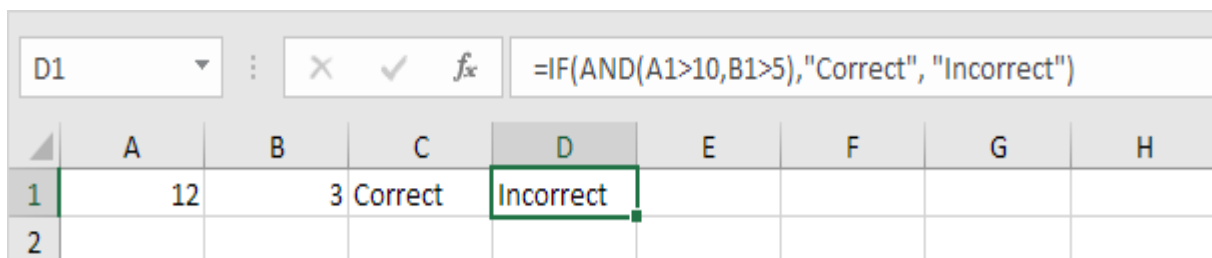
	A	B	C	D	E	F	G	H
1	12	3	Correct					
2								

The IF function returns Correct because the value in cell A1 is higher than 10.

And Function

The AND Function returns TRUE if all conditions are true and returns FALSE if any of the conditions are false.

1. Select cell D1 and enter the following formula.



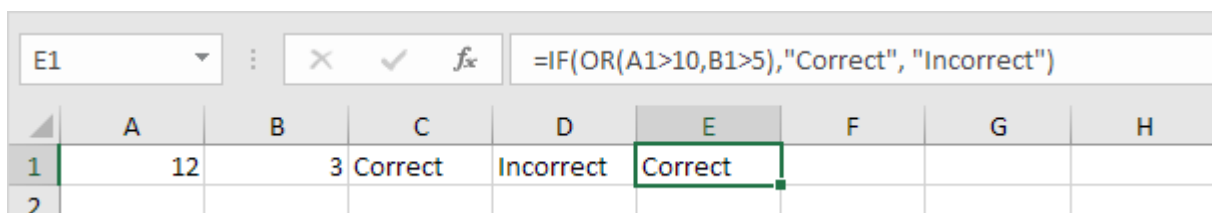
	A	B	C	D	E	F	G	H
1	12	3	Correct	Incorrect				
2								

The AND function returns FALSE because the value in cell B1 is not higher than 5. As a result the IF function returns Incorrect.

Or Function

The OR function returns TRUE if any of the conditions are TRUE and returns FALSE if all conditions are false.

1. Select cell E1 and enter the following formula.



	A	B	C	D	E	F	G	H
1	12	3	Correct	Incorrect	Correct			
2								

The OR function returns TRUE because the value in cell A1 is higher than 10. As a result the IF function returns Correct.

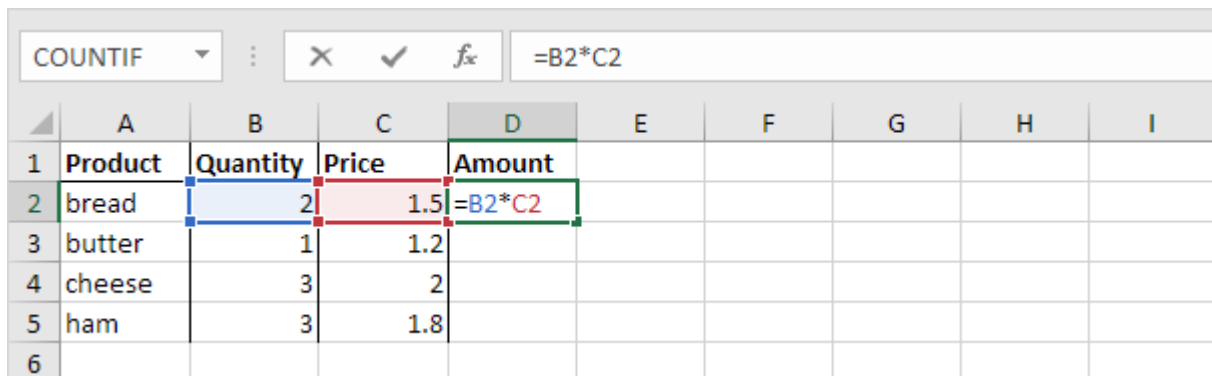
Chapter 3: Cell References

Relative Reference | Absolute Reference | Mixed Reference

Cell references in Excel are very important. Understand the difference between relative, absolute and mixed reference, and you are on your way to success.

Relative Reference

By default, Excel uses relative reference. See the formula in cell D2 below. Cell D2 references (points to) cell B2 and cell C2. Both references are relative.

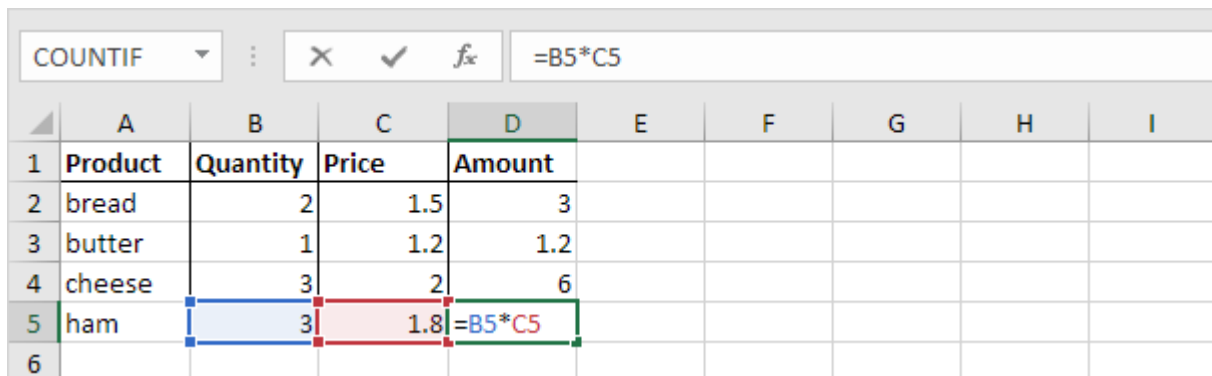


The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I
1	Product	Quantity	Price	Amount					
2	bread	2	1.5	=B2*C2					
3	butter	1	1.2						
4	cheese	3	2						
5	ham	3	1.8						
6									

The formula bar shows the formula `=B2*C2`. The cell D2 is selected, and its formula is visible in the cell.

1. Select cell D2, click on the lower right corner of cell D2 and drag it down to cell D5.



The screenshot shows the same Excel spreadsheet as above, but with the formula in cell D2 dragged down to cell D5. The formula bar now shows `=B5*C5`. The cell D5 is selected, and its formula is visible in the cell.

	A	B	C	D	E	F	G	H	I
1	Product	Quantity	Price	Amount					
2	bread	2	1.5	3					
3	butter	1	1.2	1.2					
4	cheese	3	2	6					
5	ham	3	1.8	=B5*C5					
6									

Cell D3 references cell B3 and cell C3. Cell D4 references cell B4 and cell C4. Cell D5 references cell B5 and cell C5. In other words: each cell references its two neighbors on the left.

Absolute Reference

See the formula in cell E3 below.

1. To create an absolute reference to cell H3, place a \$ symbol in front of the column letter and row number of cell H3 (`H3`) in the formula of cell E3.

COUNTIF				fx		=B3*\$H\$3			
	A	B	C	D	E	F	G	H	I
1									
2		Length (cm)	Width (cm)		Length (inch)	Width (inch)		Conversion rate	
3		1	10		=B3*\$H\$3			0.3937008	
4		5	10						
5		4	8						
6		2	10						
7									

2. Now we can quickly drag this formula to the other cells.

COUNTIF				fx		=C6*\$H\$3			
	A	B	C	D	E	F	G	H	I
1									
2		Length (cm)	Width (cm)		Length (inch)	Width (inch)		Conversion rate	
3		1	10		0.3937008	3.937008		0.3937008	
4		5	10		1.968504	3.937008			
5		4	8		1.5748032	3.1496064			
6		2	10		0.7874016	=C6*\$H\$3			
7									

The reference to cell H3 is fixed (when we drag the formula down and across). As a result, the correct lengths and widths in inches are calculated.

Mixed Reference

Sometimes we need a combination of relative and absolute reference (mixed reference)

1. See the formula in cell F2 below.

COUNTIF				fx		=B2*(1-B6)		
	A	B	C	D	E	F	G	H
1	Product	Price			Prices / Month	Jan	Feb	Mar
2	Jeans	80			Jeans	=B2*(1-B6)		
3	Shirts	30			Shirts			
4								
5	Month	Jan	Feb	Mar				
6	Reduction	20%	40%	80%				
7								

2. We want to copy this formula to the other cells quickly. Drag cell F2 across one cell, and look at the formula in cell G2.

		COUNTIF				=C2*(1-C6)		
	A	B	C	D	E	F	G	H
1	Product	Price			Prices / Month	Jan	Feb	Mar
2	Jeans	80			Jeans	64	=C2*(1-C6)	
3	Shirts	30			Shirts			
4								
5	Month	Jan	Feb	Mar				
6	Reduction	20%	40%	80%				
7								

Do you see what happens? The reference to the price should be a fixed reference to column B.
 Solution: place a \$ symbol in front of the column letter of cell B2 (\$B2) in the formula of cell F2. In a similar way, when we drag cell F2 down, the reference to the reduction should be a fixed reference to row 6. Solution: place a \$ symbol in front of the row number of cell B6 (B\$6) in the formula of cell F2.

Result:

		COUNTIF				= \$B2*(1-B\$6)		
	A	B	C	D	E	F	G	H
1	Product	Price			Prices / Month	Jan	Feb	Mar
2	Jeans	80			Jeans	= \$B2*(1-B\$6)		
3	Shirts	30			Shirts			
4								
5	Month	Jan	Feb	Mar				
6	Reduction	20%	40%	80%				
7								

Note: we don't place a \$ symbol in front of the row number of B2 (this way we allow the reference to change from B2 (Jeans) to B3 (Shirts) when we drag the formula down). In a similar way, we don't place a \$ symbol in front of the column letter of B6 (this way we allow the reference to change from B6 (Jan) to C6 (Feb) and D6 (Mar) when we drag the formula across).

3. Now we can quickly drag this formula to the other cells.

		COUNTIF				= \$B3*(1-D\$6)		
	A	B	C	D	E	F	G	H
1	Product	Price			Prices / Month	Jan	Feb	Mar
2	Jeans	80			Jeans	64	48	16
3	Shirts	30			Shirts	24	18	= \$B3*(1-D\$6)
4								
5	Month	Jan	Feb	Mar				
6	Reduction	20%	40%	80%				
7								

The references to column B and row 6 are fixed.

Chapter 4: Lookup & Reference Functions

Learn all about Excel's lookup & reference functions such as the VLOOKUP, HLOOKUP, MATCH, INDEX and CHOOSE function.

Lookup

The VLOOKUP (Vertical lookup) function looks for a value in the leftmost column of a table, and then returns a value in the same row from another column you specify.

1. Insert the VLOOKUP function shown below.

	A	B	C	D	E	F	G	H	I
1	ID	Product							
2	104	Printer							
3	103				ID	Brand	Product		
4	104				101	Dell	Computer		
5	101				102	Logitech	Keyboard		
6	102				103	Logitech	Mouse		
7	103				104	HP	Printer		
8	101								
9	104								
10	101								
11	102								
12									

Explanation: the VLOOKUP function looks for the ID (104) in the leftmost column of the range \$E\$4:\$G\$7 and returns the value in the same row from the third column (third argument is set to 3). The fourth argument is set to FALSE to return an exact match or a #N/A error if not found.

2. Drag the VLOOKUP function in cell B2 down to cell B11.

		=VLOOKUP(A2,\$E\$4:\$G\$7,3,FALSE)							
	A	B	C	D	E	F	G	H	I
1	ID	Product							
2	104	Printer							
3	103	Mouse			ID	Brand	Product		
4	104	Printer			101	Dell	Computer		
5	101	Computer			102	Logitech	Keyboard		
6	102	Keyboard			103	Logitech	Mouse		
7	103	Mouse			104	HP	Printer		
8	101	Computer							
9	104	Printer							
10	101	Computer							
11	102	Keyboard							
12									
13									

Note: when we drag the VLOOKUP function down, the absolute reference (\$E\$4:\$G\$7) stays the same, while the relative reference (A2) changes to A3, A4, A5, etc.

HLookup

In a similar way, you can use the HLOOKUP (Horizontal lookup) function.

		=HLOOKUP(A2,\$E\$4:\$H\$6,3,FALSE)							
	A	B	C	D	E	F	G	H	I
1	ID	Product							
2	104	Printer							
3	103	Mouse							
4	104	Printer		ID	101	102	103	104	
5	101	Computer		Brand	Dell	Logitech	Logitech	HP	
6	102	Keyboard		Product	Computer	Keyboard	Mouse	Printer	
7	103	Mouse							
8	101	Computer							
9	104	Printer							
10	101	Computer							
11	102	Keyboard							
12									

Match

The MATCH function returns the position of a value in a given range.

	A	B	C	D	E	F	G	H	I
1									
2	Yellow	3							
3									
4					Green				
5					Blue				
6					Yellow				
7					White				
8									

Explanation: Yellow found at position 3 in the range E4:E7. The third argument is optional. Set this argument to 0 to return the position of the value that is exactly equal to lookup_value (A2) or a #N/A error if not found.

Index

The INDEX function below returns a specific value in a two-dimensional range.

	A	B	C	D	E	F	G	H	I
1									
2	3	2	92						
3									
4					43	77			
5					77	35			
6					97	92			
7					21	54			
8									

Explanation: 92 found at the intersection of row 3 and column 2 in the range E4:F7.

The INDEX function below returns a specific value in a one-dimensional range.

	A	B	C	D	E	F	G	H	I
1									
2	3		97						
3									
4					43				
5					77				
6					97				
7					21				
8									

Explanation: 97 found at position 3 in the range E4:E7.

Choose

The CHOOSE function returns a value from a list of values, based on a position number.

	A	B	C	D	E	F	G	H	I
1									
2	3	Boat							
3									

Explanation: Boat found at position 3.