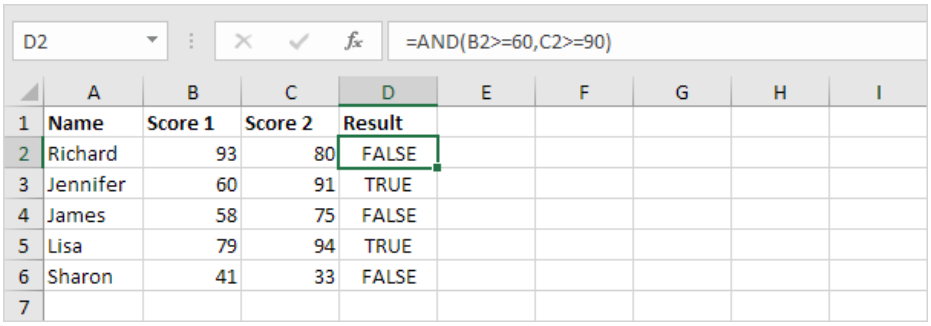
Functions

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.

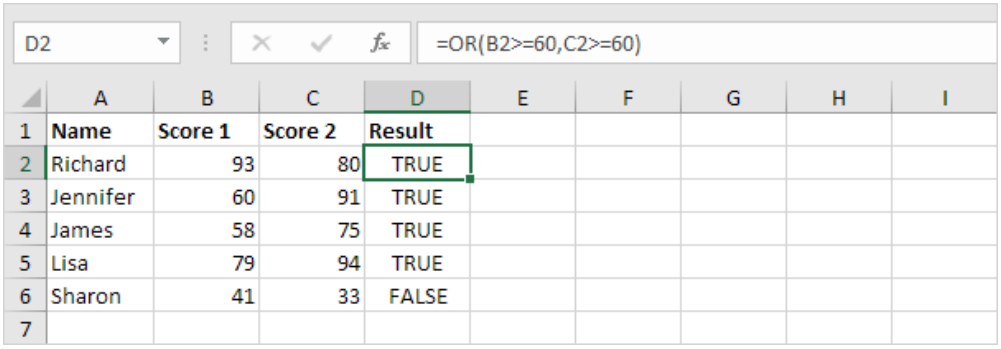


	A	B	C	D	E	F	G	H	I
1	**Name**	**Score 1**	**Score 2**	**Result**					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	TRUE					
4	James	58	75	FALSE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

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.

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.

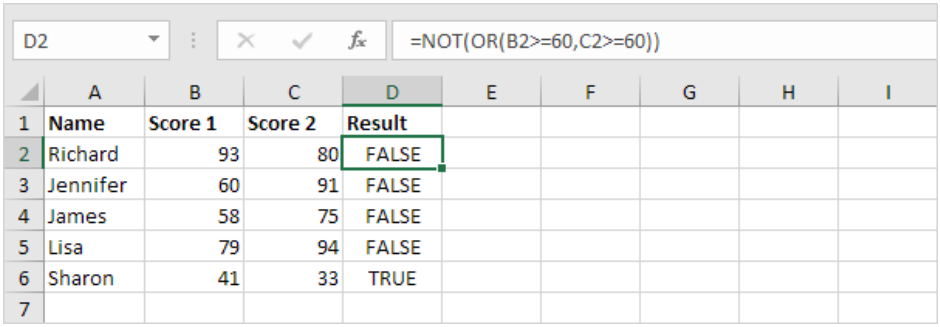


	A	B	C	D	E	F	G	H	I
1	**Name**	**Score 1**	**Score 2**	**Result**					
2	Richard	93	80	TRUE					
3	Jennifer	60	91	TRUE					
4	James	58	75	TRUE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

Explanation: the OR function returns TRUE if at least one score is greater than or equal to 60, else it returns FALSE. Visit our page about the OR function for many more examples.

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.



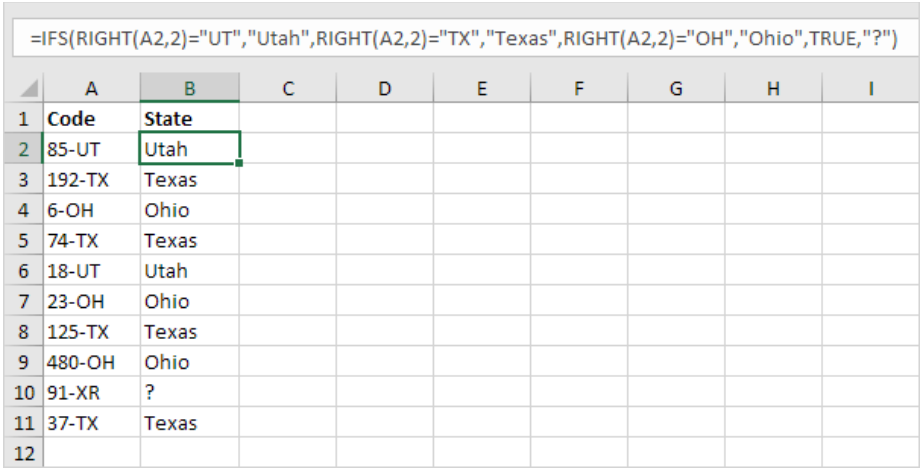
	A	B	C	D	E	F	G	H	I
1	**Name**	**Score 1**	**Score 2**	**Result**					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	FALSE					
4	James	58	75	FALSE					
5	Lisa	79	94	FALSE					
6	Sharon	41	33	TRUE					
7									

Explanation: in this example, the NOT function reverses the result of the OR function (see previous example).

SWITCH

This example teaches you how to use the SWITCH function in Excel 2016 or later instead of the IFS function.

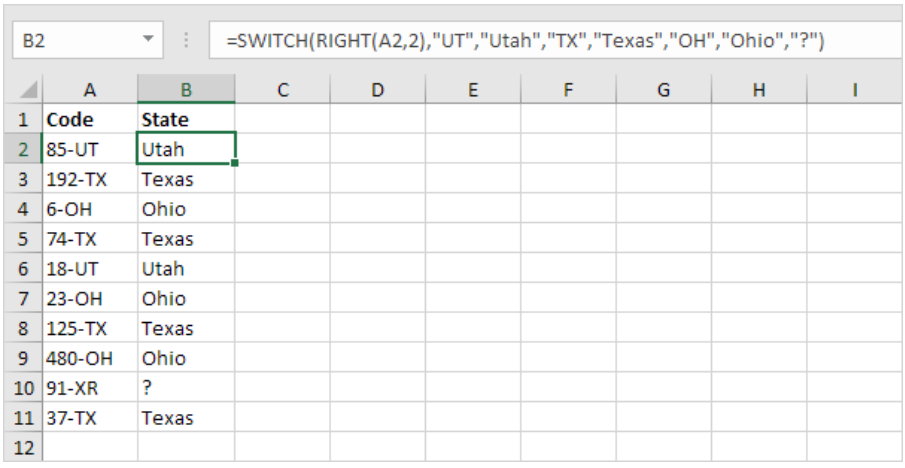
1a. For example, the IFS function below finds the correct states.



	A	B	C	D	E	F	G	H	I
1	**Code**	**State**							
2	85-UT	Utah							
3	192-TX	Texas							
4	6-OH	Ohio							
5	74-TX	Texas							
6	18-UT	Utah							
7	23-OH	Ohio							
8	125-TX	Texas							
9	480-OH	Ohio							
10	91-XR	?							
11	37-TX	Texas							
12									

Explanation: cell A2 contains the string 85-UT. The RIGHT function extracts the 2 rightmost characters from this string (UT). As a result, the IFS function returns the correct state (Utah). If the 2 rightmost characters are not equal to UT, TX or OH, the IFS function returns a question mark. Instead of TRUE, you can also use 1=1 or something else that is always TRUE.

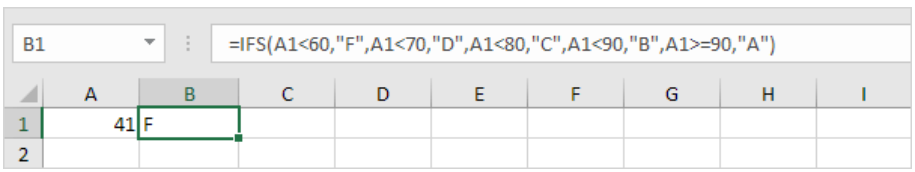
1b. The SWITCH function below produces the exact same result but is much easier to read.



	A	B	C	D	E	F	G	H	I
1	**Code**	**State**							
2	85-UT	Utah							
3	192-TX	Texas							
4	6-OH	Ohio							
5	74-TX	Texas							
6	18-UT	Utah							
7	23-OH	Ohio							
8	125-TX	Texas							
9	480-OH	Ohio							
10	91-XR	?							
11	37-TX	Texas							
12									

Explanation: if the first argument (RIGHT(A2,2) in this example) equals UT, the SWITCH function returns Utah. If TX, Texas. If OH, Ohio. The last argument (a question mark in this example) is always the default value (if there's no match).

2. Why not always use the SWITCH function in Excel? There are many examples where you cannot use the SWITCH function instead of the IFS function.

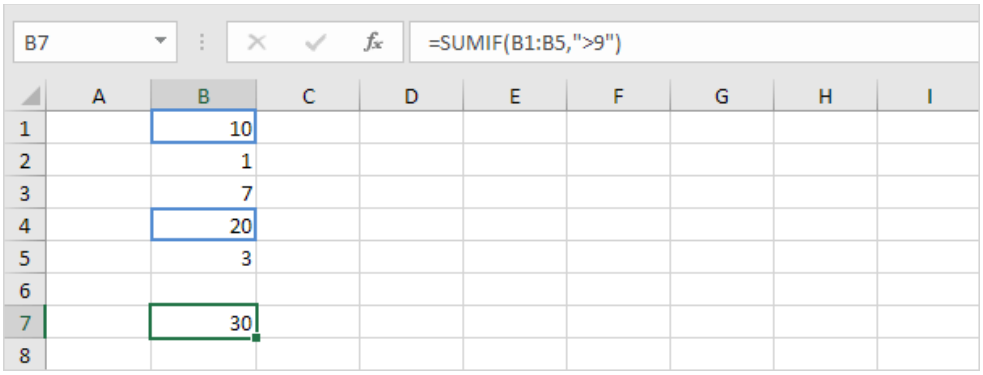


	A	B	C	D	E	F	G	H	I
1	41	F							
2									

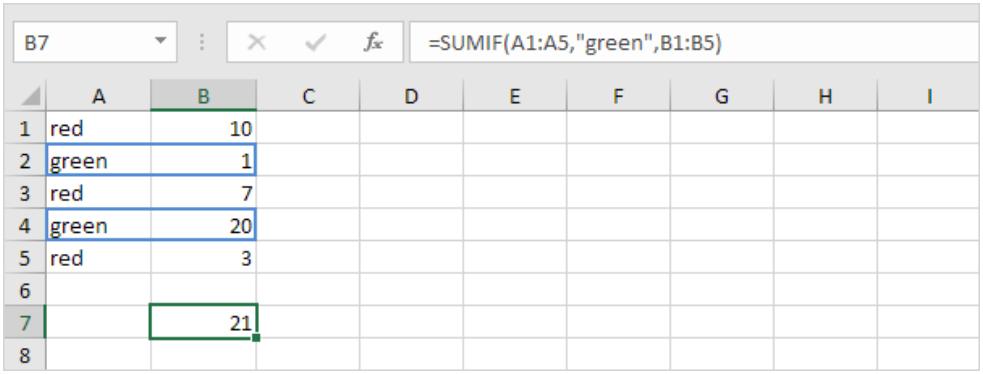
Explanation: because we use"<" and ">=" symbols in this IFS function, we cannot use the SWITCH function.

Sumif

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

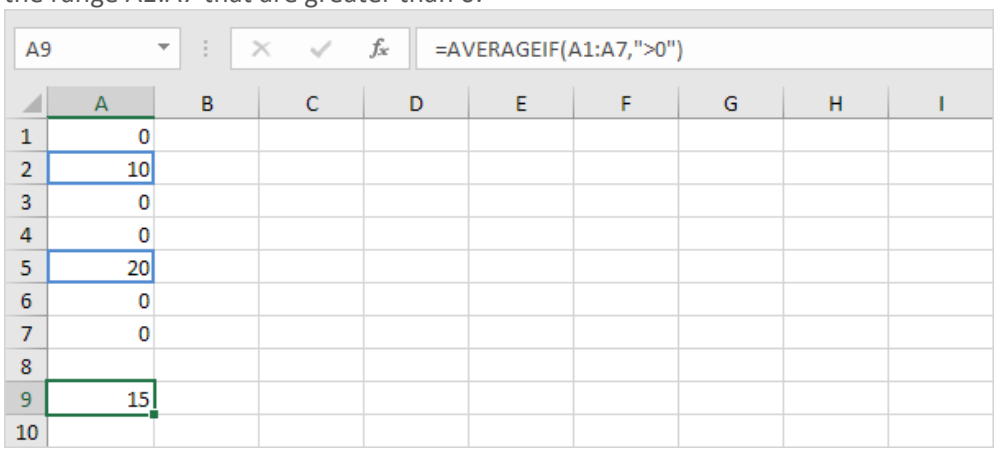


To sum cells based on one criteria (for example, green), use the following SUMIF function (three arguments, last argument is the range to sum).

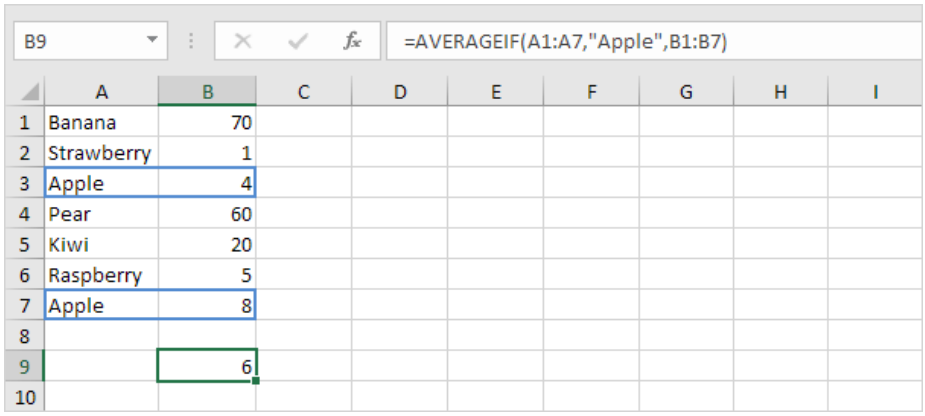


The AVERAGEIF function in Excel calculates the average of cells that meet one criteria. AVERAGEIFS calculates the average of cells that meet multiple criteria.

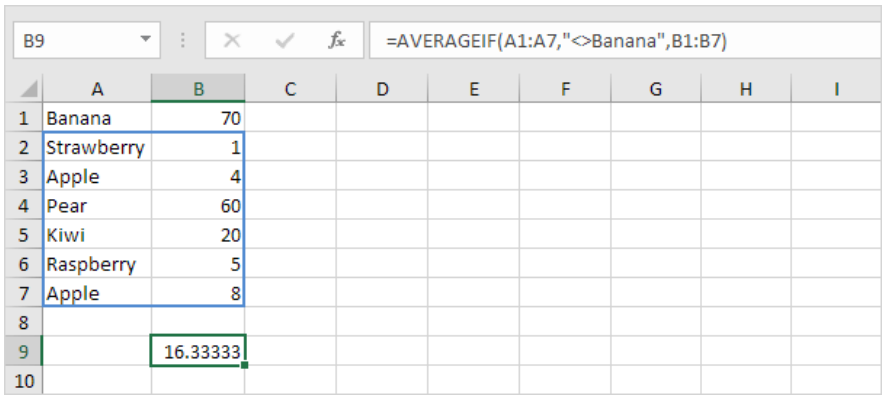
1. For example, the AVERAGEIF function below (two arguments) calculates the average of all values in the range A1:A7 that are greater than 0.



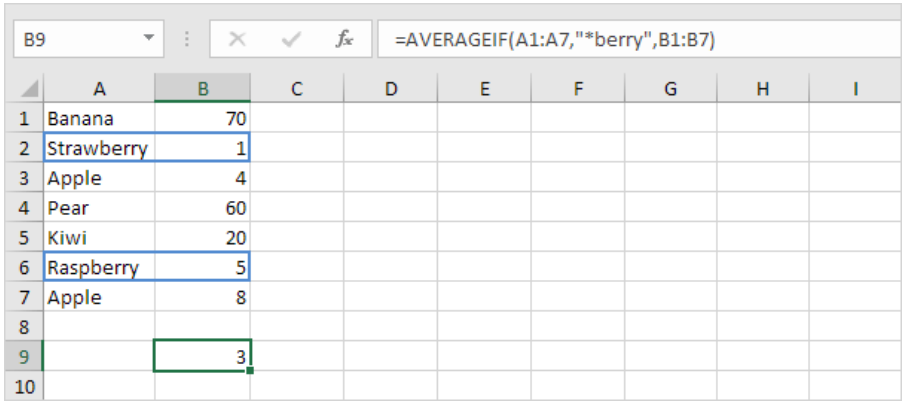
2. The AVERAGEIF function below (three arguments, last argument is the range to average) calculates the average of all values in the range B1:B7 if the corresponding cells in the range A1:A7 contain exactly Apple.



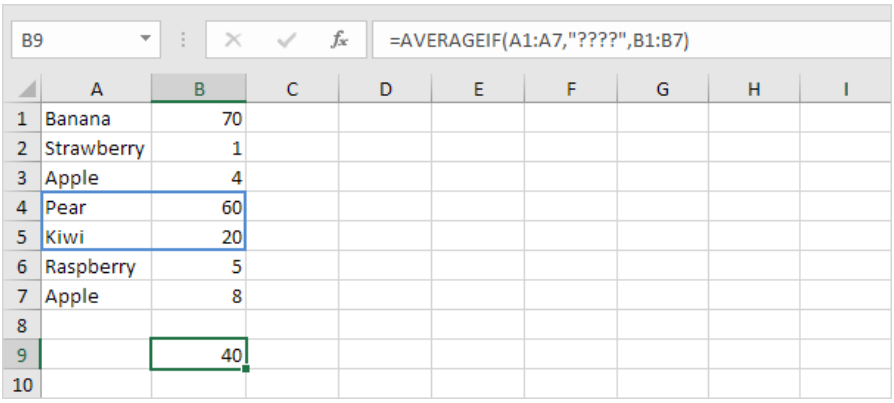
3. The AVERAGEIF function below calculates the average of all values in the range B1:B7 if the corresponding cells in the range A1:A7 do not contain exactly Banana.



4. The AVERAGEIF function below calculates the average of all values in the range B1:B7 if the corresponding cells in the range A1:A7 contain a series of zero or more characters + berry. An asterisk (*) matches a series of zero or more characters.



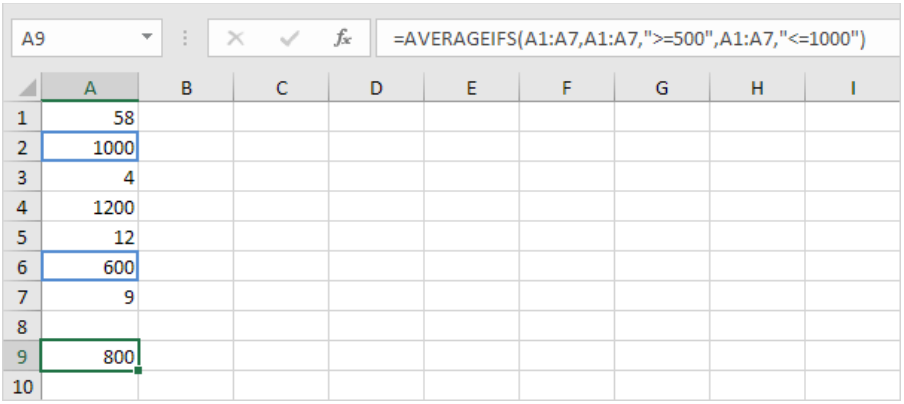
5. The AVERAGEIF function below calculates the average of all values in the range B1:B7 if the corresponding cells in the range A1:A7 contain exactly 4 characters. A question mark (?) matches exactly one character.



	A	B
1	Banana	70
2	Strawberry	1
3	Apple	4
4	Pear	60
5	Kiwi	20
6	Raspberry	5
7	Apple	8
8		
9		40
10		

The AVERAGEIFS function (with the letter S at the end) in Excel calculates the average of cells that meet multiple criteria.

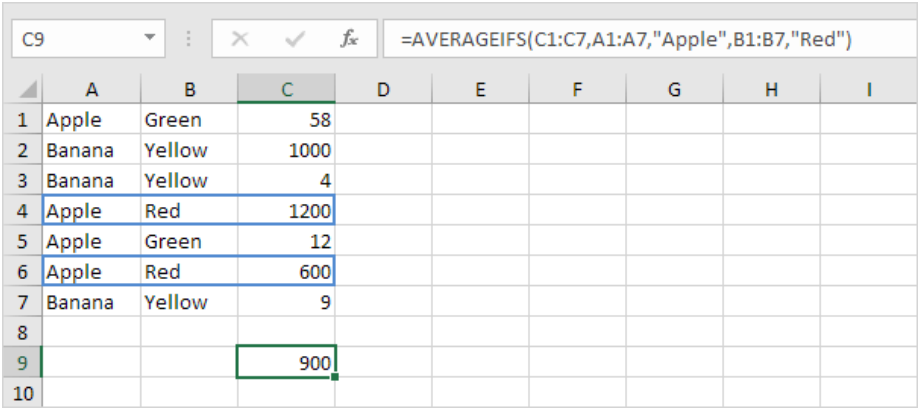
6. The AVERAGEIFS function below calculates the average of all values in the range A1:A7 that are greater than or equal to 500 and less than or equal to 1000.



	A
1	58
2	1000
3	4
4	1200
5	12
6	600
7	9
8	
9	800
10	

Note: first argument is the range to average, followed by two or more range/criteria pairs.

7. The AVERAGEIFS function below calculates the average of all values in the range C1:C7 if the corresponding cells in the range A1:A7 contain exactly Apple and the corresponding cells in the range B1:B7 contain exactly Red.



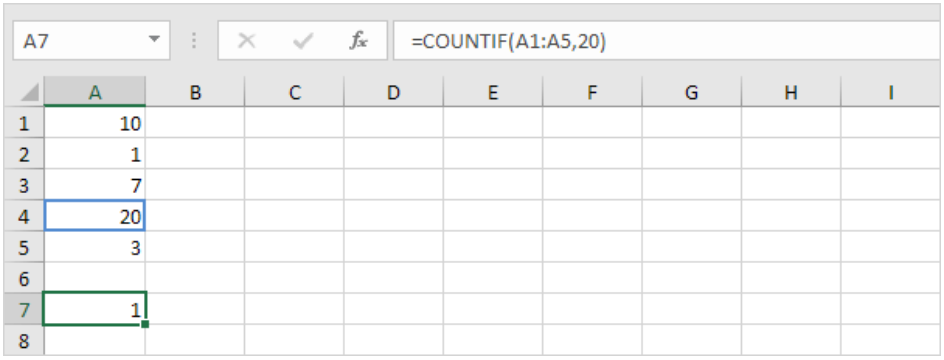
	A	B	C
1	Apple	Green	58
2	Banana	Yellow	1000
3	Banana	Yellow	4
4	Apple	Red	1200
5	Apple	Green	12
6	Apple	Red	600
7	Banana	Yellow	9
8			
9			900
10			

The powerful COUNTIF function in Excel counts cells based on one criteria. This page contains many easy to follow COUNTIF examples.

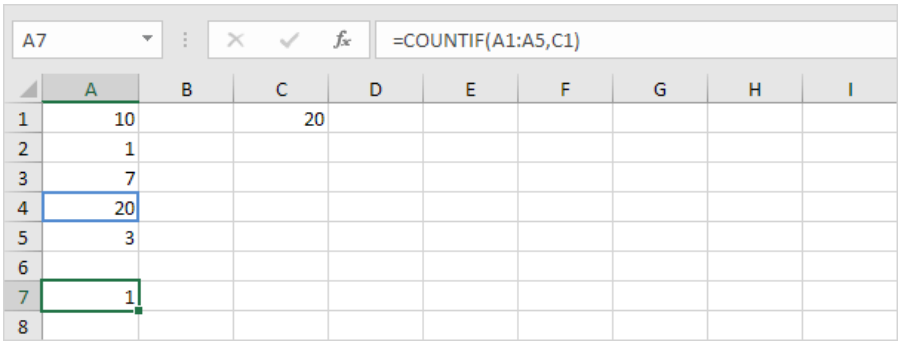
Countif with Numeric Criteria

You can use the COUNTIF function in Excel to count cells that contain a specific value, count cells that are greater than or equal to a value, etc.

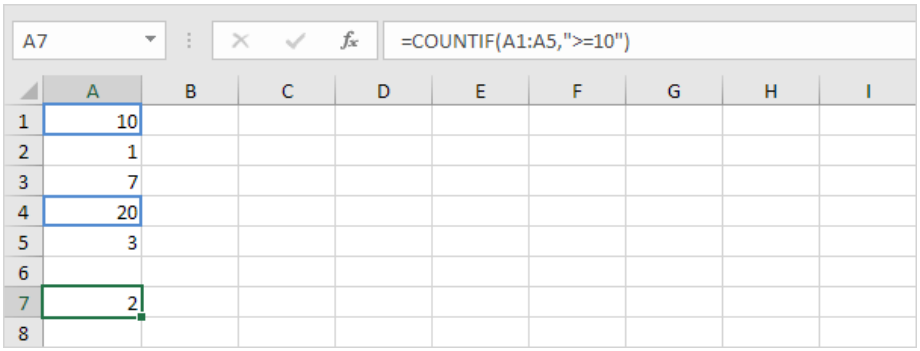
1. For example, the COUNTIF function below counts the number of cells that contain the value 20.



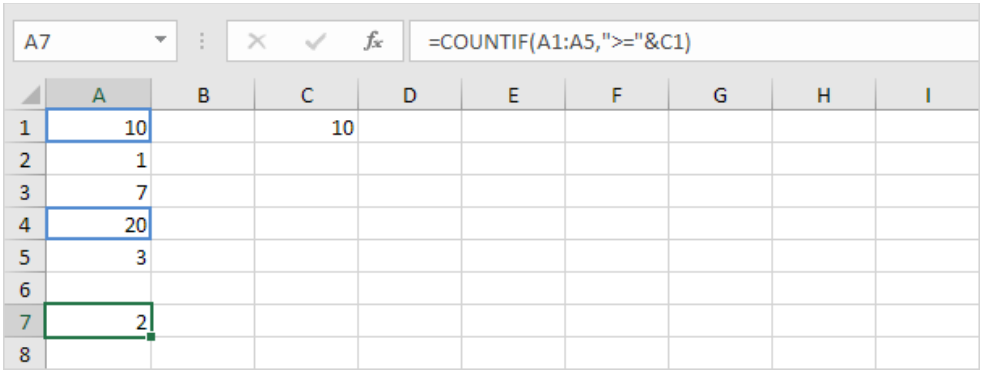
2. The following COUNTIF function gives the exact same result. It counts the number of cells that are equal to the value in cell C1.



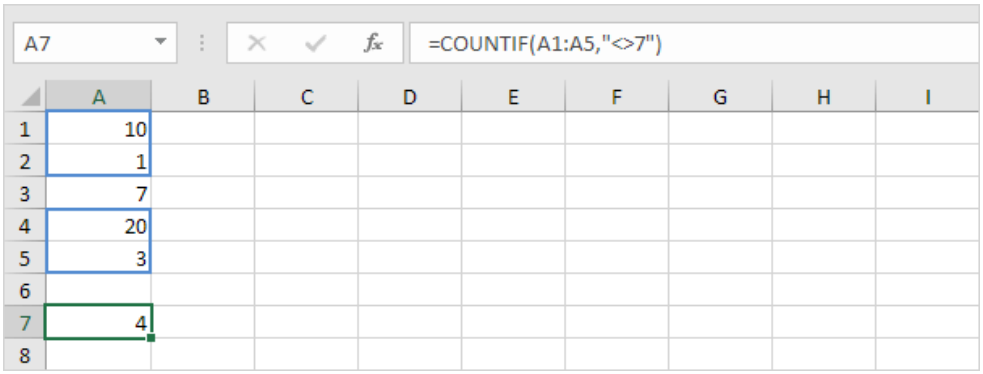
3. The COUNTIF function below counts the number of cells that are greater than or equal to 10.



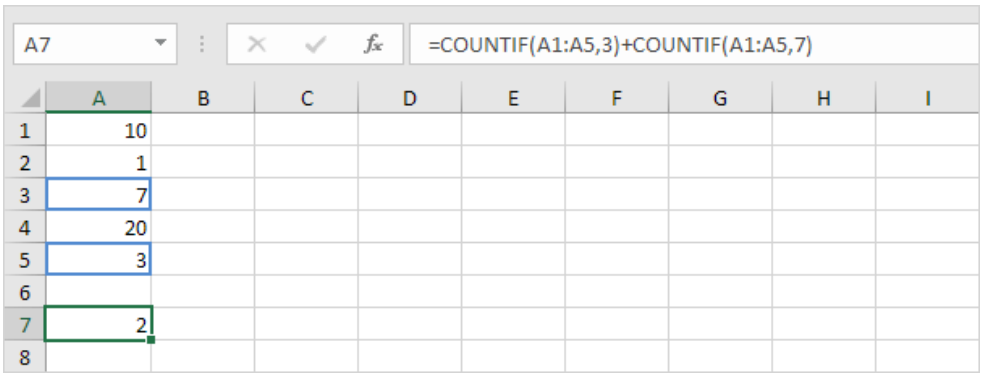
4. The following COUNTIF function gives the exact same result. The & operator joins the 'greater than or equal to' symbol and the value in cell C1.



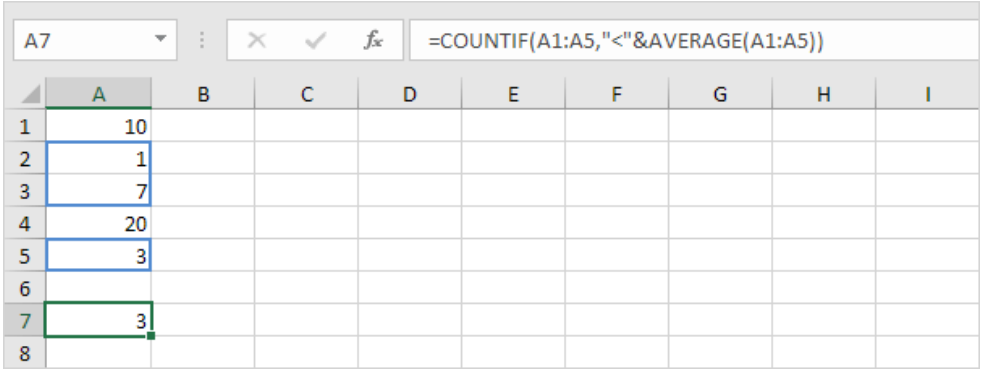
5. The COUNTIF function below counts the number of cells that are not equal to 7.



6. The COUNTIF functions below count the number of cells that are equal to 3 or 7.



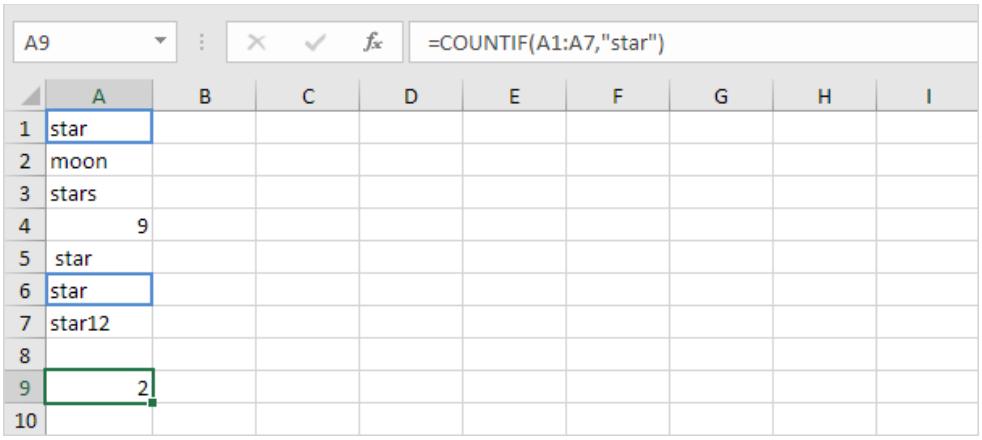
7. The COUNTIF function below counts the number of cells that are less than the average of the values (8.2).



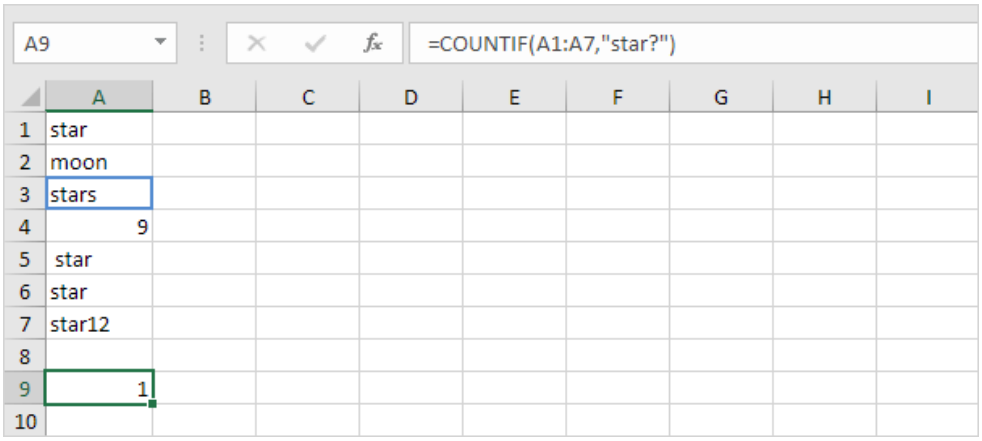
Countif with Text Criteria

You can also use the COUNTIF function in Excel to count cells that contain specific text. Always enclose text in double quotation marks. You can even use wildcards.

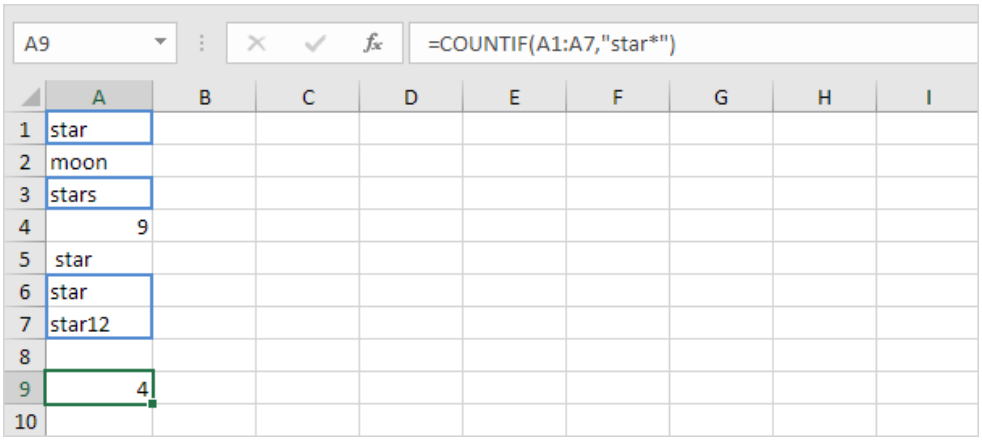
1. For example, the COUNTIF function below counts the number of cells that contain exactly star.



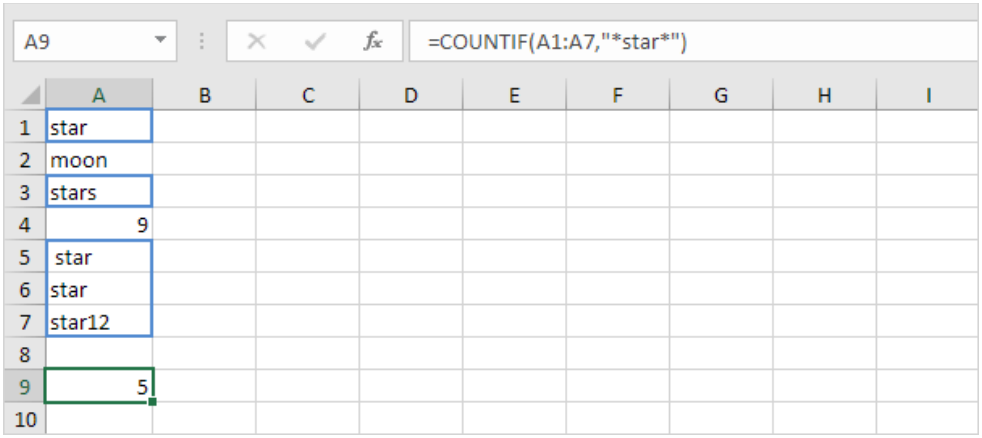
2. The COUNTIF function below counts the number of cells that contain exactly star + 1 character. A question mark (?) matches exactly one character.



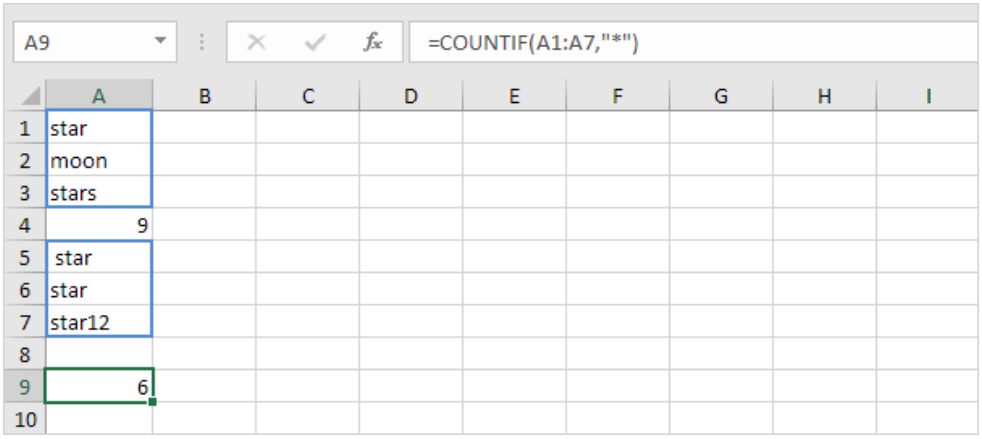
3. The COUNTIF function below counts the number of cells that contain exactly star + a series of zero or more characters. An asterisk (*) matches a series of zero or more characters.



4. The COUNTIF function below counts the number of cells that contain star in any way. No matter what is before or after star, this function finds all the cells that contain star in any way.



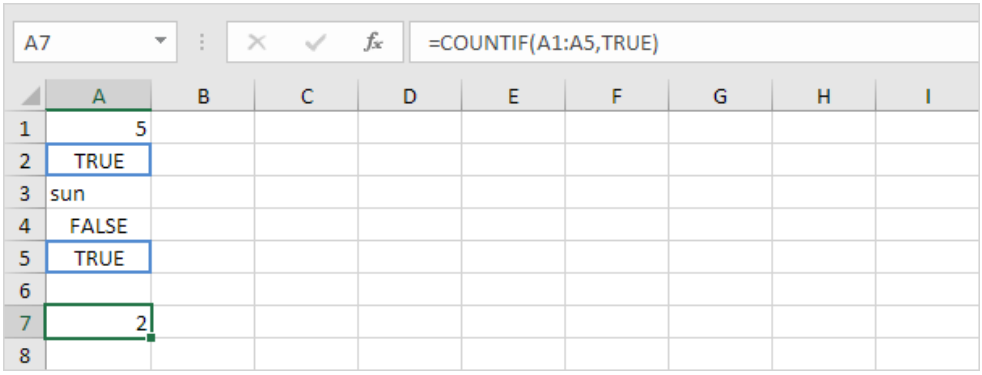
5. The COUNTIF function below counts the number of cells that contain text.



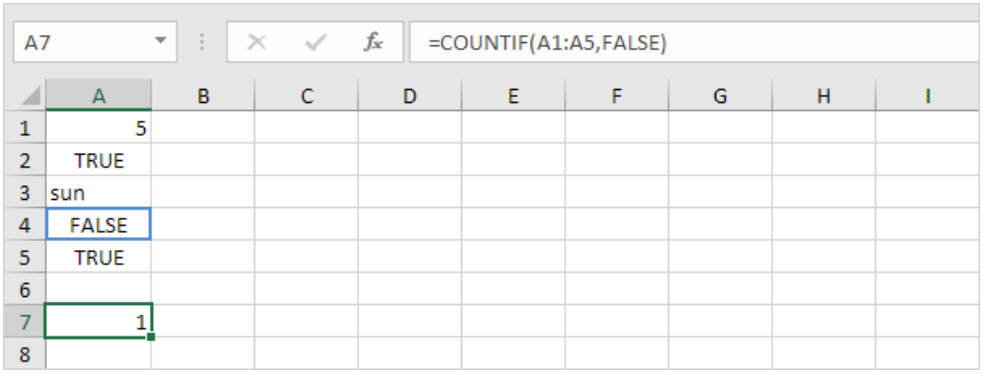
Count Booleans

You can also use the COUNTIF function in Excel to count Boolean values (TRUE or FALSE).

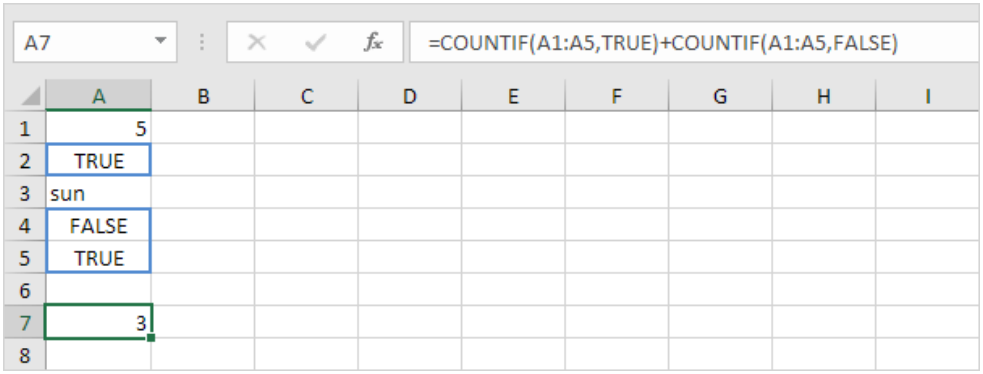
1. For example, the COUNTIF function below counts the number of cells that contain the Boolean TRUE.



2. The COUNTIF function below counts the number of cells that contain the Boolean FALSE.



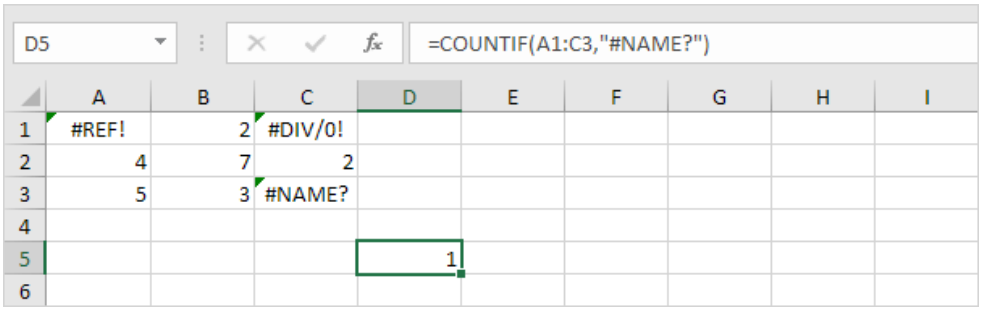
3. The COUNTIF functions below count the number of cells that contain the Boolean TRUE or FALSE.



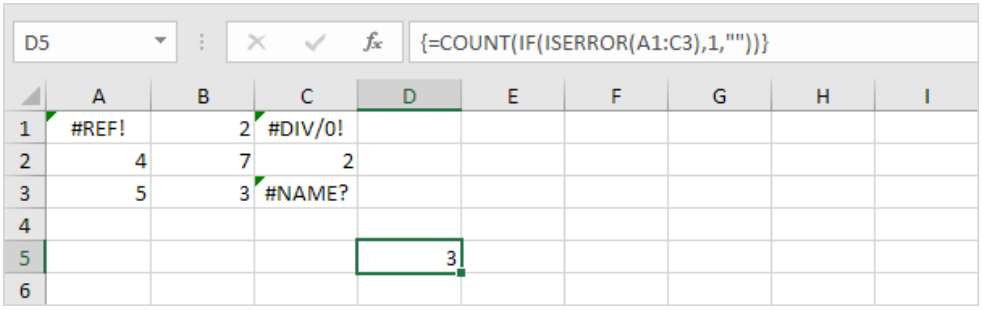
Count Errors

You can also use the COUNTIF function in Excel to count specific errors.

1. For example, count the number of cells that contain the #NAME? error.

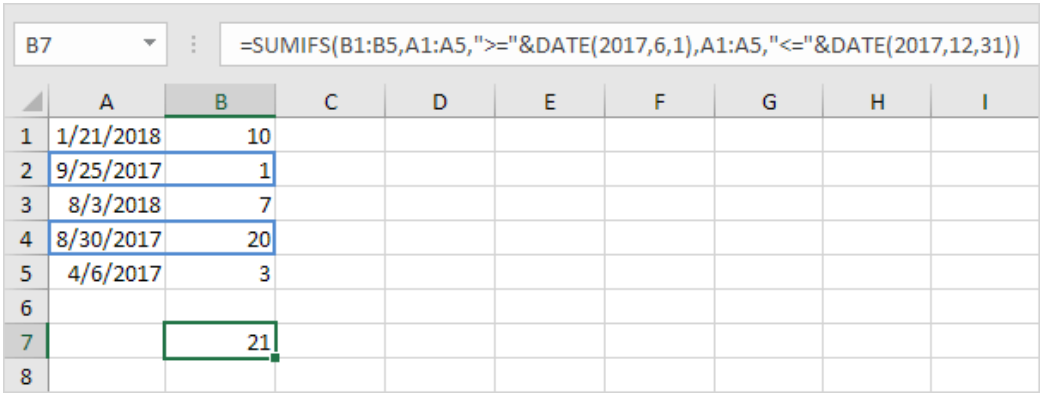


2. The array formula below counts the total number of errors in a range of cells.



Note: finish an array formula by pressing CTRL + SHIFT + ENTER. Excel adds the curly braces {}. Visit our page about Counting Errors for detailed instructions on how to create this array formula.

The SUMIFS function (with the letter S at the end) below sums the sales between two dates.

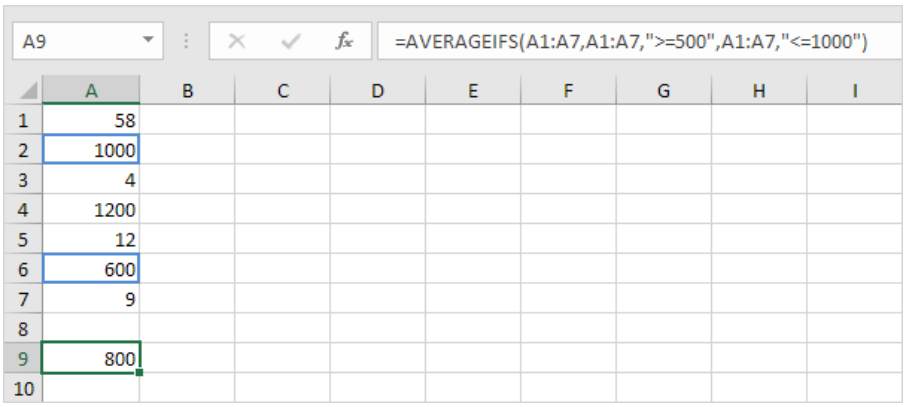


	A	B
1	1/21/2018	10
2	9/25/2017	1
3	8/3/2018	7
4	8/30/2017	20
5	4/6/2017	3
6		
7		21
8		

Note: the SUMIFS function in Excel sums cells based on two or more criteria (first argument is the range to sum, followed by two or more range/criteria pairs). Adjust the dates to sum the sales in a specific month, year, etc.

The AVERAGEIFS function (with the letter S at the end) in Excel calculates the average of cells that meet multiple criteria.

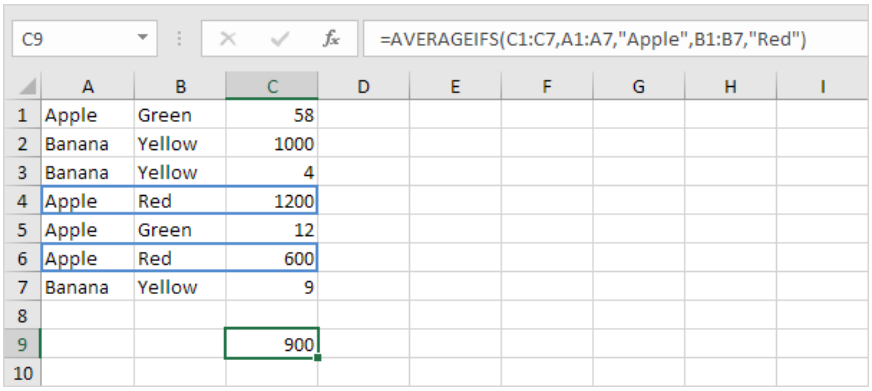
6. The AVERAGEIFS function below calculates the average of all values in the range A1:A7 that are greater than or equal to 500 and less than or equal to 1000.



	A
1	58
2	1000
3	4
4	1200
5	12
6	600
7	9
8	
9	800
10	

Note: first argument is the range to average, followed by two or more range/criteria pairs.

7. The AVERAGEIFS function below calculates the average of all values in the range C1:C7 if the corresponding cells in the range A1:A7 contain exactly Apple and the corresponding cells in the range B1:B7 contain exactly Red.



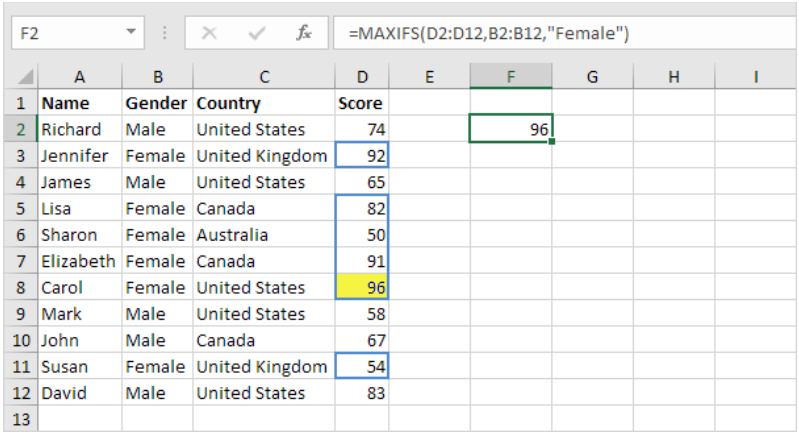
	A	B	C
1	Apple	Green	58
2	Banana	Yellow	1000
3	Banana	Yellow	4
4	Apple	Red	1200
5	Apple	Green	12
6	Apple	Red	600
7	Banana	Yellow	9
8			
9			900
10			

Note: again, the first argument is the range to average, followed by two or more range/criteria pairs.

MaxIfs and MinIfs

Use MAXIFS and MINIFS in Excel 2016 or later to find the maximum and minimum value based on one criteria or multiple criteria.

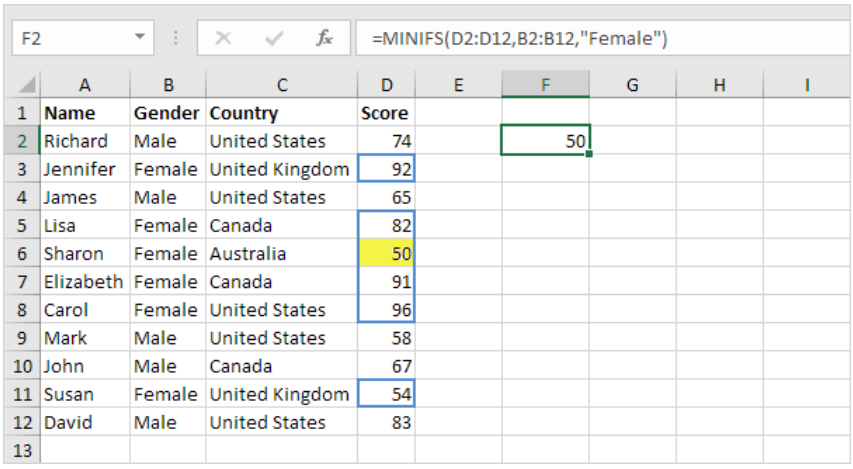
1. For example, the MAXIFS function below finds the highest female score.



	A	B	C	D	E	F	G	H	I
1	Name	Gender	Country	Score					
2	Richard	Male	United States	74		96			
3	Jennifer	Female	United Kingdom	92					
4	James	Male	United States	65					
5	Lisa	Female	Canada	82					
6	Sharon	Female	Australia	50					
7	Elizabeth	Female	Canada	91					
8	Carol	Female	United States	96					
9	Mark	Male	United States	58					
10	John	Male	Canada	67					
11	Susan	Female	United Kingdom	54					
12	David	Male	United States	83					
13									

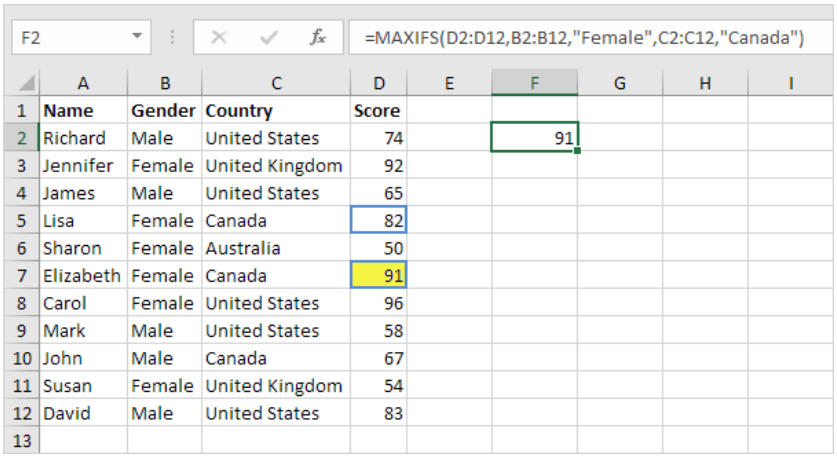
Note: the first argument (D2:D12 in this example) is always the range in which the maximum or minimum will be determined. This MAXIFS function has 1 range/criteria pair (B2:B12/Female).

2. The MINIFS function below finds the lowest female score.



	A	B	C	D	E	F	G	H	I
1	Name	Gender	Country	Score					
2	Richard	Male	United States	74		50			
3	Jennifer	Female	United Kingdom	92					
4	James	Male	United States	65					
5	Lisa	Female	Canada	82					
6	Sharon	Female	Australia	50					
7	Elizabeth	Female	Canada	91					
8	Carol	Female	United States	96					
9	Mark	Male	United States	58					
10	John	Male	Canada	67					
11	Susan	Female	United Kingdom	54					
12	David	Male	United States	83					
13									

3. For example, the MAXIFS function below finds the highest female score in Canada.



	A	B	C	D	E	F	G	H	I
1	Name	Gender	Country	Score					
2	Richard	Male	United States	74		91			
3	Jennifer	Female	United Kingdom	92					
4	James	Male	United States	65					
5	Lisa	Female	Canada	82					
6	Sharon	Female	Australia	50					
7	Elizabeth	Female	Canada	91					
8	Carol	Female	United States	96					
9	Mark	Male	United States	58					
10	John	Male	Canada	67					
11	Susan	Female	United Kingdom	54					
12	David	Male	United States	83					
13									

Note: this MAXIFS function has 2 range/criteria pairs (B2:B12/Female and C2:C12/Canada). MAXIFS and MINIFS functions can handle up to 126 range/criteria pairs.

4. The MAXIFS function below finds the highest score below 60.

F2 =MAXIFS(D2:D12,D2:D12,"<60")

	A	B	C	D	E	F	G	H	I
1	**Name**	**Gender**	**Country**	**Score**					
2	Richard	Male	United States	74		58			
3	Jennifer	Female	United Kingdom	92					
4	James	Male	United States	65					
5	Lisa	Female	Canada	82					
6	Sharon	Female	Australia	50					
7	Elizabeth	Female	Canada	91					
8	Carol	Female	United States	96					
9	Mark	Male	United States	58					
10	John	Male	Canada	67					
11	Susan	Female	United Kingdom	54					
12	David	Male	United States	83					
13									

Note: this MAXIFS function only uses the range D2:D12.

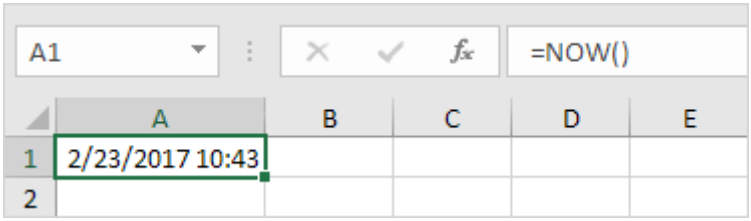
You can also use the COUNTIFS function to create a frequency distribution.

E4 =COUNTIFS($A$2:$A$19,">="&C4,$A$2:$A$19,"<="&D4)

	A	B	C	D	E	F	G	H
1	Number of students							
2	22							
3	29		**Min**	**Max**	**Count**			
4	40		0	10	0			
5	30		11	20	1			
6	48		21	30	10			
7	24		31	40	5			
8	21		41	50	1			
9	19		51	60	1			
10	24							
11	22							
12	25							
13	52							
14	35							
15	40							
16	31							
17	37							
18	21							
19	23							
20								

Explanation: the COUNTIFS function in Excel counts cells based on two or more criteria. The COUNTIFS function shown above has 2 range/criteria pairs. The & operator joins ">=" with the value in cell C4 and "<=" with the value in cell D4. You can easily copy this formula to the other cells.

To get the current date and time, use the NOW function.



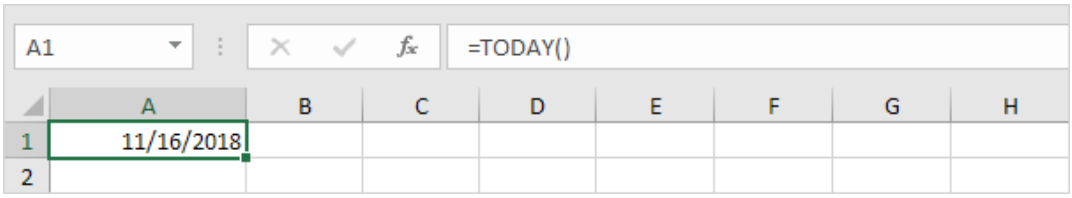
Note: use the TODAY function to enter today's date in Excel.

Today's Date

To enter today's date in Excel, use the TODAY function. To enter the current date and time, use the NOW function. To enter the current date and time as a static value, use keyboard shortcuts.

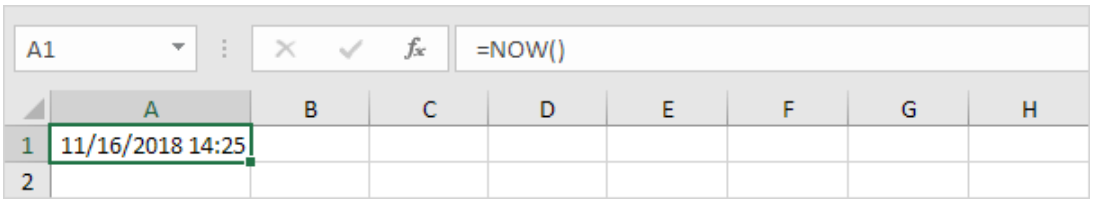
Today and Now

1. To enter today's date in Excel, use the TODAY function.



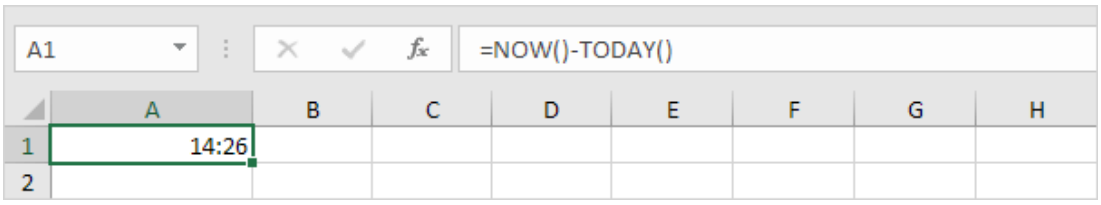
Note: the TODAY function takes no arguments. This date will update automatically when you open the workbook on another date.

2. To enter the current date and time, use the NOW function.



Note: the NOW function takes no arguments. This time will update automatically whenever the sheet is recalculated. This happens when you make a change to any cell or when you open the workbook. Press F9 to manually recalculate the workbook.

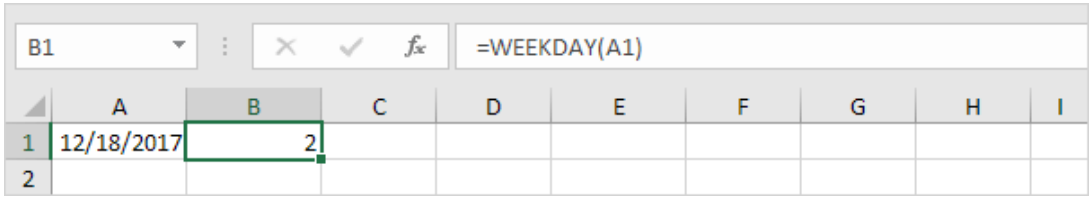
3. To enter the current time only, use NOW()-TODAY() and apply a time format.



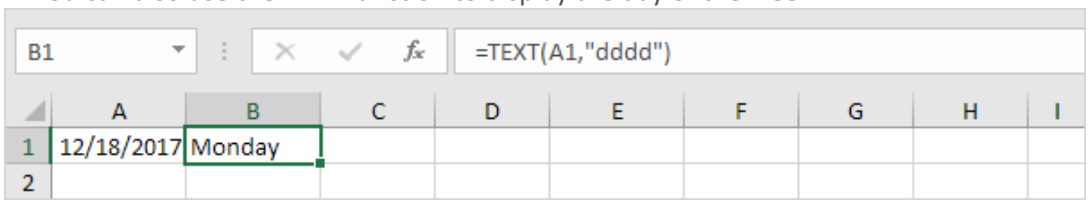
Note: dates are stored as numbers in Excel and count the number of days since January 0, 1900. Times are handled internally as numbers between 0 and 1. Visit our page about date and time formats for more information.

Weekday function

1. The WEEKDAY function in Excel returns a number from 1 (Sunday) to 7 (Saturday) representing the day of the week of a date. Apparently, 12/18/2017 falls on a Monday.



2. You can also use the TEXT function to display the day of the week.



Excel WORKDAY function can be used when you want to get the date after a given number of working days. For example, if I start a project today and it will take 20 working days to complete it, then I can use the WORKDAY function to get the completion date. This function is best suited when you want to calculate the invoice due date, project due date, delivery date, etc.

This function, by default, takes Saturday and Sunday as the weekend.
Excel Workday function would return the completion date when you specify the start date and the number of working day. It automatically excludes Saturday and Sunday as weekend (non-working days).

	A	B	C	D	E
1	***DATA***			***Formula***	***Result***
2	*Start Date*	*Days to Complete*		=WORKDAY(A3,B3)	15-07-2016
3	28-02-2016	100			
4					
5					
6					

Workday uses the start date and returns the date after 100 days. Saturday and Sunday are considered Weekend and are not counted in the calculation

In the above example, the start date is 28 Feb 2016, and the result is 15 July 2016, which is after 100 working days (excluding Saturdays and Sundays).

If you want to exclude holidays while calculating the completion date, there is a third argument in the Workday function that lets you specify a list of holidays.

	A	B	C	D	E	F
1	***DATA***				***Formula***	***Result***
2	*Start Date*	*Days to Complete*	*Holidays*		=WORKDAY(A3,B3,$C$3:$C$5	20-07-2016
3	28-02-2016	100	03-03-2016			
4			22-03-2016			
5			11-05-2016			
6						

Returns the date after 100 working days. Working days exclude weekends (Saturday and Sunday) and the specified holidays.

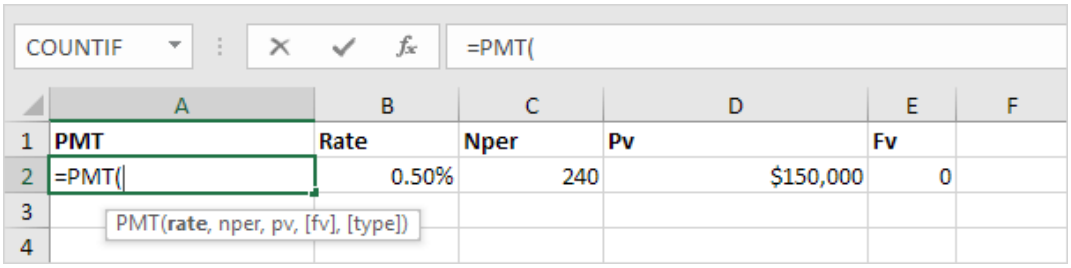
In the above example, the start date is 28 Feb 2016, and the result is 20 July 2016, which is after 100 working days. The calculation excludes weekends (Saturdays and Sundays) and the specified holidays in C3:C5. In case, a holiday occurs on a weekend, it is counted only once.

To illustrate Excel's most popular financial functions, we consider a loan with monthly payments, an annual interest rate of 6%, a 20-year duration, a present value of $150,000 (amount borrowed) and a future value of 0 (that's what you hope to achieve when you pay off a loan).

We make monthly payments, so we use 6%/12 = 0.5% for Rate and 20*12 = 240 for Nper (total number of periods). If we make annual payments on the same loan, we use 6% for Rate and 20 for Nper.

PMT

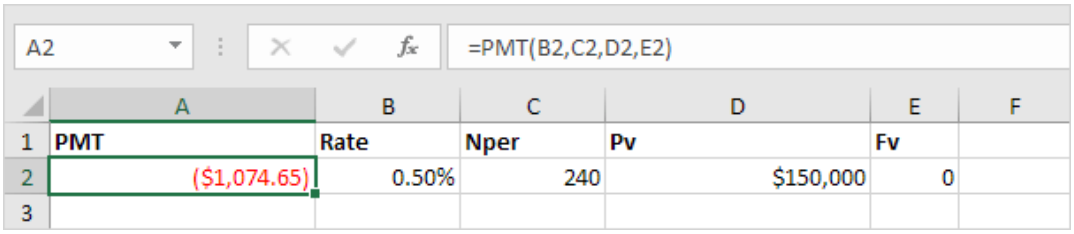
Select cell A2 and insert the PMT function.



	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	=PMT(	0.50%	240	$150,000	0	
3						
4						

Note: the last two arguments are optional. For loans, Fv can be omitted (the future value of a loan equals 0, however, it's included here for clarification). If Type is omitted, it is assumed that payments are due at the end of the period.

Result. The monthly payment equals $1,074.65.

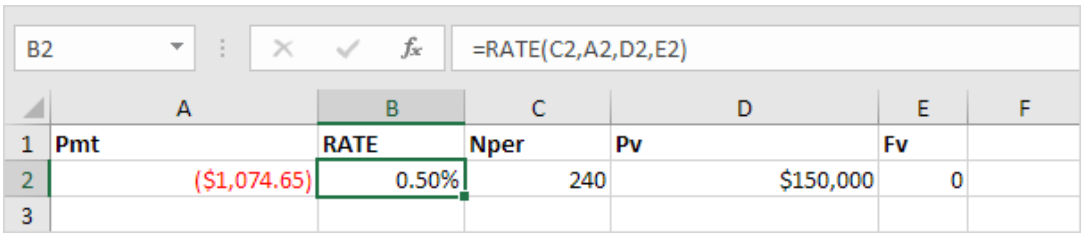


	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

Tip: when working with financial functions in Excel, always ask yourself the question, am I making a payment (negative) or am I receiving money (positive)? We pay off a loan of $150,000 (positive, we received that amount) and we make monthly payments of $1,074.65 (negative, we pay).

RATE

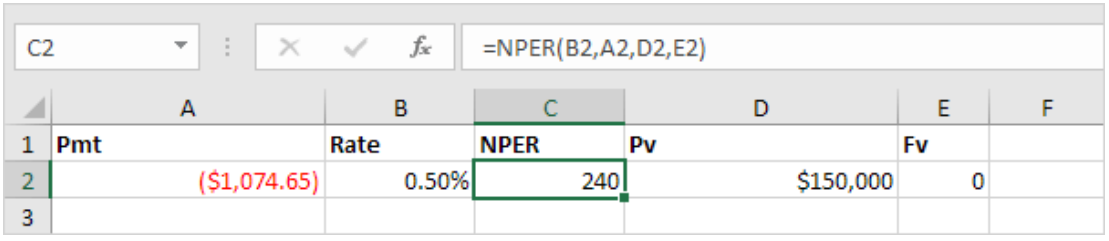
If Rate is the only unknown variable, we can use the RATE function to calculate the interest rate.



	A	B	C	D	E	F
1	Pmt	RATE	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

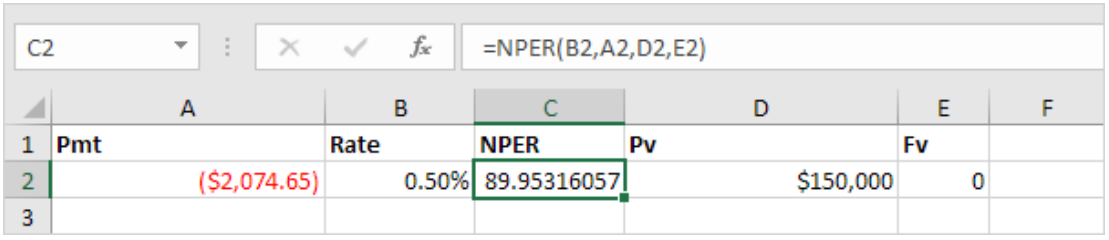
NPER

Or the NPER function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, it takes 240 months to pay off this loan.



	A	B	C	D	E	F
1	**Pmt**	**Rate**	**NPER**	**Pv**	**Fv**	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

We already knew this, but we can change the monthly payment now to see how this affects the total number of periods.

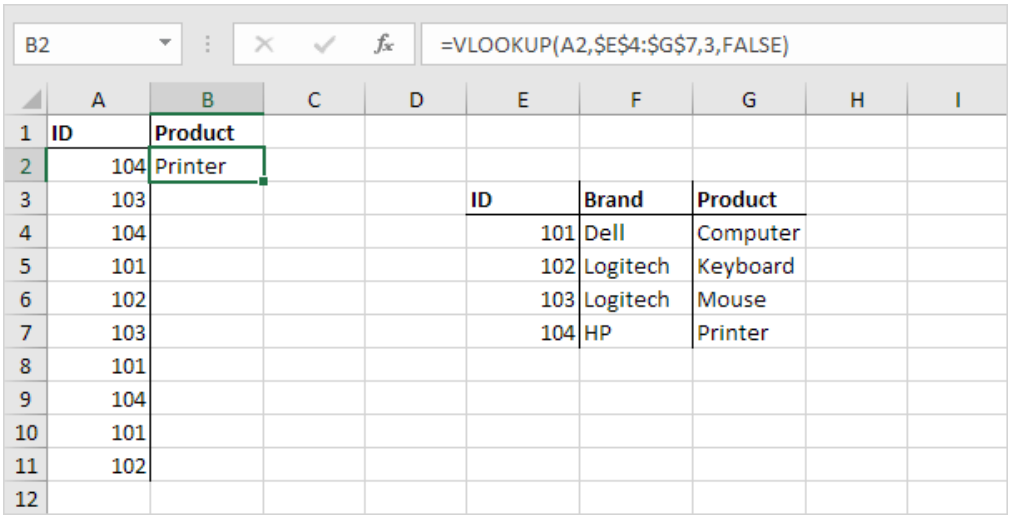


	A	B	C	D	E	F
1	**Pmt**	**Rate**	**NPER**	**Pv**	**Fv**	
2	($2,074.65)	0.50%	89.95316057	$150,000	0	
3						

Conclusion: if we make monthly payments of $2,074.65, it takes less than 90 months to pay off this loan.

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.

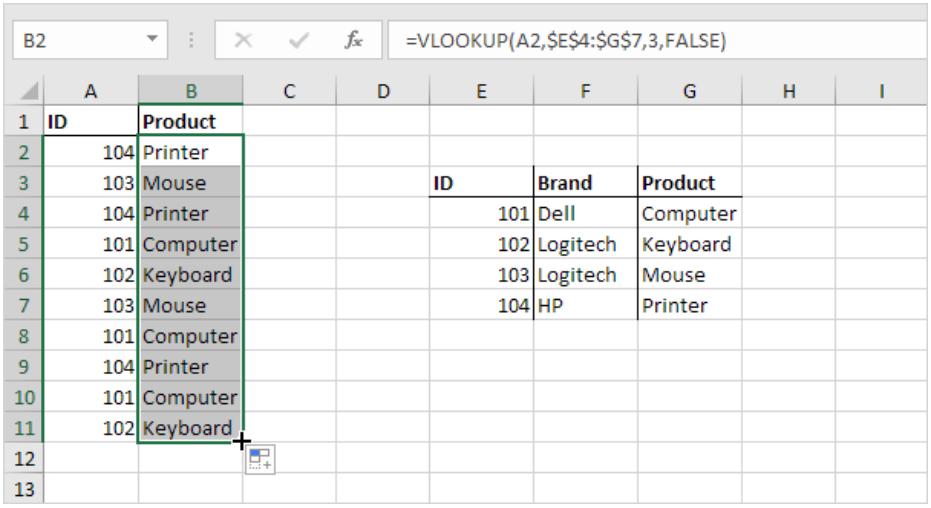
1. Insert the VLOOKUP function shown below.



	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.

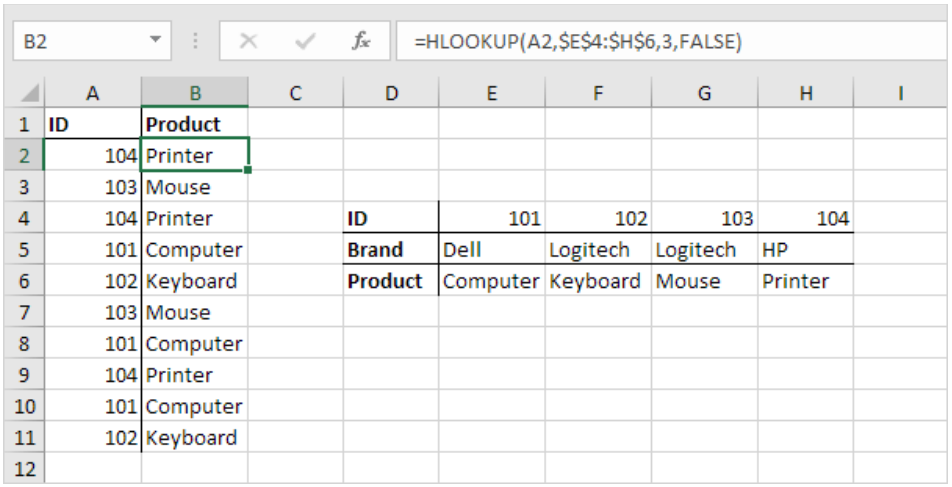


	A	B	C	D	E	F	G	H	I
1	ID	Product							
2	104	Printer							
3	103	Mouse			ID	Brand	Product		
4	104	Printer			101	Dell	Computer		
5	101	Computer			102	Logitech	Keyboard		
6	102	Keyboard			103	Logitech	Mouse		
7	103	Mouse			104	HP	Printer		
8	101	Computer							
9	104	Printer							
10	101	Computer							
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. Visit our page about the VLOOKUP function for much more information and many examples.

Hlookup

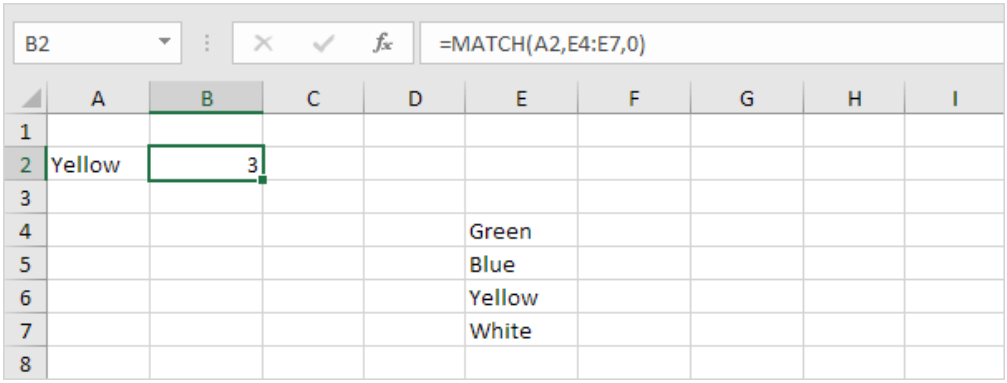
In a similar way, you can use the HLOOKUP (Horizontal lookup) function.



	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

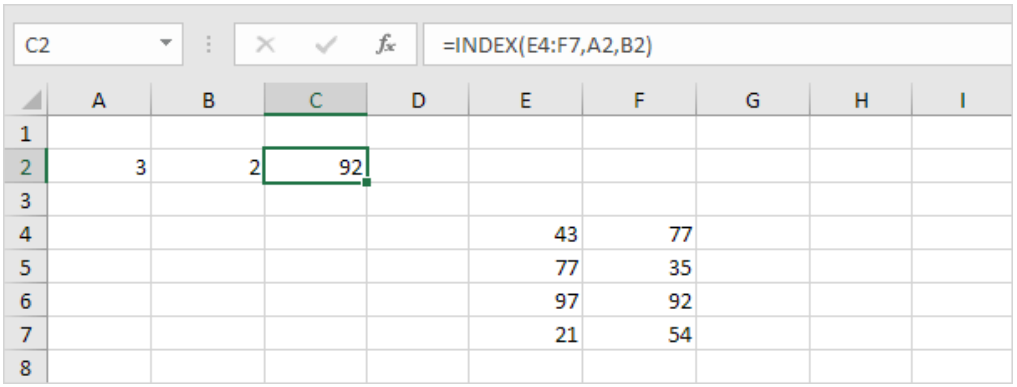
The MATCH function returns the position of a value in a given range.



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. Use INDEX and MATCH in Excel and impress your boss.

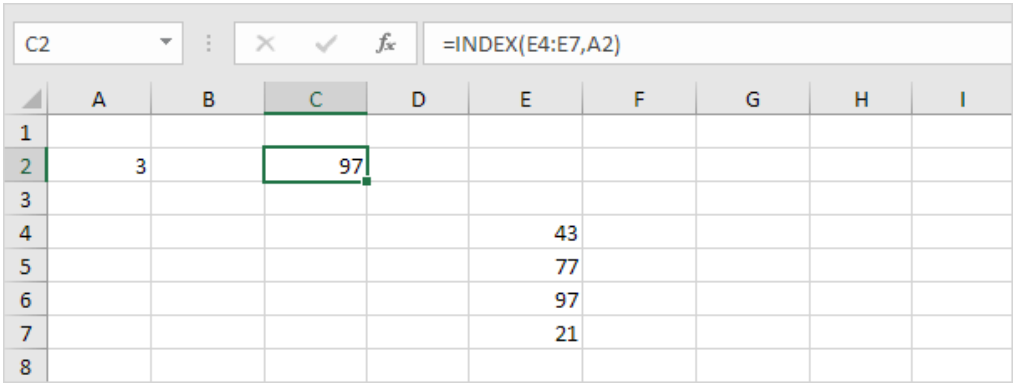
Index

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



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

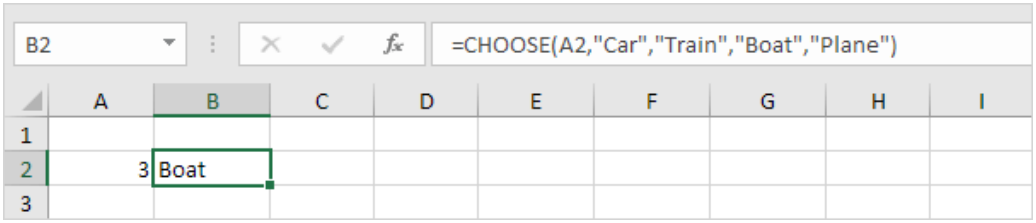
The INDEX function below returns a specific value in a one-dimensional range.



Explanation: 97 found at position 3 in the range E4:E7. Use INDEX and MATCH in Excel and impress your boss.

Choose

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



Explanation: Boat found at position 3.

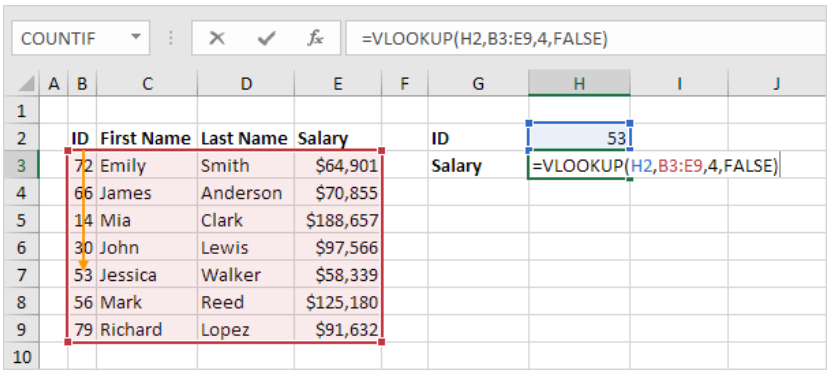
Vlookup

The VLOOKUP function is one of the most popular functions in Excel. This page contains many easy to follow VLOOKUP examples.

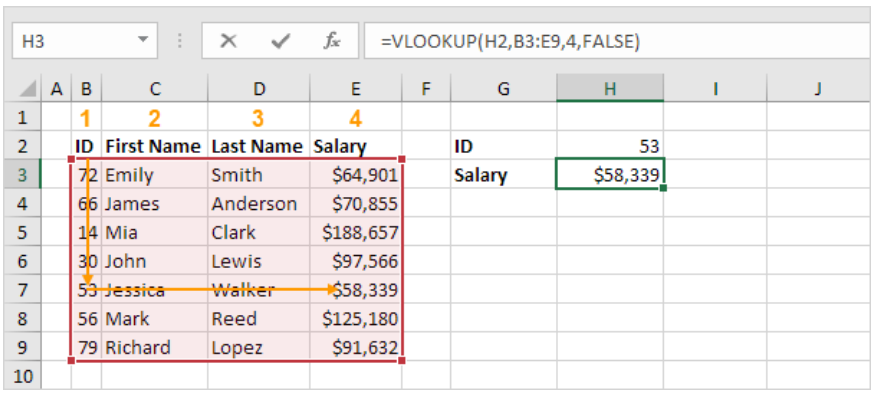
Exact Match

Most of the time you are looking for an exact match when you use the VLOOKUP function in Excel. Let's take a look at the arguments of the VLOOKUP function.

1. The VLOOKUP function below looks up the value 53 (first argument) in the leftmost column of the red table (second argument).

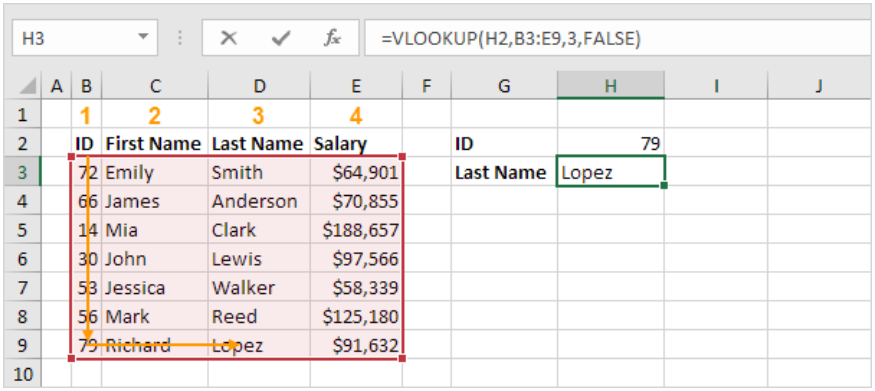


2. The value 4 (third argument) tells the VLOOKUP function to return the value in the same row from the fourth column of the red table.



Note: the Boolean FALSE (fourth argument) tells the VLOOKUP function to return an exact match. If the VLOOKUP function cannot find the value 53 in the first column, it will return a #N/A error.

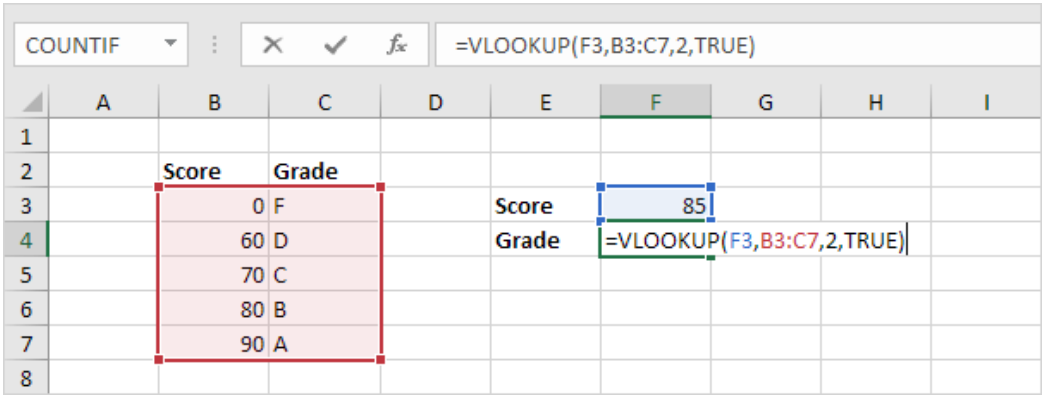
3. Here's another example. Instead of returning the salary, the VLOOKUP function below returns the last name (third argument is set to 3) of ID 79.



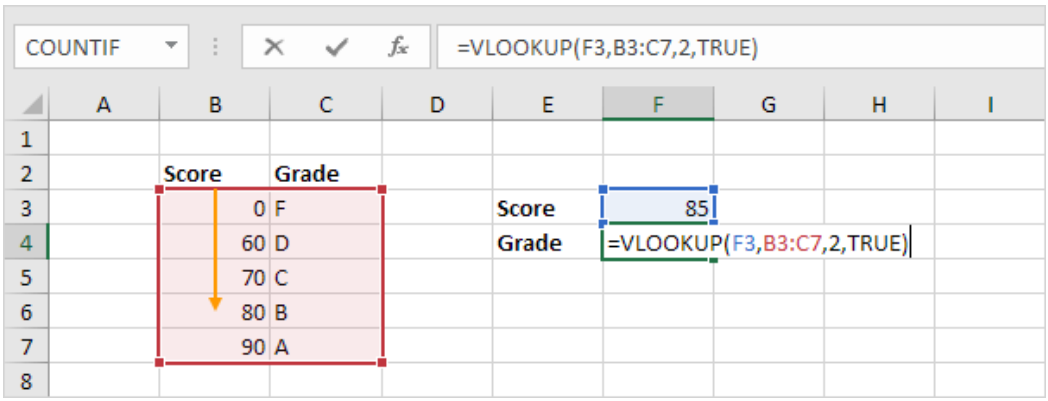
Approximate Match

Let's take a look at an example of the VLOOKUP function in approximate match mode (fourth argument set to TRUE).

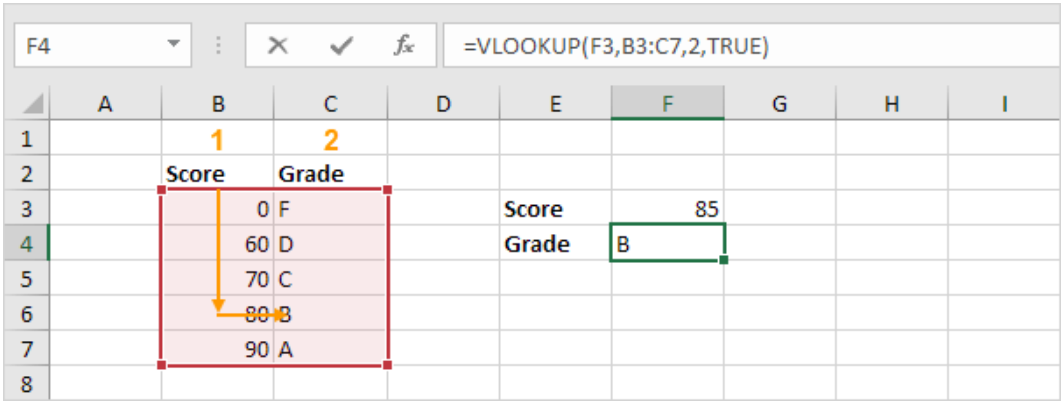
1. The VLOOKUP function below looks up the value 85 (first argument) in the leftmost column of the red table (second argument). There's just one problem. There's no value 85 in the first column.



2. Fortunately, the Boolean TRUE (fourth argument) tells the VLOOKUP function to return an approximate match. If the VLOOKUP function cannot find the value 85 in the first column, it will return the largest value smaller than 85. In this example, this will be the value 80.



3. The value 2 (third argument) tells the VLOOKUP function to return the value in the same row from the second column of the red table.

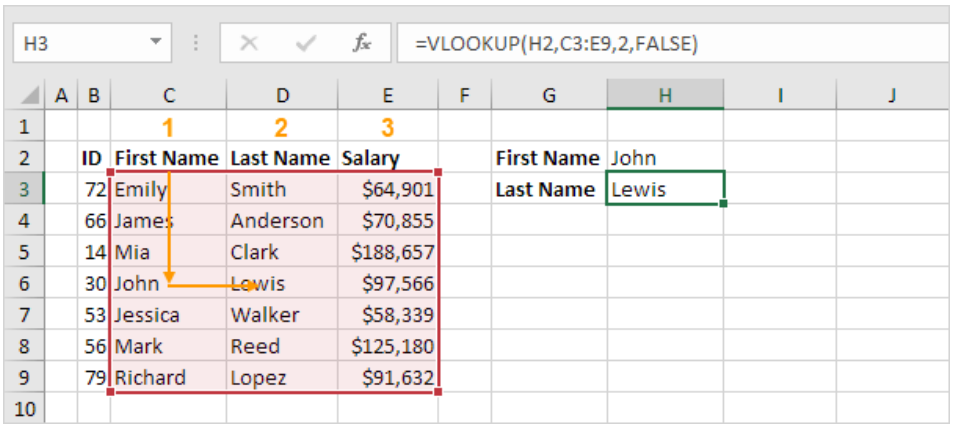


Note: always sort the leftmost column of the red table in ascending order if you use the VLOOKUP function in approximate match mode (fourth argument set to TRUE).

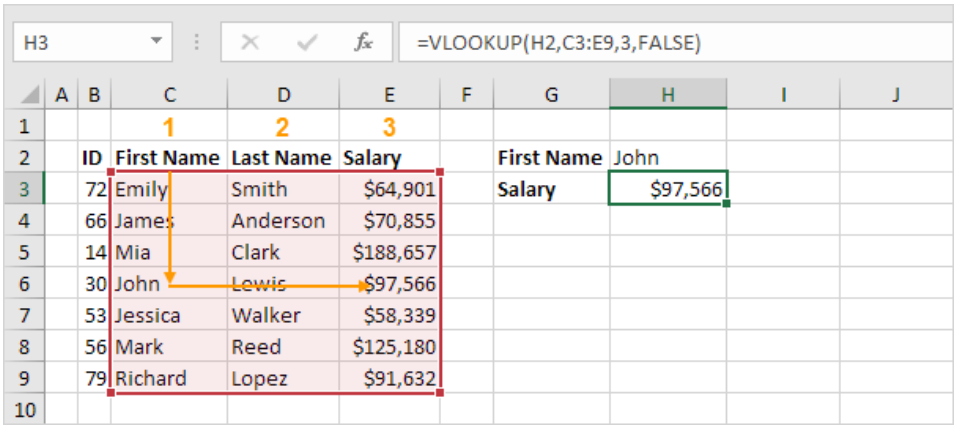
Vlookup Looks Right

The VLOOKUP function always looks up a value in the leftmost column of a table and returns the corresponding value from a column to the right.

1. For example, the VLOOKUP function below looks up the first name and returns the last name.



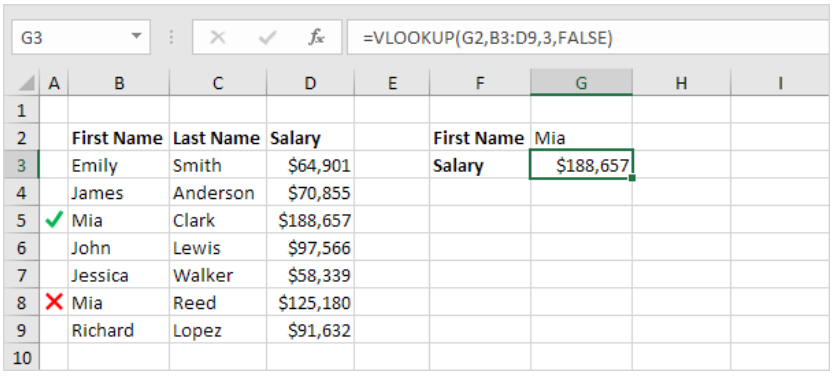
2. If you change the column index number (third argument) to 3, the VLOOKUP function looks up the first name and returns the salary.



Note: in this example, the VLOOKUP function cannot lookup the first name and return the ID. The VLOOKUP function only looks to the right. No worries, you can use the INDEX and the MATCH function in Excel to perform a left lookup.

First Match

If the leftmost column of the table contains duplicates, the VLOOKUP function matches the first instance. For example, take a look at the VLOOKUP function below.

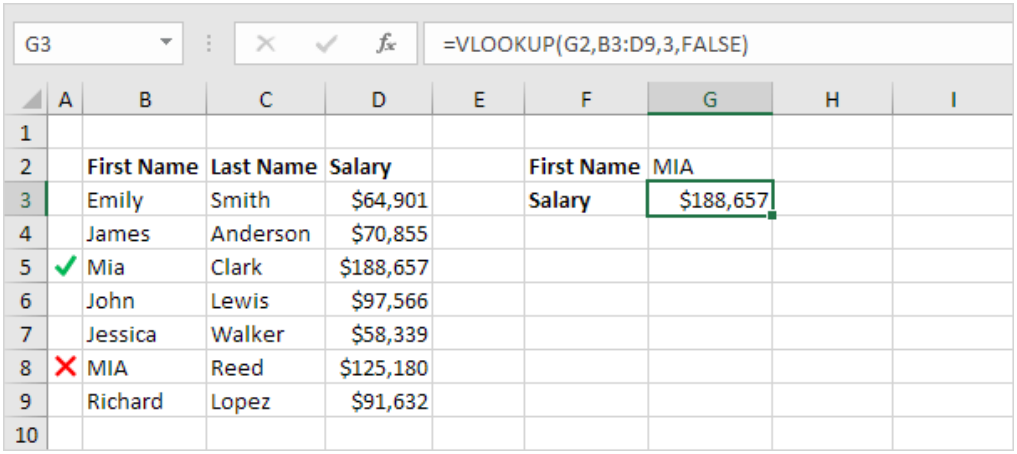


	A	B	C	D	E	F	G	H	I
1									
2		**First Name**	**Last Name**	**Salary**		**First Name**	Mia		
3		Emily	Smith	$64,901		**Salary**	$188,657		
4		James	Anderson	$70,855					
5	✓	Mia	Clark	$188,657					
6		John	Lewis	$97,566					
7		Jessica	Walker	$58,339					
8	✗	Mia	Reed	$125,180					
9		Richard	Lopez	$91,632					
10									

Explanation: the VLOOKUP function returns the salary of Mia Clark, not Mia Reed.

Vlookup is Case-insensitive

The VLOOKUP function in Excel performs a case-insensitive lookup. For example, the VLOOKUP function below looks up MIA (cell G2) in the leftmost column of the table.

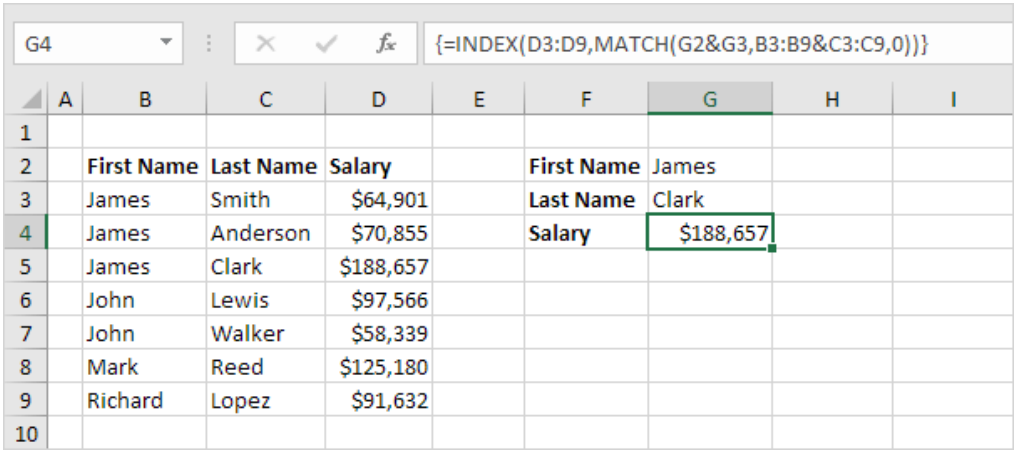


	A	B	C	D	E	F	G	H	I
1									
2		**First Name**	**Last Name**	**Salary**		**First Name**	MIA		
3		Emily	Smith	$64,901		**Salary**	$188,657		
4		James	Anderson	$70,855					
5	✓	Mia	Clark	$188,657					
6		John	Lewis	$97,566					
7		Jessica	Walker	$58,339					
8	✗	MIA	Reed	$125,180					
9		Richard	Lopez	$91,632					
10									

Explanation: the VLOOKUP function is case-insensitive so it looks up MIA or Mia or mia or miA, etc. As a result, the VLOOKUP function returns the salary of Mia Clark (first instance). You can use the INDEX, MATCH and the EXACT function in Excel to perform a case-sensitive lookup.

Multiple Criteria

Do you want to look up a value based on multiple criteria? Use the INDEX and the MATCH function in Excel to perform a two-column lookup.



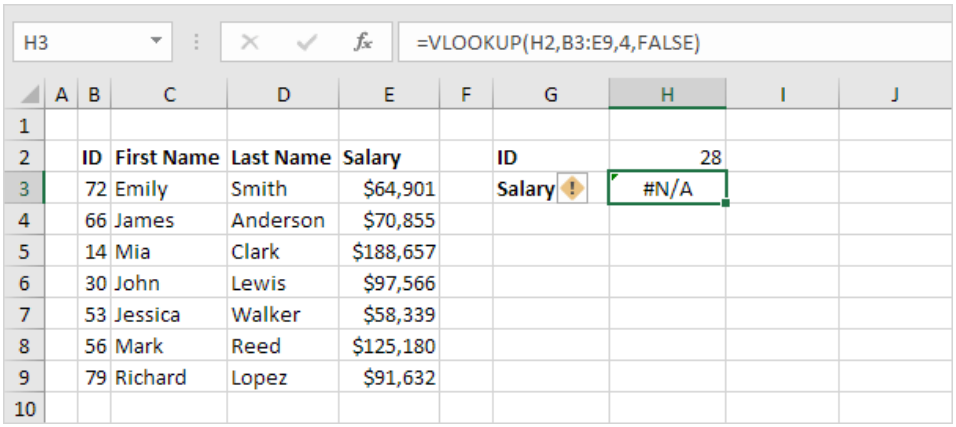
	A	B	C	D	E	F	G	H	I
1									
2		**First Name**	**Last Name**	**Salary**		**First Name**	James		
3		James	Smith	$64,901		**Last Name**	Clark		
4		James	Anderson	$70,855		**Salary**	$188,657		
5		James	Clark	$188,657					
6		John	Lewis	$97,566					
7		John	Walker	$58,339					
8		Mark	Reed	$125,180					
9		Richard	Lopez	$91,632					
10									

Note: the array formula above looks up the salary of James Clark, not James Smith, not James Anderson.

#N/A error

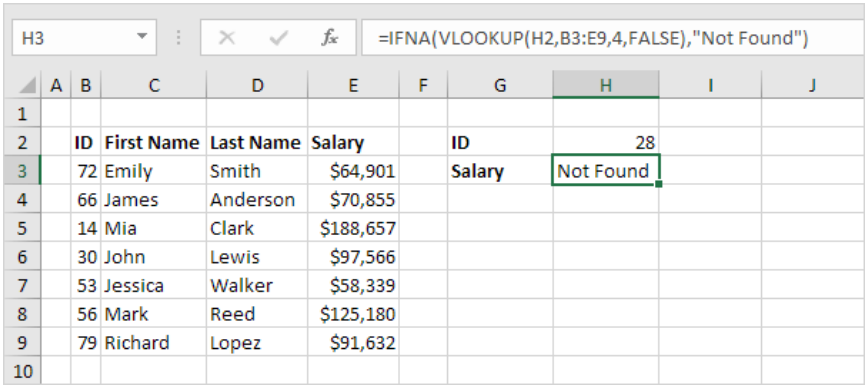
If the VLOOKUP function cannot find a match, it returns a #N/A error.

1. For example, the VLOOKUP function below cannot find the value 28 in the leftmost column.



	A	B	C	D	E	F	G	H	I	J
1										
2		**ID**	**First Name**	**Last Name**	**Salary**		**ID**	28		
3		72	Emily	Smith	$64,901		**Salary**	#N/A		
4		66	James	Anderson	$70,855					
5		14	Mia	Clark	$188,657					
6		30	John	Lewis	$97,566					
7		53	Jessica	Walker	$58,339					
8		56	Mark	Reed	$125,180					
9		79	Richard	Lopez	$91,632					
10										

2. If you like, you can use the IFNA function to replace the #N/A error with a friendly message.



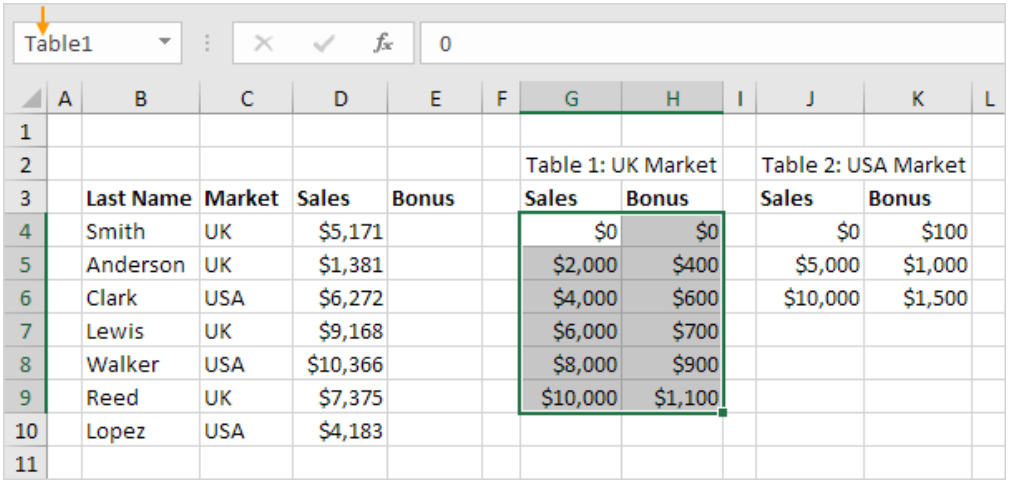
	A	B	C	D	E	F	G	H	I	J
1										
2		**ID**	**First Name**	**Last Name**	**Salary**		**ID**	28		
3		72	Emily	Smith	$64,901		**Salary**	Not Found		
4		66	James	Anderson	$70,855					
5		14	Mia	Clark	$188,657					
6		30	John	Lewis	$97,566					
7		53	Jessica	Walker	$58,339					
8		56	Mark	Reed	$125,180					
9		79	Richard	Lopez	$91,632					
10										

Note: the IFNA function was introduced in Excel 2013. If you're using Excel 2010 or Excel 2007, simply replace IFNA with IFERROR. Remember, the IFERROR function catches other errors as well. For example, the #NAME? error if you accidentally misspell the word VLOOKUP.

Multiple Lookup Tables

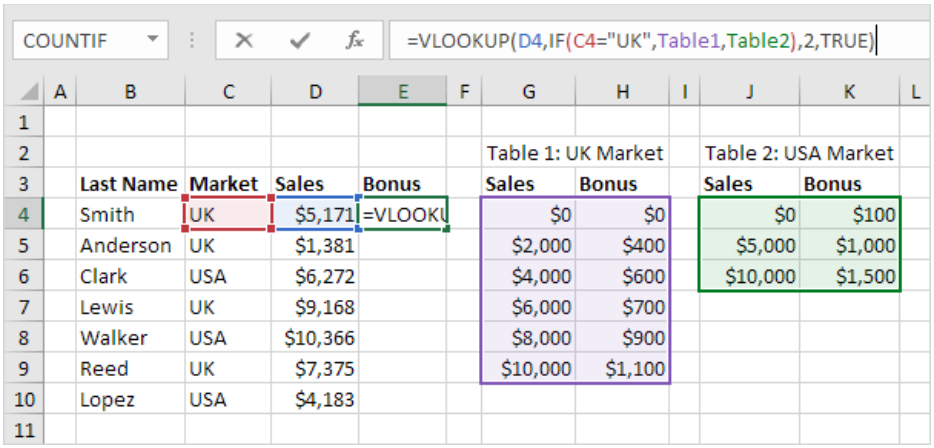
When using the VLOOKUP function in Excel, you can have multiple lookup tables. You can use the IF function to check whether a condition is met, and return one lookup table if TRUE and another lookup table if FALSE.

1. Create two named ranges: Table1 and Table2.



	Last Name	Market	Sales	Bonus	Table 1: UK Market Sales	Table 1: UK Market Bonus	Table 2: USA Market Sales	Table 2: USA Market Bonus
4	Smith	UK	$5,171		$0	$0	$0	$100
5	Anderson	UK	$1,381		$2,000	$400	$5,000	$1,000
6	Clark	USA	$6,272		$4,000	$600	$10,000	$1,500
7	Lewis	UK	$9,168		$6,000	$700		
8	Walker	USA	$10,366		$8,000	$900		
9	Reed	UK	$7,375		$10,000	$1,100		
10	Lopez	USA	$4,183					

2. Select cell E4 and enter the VLOOKUP function shown below.

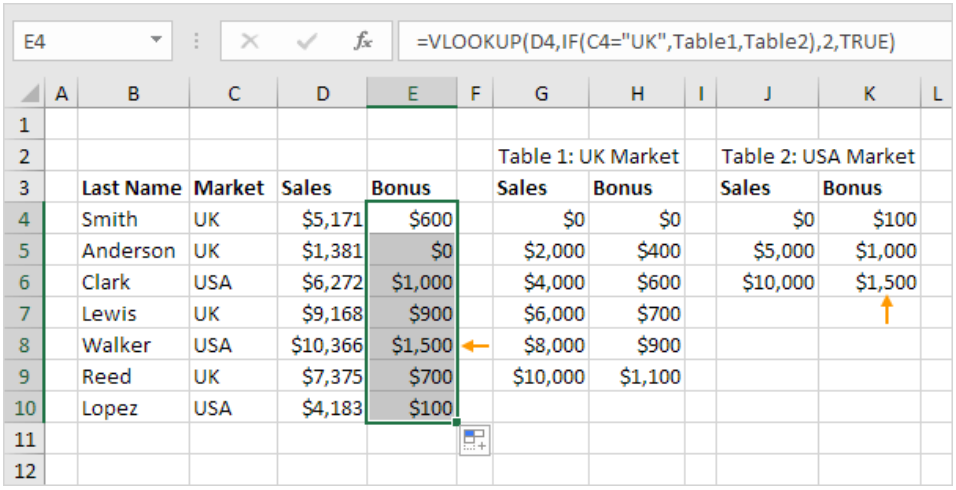


	Last Name	Market	Sales	Bonus	Table 1: UK Market Sales	Table 1: UK Market Bonus	Table 2: USA Market Sales	Table 2: USA Market Bonus
4	Smith	UK	$5,171	=VLOOKU	$0	$0	$0	$100
5	Anderson	UK	$1,381		$2,000	$400	$5,000	$1,000
6	Clark	USA	$6,272		$4,000	$600	$10,000	$1,500
7	Lewis	UK	$9,168		$6,000	$700		
8	Walker	USA	$10,366		$8,000	$900		
9	Reed	UK	$7,375		$10,000	$1,100		
10	Lopez	USA	$4,183					

Explanation: the bonus depends on the market (UK or USA) and the sales amount. The second argument of the VLOOKUP function does the trick. If UK, the VLOOKUP function uses Table1, if USA, the VLOOKUP function uses Table2. Set the fourth argument of the VLOOKUP function to TRUE to return an approximate match.

3. Press Enter.

4. Select cell E4, click on the lower right corner of cell E4 and drag it down to cell E10.



	A	B	C	D	E	F	G	H	I	J	K	L
1												
2							Table 1: UK Market			Table 2: USA Market		
3		Last Name	Market	Sales	Bonus		Sales	Bonus		Sales	Bonus	
4		Smith	UK	$5,171	$600		$0	$0		$0	$100	
5		Anderson	UK	$1,381	$0		$2,000	$400		$5,000	$1,000	
6		Clark	USA	$6,272	$1,000		$4,000	$600		$10,000	$1,500	
7		Lewis	UK	$9,168	$900		$6,000	$700				
8		Walker	USA	$10,366	$1,500		$8,000	$900				
9		Reed	UK	$7,375	$700		$10,000	$1,100				
10		Lopez	USA	$4,183	$100							
11												
12												

Note: for example, Walker receives a bonus of $1,500. Because we're using named ranges, we can easily copy this VLOOKUP function to the other cells without worrying about cell references.

Tax Rates

This example teaches you how to calculate the tax on an income using the VLOOKUP function in Excel. The following tax rates apply to individuals who are residents of Australia.

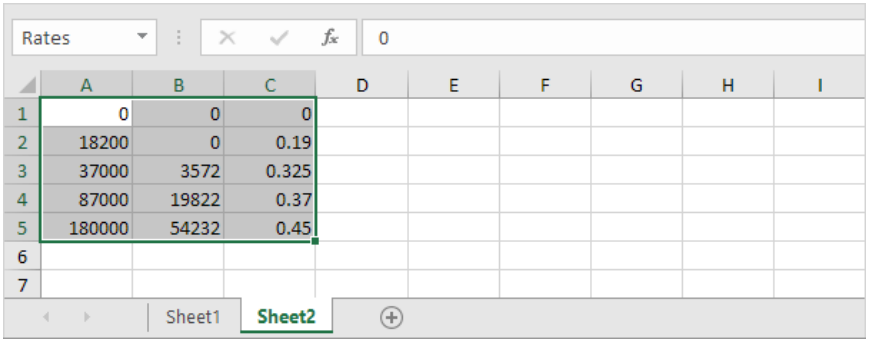
Taxable income	Tax on this income
0 - $18,200	Nil
$18,201 - $37,000	19c for each $1 over $18,200
$37,001 - $87,000	$3,572 plus 32.5c for each $1 over $37,000
$87,001 - $180,000	$19,822 plus 37c for each $1 over $87,000
$180,001 and over	$54,232 plus 45c for each $1 over $180,000

Example: if income is 39000, tax equals 3572 + 0.325 * (39000 - 37000) = 3572 + 650 = $4222

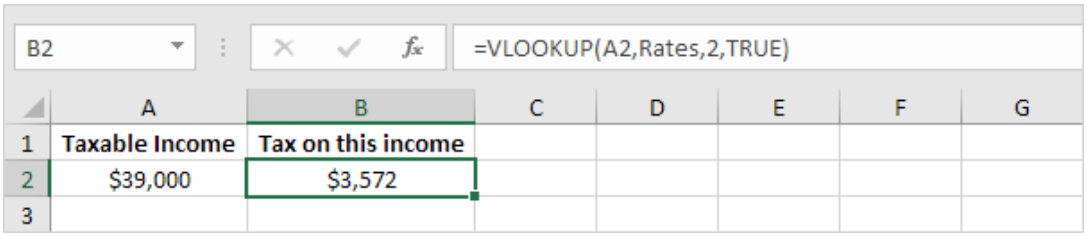
	A	B	C	D	E	F	G
1	Taxable Income	Tax on this income					
2	$39,000	$4,222					
3							

To automatically calculate the tax on an income, execute the following steps.

1. On the second sheet, create the following range and name it Rates.

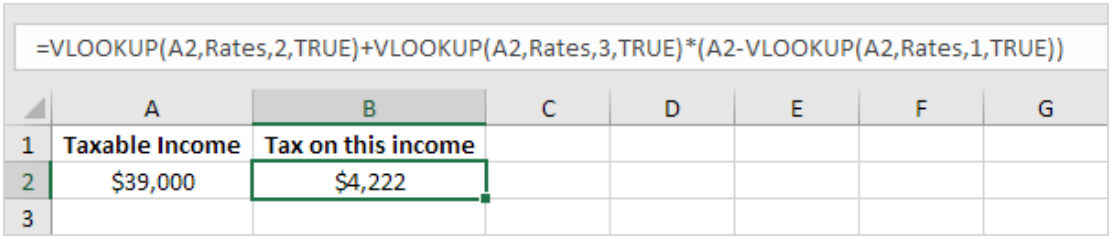


2. When you set the fourth argument of the VLOOKUP function to TRUE, the VLOOKUP function returns an exact match or if not found, it returns the largest value smaller than lookup_value (A2). That's exactly what we want!



Explanation: Excel cannot find 39000 in the first column of Rates. However, it can find 37000 (the largest value smaller than 39000). As a result, it returns 3572 (col_index_num, the third argument, is set to 2).

3. Now, what's left is the remainder of the equation, + 0.325 * (39000 - 37000). This is easy. We can return 0.325 by setting col_index_num to 3 and return 37000 by setting col_index_num to 1. The complete formula below does the trick.



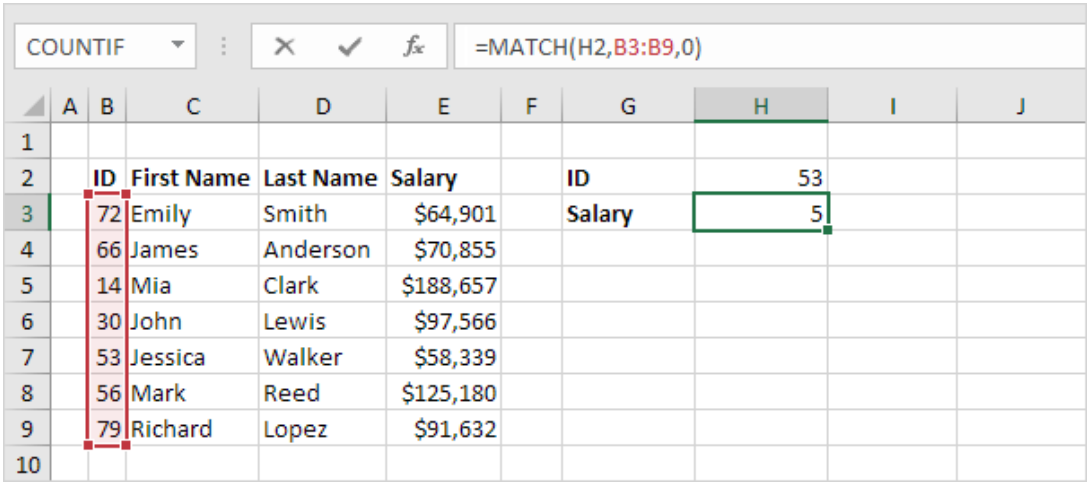
Note: when you set the fourth argument of the VLOOKUP function to TRUE, the first column of the table must be sorted in ascending order.

Index and Match

Use INDEX and MATCH in Excel and impress your boss. Instead of using VLOOKUP, use INDEX and MATCH. To perform advanced lookups, you'll need INDEX and MATCH.

Match

The MATCH function returns the position of a value in a given range. For example, the MATCH function below looks up the value 53 in the range B3:B9.

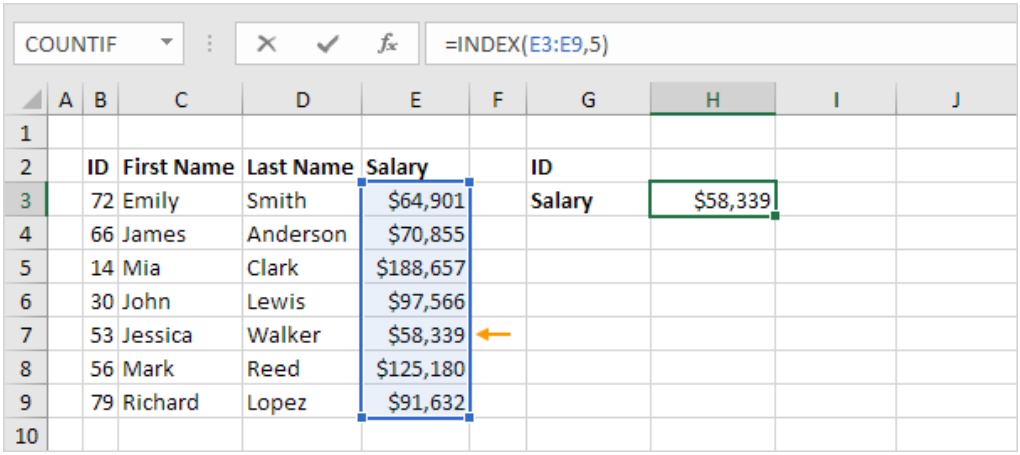


	ID	First Name	Last Name	Salary		ID	53
	72	Emily	Smith	$64,901		Salary	5
	66	James	Anderson	$70,855			
	14	Mia	Clark	$188,657			
	30	John	Lewis	$97,566			
	53	Jessica	Walker	$58,339			
	56	Mark	Reed	$125,180			
	79	Richard	Lopez	$91,632			

Explanation: 53 (first argument) found at position 5 in the range B3:B9 (second argument). In this example, we use the MATCH function to return an exact match so we set the third argument to 0.

Index

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

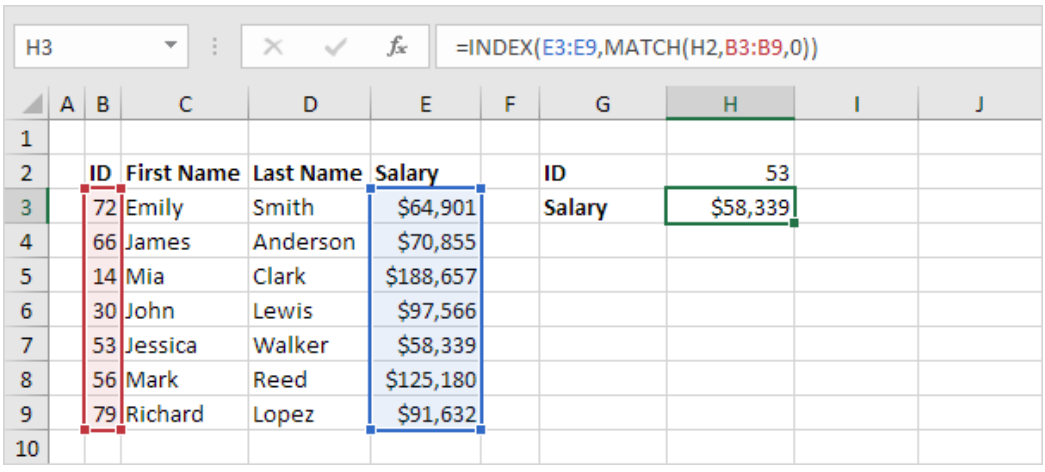


	ID	First Name	Last Name	Salary		ID	
	72	Emily	Smith	$64,901		Salary	$58,339
	66	James	Anderson	$70,855			
	14	Mia	Clark	$188,657			
	30	John	Lewis	$97,566			
	53	Jessica	Walker	$58,339	←		
	56	Mark	Reed	$125,180			
	79	Richard	Lopez	$91,632			

Explanation: the INDEX function returns the 5th value (second argument) in the range E3:E9 (first argument).

Index and Match

Replace the value 5 in the INDEX function (see previous example) with the MATCH function (see first example) to lookup the salary of ID 53.

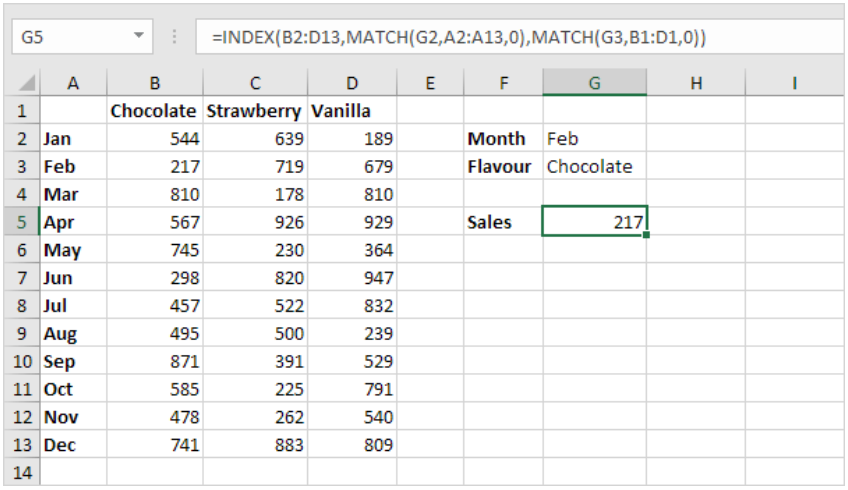


	ID	First Name	Last Name	Salary		ID	53
	72	Emily	Smith	$64,901		Salary	$58,339
	66	James	Anderson	$70,855			
	14	Mia	Clark	$188,657			
	30	John	Lewis	$97,566			
	53	Jessica	Walker	$58,339			
	56	Mark	Reed	$125,180			
	79	Richard	Lopez	$91,632			

Explanation: the MATCH function returns position 5. The INDEX function needs position 5. It's a perfect combination. If you like, you can also use the VLOOKUP function. It's up to you. However, you'll need INDEX and MATCH to perform advanced lookups, as we will see next.

Two-way Lookup

The INDEX function can also return a specific value in a two-dimensional range. For example, use the INDEX and the MATCH function in Excel to perform a two-way-lookup.

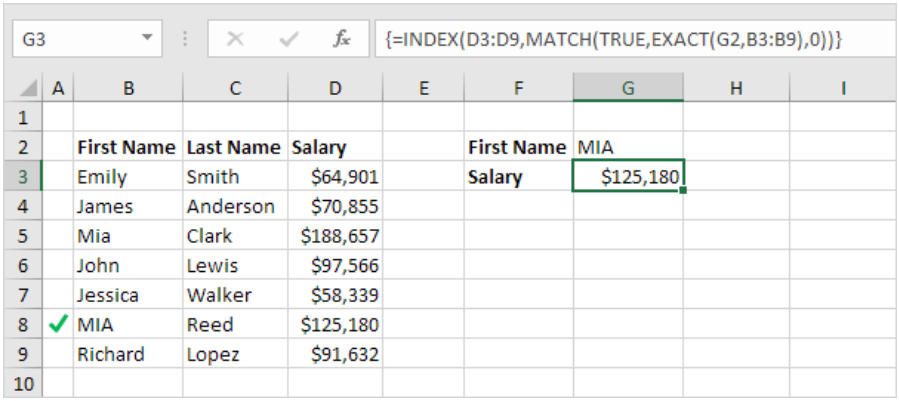


G5 =INDEX(B2:D13,MATCH(G2,A2:A13,0),MATCH(G3,B1:D1,0))

	A	B	C	D	E	F	G	H	I
1		Chocolate	Strawberry	Vanilla					
2	Jan	544	639	189		Month	Feb		
3	Feb	217	719	679		Flavour	Chocolate		
4	Mar	810	178	810					
5	Apr	567	926	929		Sales	217		
6	May	745	230	364					
7	Jun	298	820	947					
8	Jul	457	522	832					
9	Aug	495	500	239					
10	Sep	871	391	529					
11	Oct	585	225	791					
12	Nov	478	262	540					
13	Dec	741	883	809					
14									

Case-sensitive Lookup

By default, the VLOOKUP function performs a case-insensitive lookup. However, you can use the INDEX, MATCH and the EXACT function in Excel to perform a case-sensitive lookup.



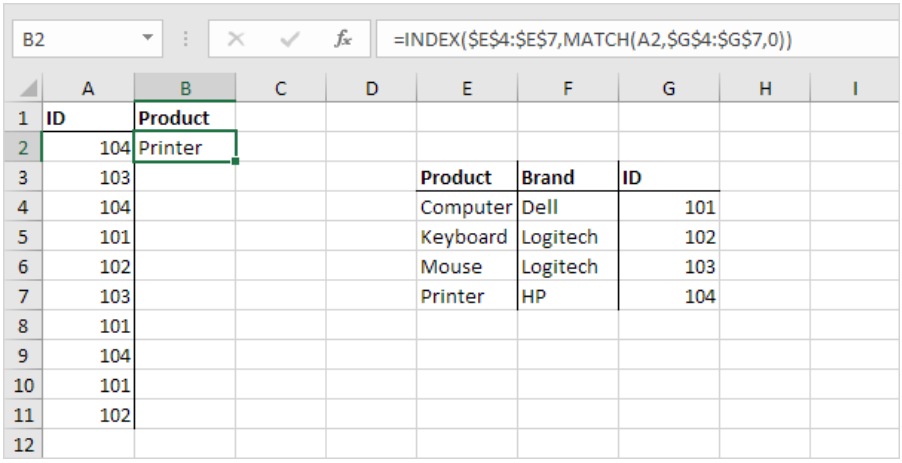
G3 {=INDEX(D3:D9,MATCH(TRUE,EXACT(G2,B3:B9),0))}

	A	B	C	D	E	F	G	H	I
1									
2		First Name	Last Name	Salary		First Name	MIA		
3		Emily	Smith	$64,901		Salary	$125,180		
4		James	Anderson	$70,855					
5		Mia	Clark	$188,657					
6		John	Lewis	$97,566					
7		Jessica	Walker	$58,339					
8	✓	MIA	Reed	$125,180					
9		Richard	Lopez	$91,632					
10									

Note: the formula correctly looks up the salary of MIA Reed, not Mia Clark.

Left Lookup

The VLOOKUP function only looks to the right. No worries, you can use the INDEX and the MATCH function in Excel to perform a left lookup.



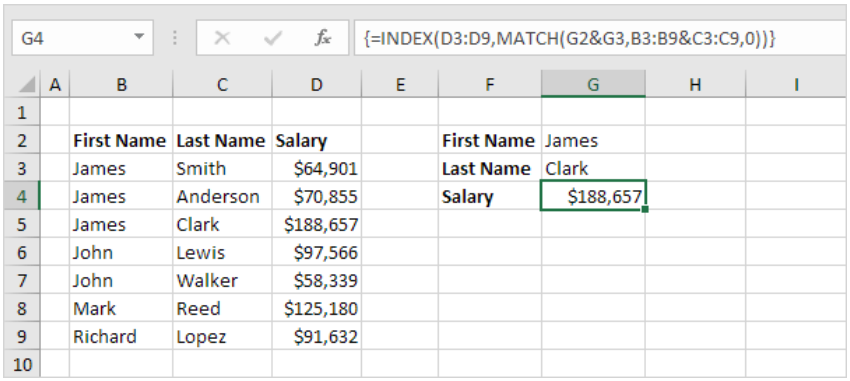
B2 =INDEX($E$4:$E$7,MATCH(A2,$G$4:$G$7,0))

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

Note: when we drag this formula down, the absolute references ($E$4:$E$7 and $G$4:$G$7) stay the same, while the relative reference (A2) changes to A3, A4, A5, etc.

Two-column Lookup

Do you want to look up a value based on multiple criteria? Use the INDEX and the MATCH function in Excel to perform a two-column lookup.



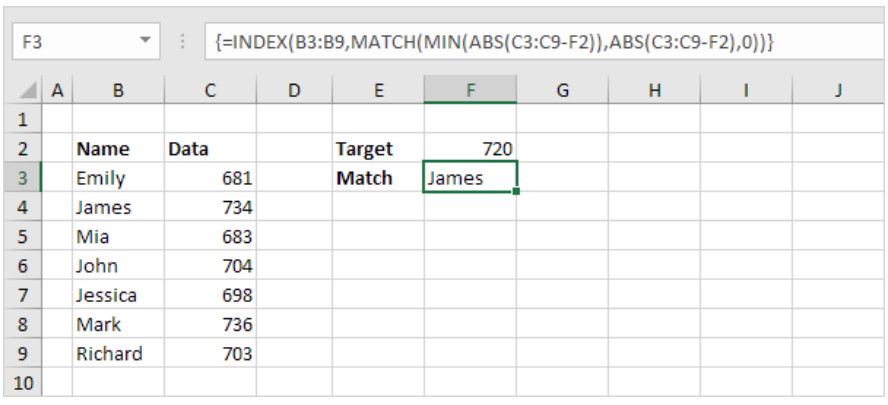
G4 {=INDEX(D3:D9,MATCH(G2&G3,B3:B9&C3:C9,0))}

	A	B	C	D	E	F	G	H	I
1									
2		First Name	Last Name	Salary		First Name	James		
3		James	Smith	$64,901		Last Name	Clark		
4		James	Anderson	$70,855		Salary	$188,657		
5		James	Clark	$188,657					
6		John	Lewis	$97,566					
7		John	Walker	$58,339					
8		Mark	Reed	$125,180					
9		Richard	Lopez	$91,632					
10									

Note: the array formula above looks up the salary of James Clark, not James Smith, not James Anderson.

Closest Match

To find the closest match to a target value in a data column, use the INDEX, MATCH, ABS and the MIN function in Excel.



F3 {=INDEX(B3:B9,MATCH(MIN(ABS(C3:C9-F2)),ABS(C3:C9-F2),0))}

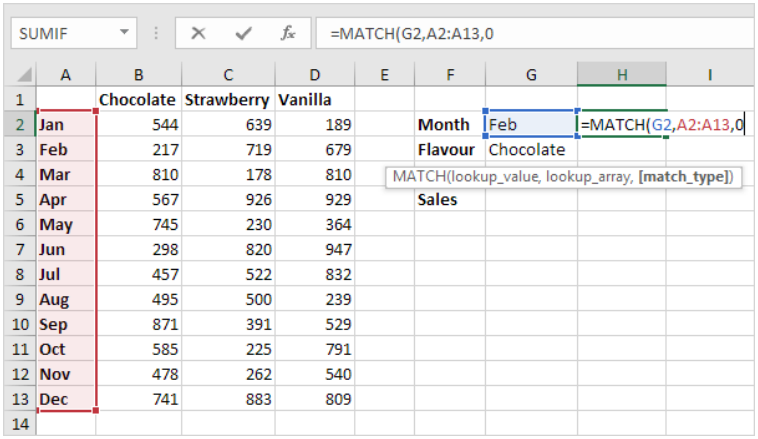
	A	B	C	D	E	F	G	H	I	J
1										
2		Name	Data		Target	720				
3		Emily	681		Match	James				
4		James	734							
5		Mia	683							
6		John	704							
7		Jessica	698							
8		Mark	736							
9		Richard	703							
10										

Two-way Lookup

This example teaches you how to lookup a value in a two-dimensional range. We use the INDEX and the MATCH function in Excel.

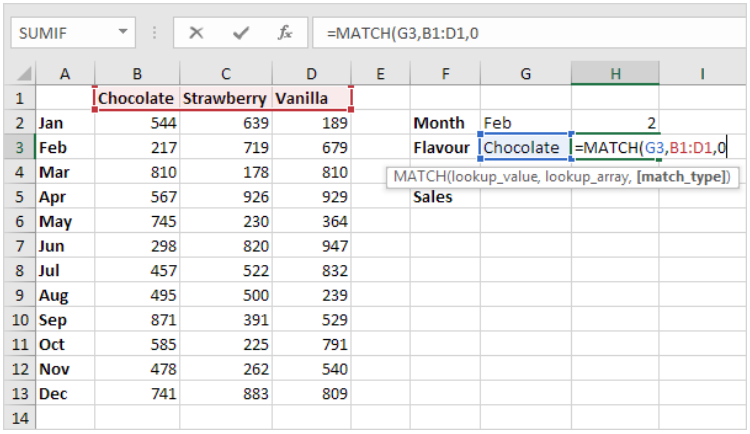
Below you can find the sales of different ice cream flavors in each month.

1. To find the position of Feb in the range A2:A13, use the MATCH function. The result is 2.



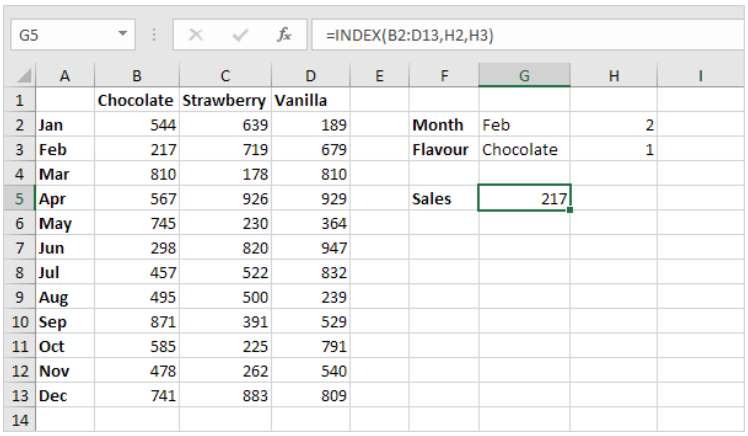
	A	B	C	D	E	F	G	H	I
1		Chocolate	Strawberry	Vanilla					
2	Jan	544	639	189		Month	Feb	=MATCH(G2,A2:A13,0	
3	Feb	217	719	679		Flavour	Chocolate		
4	Mar	810	178	810					
5	Apr	567	926	929		Sales			
6	May	745	230	364					
7	Jun	298	820	947					
8	Jul	457	522	832					
9	Aug	495	500	239					
10	Sep	871	391	529					
11	Oct	585	225	791					
12	Nov	478	262	540					
13	Dec	741	883	809					
14									

2. To find the position of Chocolate in the range B1:D1, use the MATCH function. The result is 1.



	A	B	C	D	E	F	G	H	I
1		Chocolate	Strawberry	Vanilla					
2	Jan	544	639	189		Month	Feb	2	
3	Feb	217	719	679		Flavour	Chocolate	=MATCH(G3,B1:D1,0	
4	Mar	810	178	810					
5	Apr	567	926	929		Sales			
6	May	745	230	364					
7	Jun	298	820	947					
8	Jul	457	522	832					
9	Aug	495	500	239					
10	Sep	871	391	529					
11	Oct	585	225	791					
12	Nov	478	262	540					
13	Dec	741	883	809					
14									

3. Use these results and the INDEX function to find the sales of Chocolate in February.



	A	B	C	D	E	F	G	H	I
1		Chocolate	Strawberry	Vanilla					
2	Jan	544	639	189		Month	Feb	2	
3	Feb	217	719	679		Flavour	Chocolate	1	
4	Mar	810	178	810					
5	Apr	567	926	929		Sales	217		
6	May	745	230	364					
7	Jun	298	820	947					
8	Jul	457	522	832					
9	Aug	495	500	239					
10	Sep	871	391	529					
11	Oct	585	225	791					
12	Nov	478	262	540					
13	Dec	741	883	809					
14									

Explanation: 217 found at the intersection of row 2 and column 1 in the range B2:D13.

4. Put it all together.

G5 =INDEX(B2:D13,MATCH(G2,A2:A13,0),MATCH(G3,B1:D1,0))

	A	B	C	D	E	F	G	H	I
1		Chocolate	Strawberry	Vanilla					
2	Jan	544	639	189		Month	Feb		
3	Feb	217	719	679		Flavour	Chocolate		
4	Mar	810	178	810					
5	Apr	567	926	929		Sales	217		
6	May	745	230	364					
7	Jun	298	820	947					
8	Jul	457	522	832					
9	Aug	495	500	239					
10	Sep	871	391	529					
11	Oct	585	225	791					
12	Nov	478	262	540					
13	Dec	741	883	809					
14									