

Countifs

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

B7									
	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.

A7									
	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, greater than 9), use the following SUMIF function (two arguments).

B7									
	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).

B7									
	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, circle and red), use the following SUMIFS function (first argument is the range to sum).

C7									
	A	B	C	D	E	F	G	H	I
1	circle	red	10						
2	triangle	green	1						
3	circle	red	7						
4	circle	green	20						
5	triangle	red	3						
6									
7			17						
8									

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

Logical Functions

If

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

1. For example, take a look at the IF function in cell C2 below.

C2									
	A	B	C	D	E	F	G	H	I
1	Name	Score	Result						
2	Richard	93	Pass						
3	Jennifer	60	Pass						
4	James	58	Fail						
5	Lisa	79	Pass						
6	Sharon	41	Fail						
7									

Explanation: if the score is greater than or equal to 60, the IF function returns Pass, else it returns

And

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

1. For example, take a look at the AND function in cell D2 below.

D2									
	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	TRUE					
4	James	58	75	FALSE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

Explanation: the AND function returns TRUE if the first score is greater than or equal to 60 and the second score is greater than or equal to 90, else it returns FALSE.

Or

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

1. For example, take a look at the OR function in cell D2 below.

D2									
	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	TRUE					
3	Jennifer	60	91	TRUE					
4	James	58	75	TRUE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

Explanation: the OR function returns TRUE if at least one score is greater than or equal to 60, else it returns FALSE.

Not

The NOT function changes TRUE to FALSE, and FALSE to TRUE.

1. For example, take a look at the NOT function in cell D2 below.

D2									
	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	FALSE					
4	James	58	75	FALSE					
5	Lisa	79	94	FALSE					
6	Sharon	41	33	TRUE					
7									

Explanation: in this example, the NOT function reverses the result of the OR function

Cell References

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 references. See the formula in cell D2 below. Cell D2 references (points to) cell B2 and cell C2. Both references are relative.

COUNTIF									
	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									

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

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								=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 (\$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 (B\$6) in the formula of cell F2.

Result:

COUNTIF : X ✓ fx =\$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 B\$6 (this way we allow the reference to change from B\$6 (Jan) to C\$6 (Feb) and D\$6 (Mar) when we drag the formula across).

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

COUNTIF : X ✓ fx =\$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.

DATA VALIDATION

Budget Limit

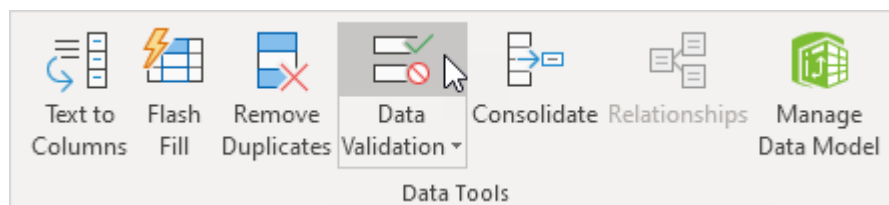
This example teaches you how to use data validation to prevent users from exceeding a budget limit.

1. Select the range B2:B8.

	A	B	C
1	Party Budget		
2	Balloons	\$10.00	
3	Confetti	\$5.00	
4	Cups	\$5.00	
5	Drinks	\$40.00	
6	Cake	\$10.00	
7	Snacks		
8	Ice Cream	\$10.00	
9			
10	Total	\$80.00	
11			

Note: cell B10 contains a SUM function that calculates the sum of the range B2:B8.

2. On the Data tab, in the Data Tools group, click Data Validation.



3. In the Allow list, click Custom.

4. In the Formula box, enter the formula shown below and click OK.

Data Validation

Settings Input Message Error Alert

Validation criteria

Allow: Custom ☒ Ignore blank

Data: between

Formula: =SUM(\$B\$2:\$B\$8) <= 100

☐ Apply these changes to all other cells with the same settings

Clear All OK Cancel

Explanation: the sum of the range B2:B8 may not exceed the budget limit of \$100. Therefore, we apply data validation to the range B2:B8 (not cell B10!) because this is where the values are entered. Because we selected the range B2:B8 before we clicked on Data Validation, Excel automatically copies the formula to the other cells. Notice how we created an [absolute reference](#) (\$B\$2:\$B\$8) to fix this reference.

5. To check this, select cell B3 and click Data Validation.

The Data Validation dialog box is shown with the 'Settings' tab selected. Under 'Validation criteria', 'Allow:' is set to 'Custom' and 'Ignore blank' is checked. Under 'Data:', 'between' is selected. The 'Formula:' field contains the formula `=SUM(B2:B8) <= 100`. The checkbox 'Apply these changes to all other cells with the same settings' is unchecked. At the bottom are 'Clear All', 'OK', and 'Cancel' buttons.

As you can see, this cell also contains the correct formula.

6. Enter the value 30 into cell B7.

Result. Excel shows an error alert. You cannot exceed your budget limit of \$100. Note: to enter an error alert message, go to the Error Alert tab.

	A	B	C	D	E	F	G
1	Party Budget						
2	Balloons	\$10.00					
3	Confetti	\$5.00					
4	Cups	\$5.00					
5	Drinks	\$40.00					
6	Cake	\$10.00					
7	Snacks	30					
8	Ice Cream	\$10.00					
9							
10	Total	\$110.00					
11							

The error alert dialog box is titled 'Budget Limit Exceeded'. It contains a red 'X' icon and the message 'You cannot exceed your budget limit of \$100.' At the bottom are 'Retry', 'Cancel', and 'Help' buttons.