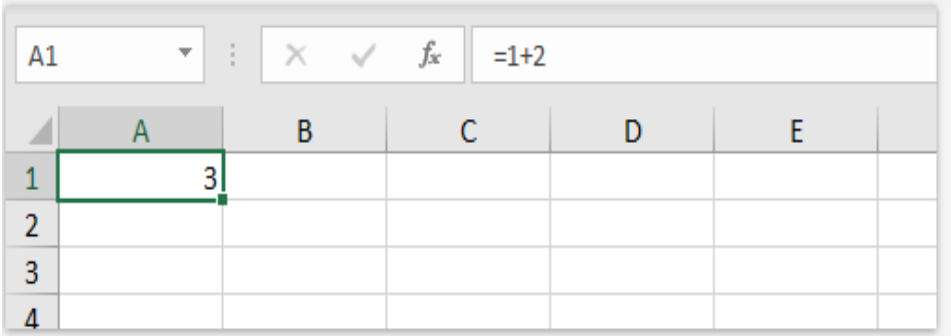
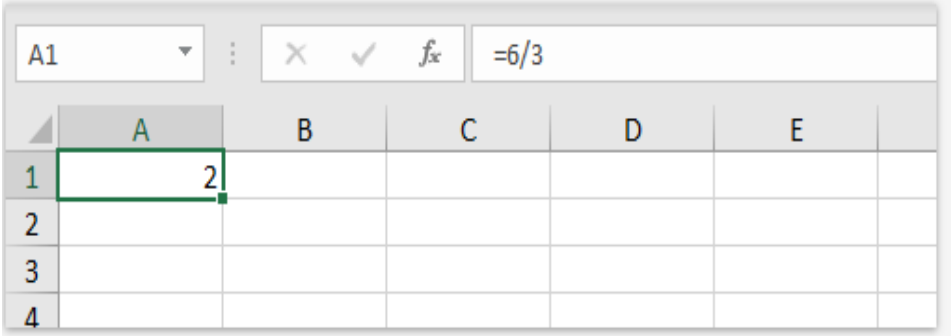
What is a Formula?

A formula in Excel is an expression that returns a specific result. For example:

```
=1+2 // returns 3
```




```
=6/3 // returns 2
```



Note: all formulas in Excel must begin with an equals sign (=).

Math Operators

The table below shows the standard math operators available in Excel:

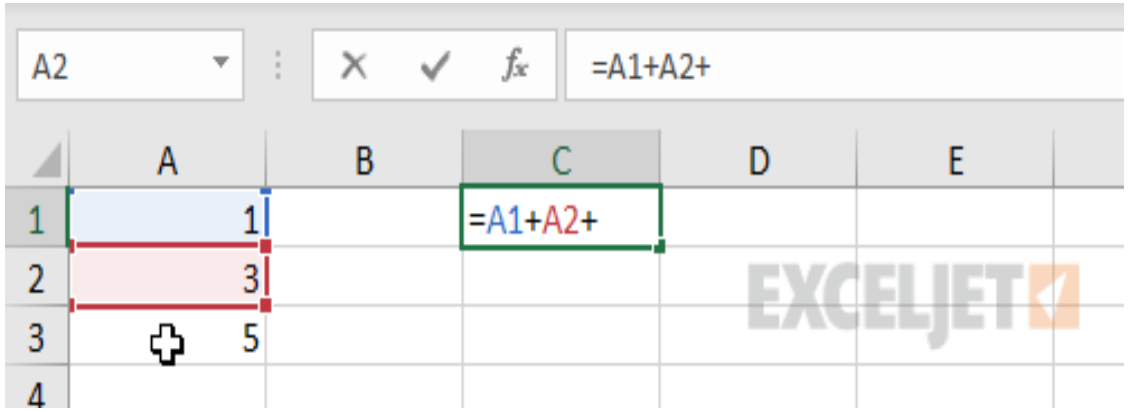
Symbol	Operation	Example
+	Addition	=2+3=5
-	Subtraction	=9-2=7
*	Multiplication	=6*7=42
/	Division	=9/3=3
^	Exponentiation	=4^2=16
()	Parentheses	=(2+4)/3=2

How to Enter a Formula

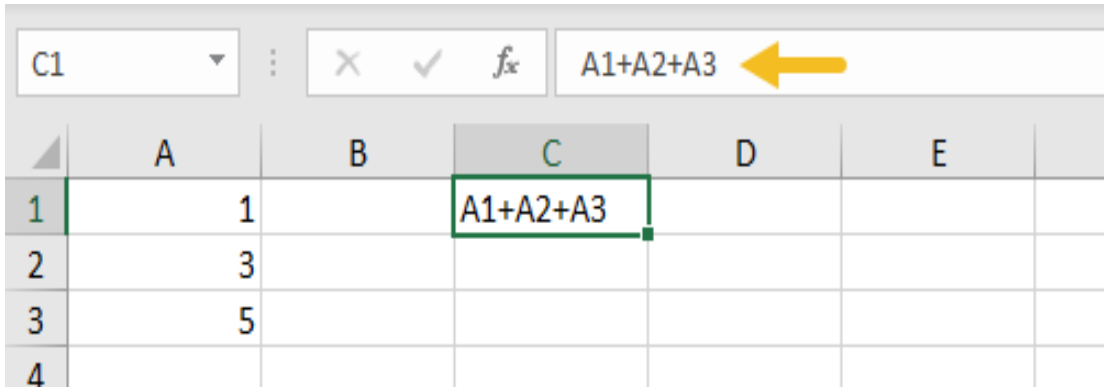
To Enter a Formula:

1. Select a cell
2. Enter an equals sign (=)
3. Type the formula, and press enter.

Instead of typing cell references, you can point and click, as seen below. Note references are color-coded:



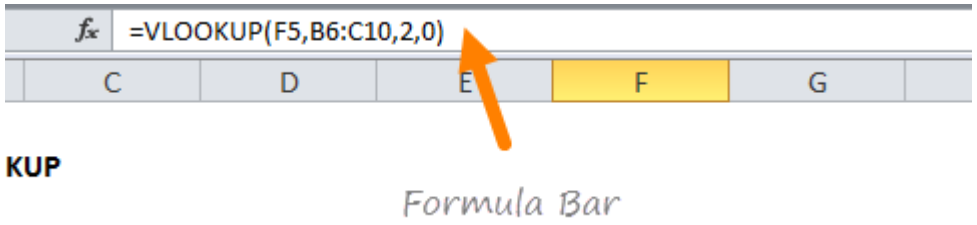
All formulas in Excel must begin with an equals sign (=). No equals sign, no formula:



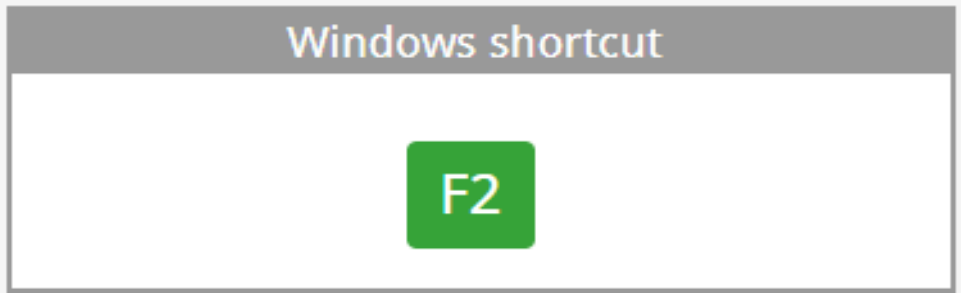
How to Change a Formula

To edit a formula, you have 3 options:

1. Select the cell, edit in the formula bar
2. Double-click the cell, edit directly
3. Select the cell, press F2, edit directly



No matter which option you use, press Enter to confirm changes when done. If you want to cancel, and leave the formula unchanged, click the Escape key.



What is a Function?

Working in Excel, you will hear the words "formula" and "function" used frequently, sometimes interchangeably. They are closely related, but not exactly the same. Technically, a formula is *any* expression that begins with an equals sign (=).

A function, on the other hand, is a formula with a special name and purpose. In most cases, functions have names that reflect their intended use. For example, you probably know the SUM function already, which returns the sum of given references:

```
=SUM(1,2,3) // returns 6
=SUM(A1:A3) // returns A1+A2+A3
```

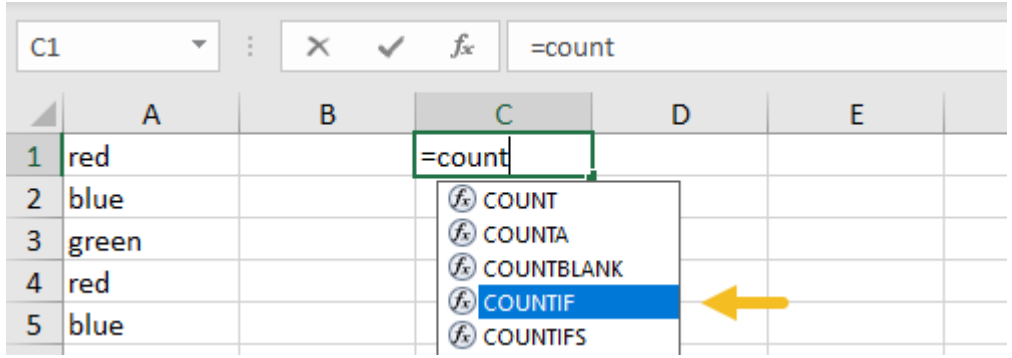
And the MIN and MAX functions return minimum and maximum values, respectively:

```
=MIN(1,2,3) // returns 1
=MAX(1,2,3) // returns 3
```

How to Enter a function

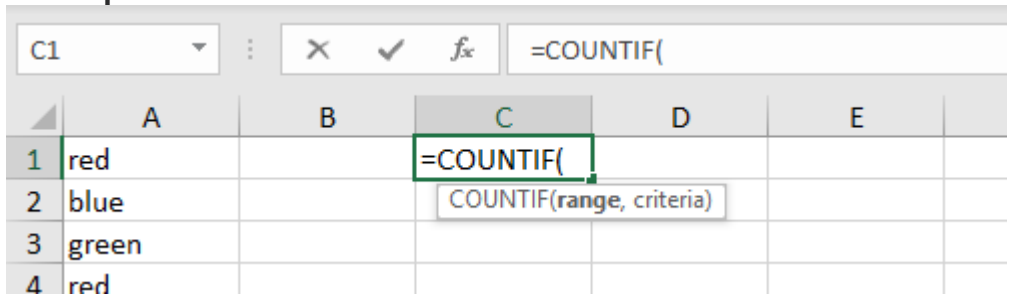
If you know the name of the function, just start typing. Here are the steps:

1. Enter equals sign (=) and start typing. Excel will list of matching functions based as you type:

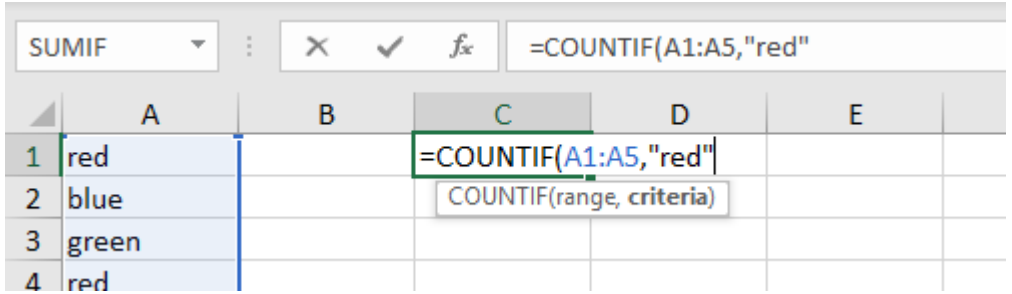


When you see the function you want in the list, use the arrow keys to select (or just keep typing).

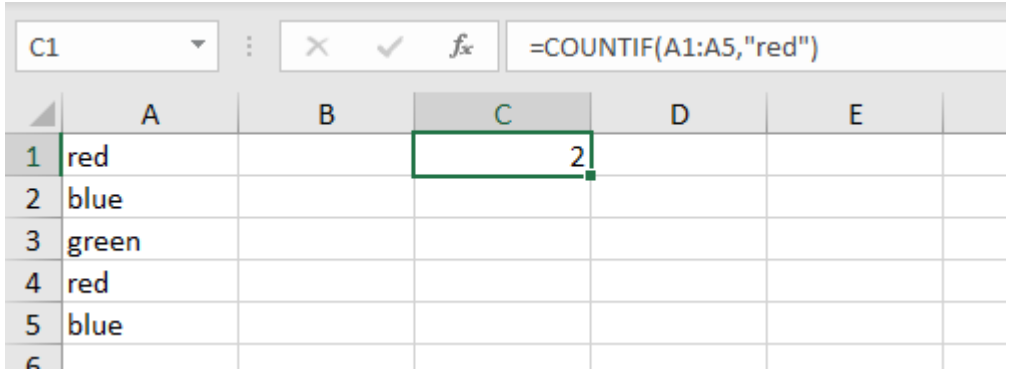
2. Type the Tab key to accept a function. Excel will complete the function:



3. Fill in required arguments:



4. Press Enter to confirm formula:



Function Arguments

Most functions require inputs to return a result. These inputs are called "arguments". A function's arguments appear after the function name, inside parentheses, separated by commas. All functions require a matching opening and closing parentheses (). The pattern looks like this:

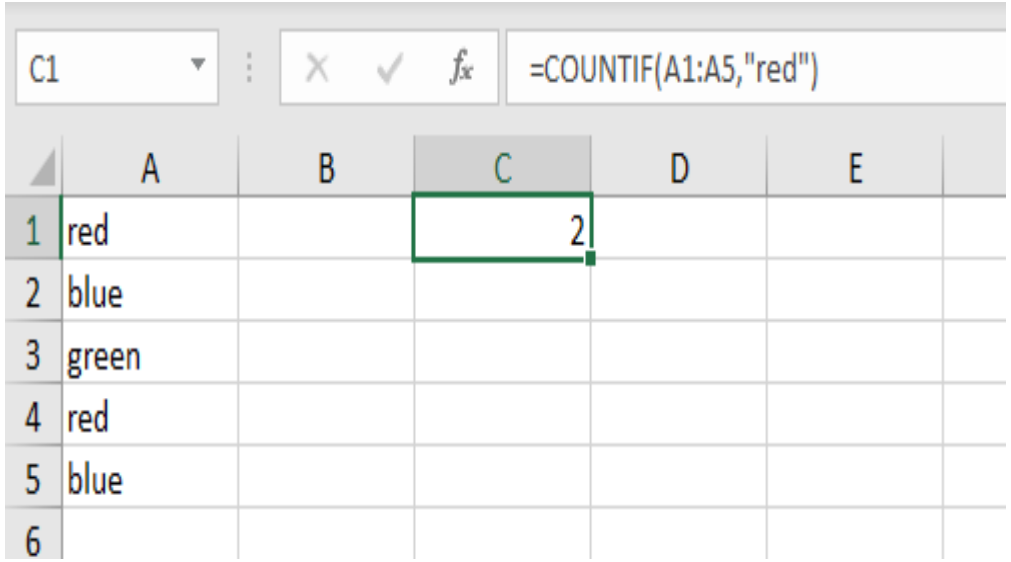
```
=FUNCTIONNAME(argument1,argument2,argument3)
```

For example, the COUNTIF function counts cells that meet criteria, and takes two arguments, *range* and *criteria*:

```
=COUNTIF(range,criteria) // two arguments
```

In the screen below, range is A1:A5 and criteria is "red". The formula in C1 is:

```
=COUNTIF(A1:A5,"red") // returns 2
```



Logical Operators

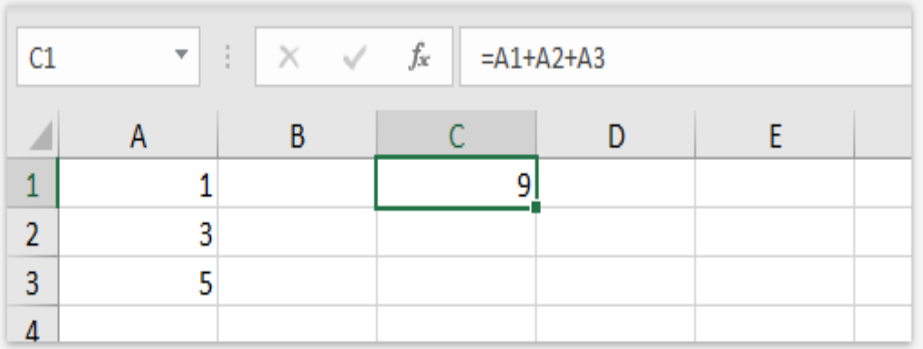
Logical operators provide support for comparisons such as "greater than", "less than", etc. The logical operators available in Excel are shown in the table below:

Operator	Meaning	Example
=	Equal to	=A1=10
<>	Not equal to	=A1<>10
>	Greater than	=A1>100
<	Less than	=A1<100
>=	Greater than or equal to	=A1>=75
<=	Less than or equal to	=A1<0

Cell References

In the examples above, values are "hardcoded". That means results won't change unless you edit the formula again and change a value manually. Generally, this is considered bad form, because it hides information and makes it harder to maintain a spreadsheet. Instead, use cell references so values can be changed at any time. In the screen below, C1 contains the following formula:

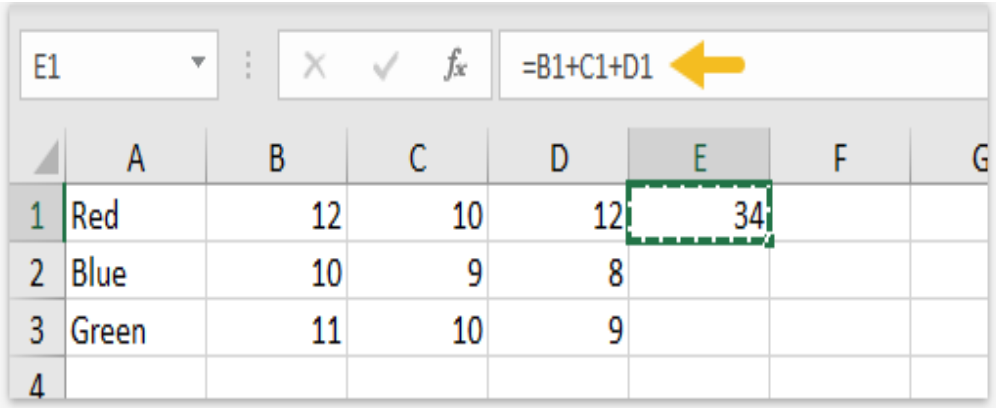
```
= A1 + A2 + A3 // returns 9
```



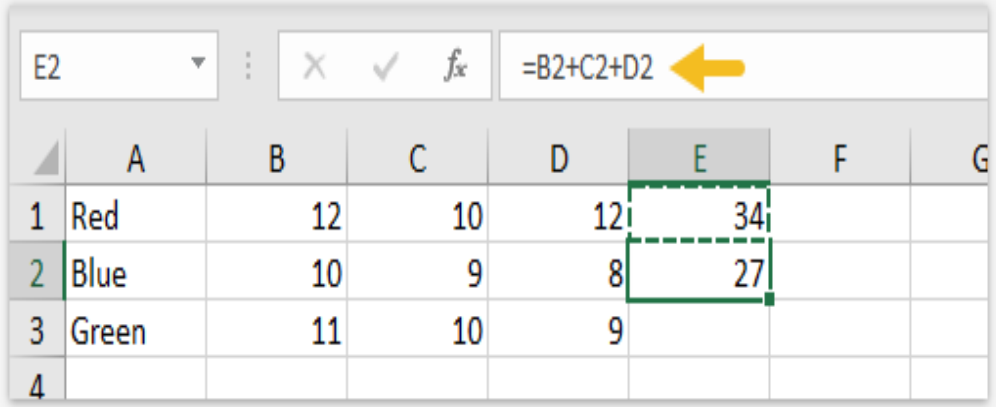
Notice because we are using cell references for A1, A2, and A3, these values can be changed at any time and C1 will still show an accurate result.

Copy And Paste Formulas

The beauty of cell references is that they automatically update when a formula is copied to a new location. This means you don't need to enter the same basic formula again and again. In the screen below, the formula in E1 has been copied to the clipboard with Control + C:



Below: formula pasted to cell E2 with Control + V. Notice cell references have changed:



Same formula pasted to E3. Cell addresses are updated again:

Relative and Absolute References

The cell references above are called *relative* references. This means the reference is relative to the cell it lives in.

```
= B1 + C1 + D1 // formula in E1
```

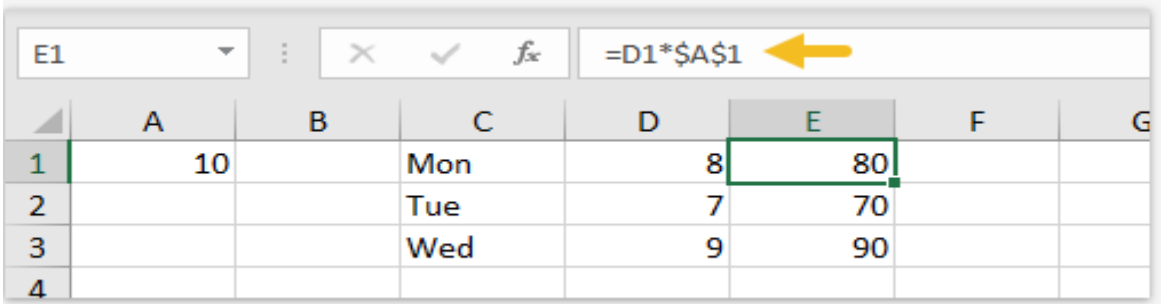
Literally, this means "cell 3 columns left "+ "cell 2 columns left" + "cell 1 column left". That's why, when the formula is copied down to cell E2, it continues to work in the same way.

Relative references are extremely useful, but there are times when you don't want a cell reference to change. A cell reference that won't change when copied is called an *absolute reference*. To make a reference absolute, use the dollar symbol ($):

```
= A1 // relative reference
= $A$1 // absolute reference
```

Tip: you can toggle between relative and absolute syntax with the F4 key.

For example, in the screen below, we want to multiply each value in column D by 10, which is entered in A1. By using an absolute reference for A1, we "lock" that reference so it won't change when the formula is copied to E2 and E3:



Here are the final formulas in E1, E2, and E3:

```
= D1 * $A$1 // formula in E1
= D2 * $A$1 // formula in E2
= D3 * $A$1 // formula in E3
```

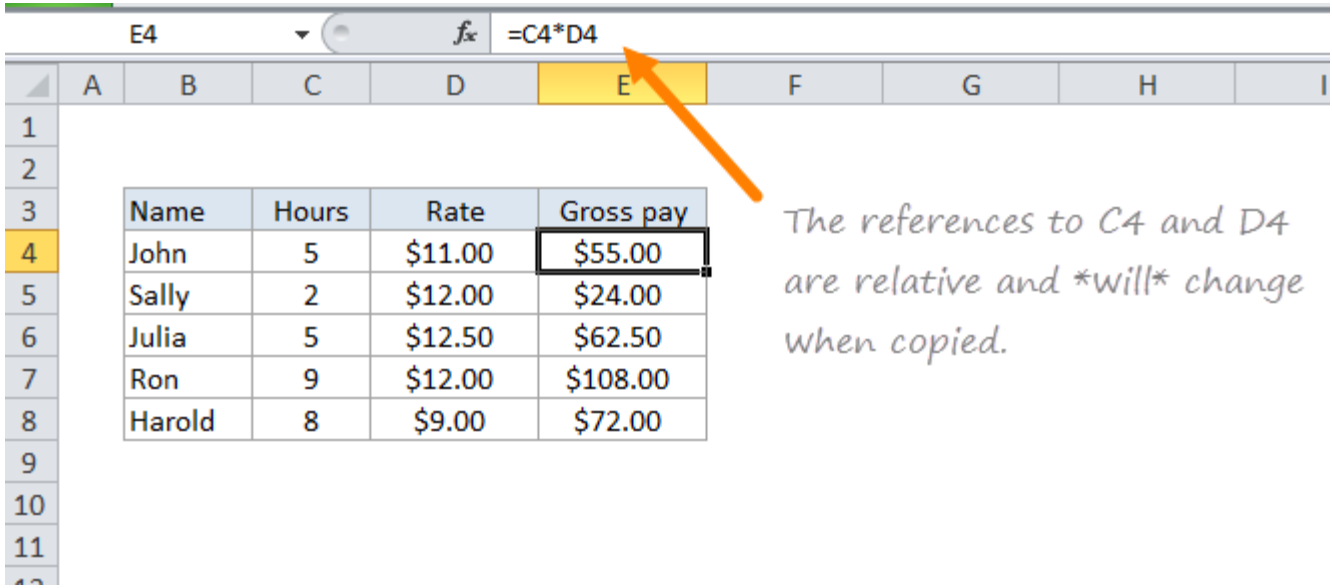
```
=$A1 // column locked
=A$1 // row locked
=$A$1:A2 // first cell locked
```

Relative References

A relative reference in Excel is a pointer to a cell or range of cells. For example, a relative reference to cell A1 looks like this:

```
=A1
```

A relative addresses will change when copied to other location in a worksheet because it describes the "offset" to another cell, rather than a fixed address. To help understand what this means, consider the phrase "the house next door to the right". You can only understand the location of this house if you understand the starting point, because the location is described in relative terms. By default, all references in Excel formulas are relative. You can convert a relative reference to absolute reference with by using dollar sign ($) characters.



Example:

In the example shown, the formula in E4 contains two relative references that will change as follows when copied down column E:

```
=C4*D4
=C5*D5
=C6*D6
=C7*D7
=C8*D8
```

Absolute References

An absolute reference in Excel refers to a reference that is "locked" so that rows and columns won't change when copied. Unlike a relative reference, an absolute reference refers to an actual fixed location on a worksheet.
To create an absolute reference in Excel, add a dollar sign before the row and column. For example, an absolute reference to A1 looks like this:

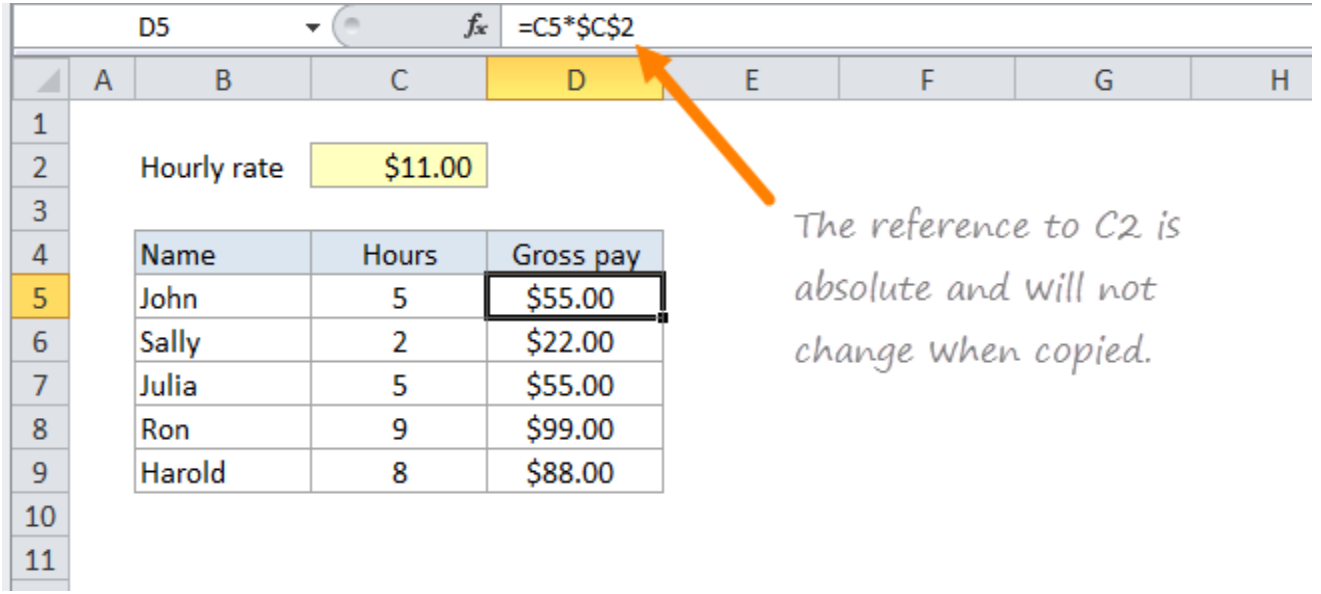
```
=$A$1
```

An absolute reference for the range A1:A10 looks like this:

```
=$A$1:$A$10
```

Example:
In the example shown, the formula in D5 will change like this when copied down column D:

```
=C5*$C$2
=C6*$C$2
=C7*$C$2
=C8*$C$2
=C9*$C$2
```



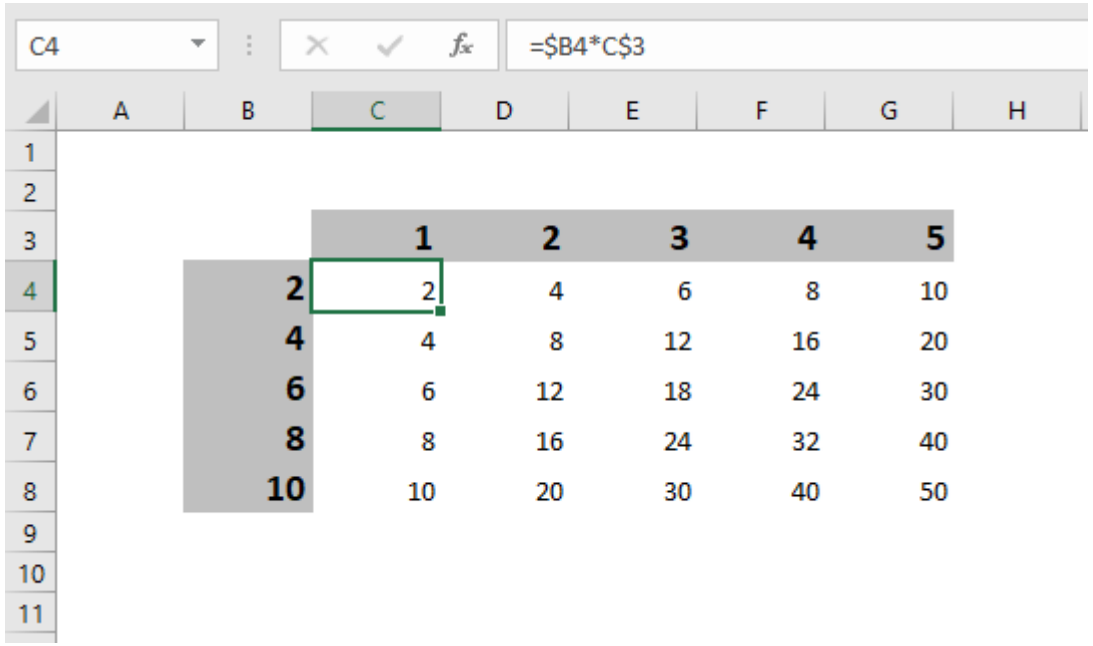
Note that the absolute reference to C2, which hold the hourly rate does not change, while the reference to hours in C5 changes with each new row.

Toggle between absolute and relative addresses
When entering formulas, you can use a keyboard shortcut to F4 without typing dollar signs ($) manually.

Mixed References

An mixed reference in Excel is a reference where part of the reference is absolute and part is relative. For example, the following references have both relative and absolute components:

```
=$A1 // column locked
=A$1 // row locked
=$A$1:A2 // first cell locked
```



Mixed references can be used to set up formulas that can be copied across rows or columns without the need for manual editing. In some cases (3rd example above) they can be used to create a reference that will expand when copied.

Mixed references are a common feature in well-designed worksheets. They are harder to set up, but they make formulas much easier to enter. In addition, they significantly reduce errors since they allow the same formula to be copied to many cells without manual edits.

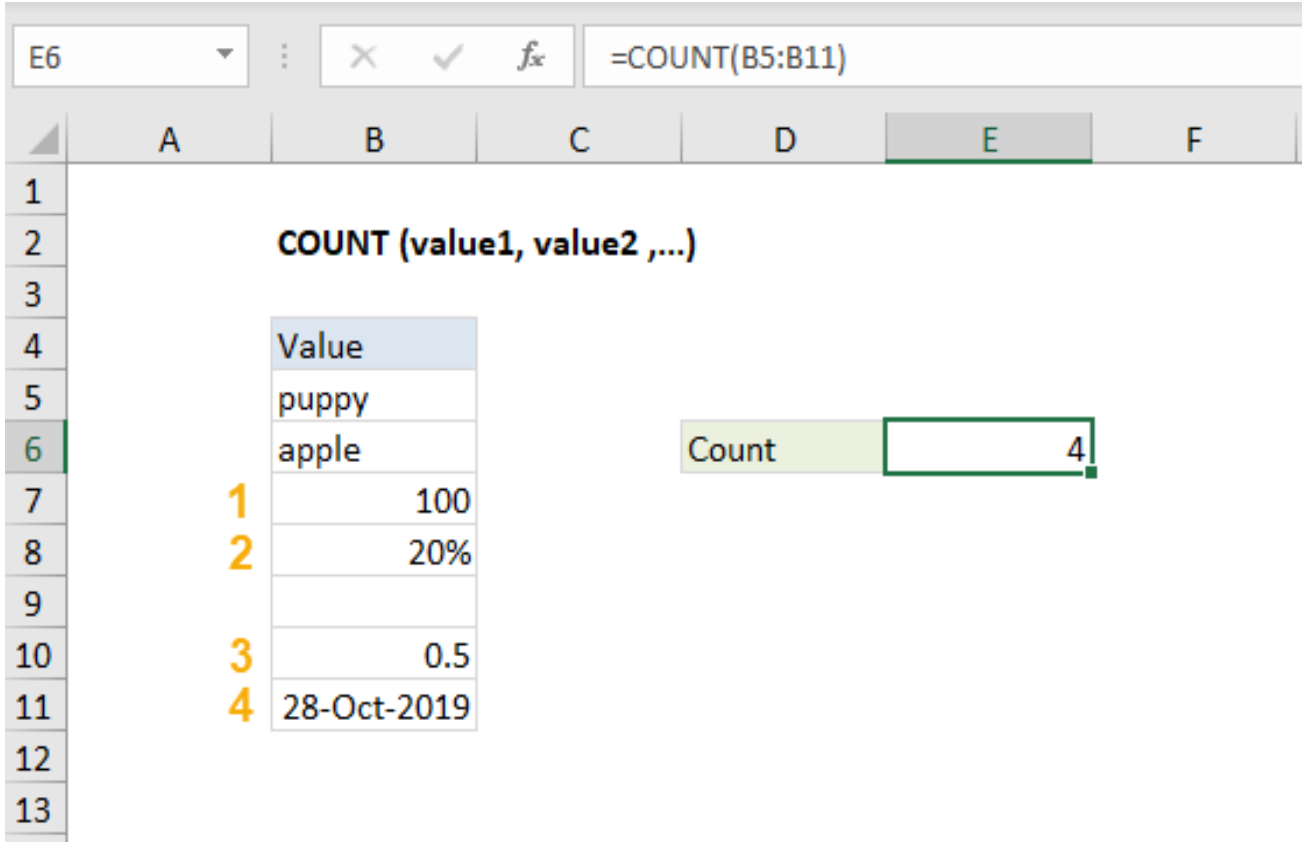
COUNT Function

Summary:
The Excel COUNT function returns the count of values that are numbers, generally cells that contain numbers. Values can be supplied as constants, cell references, or ranges.

Purpose:
Count numbers

Return value:
Count of numeric values

Syntax:
=COUNT (value1, [value2], ...)



Arguments:

value1 - An item, cell reference, or range.
value2 - [optional] An item, cell reference, or range.

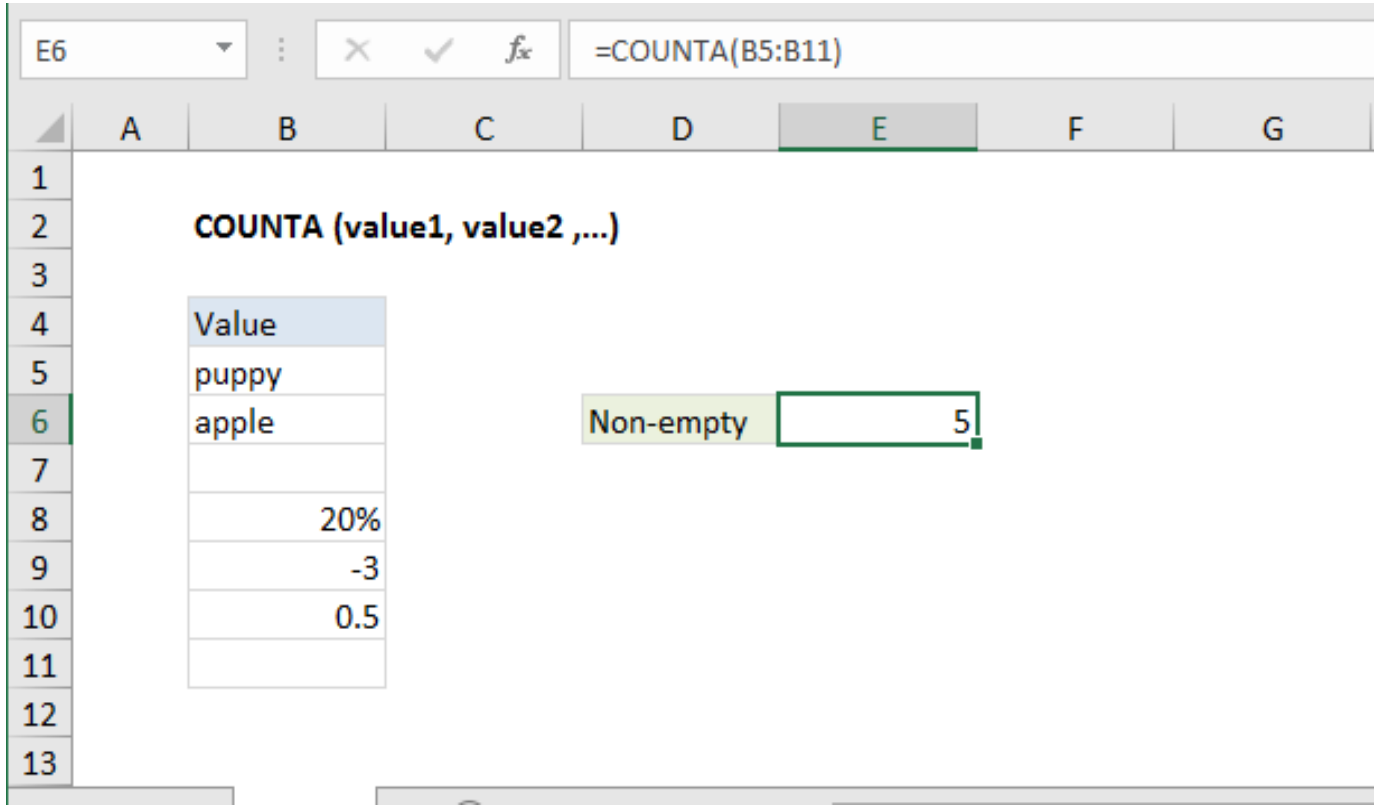
COUNTA Function

Summary:
The Excel COUNTA function returns the count of cells that contain numbers, text, logical values, error values, and empty text (""). COUNTA does not count empty cells.

Purpose:
Count the number of non-blank cells

Return value:
A number representing non-blank cells.

Syntax:
=COUNTA (value1, [value2], ...)



Arguments:

value1 - An item, cell reference, or range.
value2 - [optional] An item, cell reference, or range.

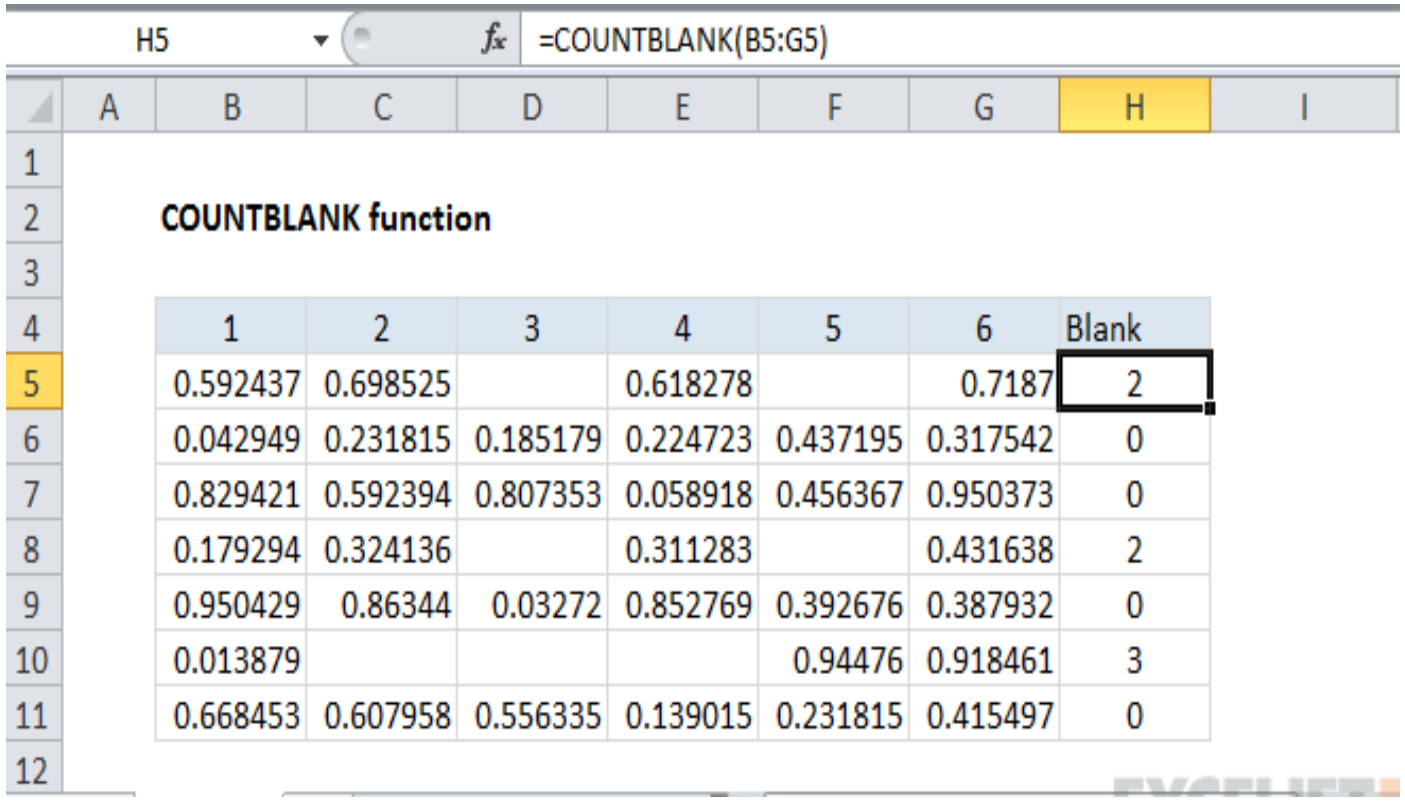
COUNTBLANK Function

Summary:
The Excel COUNTBLANK function returns a count of empty cells in a range. Cells that contain text, numbers, errors, etc. are not counted. Formulas that return empty text are counted.

Purpose:
Count cells that are blank

Return value:
A number representing blank cells

Syntax:
=COUNTBLANK (range)



	1	2	3	4	5	6	Blank
5	0.592437	0.698525		0.618278		0.7187	2
6	0.042949	0.231815	0.185179	0.224723	0.437195	0.317542	0
7	0.829421	0.592394	0.807353	0.058918	0.456367	0.950373	0
8	0.179294	0.324136		0.311283		0.431638	2
9	0.950429	0.86344	0.03272	0.852769	0.392676	0.387932	0
10	0.013879				0.94476	0.918461	3
11	0.668453	0.607958	0.556335	0.139015	0.231815	0.415497	0

Arguments:

range - The range in which to count blank cells.

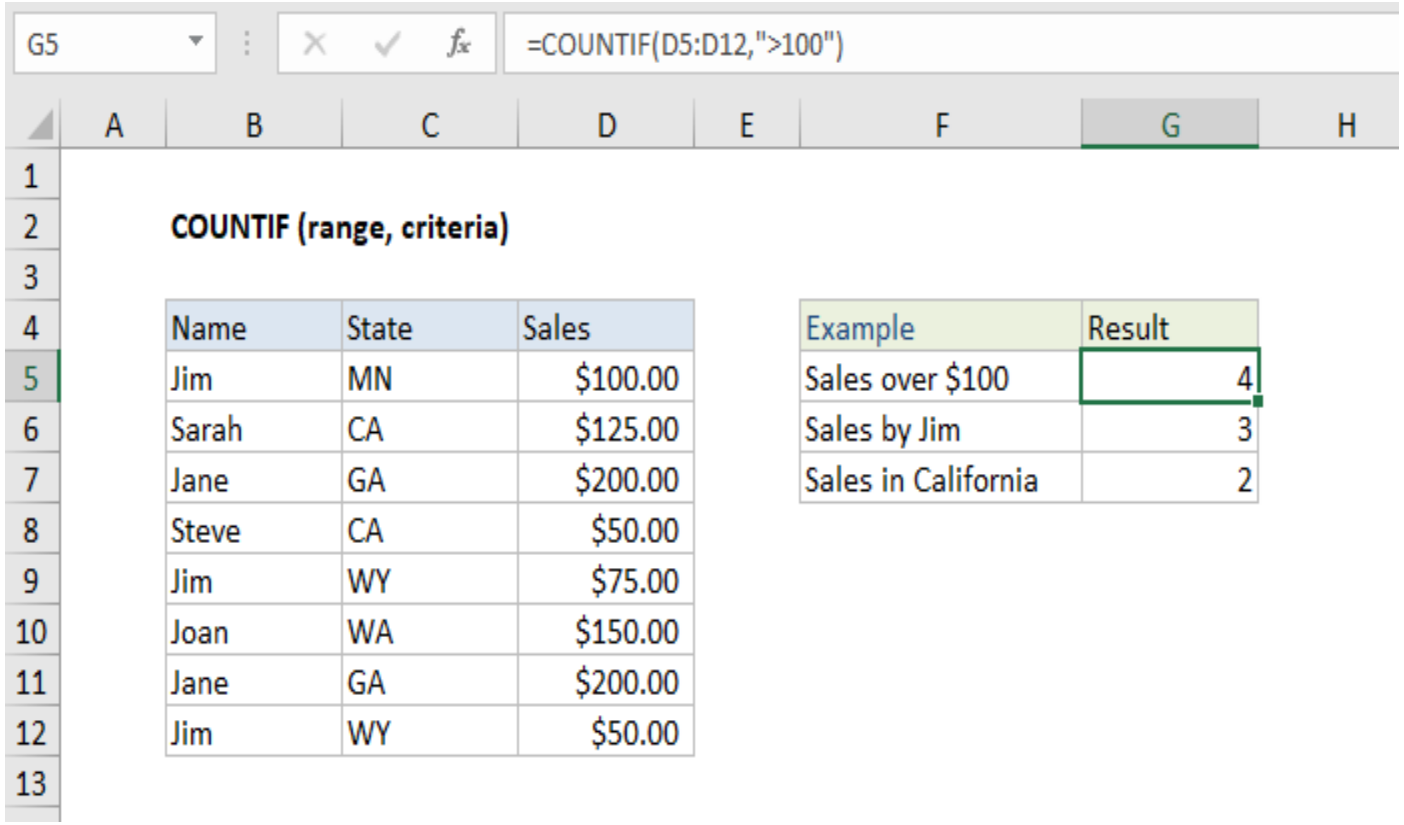
COUNTIF Function

Summary:
COUNTIF is a function to count cells that meet a single criterion. COUNTIF can be used to count cells with dates, numbers, and text that meet specific criteria. The COUNTIF function supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:
Count cells that match criteria

Return value:
A number representing cells counted.

Syntax:
=COUNTIF (range, criteria)



Arguments:

range - The range of cells to count.
criteria - The criteria that controls which cells should be counted.

COUNTIFS Function

Summary:

The Excel COUNTIFS function returns the count of cells that meet one or more criteria. COUNTIFS can be used with criteria based on dates, numbers, text, and other conditions. COUNTIFS supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:

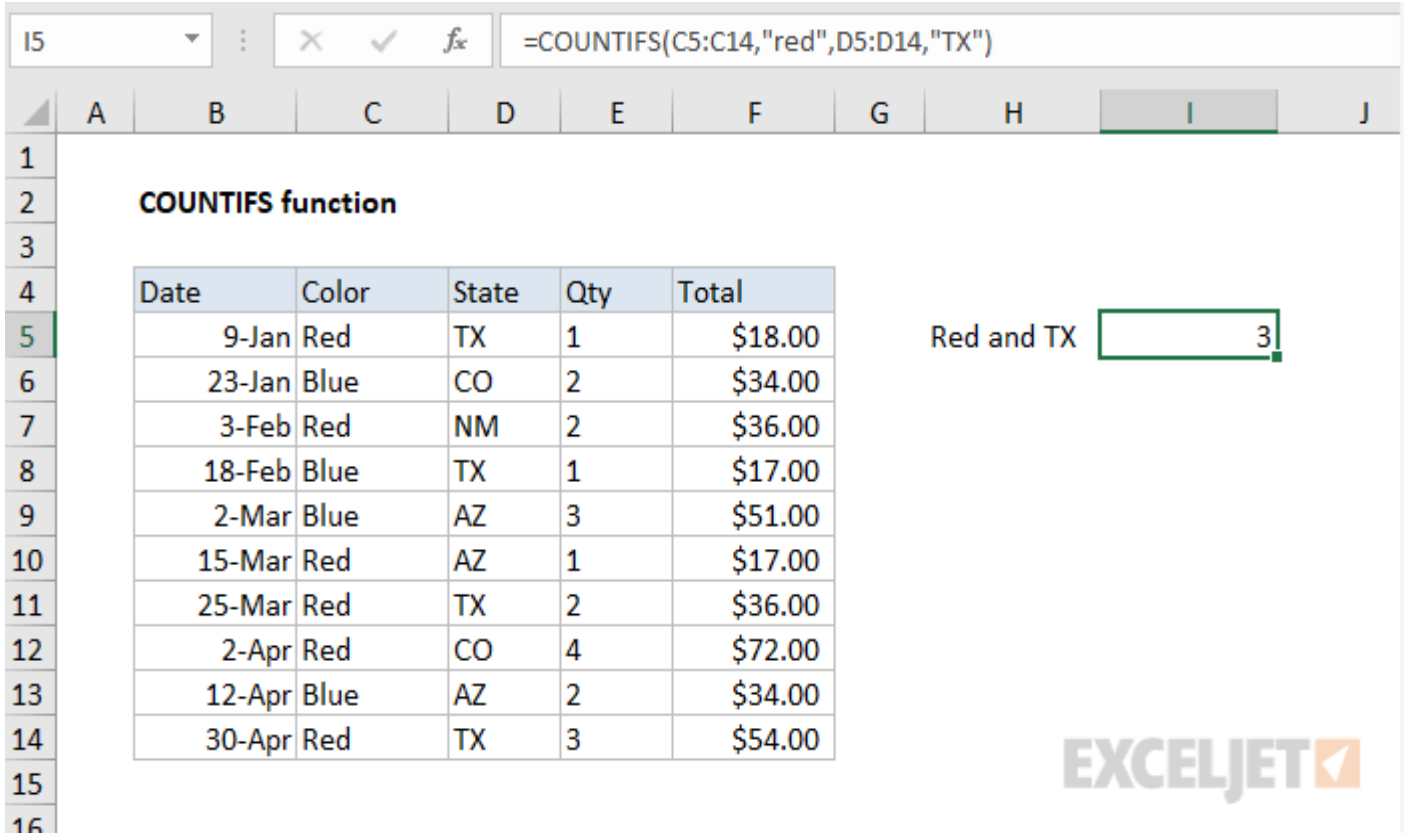
Count cells that match multiple criteria

Return value:

The number of times criteria are met

Syntax:

=COUNTIFS (range1, criteria1, [range2], [criteria2], ...)



Date	Color	State	Qty	Total
9-Jan	Red	TX	1	$18.00
23-Jan	Blue	CO	2	$34.00
3-Feb	Red	NM	2	$36.00
18-Feb	Blue	TX	1	$17.00
2-Mar	Blue	AZ	3	$51.00
15-Mar	Red	AZ	1	$17.00
25-Mar	Red	TX	2	$36.00
2-Apr	Red	CO	4	$72.00
12-Apr	Blue	AZ	2	$34.00
30-Apr	Red	TX	3	$54.00

Arguments:

range1 - The first range to evaulate.
criteria1 - The criteria to use on range1.
range2 - [optional] The second range to evaluate.
criteria2 - [optional] The criteria to use on range2.

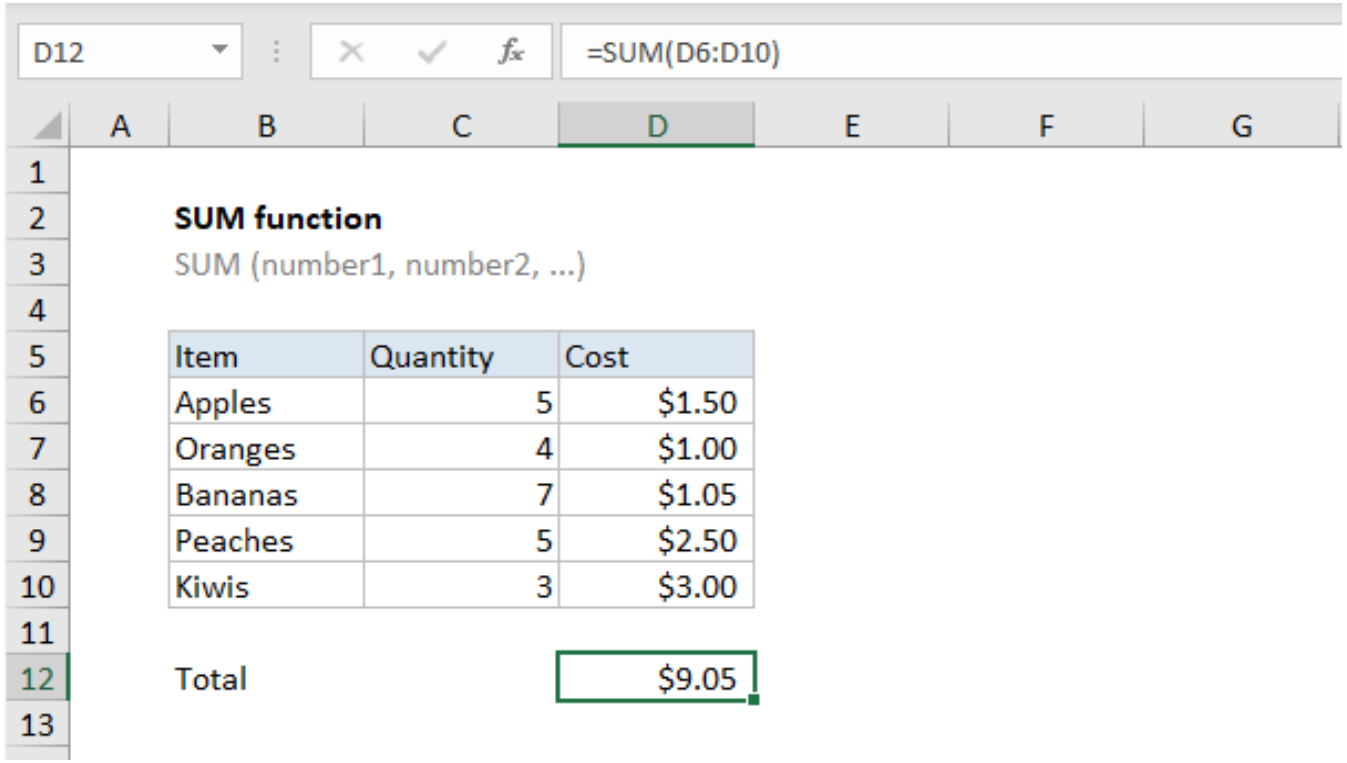
SUM Function

Summary:
The Excel SUM function returns the sum of values supplied. These values can be numbers, cell references, ranges, arrays, and constants, in any combination. SUM can handle up to 255 individual arguments.

Purpose:
Add numbers together

Return value:
The sum of values supplied.

Syntax:
=SUM (number1, [number2], [number3], ...)



Arguments:

number1 - The first value to sum.
number2 - [optional] The second value to sum.
number3 - [optional] The third value to sum.

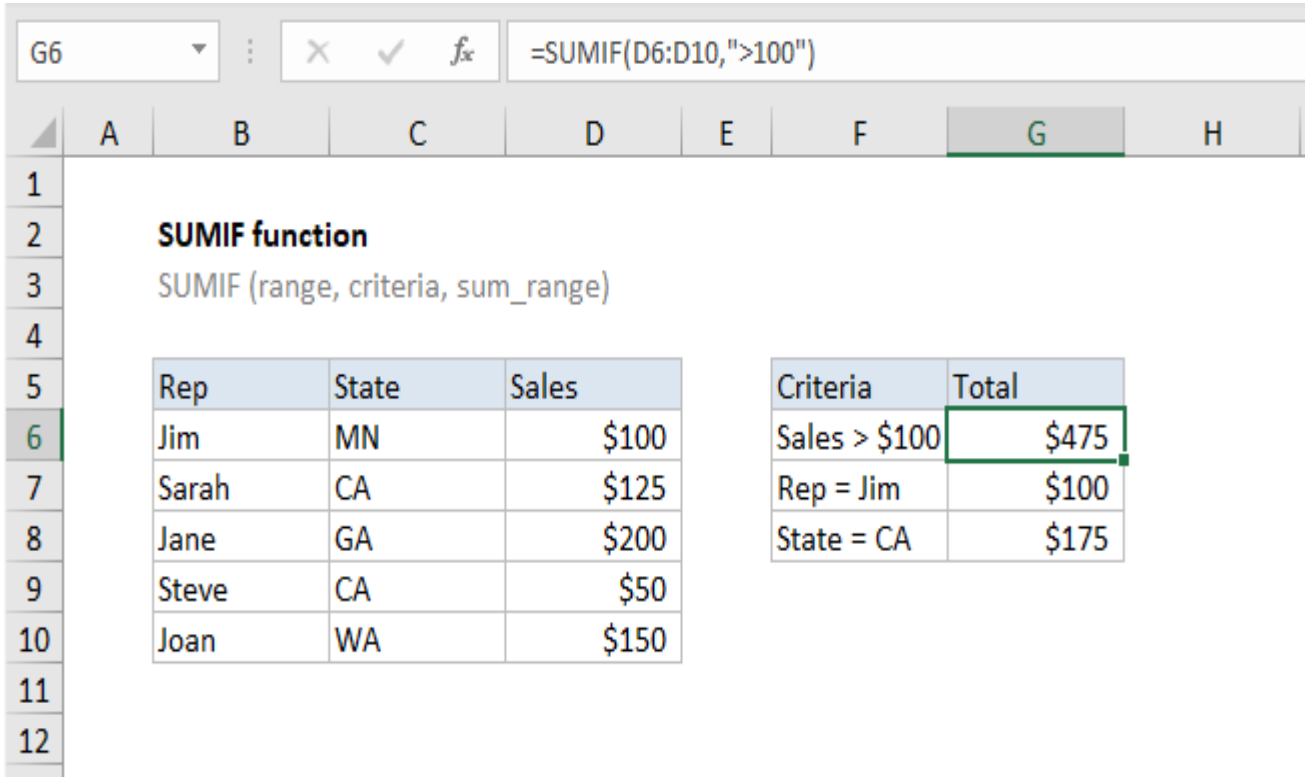
SUMIF Function

Summary:
The Excel SUMIF function returns the sum of cells that meet a single condition. Criteria can be applied to dates, numbers, and text. The SUMIF function supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:
Sum numbers in a range that meet supplied criteria

Return value:
The sum of values supplied.

Syntax:
=SUMIF (range, criteria, [sum_range])



Arguments:

range - The range of cells that you want to apply the criteria against.
criteria - The criteria used to determine which cells to add.
sum_range - [optional] The cells to add together. If sum_range is omitted, the cells in range are added together instead.

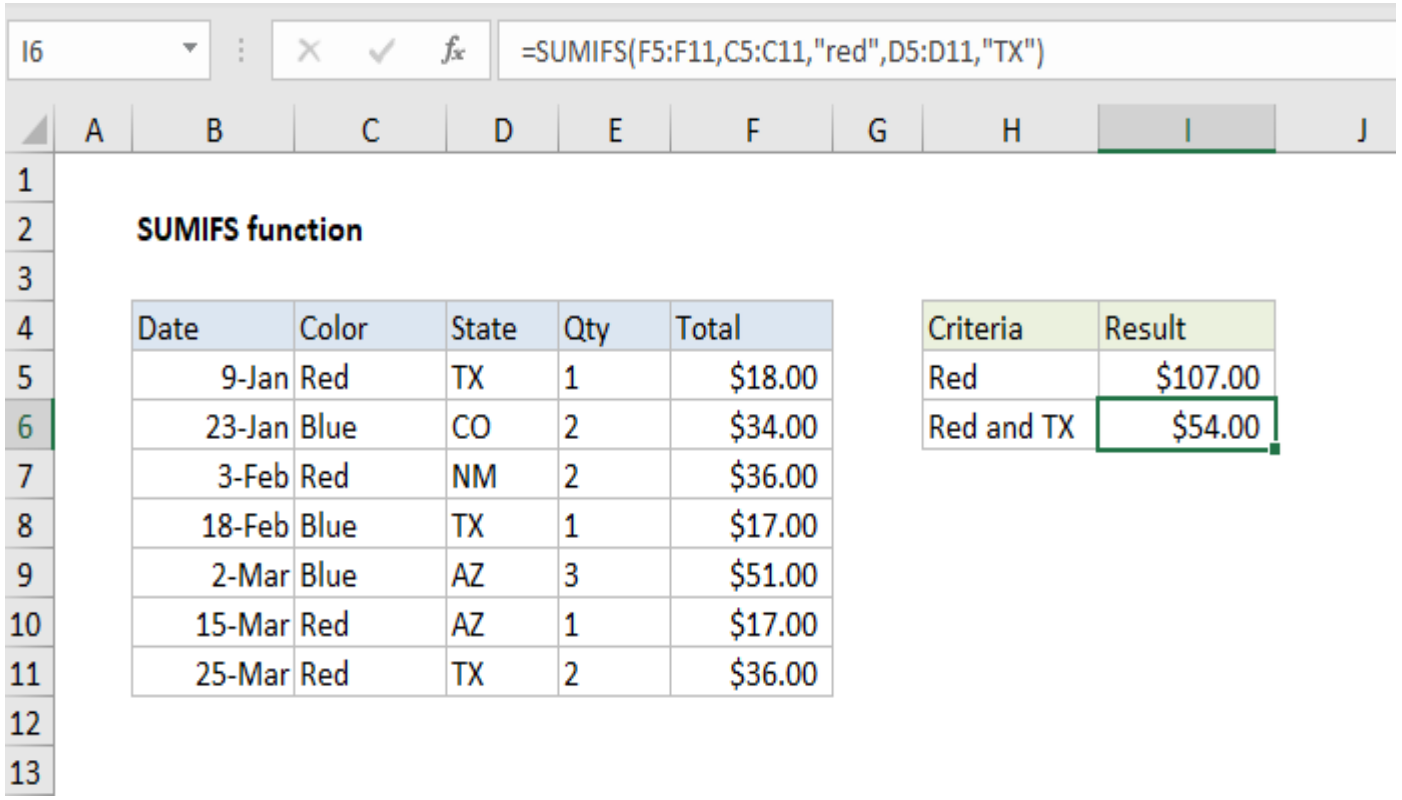
SUMIFS Function

Summary:
SUMIFS is a function to sum cells that meet multiple criteria. SUMIFS can be used to sum values when adjacent cells meet criteria based on dates, numbers, and text. SUMIFS supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:
Sum cells that match multiple criteria

Return value:
The sum of the cells that meet all criteria

Syntax:
=SUMIFS (sum_range, range1, criteria1, [range2], [criteria2], ...)



Arguments:

sum_range - The range to be summed.
range1 - The first range to evaulate.
criteria1 - The criteria to use on range1.
range2 - [optional] The second range to evaluate.
criteria2 - [optional] The criteria to use on range2.

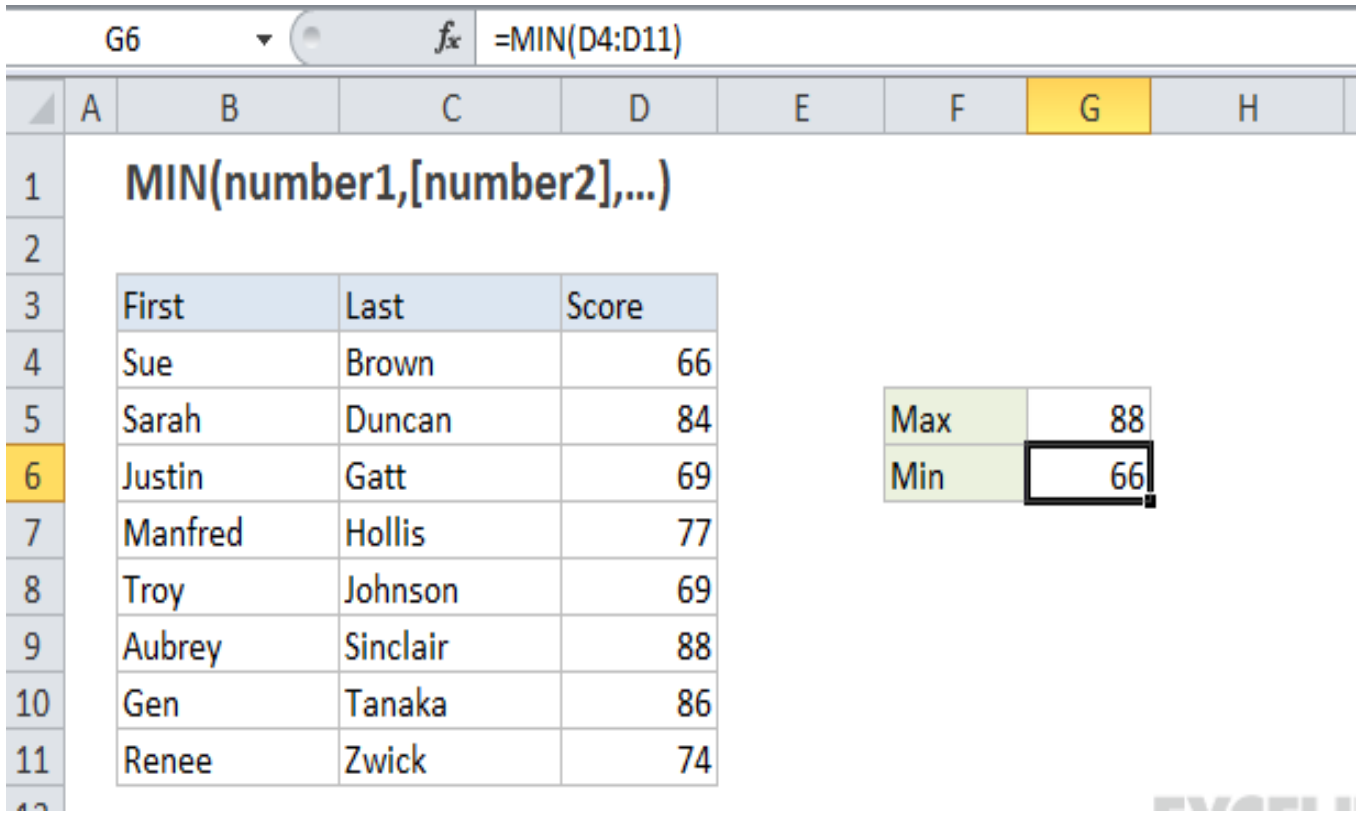
MIN Function

Summary:
The Excel MIN function returns the smallest numeric value in a range of values. The MIN function ignores empty cells, the logical values TRUE and FALSE, and text values.

Purpose:
Get the smallest value.

Return value:
The smallest value in the array.

Syntax:
=MIN (number1, [number2], ...)



Arguments:

number1 - Number, reference to numeric value, or range that contains numeric values.
number2 - [optional] Number, reference to numeric value, or range that contains numeric values.

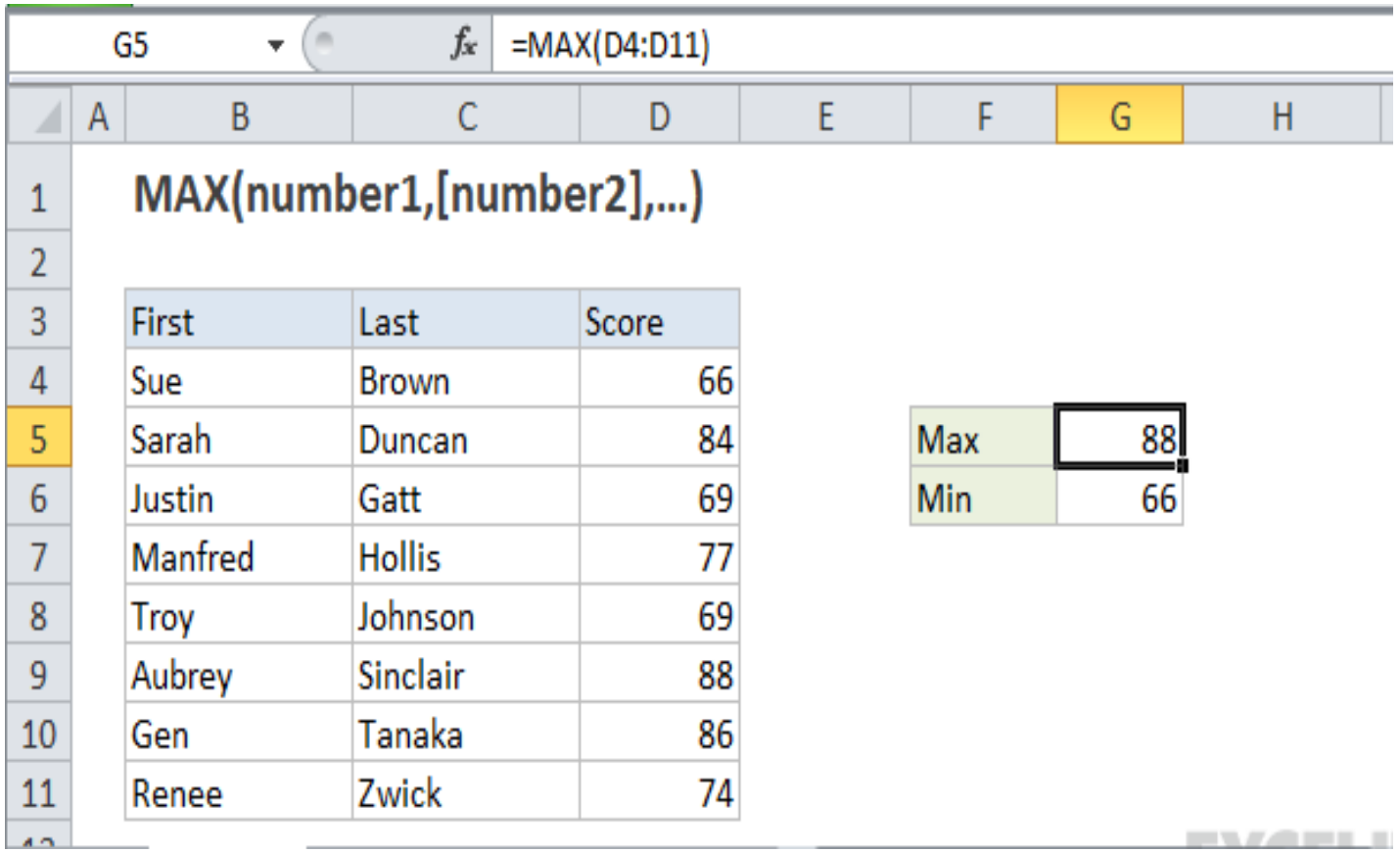
MAX Function

Summary:
The Excel MAX function returns the largest numeric value in a range of values. The MAX function ignores empty cells, the logical values TRUE and FALSE, and text values.

Purpose:
Get the largest value

Return value:
The largest value in the array.

Syntax:
=MAX (number1, [number2], ...)



Arguments:

number1 - Number, reference to numeric value, or range that contains numeric values.
number2 - [optional] Number, reference to numeric value, or range that contains numeric values.

Sir Rizwan Bhatti

SMALL Function

Summary:

The Excel SMALL function returns numeric values based on their position in a list ranked by value. In other words, it can retrive "nth smallest" values - smallest value, 2nd smallest value, 3rd smallest value, etc.

Purpose

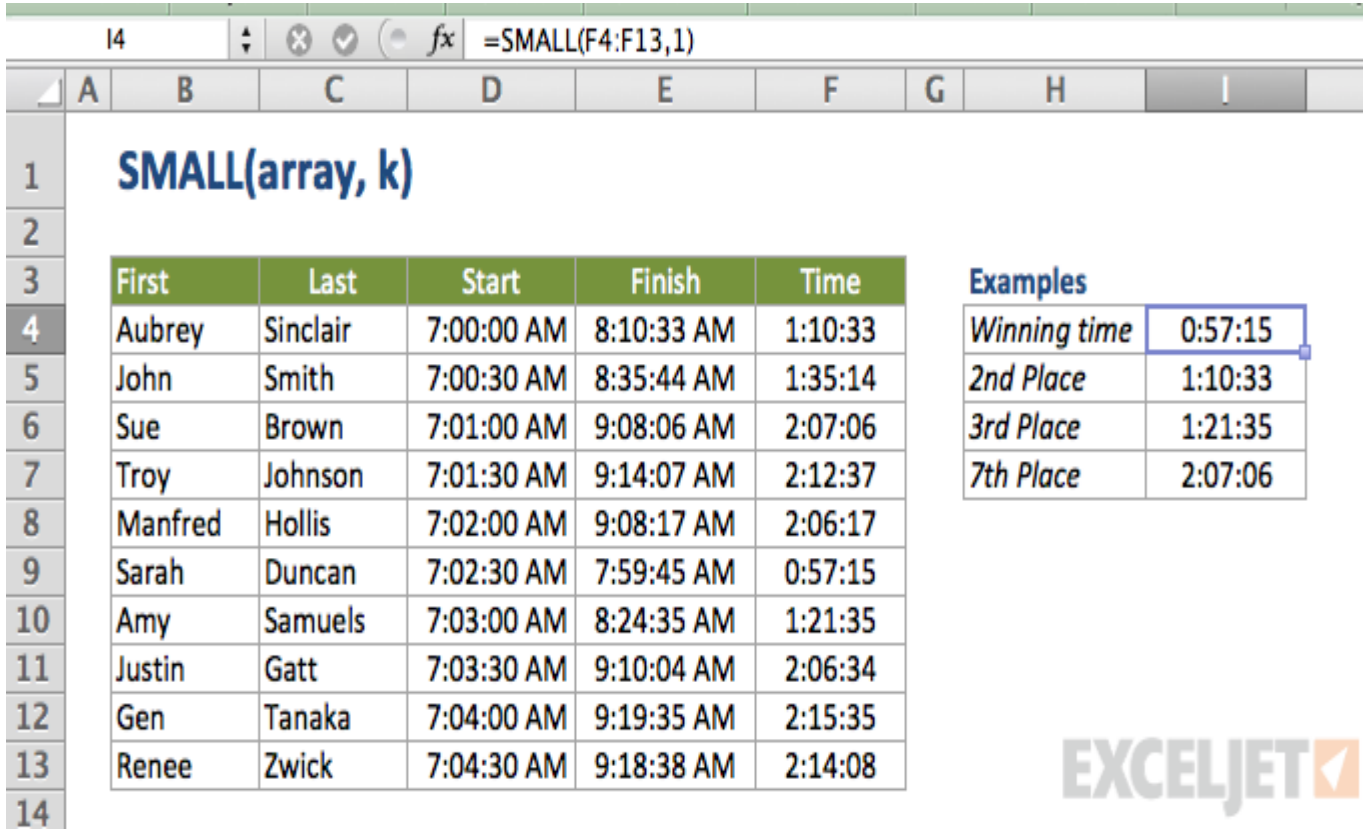
Get the nth smallest value

Return value

The nth smallest value in the array.

Syntax

=SMALL (array, n)



First	Last	Start	Finish	Time
Aubrey	Sinclair	7:00:00 AM	8:10:33 AM	1:10:33
John	Smith	7:00:30 AM	8:35:44 AM	1:35:14
Sue	Brown	7:01:00 AM	9:08:06 AM	2:07:06
Troy	Johnson	7:01:30 AM	9:14:07 AM	2:12:37
Manfred	Hollis	7:02:00 AM	9:08:17 AM	2:06:17
Sarah	Duncan	7:02:30 AM	7:59:45 AM	0:57:15
Amy	Samuels	7:03:00 AM	8:24:35 AM	1:21:35
Justin	Gatt	7:03:30 AM	9:10:04 AM	2:06:34
Gen	Tanaka	7:04:00 AM	9:19:35 AM	2:15:35
Renee	Zwick	7:04:30 AM	9:18:38 AM	2:14:08

Arguments:

array - A range of cells from which to extract smallest values.

n - An integer that specifies the position from the smallest value, i.e. the nth position.

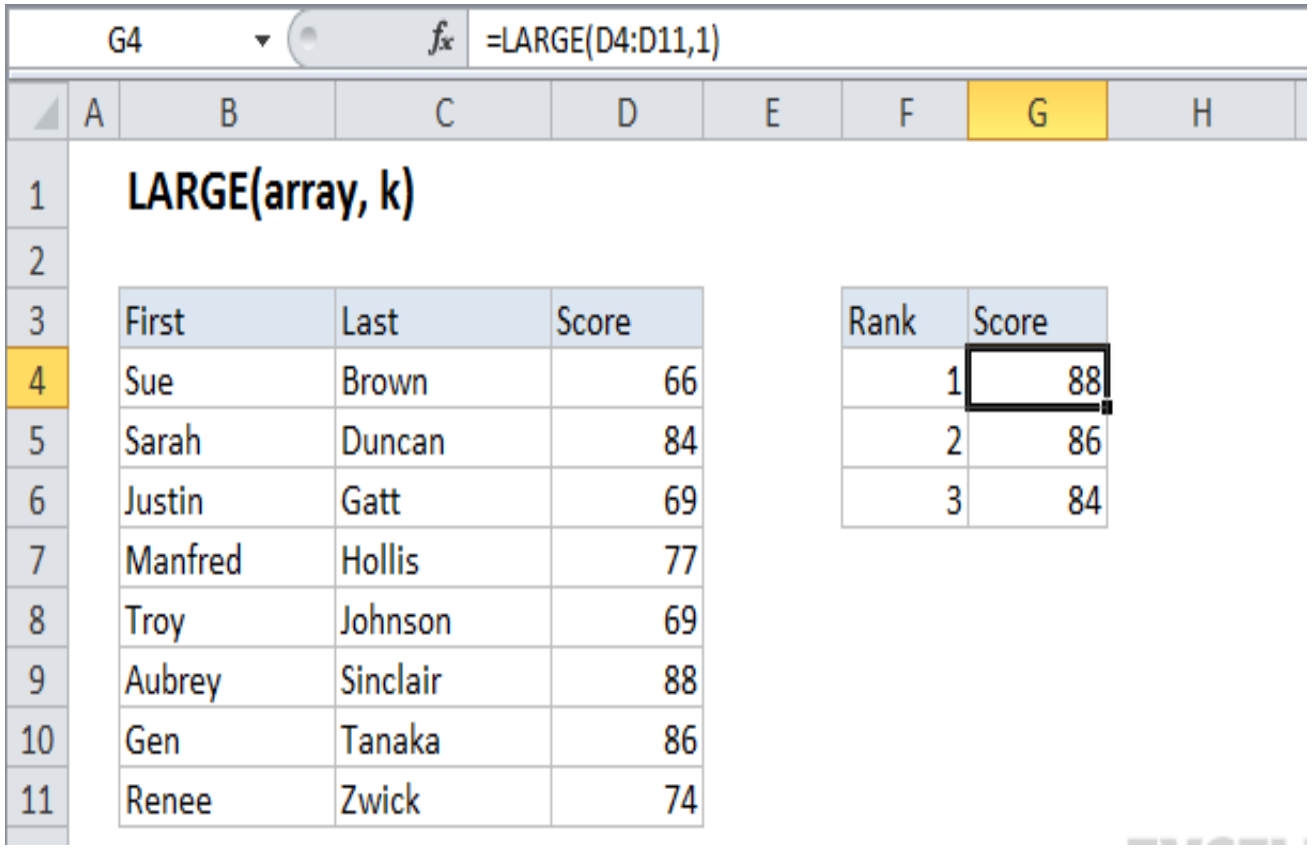
LARGE Function

Summary:
The Excel LARGE function returns numeric values based on their position in a list when sorted by value. In other words, it can retrive "nth largest" values - largest value, 2nd largest value, 3rd lagest value, etc.

Purpose:
Get the nth largest value

Return value:
The nth largest value in the array.

Syntax:
=LARGE (array, n)



Arguments:

array - The array from which you want to select the kth largest value.
n - An integer that specifies the position from the largest value, i.e. the nth position.

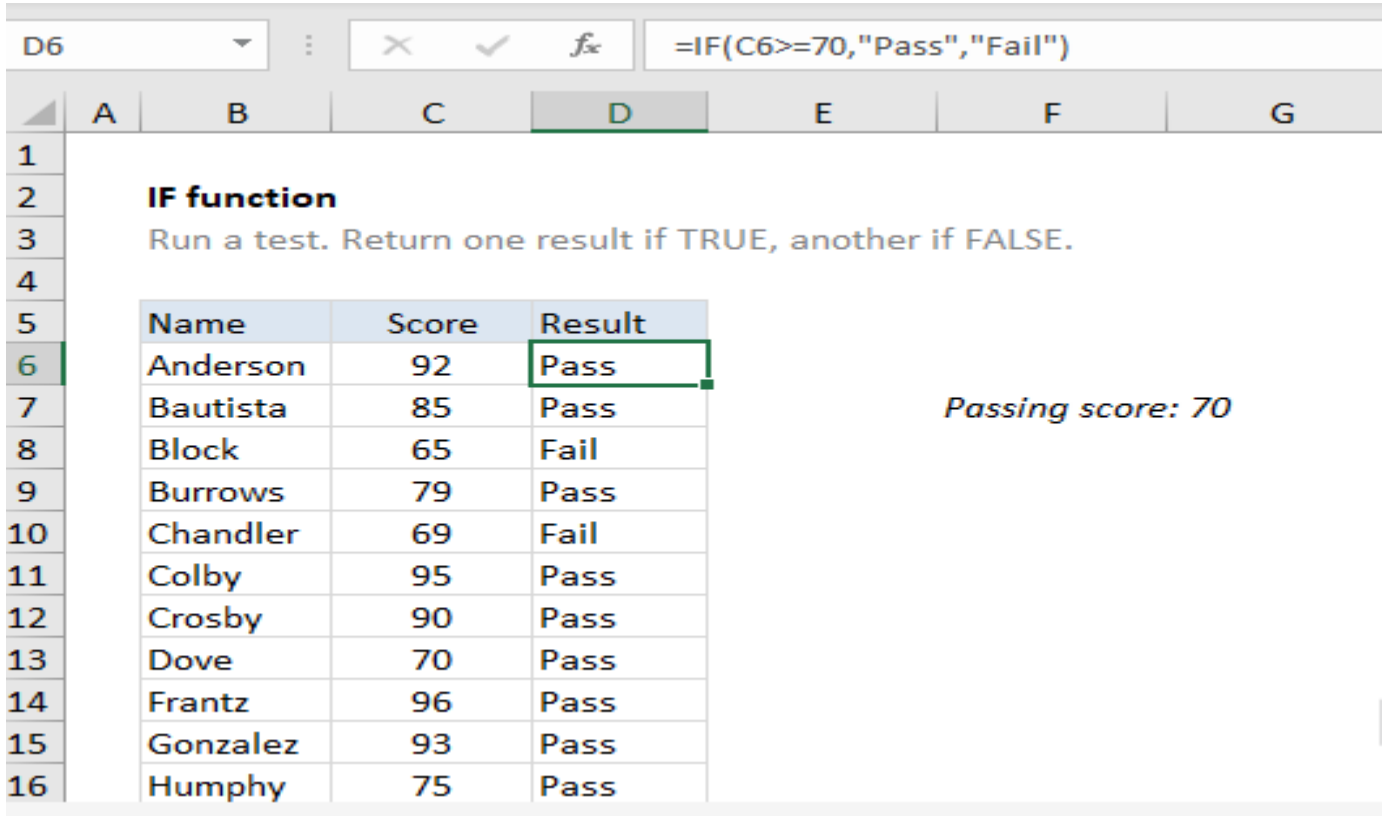
IF Function

Summary:
The IF function can perform a logical test and return one value for a TRUE result, and another for a FALSE result. For example, to "pass" scores above 70: =IF(A1>70,"Pass","Fail"). More than one condition can be tested by nesting IF functions. The IF function can be combined with logical functions like AND and OR.

Purpose:
Test for a specific condition

Return value:
The values you supply for TRUE or FALSE

Syntax:
=IF (logical_test, [value_if_true], [value_if_false])

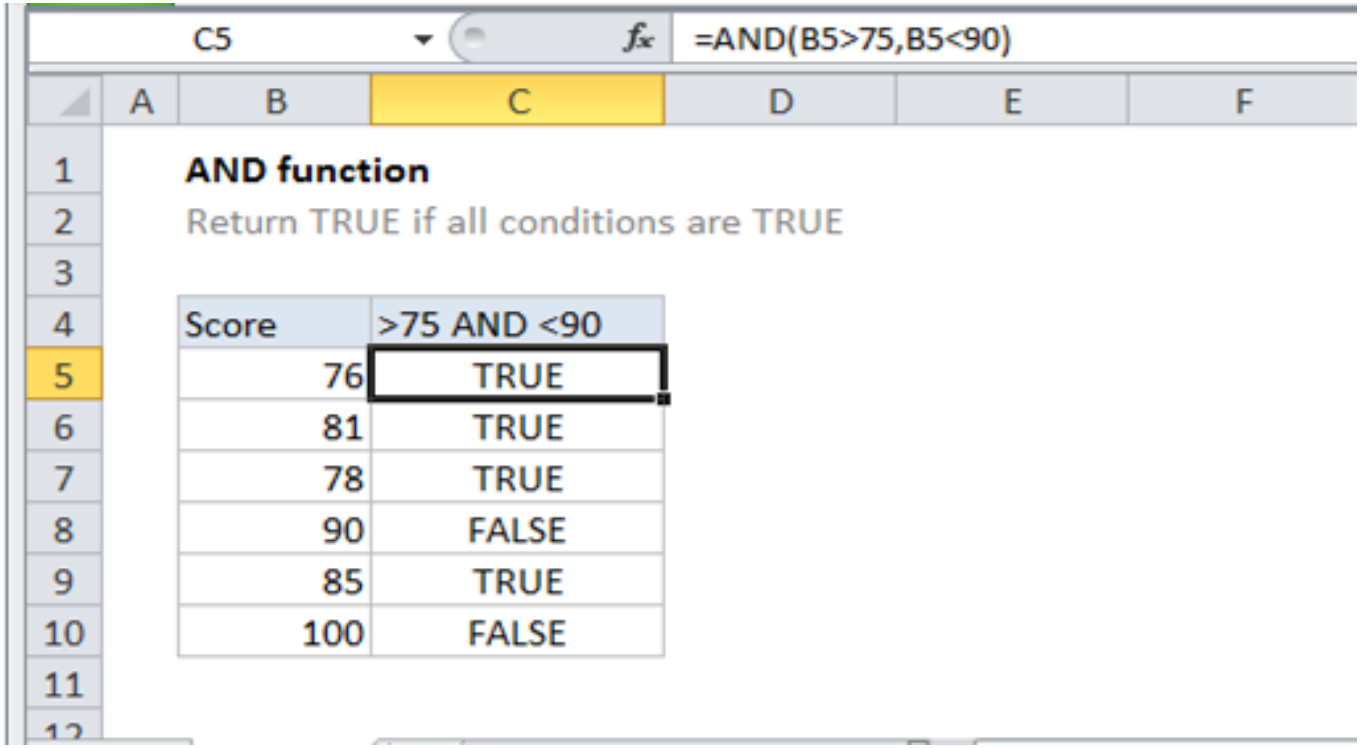


Name	Score	Result
Anderson	92	Pass
Bautista	85	Pass
Block	65	Fail
Burrows	79	Pass
Chandler	69	Fail
Colby	95	Pass
Crosby	90	Pass
Dove	70	Pass
Frantz	96	Pass
Gonzalez	93	Pass
Humphy	75	Pass

Arguments:
logical_test - A value or logical expression that can be evaluated as TRUE or FALSE.
value_if_true - [optional] The value to return when logical_test evaluates to TRUE.
value_if_false - [optional] The value to return when logical_test evaluates to FALSE.

AND Function

Summary:
The Excel AND function is a logical function used to require more than one condition at the same time. AND returns either TRUE or FALSE. To test if a number in A1 is greater than zero and less than 10, use =AND(A1>0,A1<10). The AND function can be used as the logical test inside the IF function to avoid extra nested IFs, and can be combined with the OR function.



Purpose:
Test multiple conditions with AND

Return value :
TRUE if all arguments evaluate TRUE; FALSE if not

Syntax :
=AND (logical1, [logical2], ...)

Arguments:

logical1 - The first condition or logical value to evaluate.
logical2 - [optional] The second condition or logical value to evaluate.

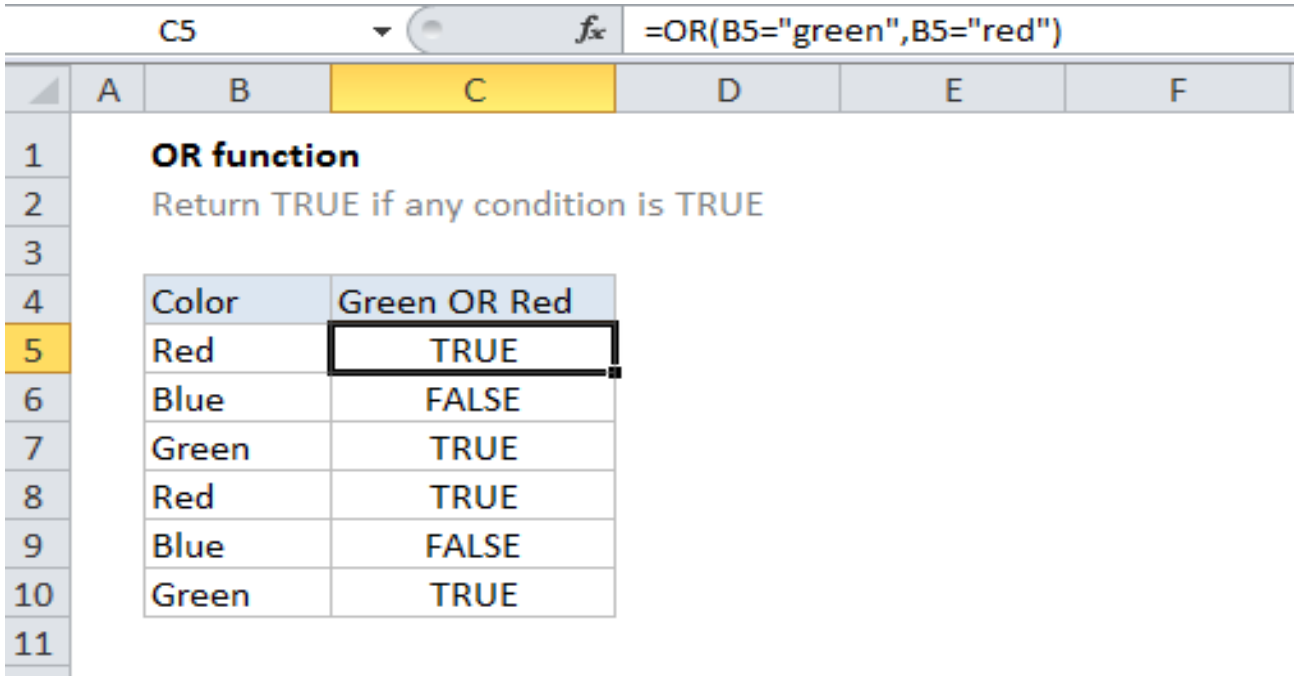
OR Function

Summary:
The OR function is a logical function to test multiple conditions at the same time. OR returns either TRUE or FALSE. For example, to test A1 for either "x" or "y", use =OR(A1="x",A1="y"). The OR function can be used as the logical test inside the IF function to avoid extra nested IFs, and can be combined with the AND function.

Purpose:
Test multiple conditions with OR

Return value:
TRUE if any arguments evaluate TRUE; FALSE if not.

Syntax:
=OR (logical1, [logical2], ...)



Arguments:

logical1 - The first condition or logical value to evaluate.
logical2 - [optional] The second condition or logical value to evaluate.

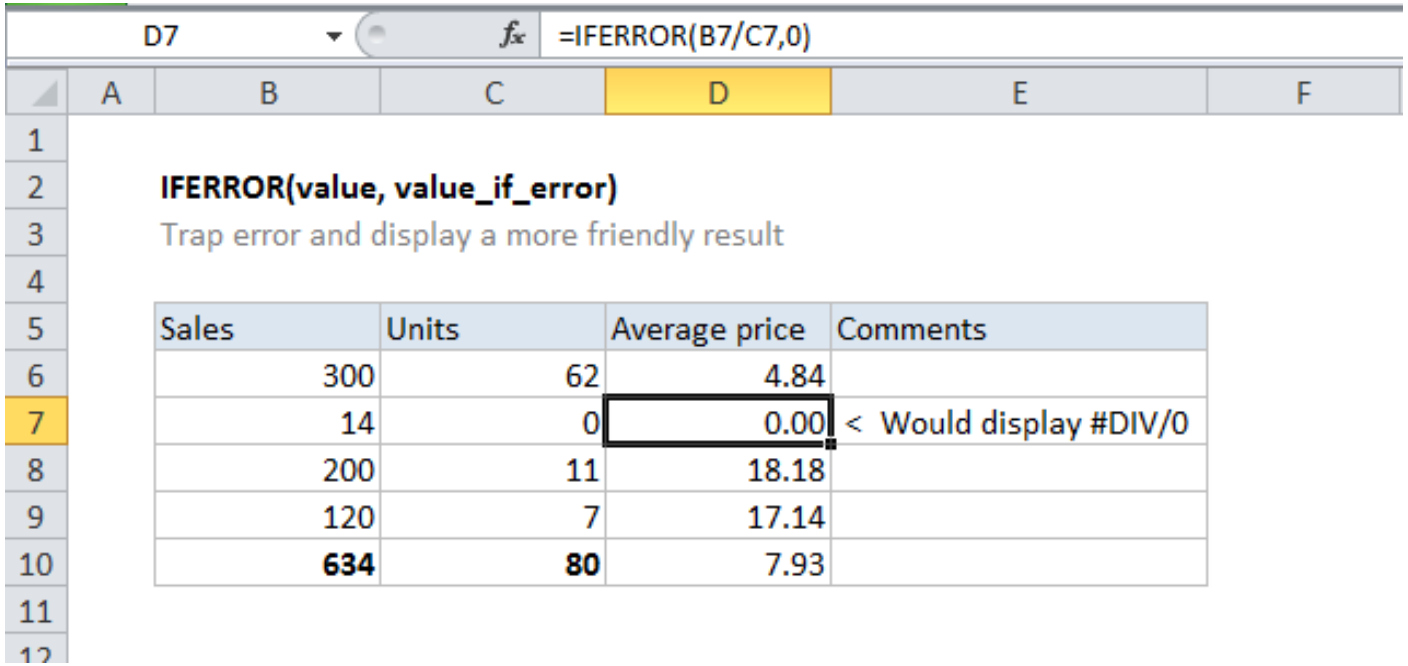
IFERROR Function

Summary:
The Excel IFERROR function returns a custom result when a formula generates an error, and a standard result when no error is detected. IFERROR is an elegant way to trap and manage errors without using more complicated nested IF statements.

Purpose:
Trap and handle errors

Return value:
The value you specify for error conditions.

Syntax:
=IFERROR (value, value_if_error)



Arguments:

value - The value, reference, or formula to check for an error.
value_if_error - The value to return if an error is found.

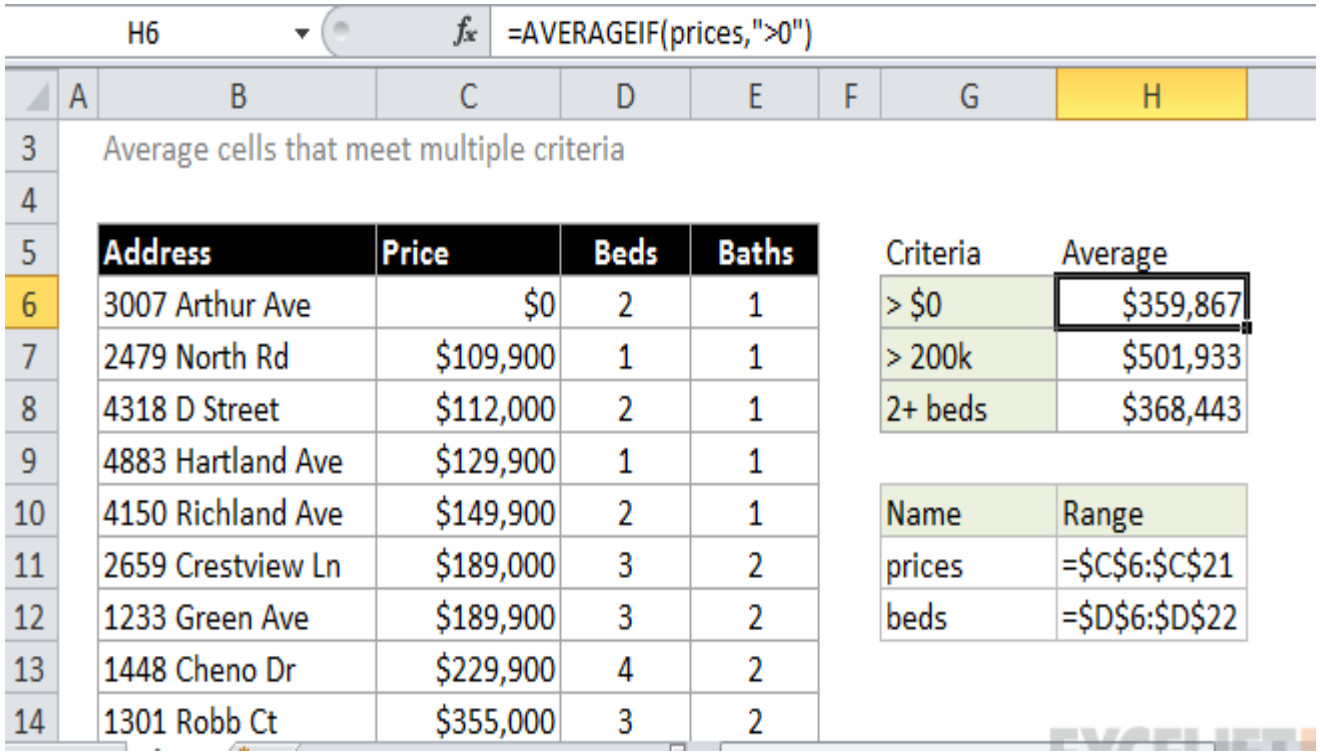
AVERAGEIF Function

Summary:
The Excel AVERAGEIF function computes the average of the numbers in a range that meet the supplied criteria. The criteria for AVERAGEIF supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:
Get the average of numbers that meet criteria

Return value:
A number representing the average.

Syntax:
=AVERAGEIF (range, criteria, [average_range])



Arguments:

range - One or more cells, including numbers or names, arrays, or references.
criteria - A number, expression, cell reference, or text.
average_range - [optional] The cells to average. When omitted, range is used.

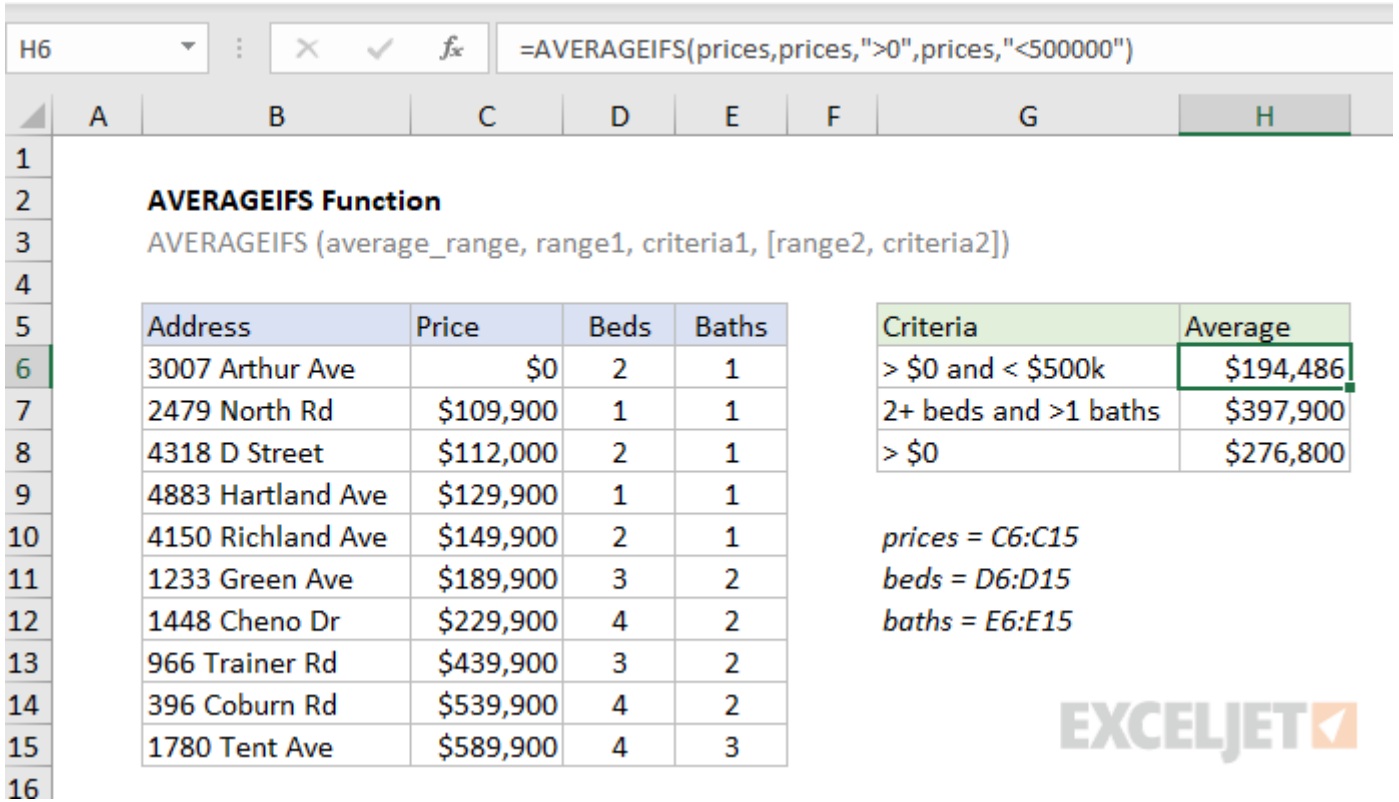
AVERAGEIFS Function

Summary:
The Excel AVERAGEIFS function calculates the average of numbers in a range that meet one or more supplied criteria. The criteria in AVERAGEIFS supports logical operators (>,<,<>,=) and wildcards (*,?) for partial matching.

Purpose:
Average cells that match multiple criteria

Return value:
The average of the cells that meet all criteria

Syntax:
=AVERAGEIFS (avg_rng, range1, criteria1, [range2], [criteria2], ...)



Arguments:

avg_rng - The range to average.
range1 - The first range to evaulate.
criteria1 - The criteria to use on range1.
range2 - [optional] The second range to evaluate.
criteria2 - [optional] The criteria to use on range2.

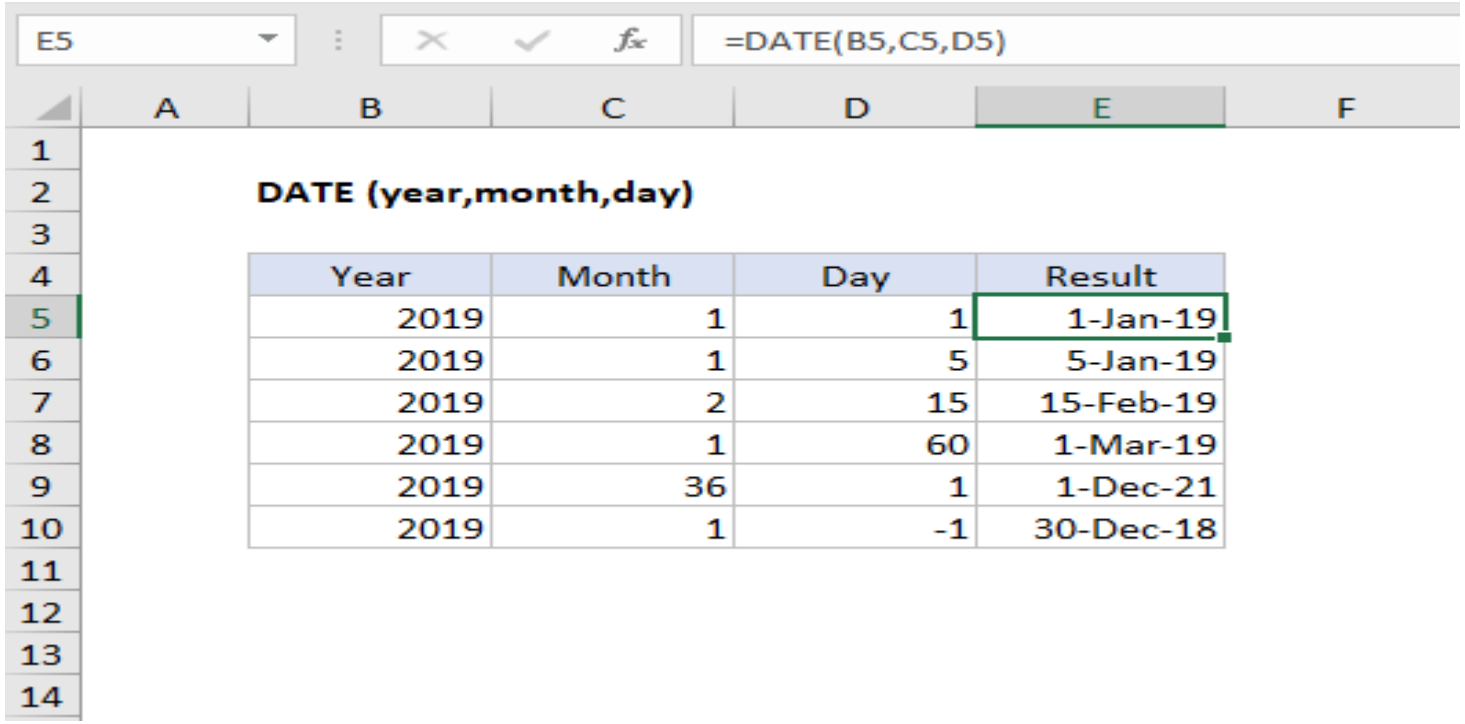
DATE Function

Summary:
The Excel DATE function creates a valid date from individual year, month, and day components. The DATE function is useful for assembling dates that need to change dynamically based on other values in a worksheet.

Purpose:
Create a date with year, month, and day

Return value:
A valid Excel date

Syntax:
=DATE (year, month, day)



Year	Month	Day	Result
2019	1	1	1-Jan-19
2019	1	5	5-Jan-19
2019	2	15	15-Feb-19
2019	1	60	1-Mar-19
2019	36	1	1-Dec-21
2019	1	-1	30-Dec-18

Arguments:

year - Number for year.
month - Number for month.
day - Number for day.

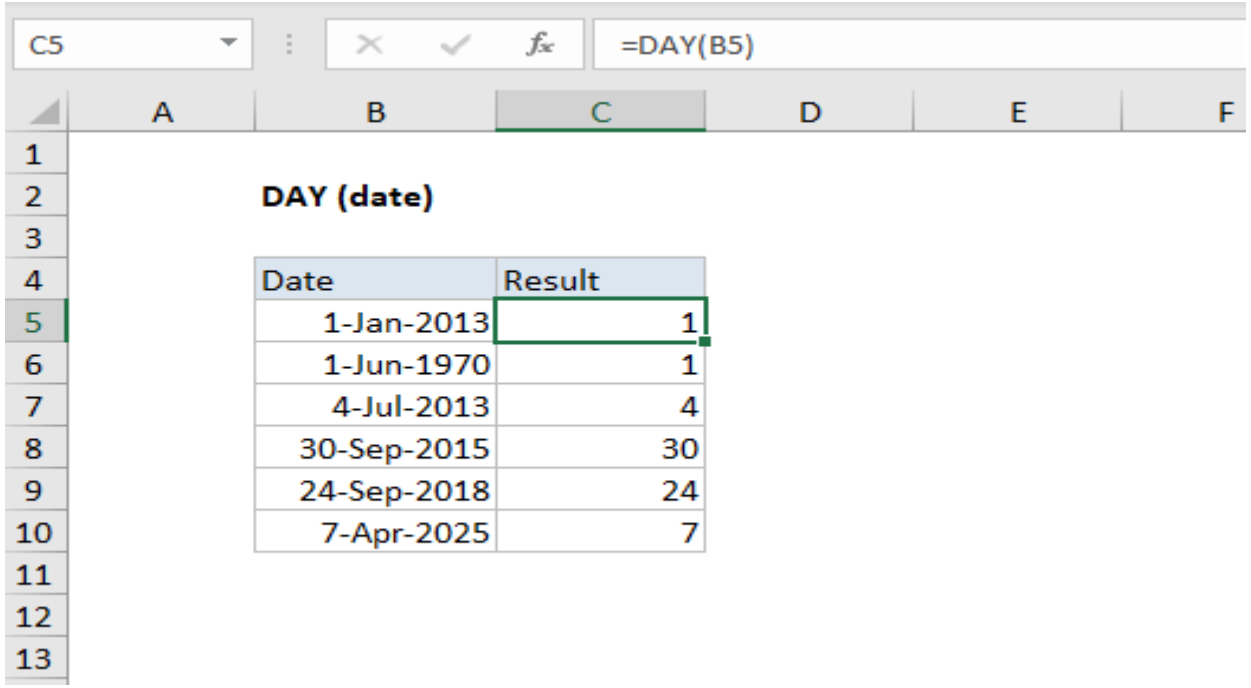
DAY Function

Summary:
The Excel DAY function returns the day of the month as a number between 1 to 31 from a given date. You can use the DAY function to extract a day number from a date into a cell. You can also use the DAY function to extract and feed a day value into another function.

Purpose:
Get the day as a number (1-31) from a date

Return value:
A number (1-31) representing the day component in a date.

Syntax:
=DAY (date)



Arguments:

date - A valid Excel date.

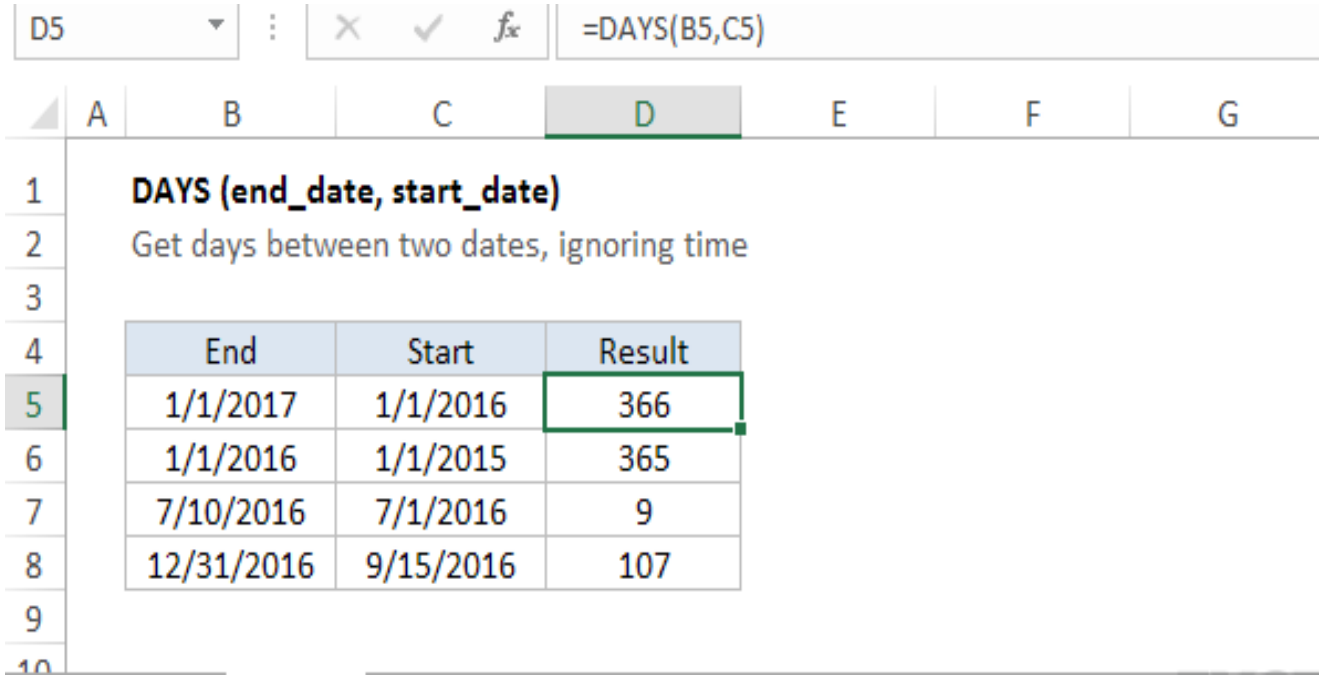
DAYS Function

Summary:
The Excel DAYS function returns the number of days between two dates. With a start date in A1 and end date in B1, =DAYS(B1,A1) will return the days between the two dates.

Purpose:
Get days between dates

Return value:
A number representing days.

Syntax:
=DAYS (end_date, start_date)



Arguments:

end_date - The end date.
start_date - The start date.

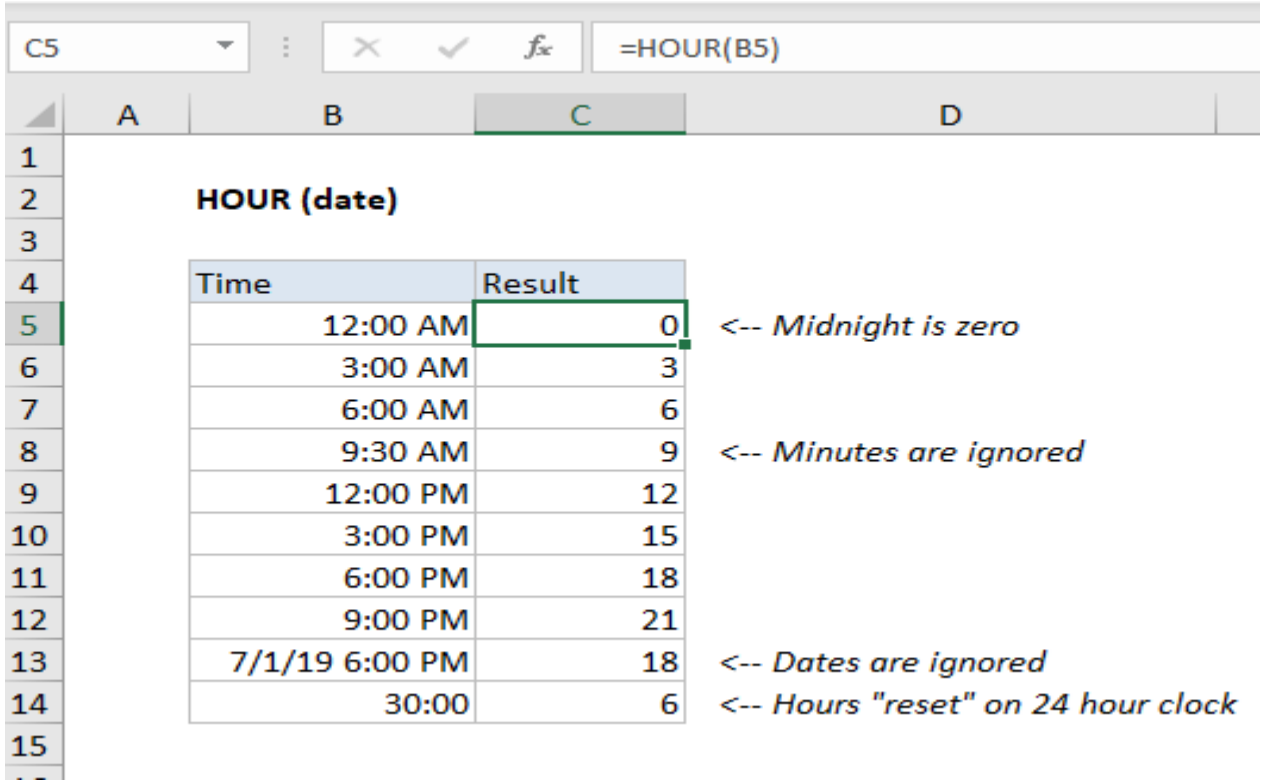
HOUR Function

Summary:
The Excel HOUR function returns the hour component of a time as a number between 0-23. For example, with a time of 9:30 AM, HOUR will return 9. You can use the HOUR function to extract the hour into a cell, or feed the result into another formula, like the TIME function.

Purpose:
Get the hour as a number (0-23) from a Time

Return value:
A number between 0 and 23.

Syntax:
=HOUR (serial_number)



Arguments:

serial_number - A valid Excel time.

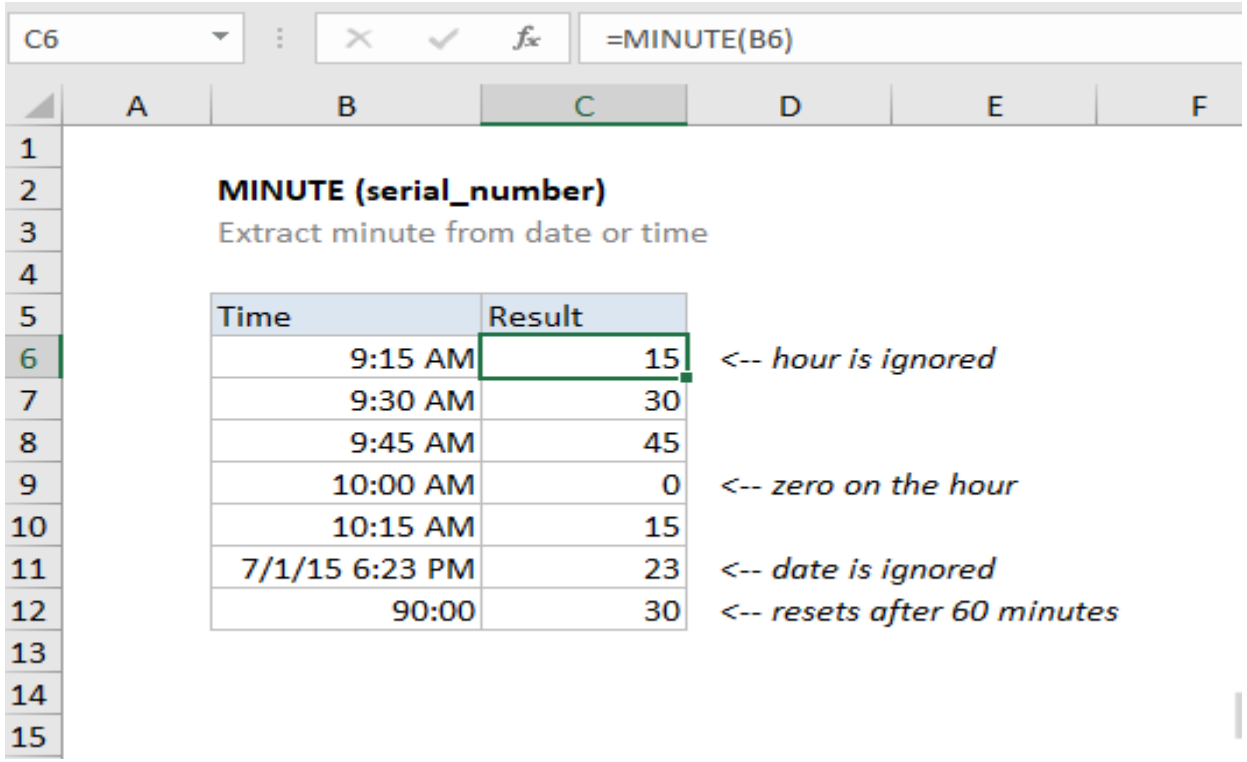
MINUTE Function

Summary:
The Excel MINUTE function extracts the minute component of a time as a number between 0-59. For example, with a time of 9:45 AM, minute will return 45. You can use the MINUTE function to extract the minute into a cell, or feed the result into another function.

Purpose:
Get minute as a number (0-59) from time

Return value:
Number between 0 and 59.

Syntax:
=MINUTE (serial_number)



Arguments:

serial_number - A valid date or time.

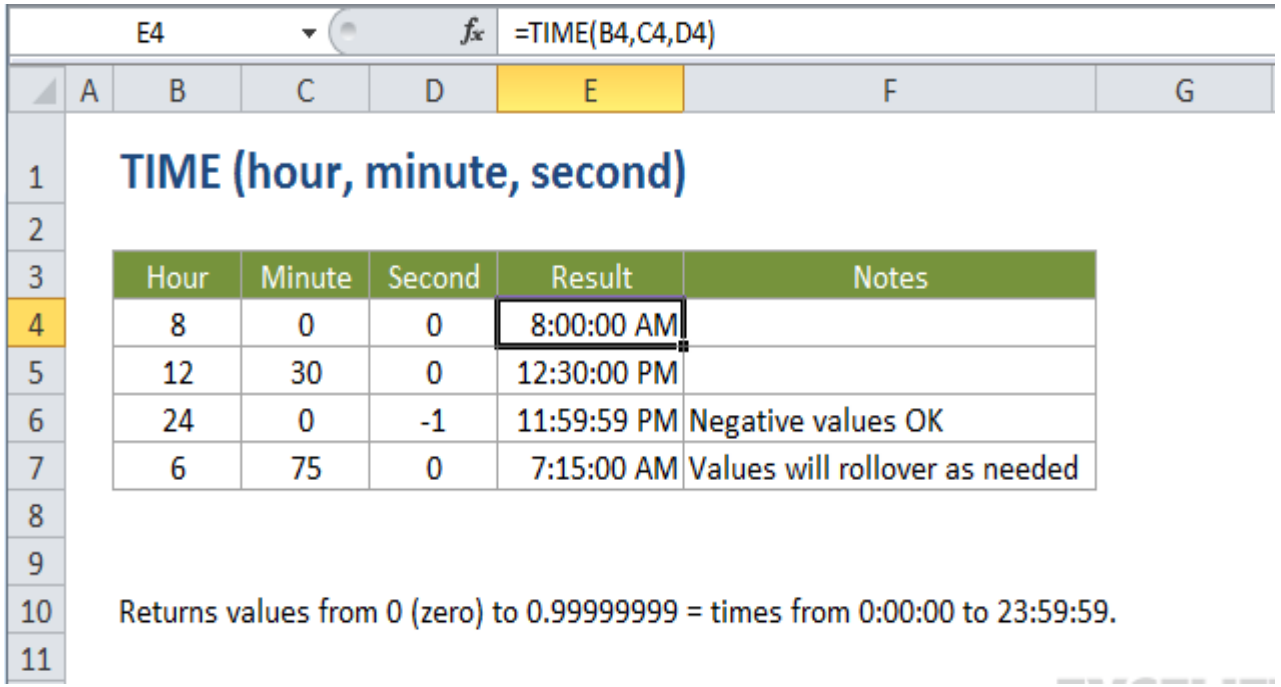
TIME Function

Summary:
The Excel TIME function is a built-in function that allows you to create a time with individual hour, minute, and second components. The TIME function is useful when you want to assemble a proper time inside another formula.

Purpose:
Create a time with hours, minutes, and seconds

Return value:
A decimal number representing a particular time in Excel.

Syntax:
=TIME (hour, minute, second)



Arguments:

hour - The hour for the time you wish to create.
minute - The minute for the time you wish to create.
second - The second for the time you wish to create.

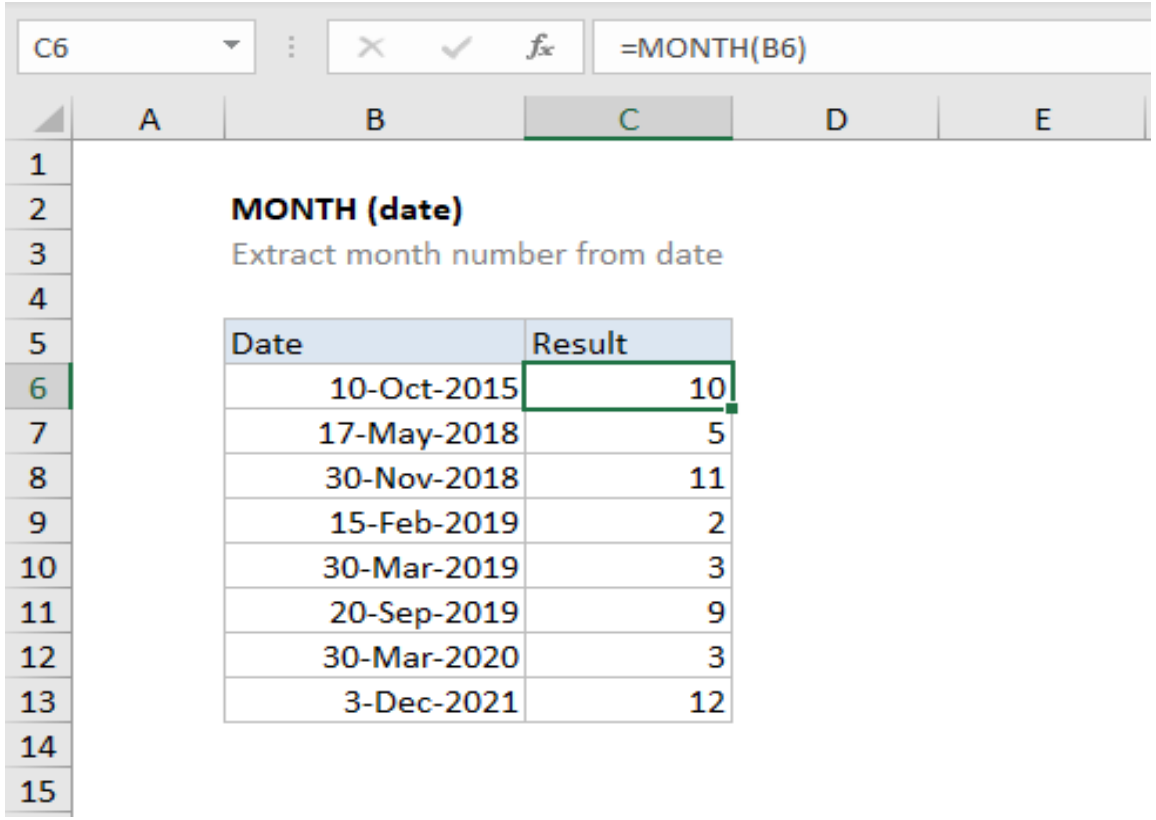
MONTH Function

Summary:
The Excel MONTH function extracts the month from a given date as number between 1 to 12. You can use the MONTH function to extract a month number from a date into a cell, or to feed a month number into another function.

Purpose:
Get month as a number (1-12) from a date

Return value:
A number between 1 and 12.

Syntax:
=MONTH (date)



Date	Result
10-Oct-2015	10
17-May-2018	5
30-Nov-2018	11
15-Feb-2019	2
30-Mar-2019	3
20-Sep-2019	9
30-Mar-2020	3
3-Dec-2021	12

Arguments:

date - A valid Excel date.

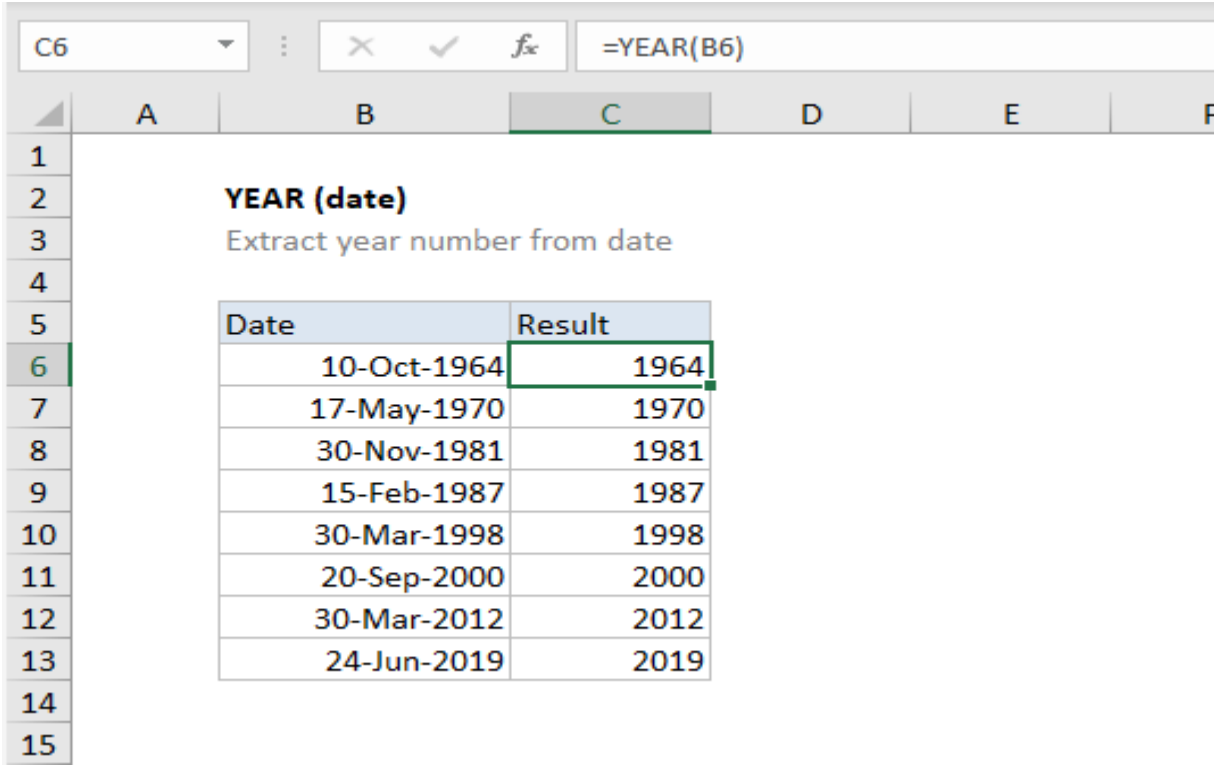
YEAR Function

Summary:
The Excel YEAR function returns the year component of a date as a 4-digit number. You can use the YEAR function to extract a year number from a date into a cell or to extract and feed a year value into another formula.

Purpose:
Get the year from a date

Return value:
Year as 4-digit number

Syntax:
=YEAR (date)



Date	Result
10-Oct-1964	1964
17-May-1970	1970
30-Nov-1981	1981
15-Feb-1987	1987
30-Mar-1998	1998
20-Sep-2000	2000
30-Mar-2012	2012
24-Jun-2019	2019

Arguments:

date - A valid Excel date.

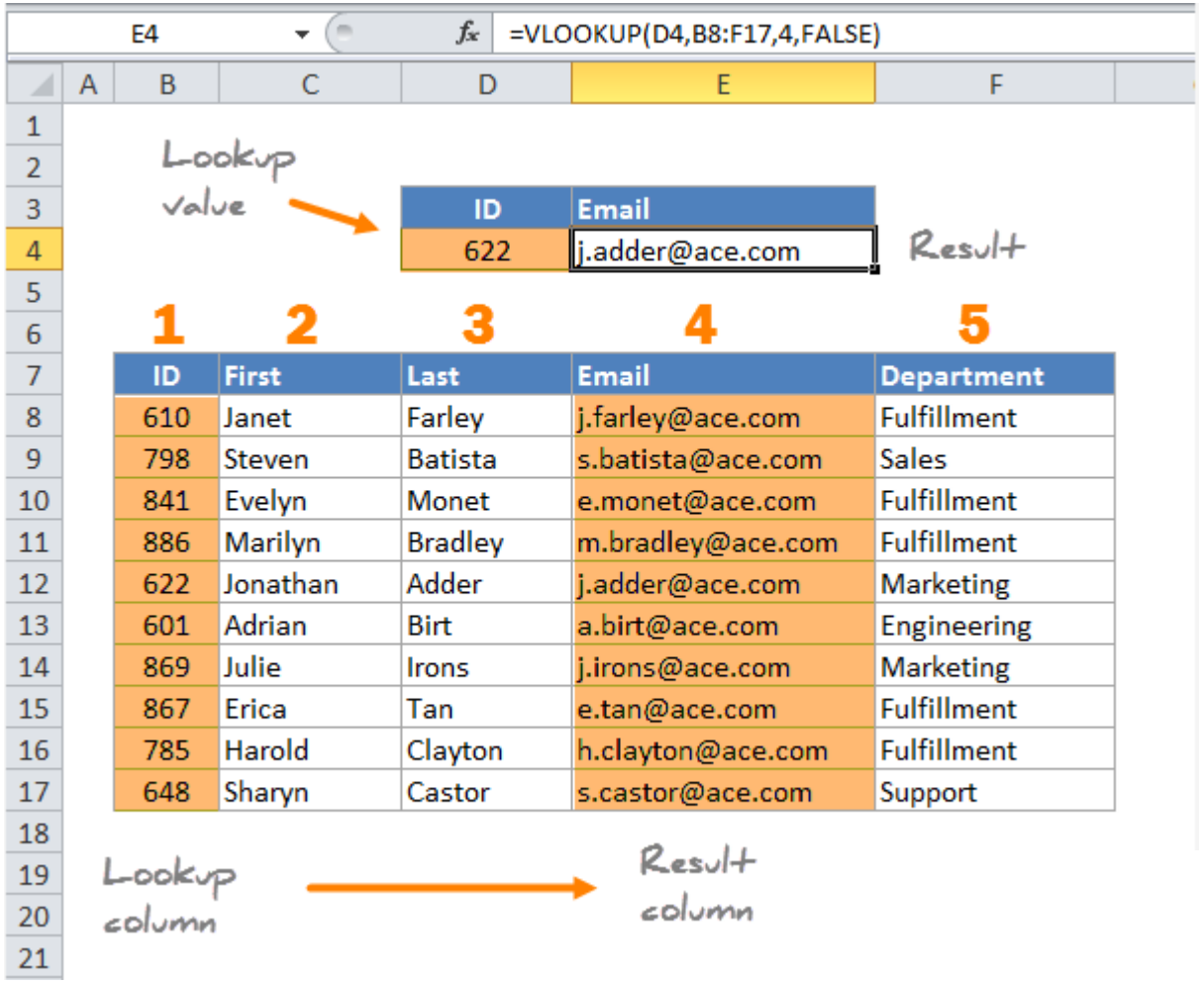
VLOOKUP Function

Summary:
VLOOKUP is an Excel function to lookup and retrieve data from a specific column in table. VLOOKUP supports approximate and exact matching, and wildcards (* ?) for partial matches. The "V" stands for "vertical". Lookup values must appear in the first column of the table, with lookup columns to the right.

Purpose:
Lookup a value in a table by matching on the first column

Return value:
The matched value from a table.

Syntax:
=VLOOKUP (value, table, col_index, [range_lookup])



Arguments:

value - The value to look for in the first column of a table.
table - The table from which to retrieve a value.
col_index - The column in the table from which to retrieve a value.
range_lookup - [optional] TRUE = approximate match (default). FALSE = exact match.

Sir Rizwan Bhatti

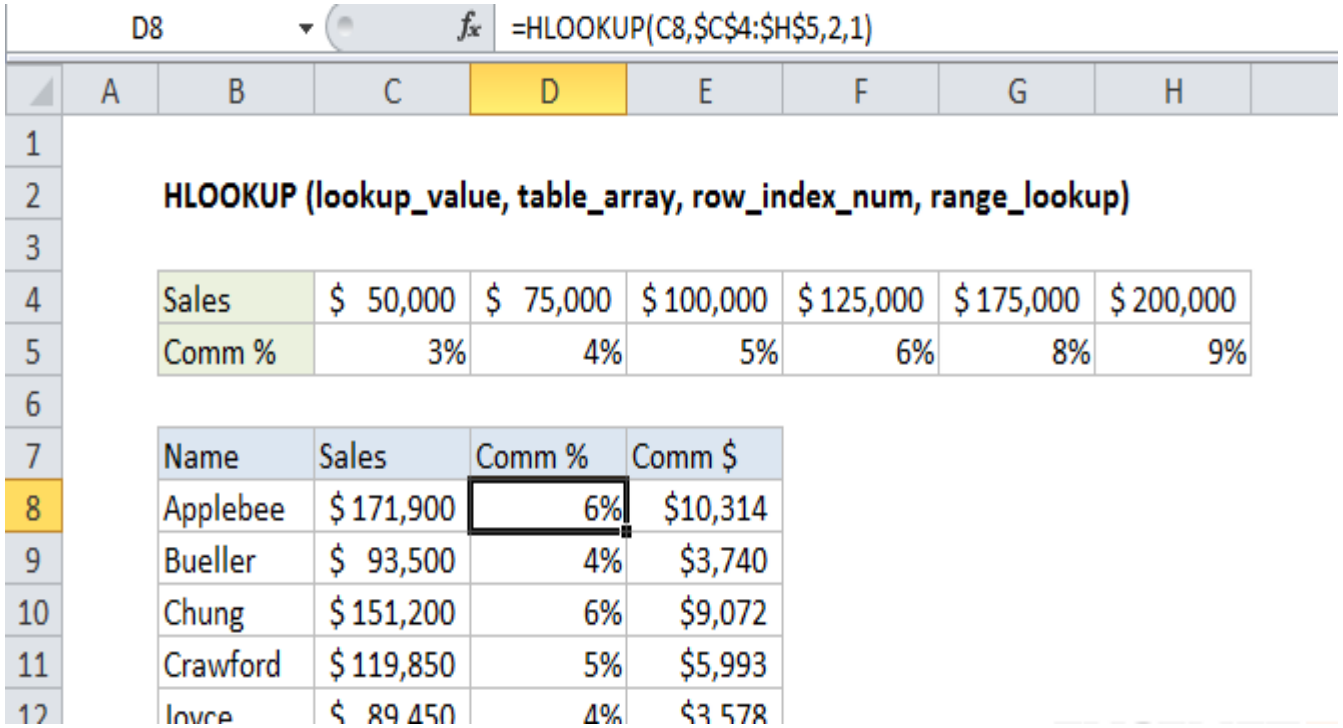
HLOOKUP Function

Summary:
HLOOKUP is an Excel function to lookup and retrieve data from a specific row in table. The "H" in HLOOKUP stands for "horizontal", where lookup values appear in the first row of the table, moving horizontally to the right. HLOOKUP supports approximate and exact matching, and wildcards (* ?) for finding partial matches.

Purpose:
Look up a value in a table by matching on the first row

Return value:
The matched value from a table.

Syntax:
=HLOOKUP (value, table, row_index, [range_lookup])



Arguments:

value - The value to look up.
table - The table from which to retrieve data.
row_index - The row number from which to retrieve data.
range_lookup - [optional] A boolean to indicate exact match or approximate match. Default = TRUE = approximate match.

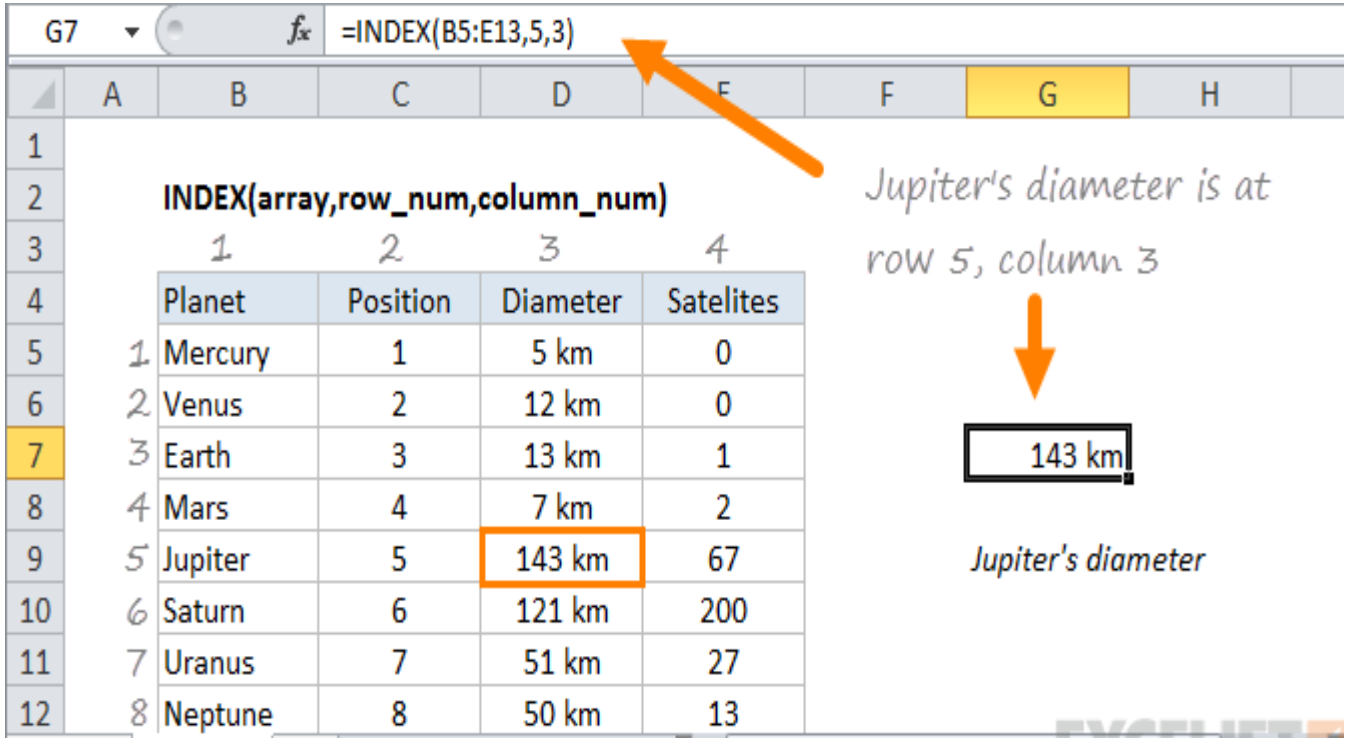
INDEX Function

Summary:
The Excel INDEX function returns the value at a given position in a range or array. You can use INDEX to retrieve individual values or entire rows and columns. INDEX is often used with the MATCH function, where MATCH locates and feeds a position to INDEX.

Purpose:
Get a value in a list or table based on location

Return value:
The value at a given location.

Syntax:
=INDEX (array, row_num, [col_num], [area_num])



	Planet	Position	Diameter	Satelites
1	Mercury	1	5 km	0
2	Venus	2	12 km	0
3	Earth	3	13 km	1
4	Mars	4	7 km	2
5	Jupiter	5	143 km	67
6	Saturn	6	121 km	200
7	Uranus	7	51 km	27
8	Neptune	8	50 km	13

Arguments:

array - A range of cells, or an array constant.
row_num - The row position in the reference or array.
col_num - [optional] The column position in the reference or array.
area_num - [optional] The range in reference that should be used.

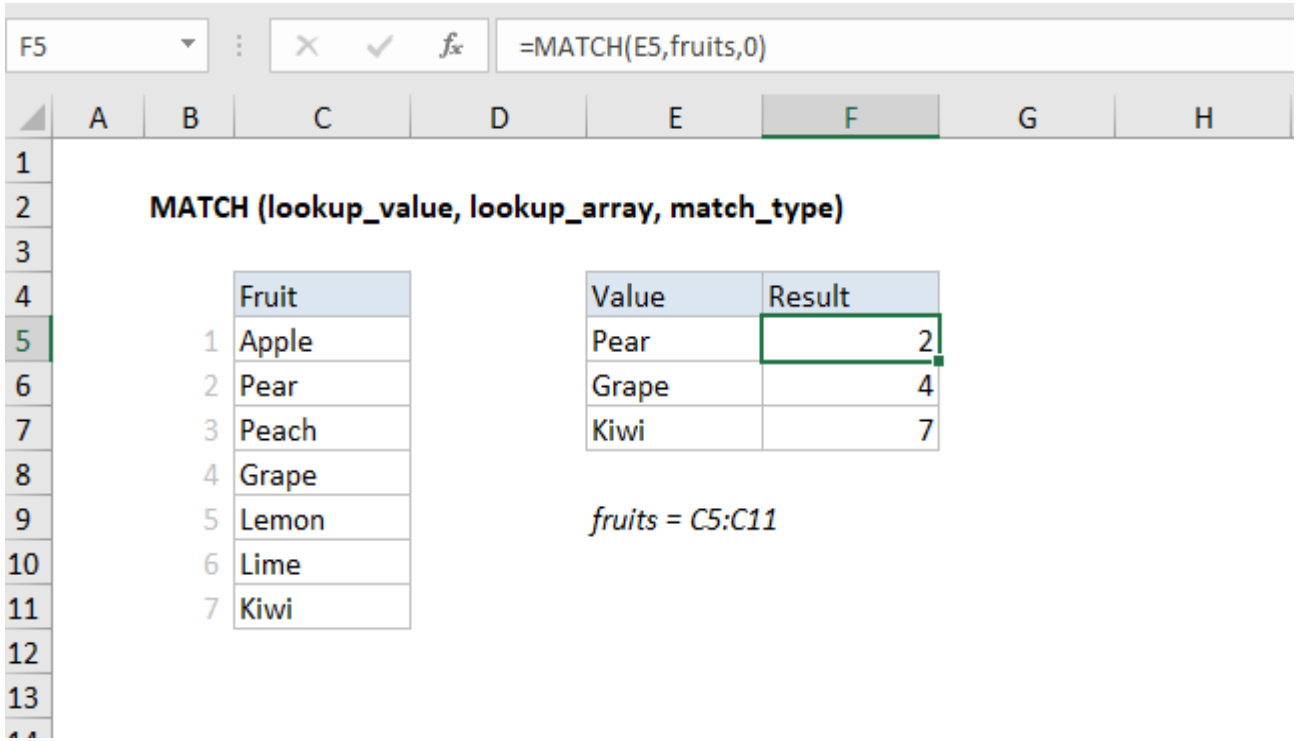
MATCH Function

Summary:
MATCH is an Excel function used to locate the position of a lookup value in a row, column, or table. MATCH supports approximate and exact matching, and wildcards (* ?) for partial matches. Often, the INDEX function is combined with MATCH to retrieve the value at the position returned by MATCH.

Purpose:
Get the position of an item in an array

Return value:
A number representing a position in lookup_array.

Syntax:
=MATCH (lookup_value, lookup_array, [match_type])



Arguments:

lookup_value - The value to match in lookup_array.
lookup_array - A range of cells or an array reference.
match_type - [optional] 1 = exact or next smallest (default), 0 = exact match, -1 = exact or next largest.

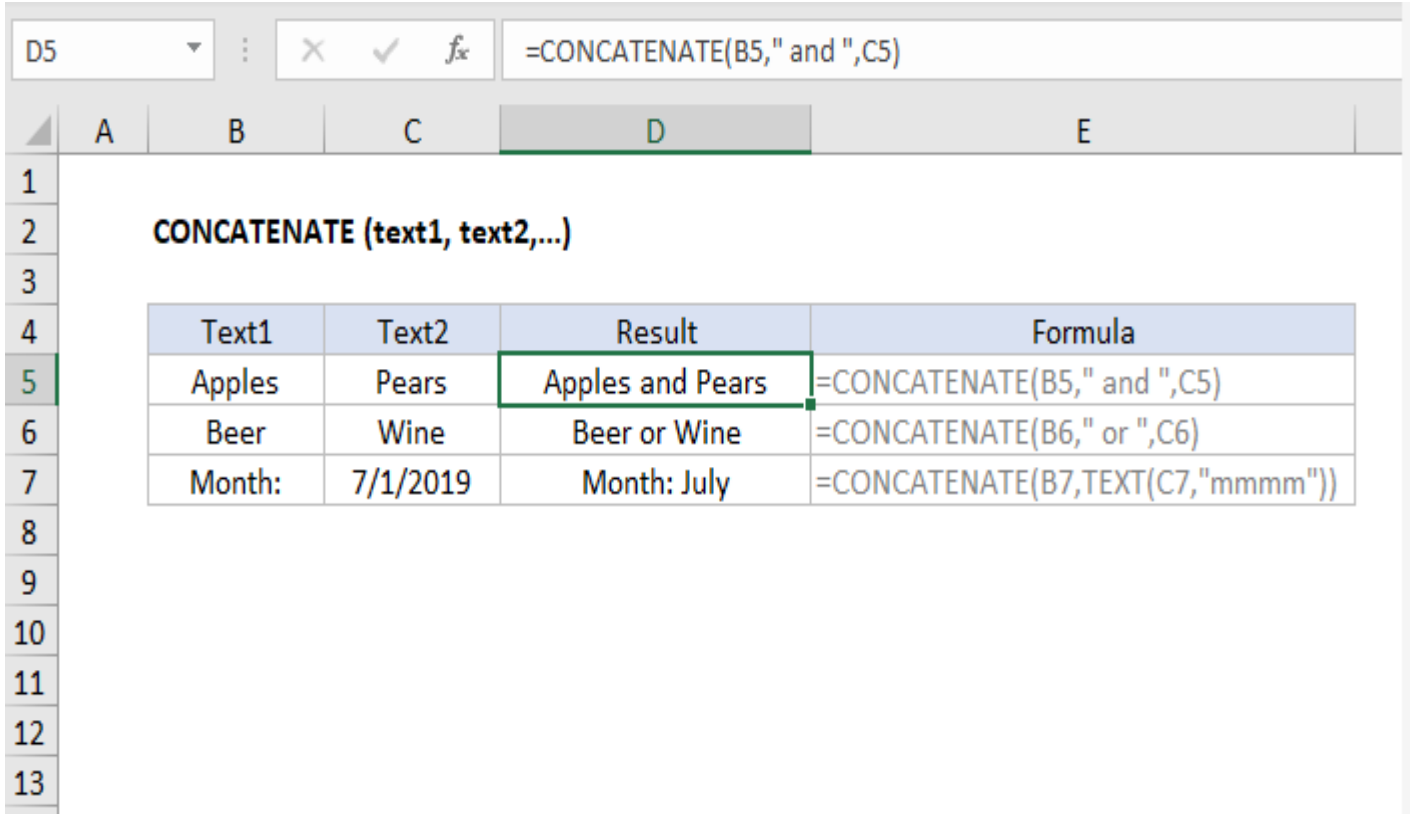
CONCATENATE Function

Summary:
The Excel CONCATENATE function concatenates (joins) join up to 30 text items together and returns the result as text. The CONCAT function replaces CONCATENATE in newer versions of Excel.

Purpose:
Join text together

Return value:
Text joined together.

Syntax:
=CONCATENATE (text1, text2, [text3], ...)



Arguments:

text1 - The first text value to join together.
text2 - The second text value to join together.
text3 - [optional] The third text value to join together.

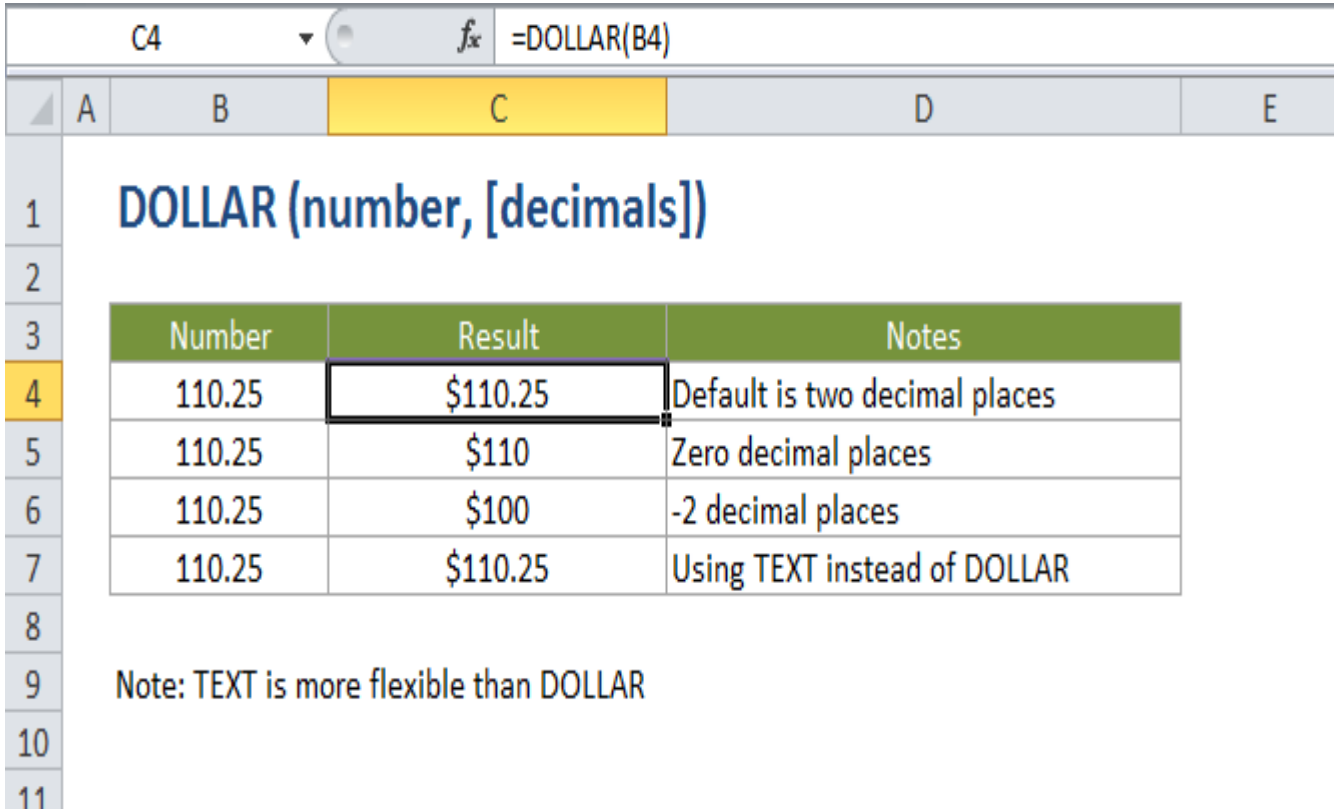
DOLLAR Function

Summary:
The Excel DOLLAR function converts a number to text using the Currency number format. The TEXT function can do the same thing, and is much more versatile.

Purpose:
Convert a number to text in currency format

Return value:
A number as text in currency format.

Syntax:
=DOLLAR (number, decimals)



Arguments:

number - The number to convert.
decimals - The number of digits to the right of the decimal point. Default is 2.

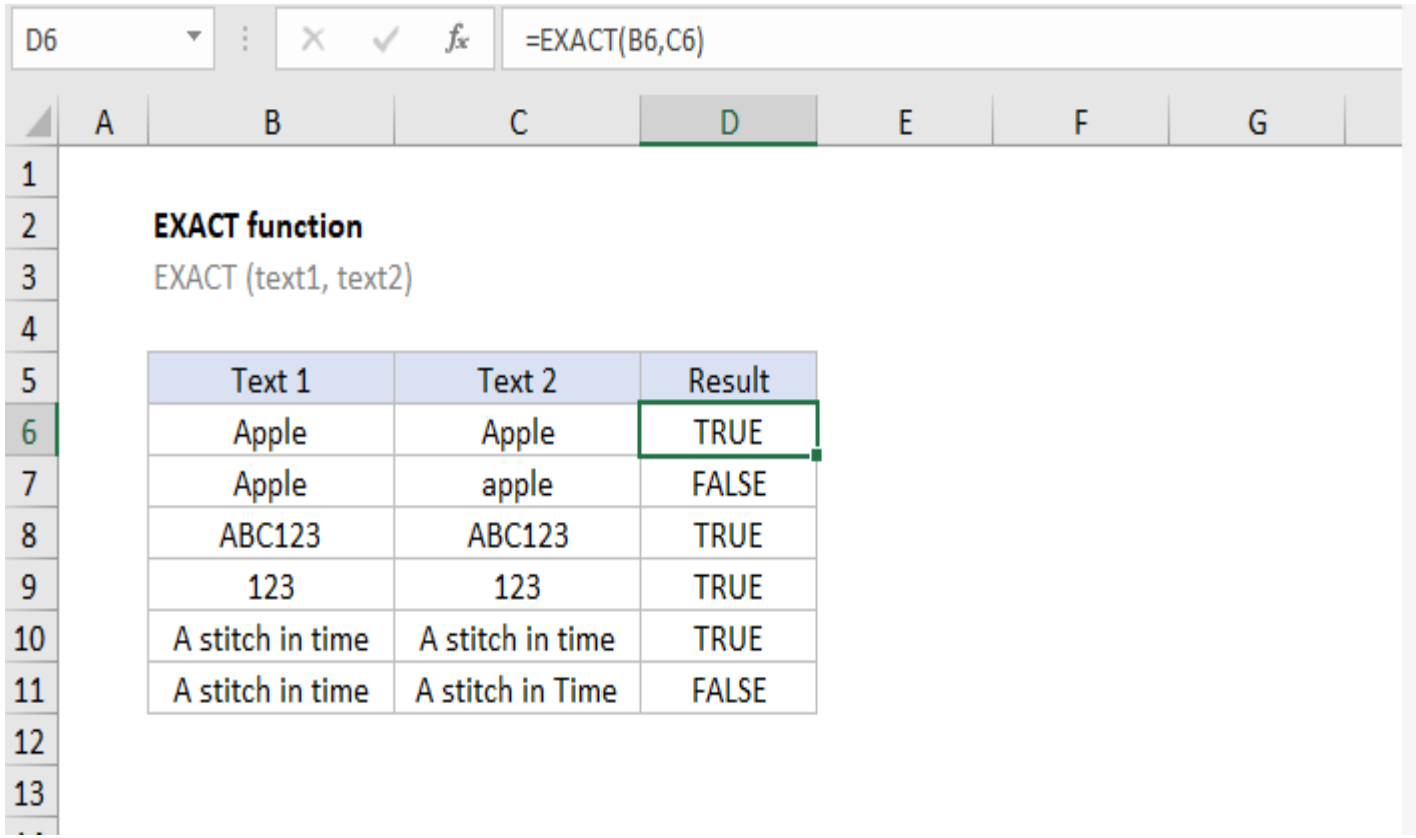
EXACT Function

Summary:
The Excel EXACT function compares two text strings, taking into account upper and lower case characters, and returns TRUE if they are the same, and FALSE if not. EXACT is case-sensitive.

Purpose:
Compare two text strings

Return value:
A boolean value (TRUE or FALSE)

Syntax:
=EXACT (text1, text2)



Text 1	Text 2	Result
Apple	Apple	TRUE
Apple	apple	FALSE
ABC123	ABC123	TRUE
123	123	TRUE
A stitch in time	A stitch in time	TRUE
A stitch in time	A stitch in Time	FALSE

Arguments:

text1 - The first text string to compare.
text2 - The second text string to compare.

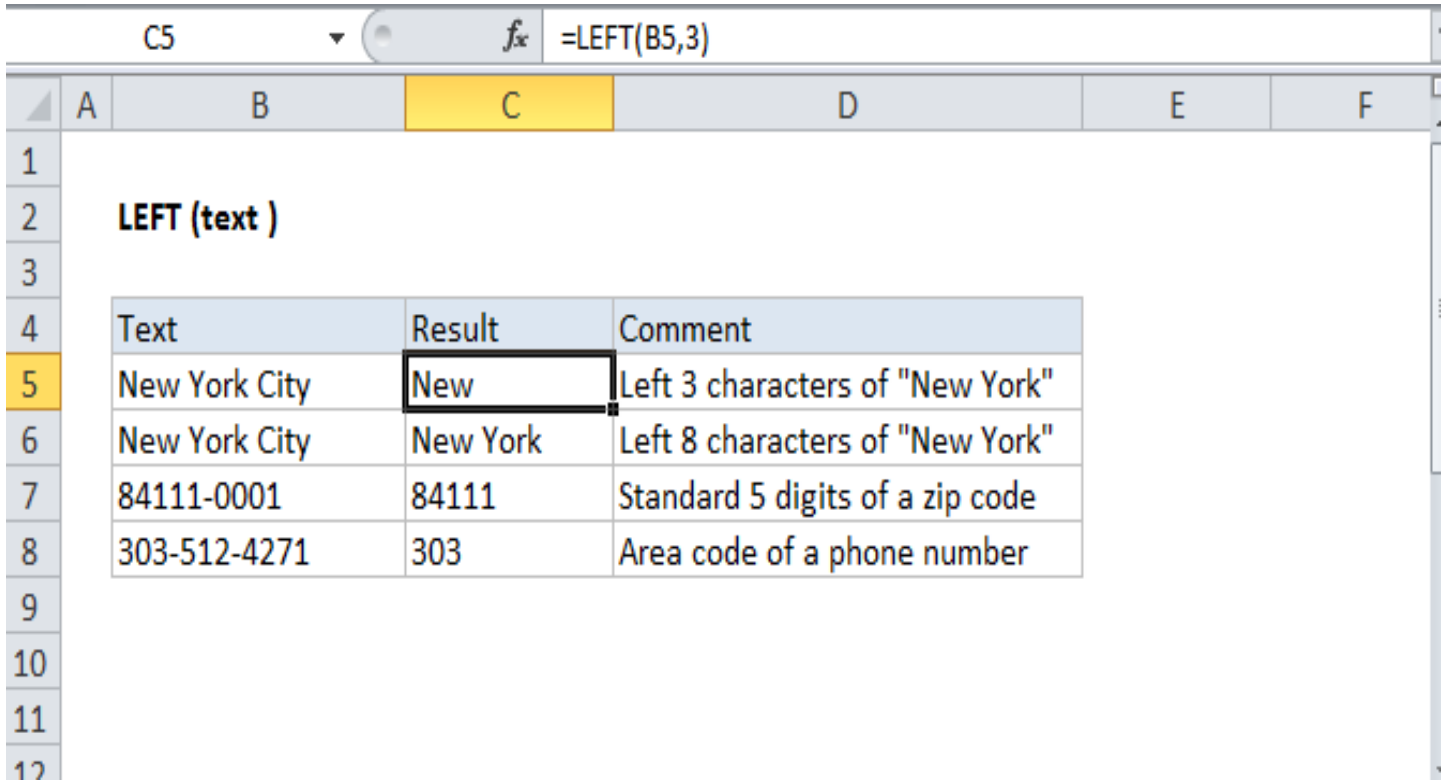
LEFT Function

Summary:
The Excel LEFT function extracts a given number of characters from the left side of a supplied text string. For example, LEFT("apple",3) returns "app".

Purpose:
Extract text from the left of a string

Return value:
One or more characters.

Syntax:
=LEFT (text, [num_chars])



Arguments:

text - The text from which to extract characters.
num_chars - [optional] The number of characters to extract, starting on the left side of text. Default = 1.

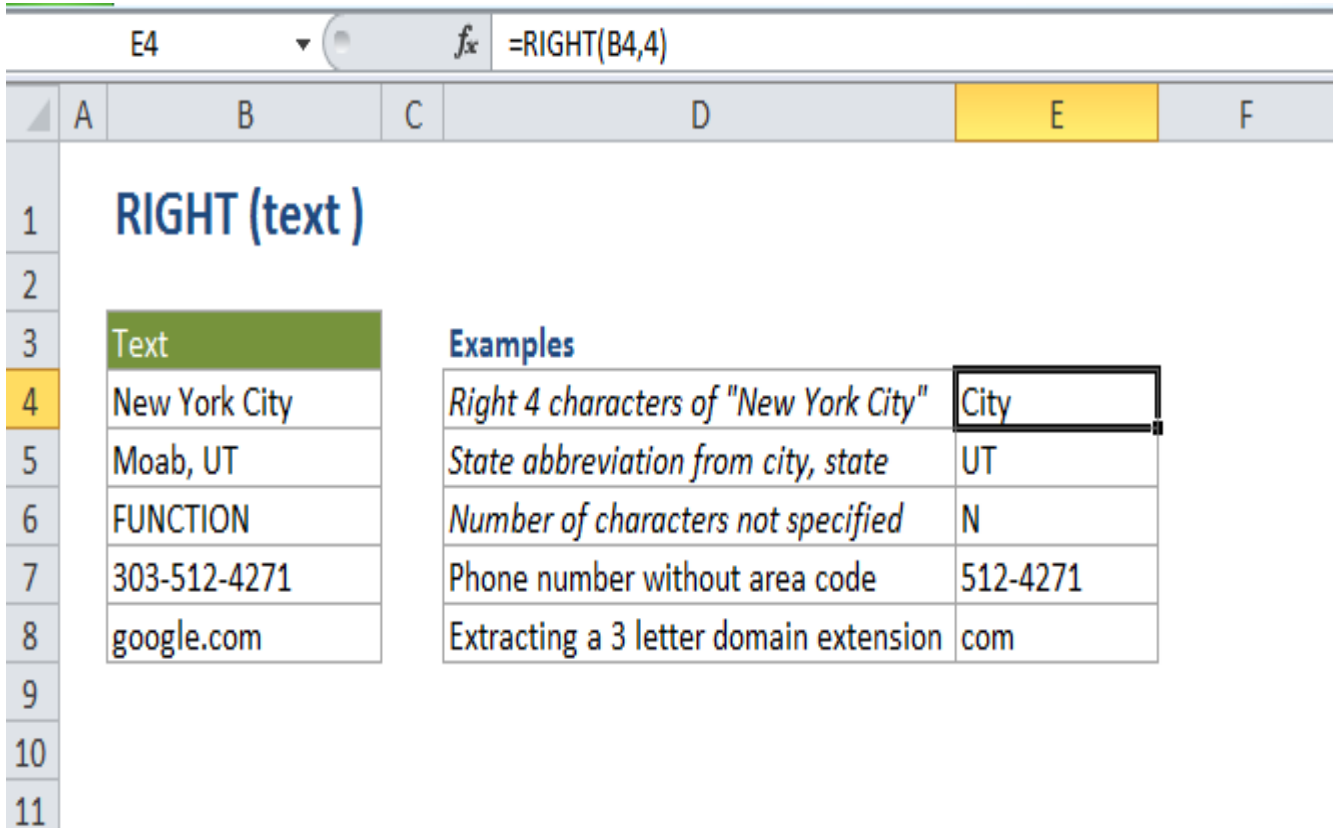
RIGHT Function

Summary:
The Excel RIGHT function extracts a given number of characters from the right side of a supplied text string. For example, RIGHT("apple",3) returns "ple".

Purpose:
Extract text from the right of a string

Return value:
One or more characters.

Syntax:
=RIGHT (text, [num_chars])



Arguments:

text - The text from which to extract characters on the right.
num_chars - [optional] The number of characters to extract, starting on the right. Optional, default = 1.

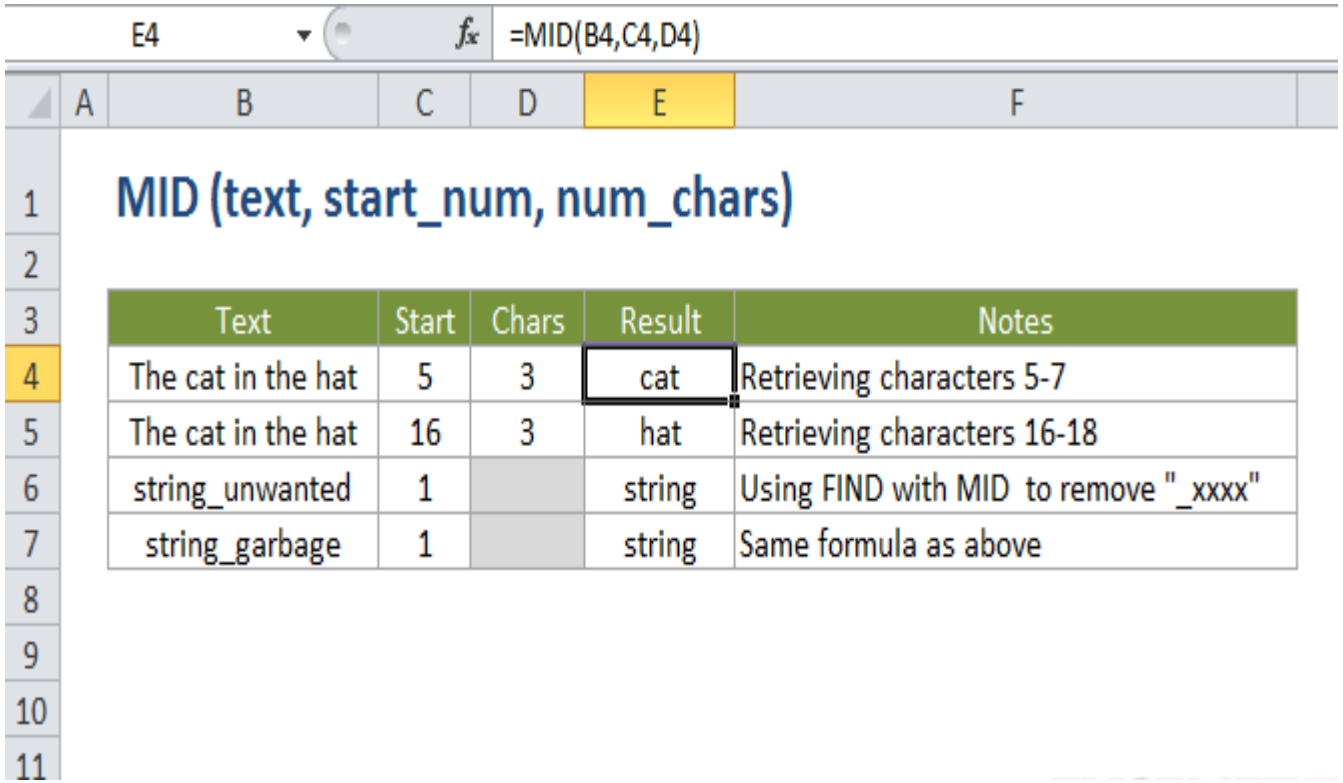
MID Function

Summary:
The Excel MID function extracts a given number of characters from the middle of a supplied text string. For example, =MID("apple",2,3) returns "ppl".

Purpose:
Extract text from inside a string

Return value:
The characters extracted.

Syntax:
=MID (text, start_num, num_chars)



Text	Start	Chars	Result	Notes
The cat in the hat	5	3	cat	Retrieving characters 5-7
The cat in the hat	16	3	hat	Retrieving characters 16-18
string_unwanted	1		string	Using FIND with MID to remove "_xxxx"
string_garbage	1		string	Same formula as above

Arguments:

text - The text to extract from.
start_num - The location of the first character to extract.
num_chars - The number of characters to extract.

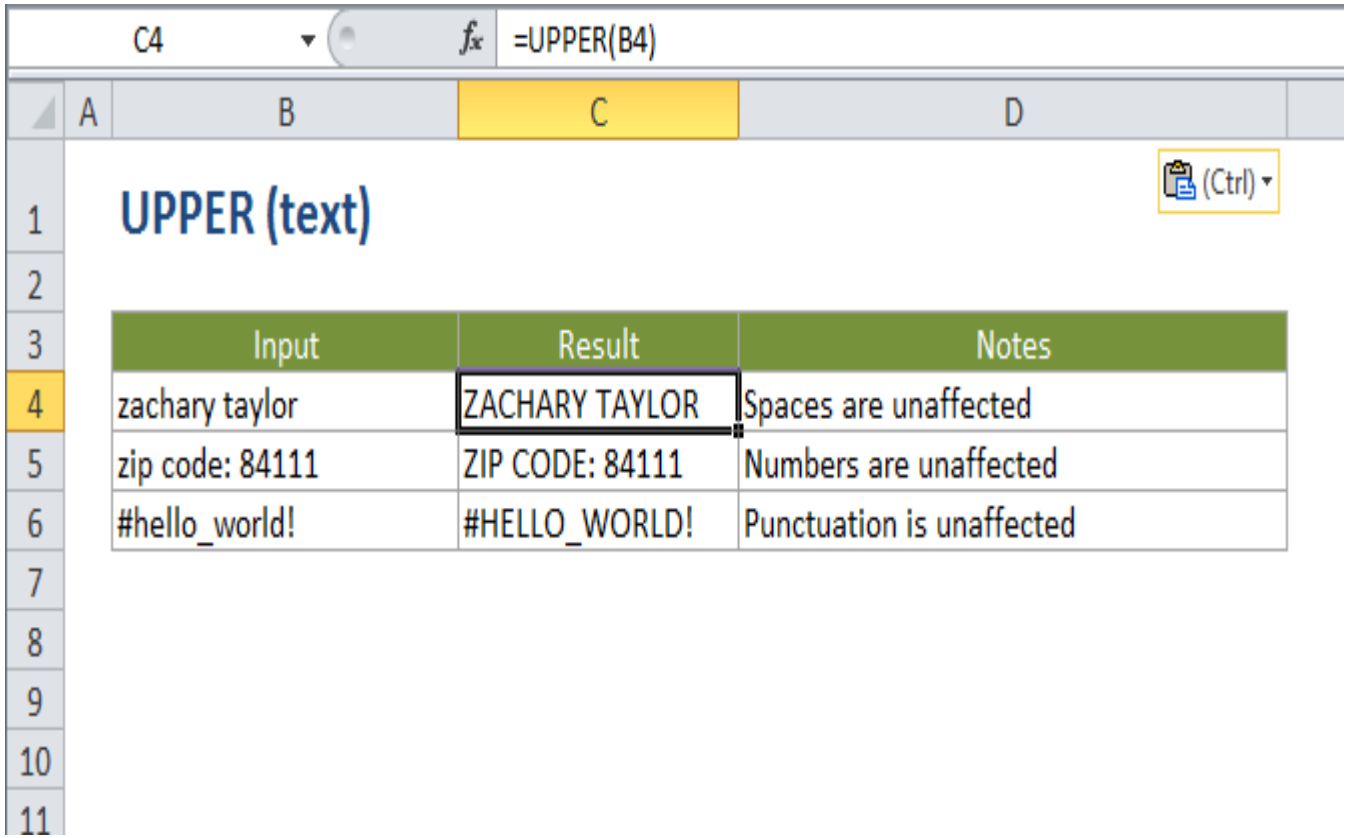
UPPER Function

The Excel UPPER function returns a upper-case version of a given text string. Numbers and punctuation are not affected.

Purpose:
Convert text to upper case

Return value:
Uppercase text.

Syntax:
=UPPER (text)



Arguments:

text - The text thatto convert to upper case.

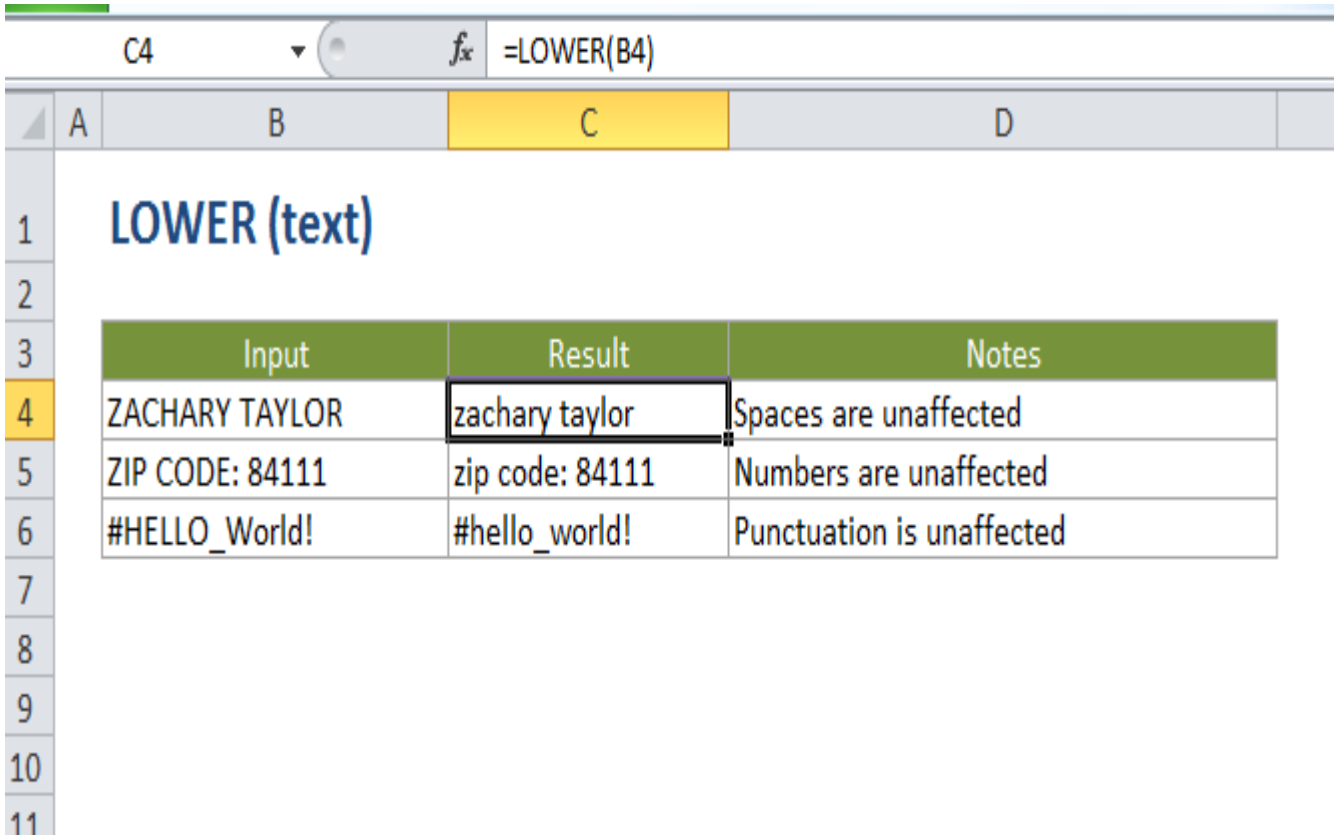
LOWER Function

Summary:
The Excel LOWER function returns a lower-case version of a given text string. Numbers and punctuation are not affected.

Purpose:
Convert text to lower case

Return value:
Text in lower case.

Syntax:
=LOWER (text)



Arguments:

text - The text that should be converted to lower case.

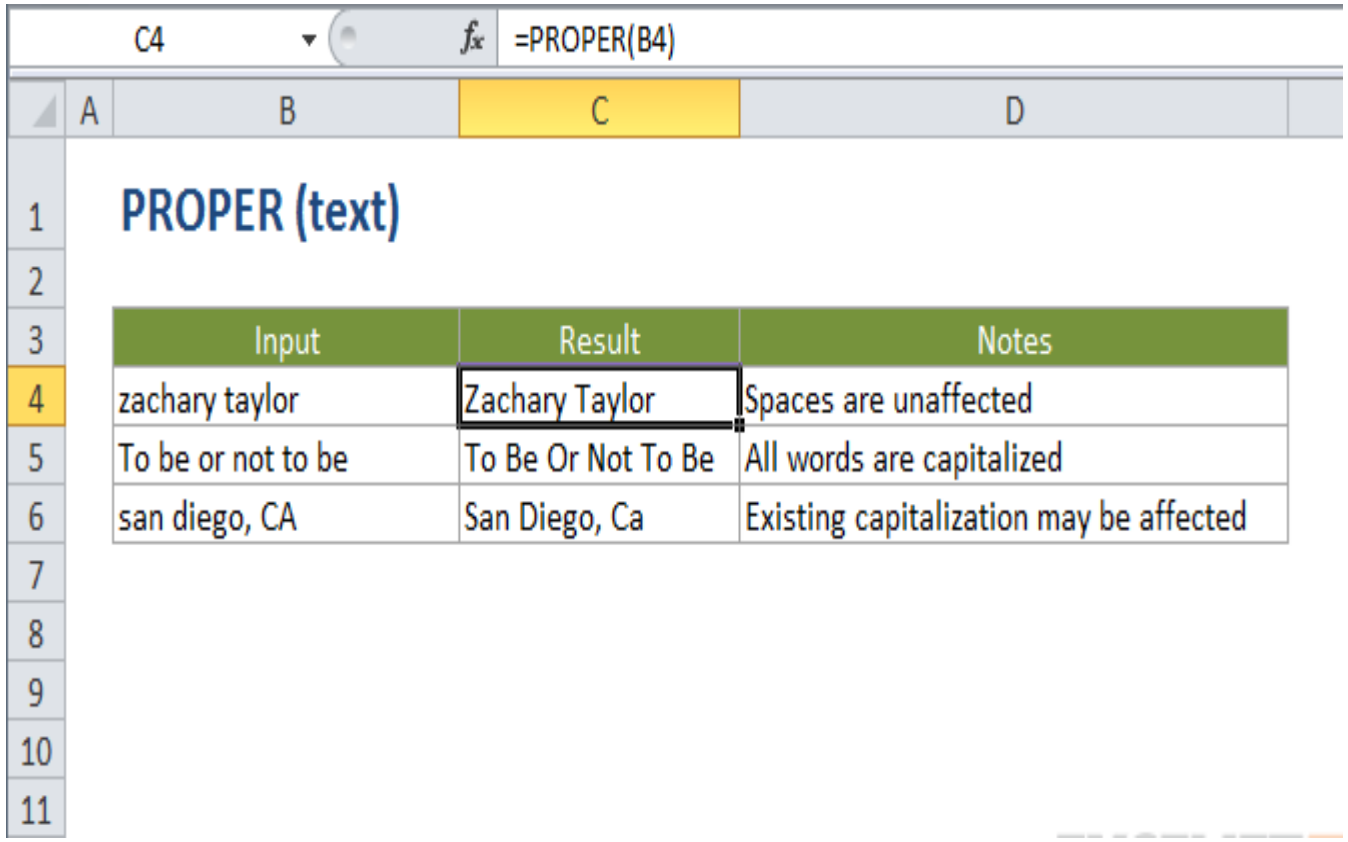
PROPER Function

Summary:
The Excel PROPER function capitalizes words given text string. Numbers and punctuation are not affected.

Purpose:
Capitalize the first letter in each word

Return value:
Text in proper case.

Syntax:
=PROPER (text)



Arguments:

text - The text that should be converted to proper case.

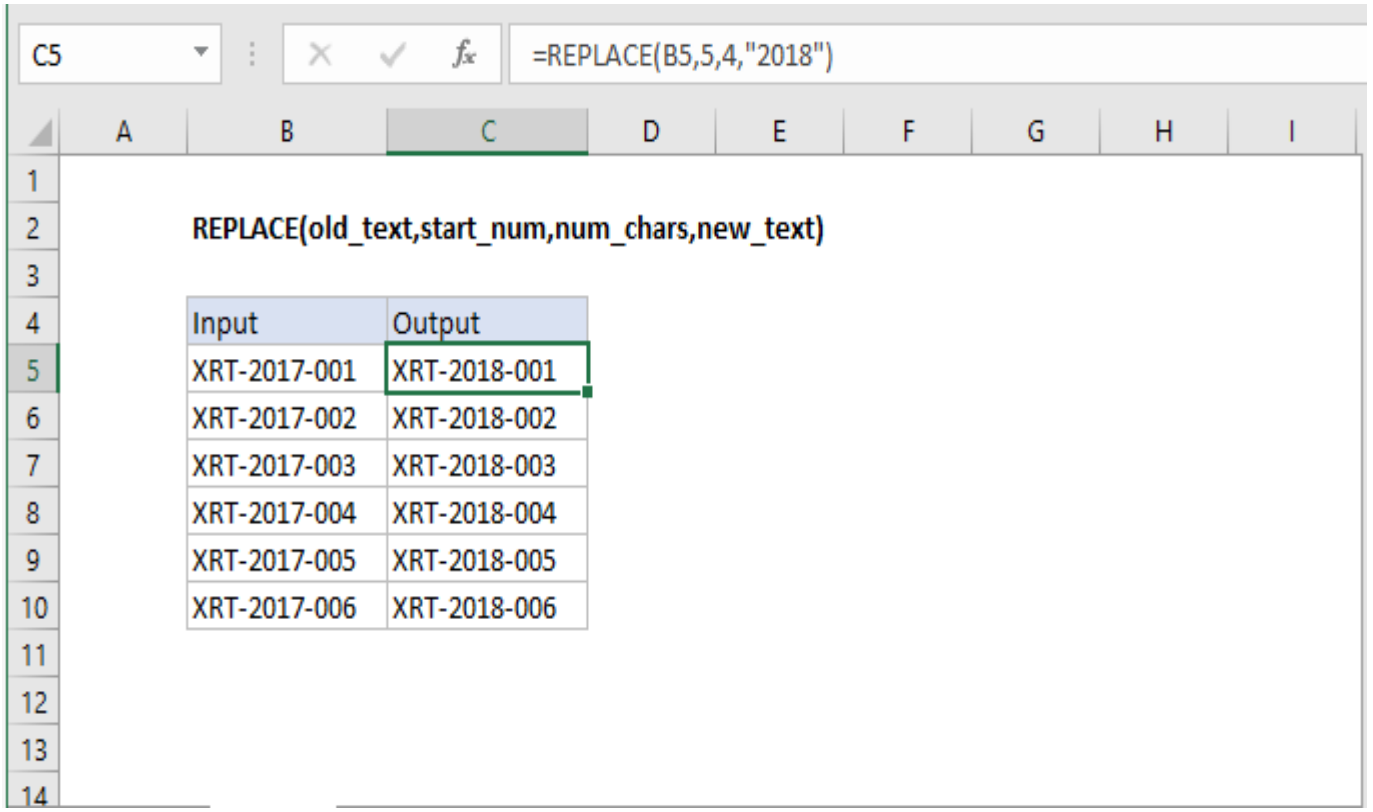
REPLACE Function

Summary:
The Excel REPLACE function replaces characters specified by location in a given text string with another text string. For example =REPLACE("XYZ123",4,3,"456") returns "XYZ456".

Purpose:
Replace text based on location

Return value:
The altered text.

Syntax:
=REPLACE (old_text, start_num, num_chars, new_text)



Arguments:

old_text - The text to replace.
start_num - The starting location in the text to search.
num_chars - The number of characters to replace.
new_text - The text to replace old_text with.

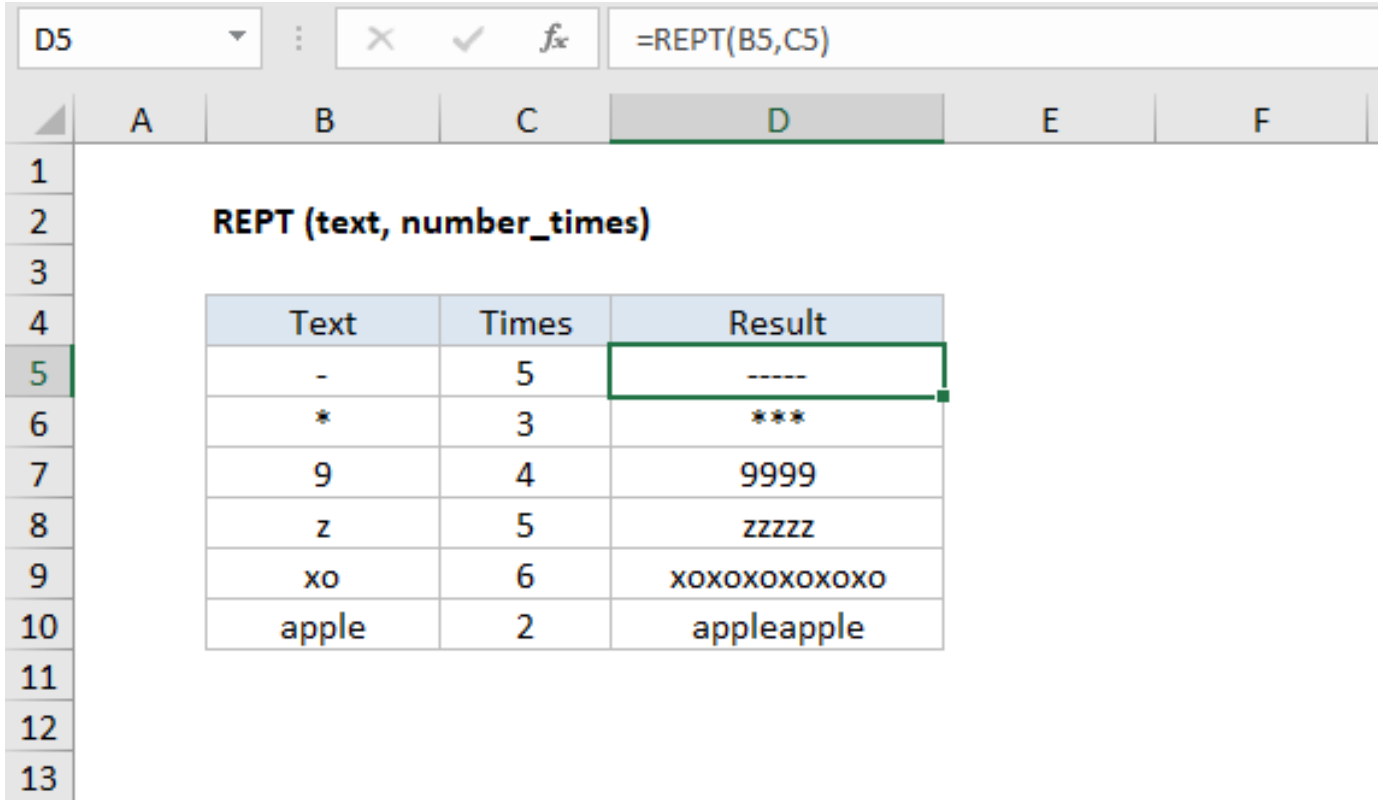
REPT Function

Summary:
The Excel REPT function repeats characters a given number of times. For example, =REPT("x",5) returns "xxxxx".

Purpose:
Repeat text as specified

Return value:
The repeated text.

Syntax:
=REPT (text, number_times)



Arguments:

text - The text to repeat.
number_times - The number of times to repeat text.

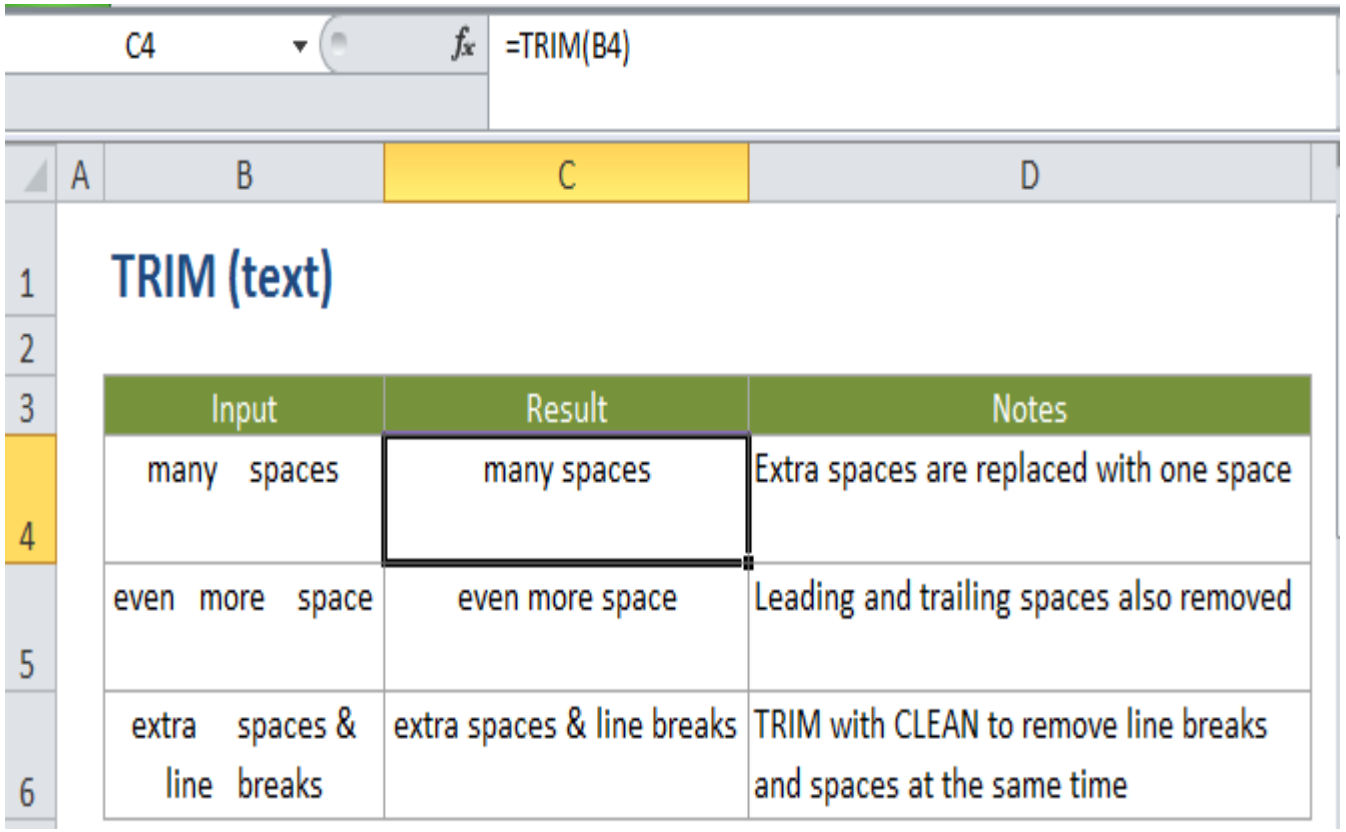
TRIM Function

Summary:
The Excel TRIM function strips extra spaces from text, leaving only a single space between words and no space characters at the start or end of the text.

Purpose:
Remove extra spaces from text

Return value:
Text with extra spaces removed.

Syntax:
=TRIM (text)



Arguments:

text - The text from which to remove extra space.

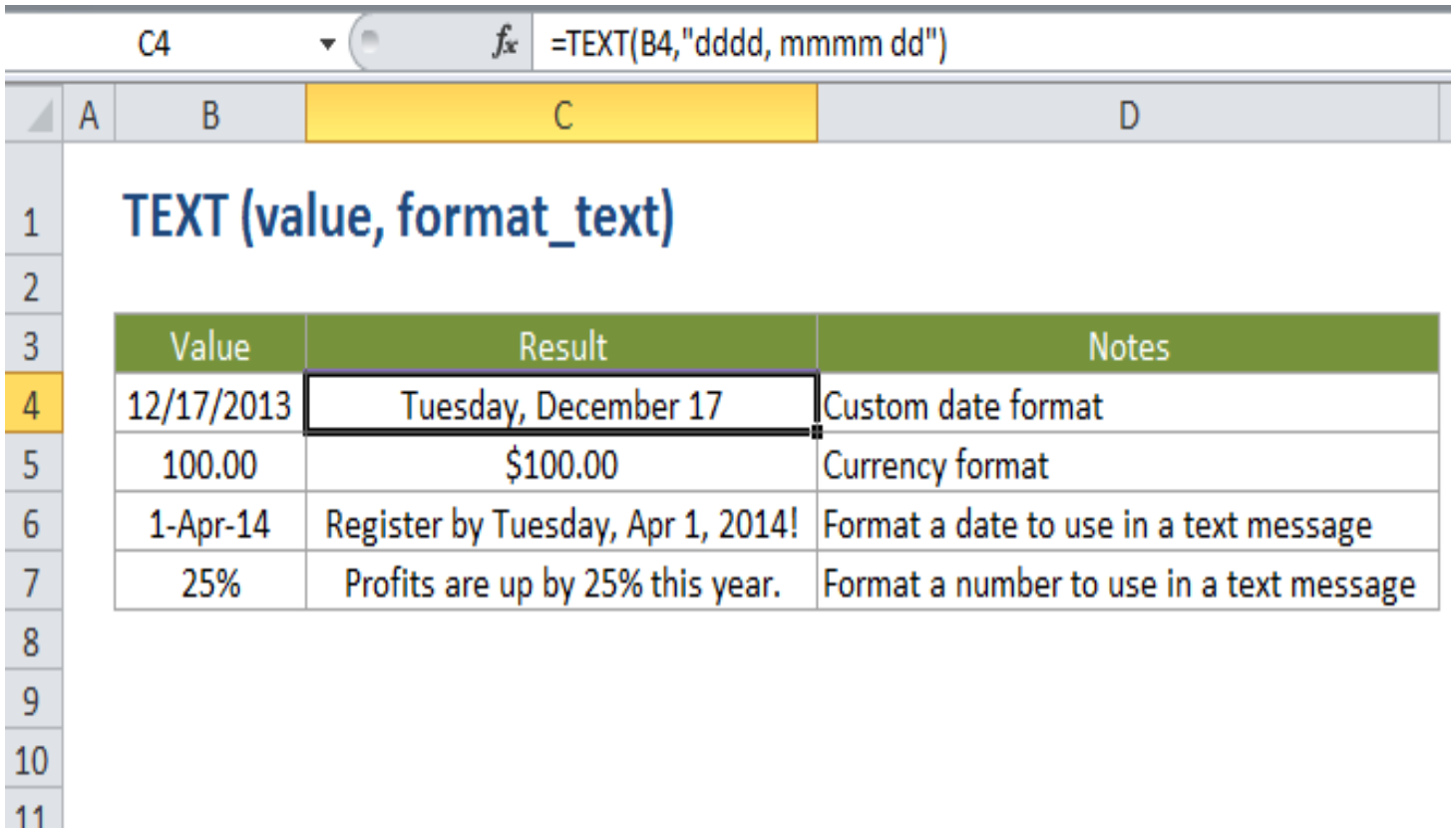
TEXT Function

Summary:
The Excel TEXT function returns a number in a given number format, as text. You can use the TEXT function to embed formatted numbers inside text.

Purpose:
Convert a number to text in a number format

Return value:
A number as text in the given format.

Syntax:
=TEXT (value, format_text)



Arguments:

value - The number to convert.
format_text - The number format to use.

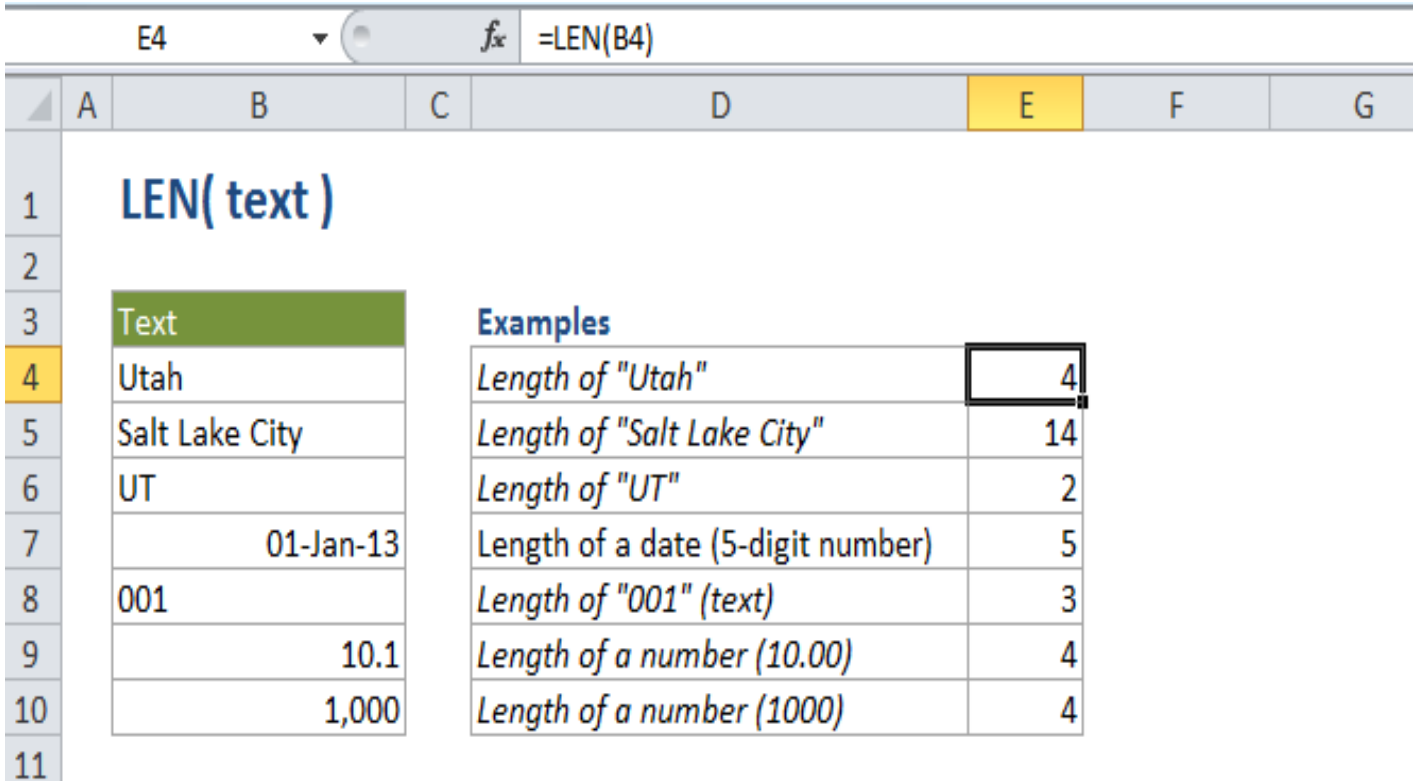
LEN Function

Summary:
The Excel LEN function returns the length of a given text string as the number of characters. LEN will also count characters in numbers, but number formatting is not included.

Purpose:
Get the length of text.

Return value:
Number of characters

Syntax:
=LEN (text)



Arguments:

text - The text for which to calculate length.

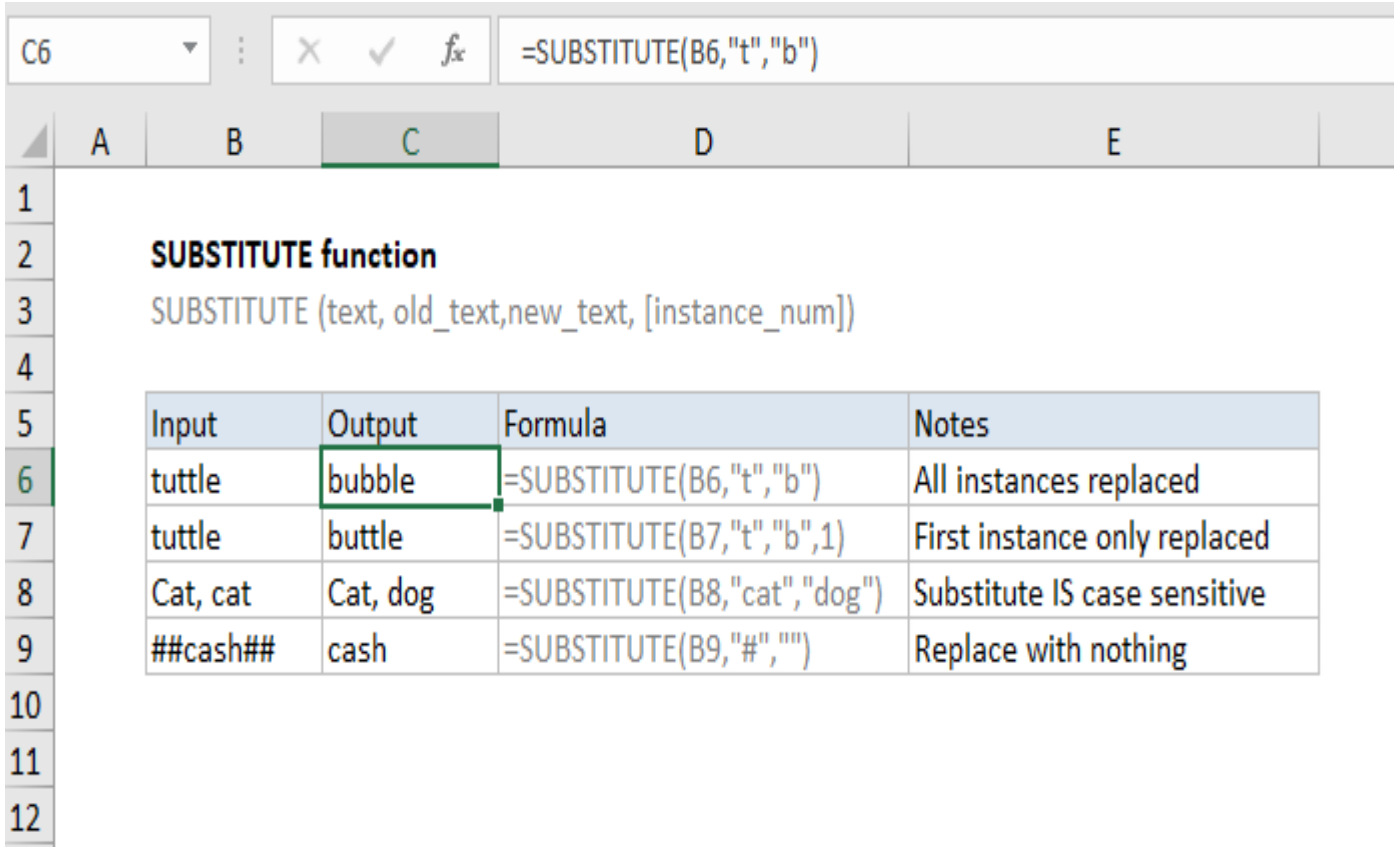
SUBSTITUTE Function

Summary:
The Excel SUBSTITUTE function replaces text in a given string by matching. For example =SUBSTITUTE("952-455-7865","-","") returns "9524557865"; the dash is stripped. SUBSTITUTE is case-sensitive and does not support wildcards.

Purpose:
Replace text based on content

Return value:
The processed text

Syntax:
=SUBSTITUTE (text, old_text, new_text, [instance])



Arguments:

text - The text to change.
old_text - The text to replace.
new_text - The text to replace with.
instance - [optional] The instance to replace. If not supplied, all instances are replaced.

Sir Rizwan Bhatti

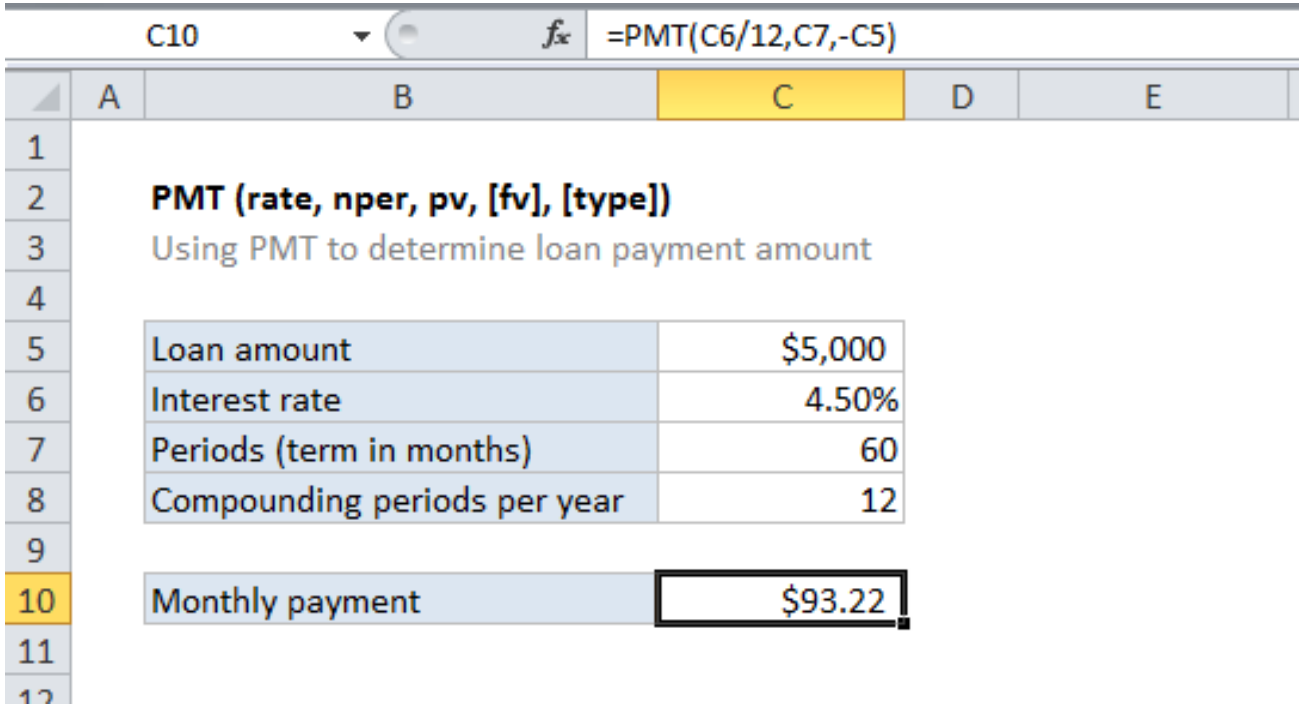
PMT Function

Summary:
The Excel PMT function is a financial function that returns the periodic payment for a loan. You can use the NPER function to figure out payments for a loan, given the loan amount, number of periods, and interest rate.

Purpose:
Get the periodic payment for a loan

Return value:
loan payment as a number

Syntax:
=PMT (rate, nper, pv, [fv], [type])



Arguments:

rate - The interest rate for the loan.
nper - The total number of payments for the loan.
pv - The present value, or total value of all loan payments now.
fv - [optional] The future value, or a cash balance you want after the last payment is made. Defaults to 0 (zero).
type - [optional] When payments are due. 0 = end of period. 1 = beginning of period. Default is 0.

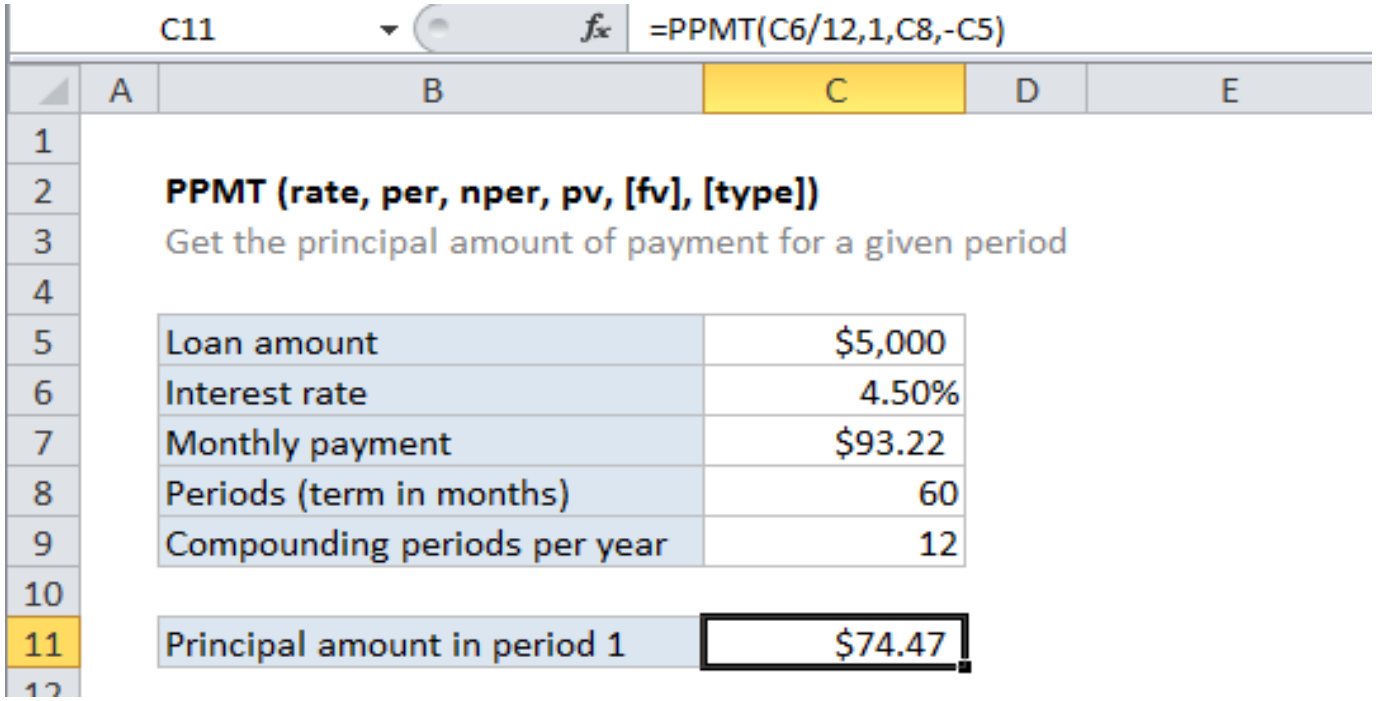
PPMT Function

Summary:
The Excel PPMT function can be used to calculate the principal portion of a given loan payment. For example, you can use PPMT to get the principal amount of a payment for the first period, the last period, or any period in between.

Purpose:
Get principal payment in given period

Return value:
The principal payment

Syntax:
=PPMT (rate, per, nper, pv, [fv], [type])



Arguments:

rate - The interest rate per period.
per - The payment period of interest.
nper - The total number of payments for the loan.
pv - The present value, or total value of all payments now.
fv - [optional] The cash balance desired after last payment is made. Defaults to 0.
type - [optional] When payments are due. 0 = end of period. 1 = beginning of

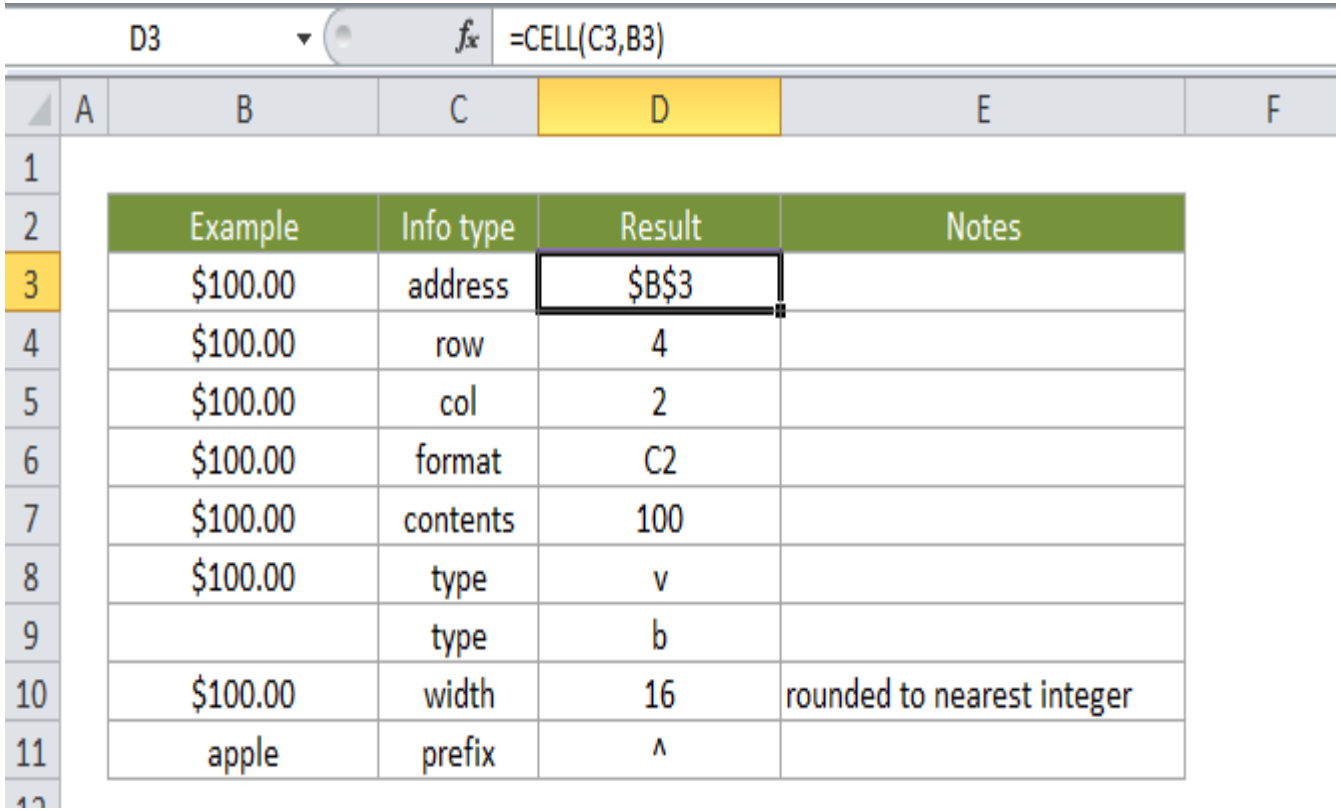
CELL Function

Summary:
The Excel CELL function returns information about a cell in a worksheet. The type of information to be returned is specified as info_type. CELL can get things like address and filename, as well as detailed info about the formatting used in the cell. See below for a full list of information available.

Purpose:
Get information about a cell

Return value:
A text value

Syntax:
=CELL (info_type, [reference])



Example	Info type	Result	Notes
$100.00	address	$B$3	
$100.00	row	4	
$100.00	col	2	
$100.00	format	C2	
$100.00	contents	100	
$100.00	type	v	
	type	b	
$100.00	width	16	rounded to nearest integer
apple	prefix	^	

Arguments:

info_type - The type of information to return about the reference.
reference - [optional] The reference from which to extract information.

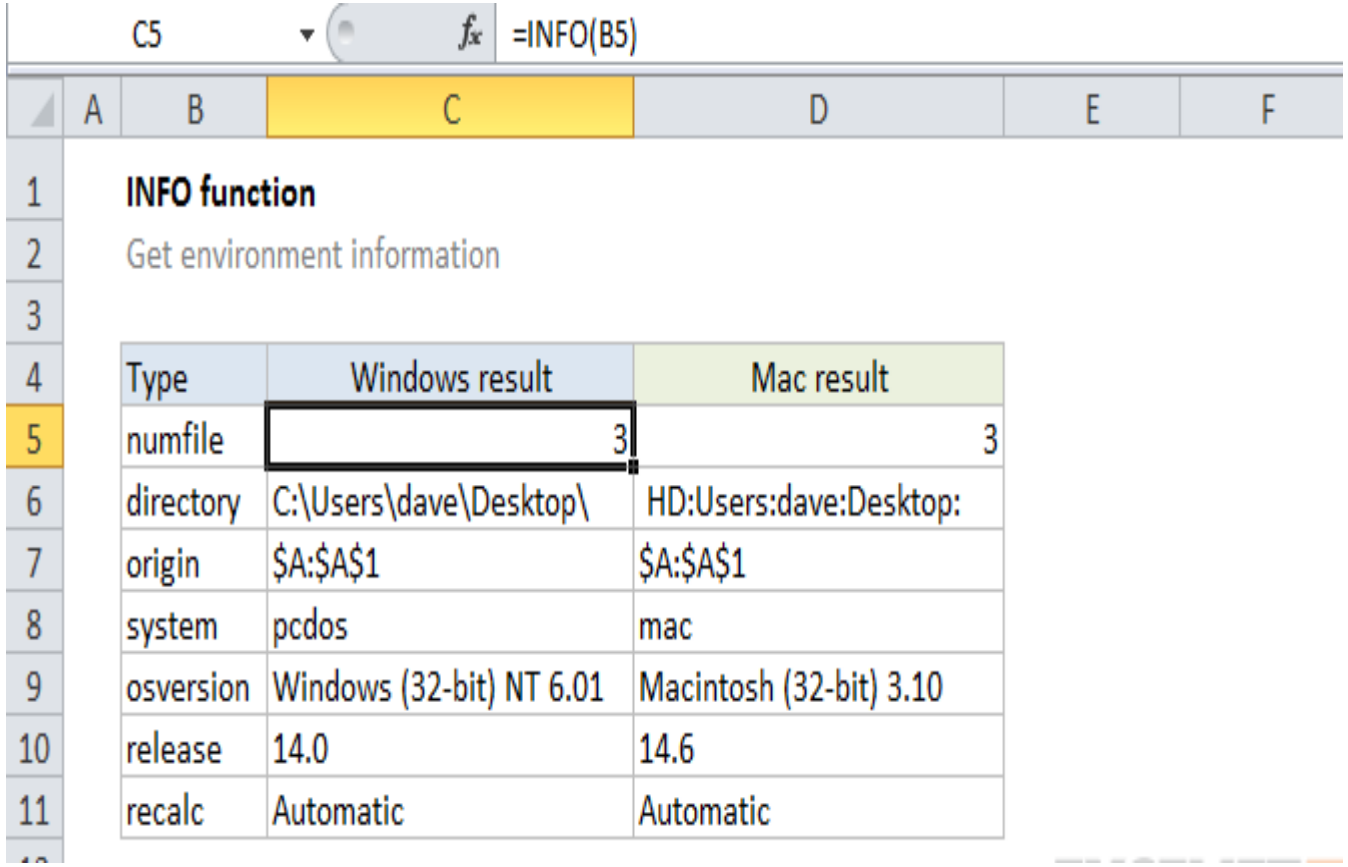
INFO Function

Summary:
The Excel INFO function returns information about the current environment, including platform, Excel version, number of worksheets in a workbook, and so on. To use the INFO function, supply the type of information you want as text. There are seven types of information available, summarized in the table below.

Purpose:
Get information about current environment

Return value:
The information requested

Syntax:
=INFO (type_text)



Type	Windows result	Mac result
numfile	3	3
directory	C:\Users\dave\Desktop\	HD:Users:dave:Desktop:
origin	$A:$A$1	$A:$A$1
system	pcdos	mac
osversion	Windows (32-bit) NT 6.01	Macintosh (32-bit) 3.10
release	14.0	14.6
recalc	Automatic	Automatic

Arguments:

type_text - The information type to return as text.

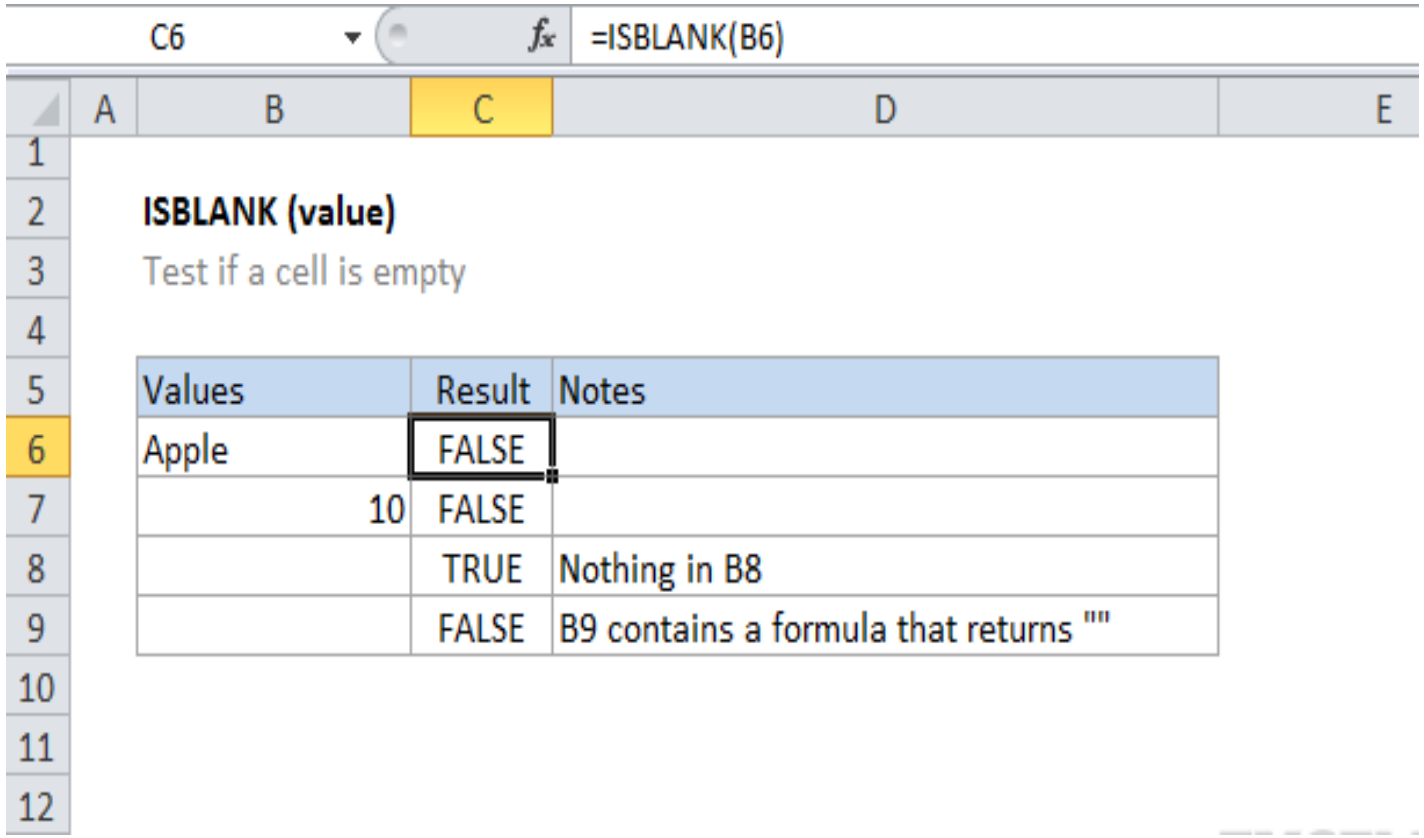
ISBLANK Function

Summary:
The Excel ISBLANK function returns TRUE when a cell contains is empty, and FALSE when a cell is not empty. For example, if A1 contains "apple", ISBLANK(A1) returns FALSE.

Purpose:
Test if a cell is empty

Return value:
A logical value (TRUE or FALSE)

Syntax:
=ISBLANK (value)



Arguments:

value - The value to check.

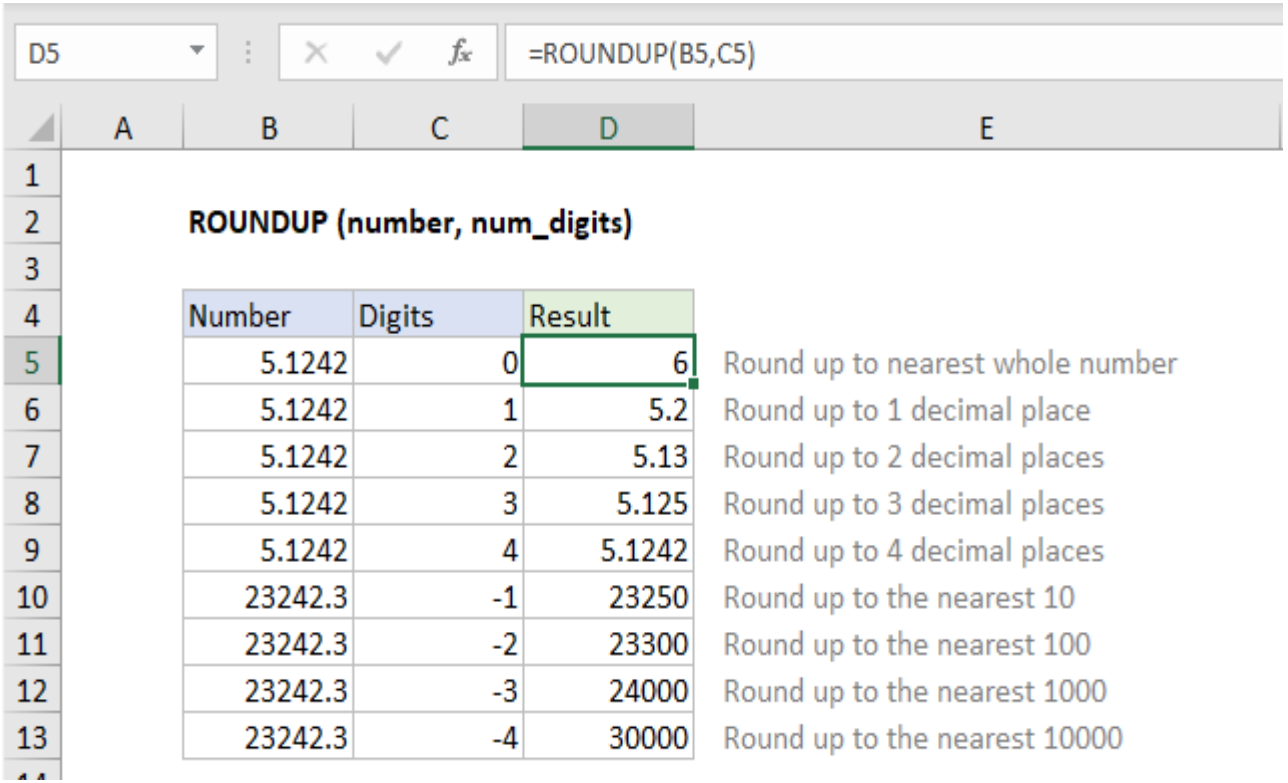
ROUNDUP Function

Summary:
The Excel ROUNDUP function returns a number rounded up to a given number of decimal places. Unlike standard rounding, where numbers less than 5 are rounded down, ROUNDUP rounds *all numbers up*.

Purpose:
Round a number up to a given number of digits

Return value:
A rounded number.

Syntax:
=ROUNDUP (number, num_digits)



Number	Digits	Result	
5.1242	0	6	Round up to nearest whole number
5.1242	1	5.2	Round up to 1 decimal place
5.1242	2	5.13	Round up to 2 decimal places
5.1242	3	5.125	Round up to 3 decimal places
5.1242	4	5.1242	Round up to 4 decimal places
23242.3	-1	23250	Round up to the nearest 10
23242.3	-2	23300	Round up to the nearest 100
23242.3	-3	24000	Round up to the nearest 1000
23242.3	-4	30000	Round up to the nearest 10000

Arguments:

number - The number to round up.
num_digits - The number of digits to which number should be rounded up.

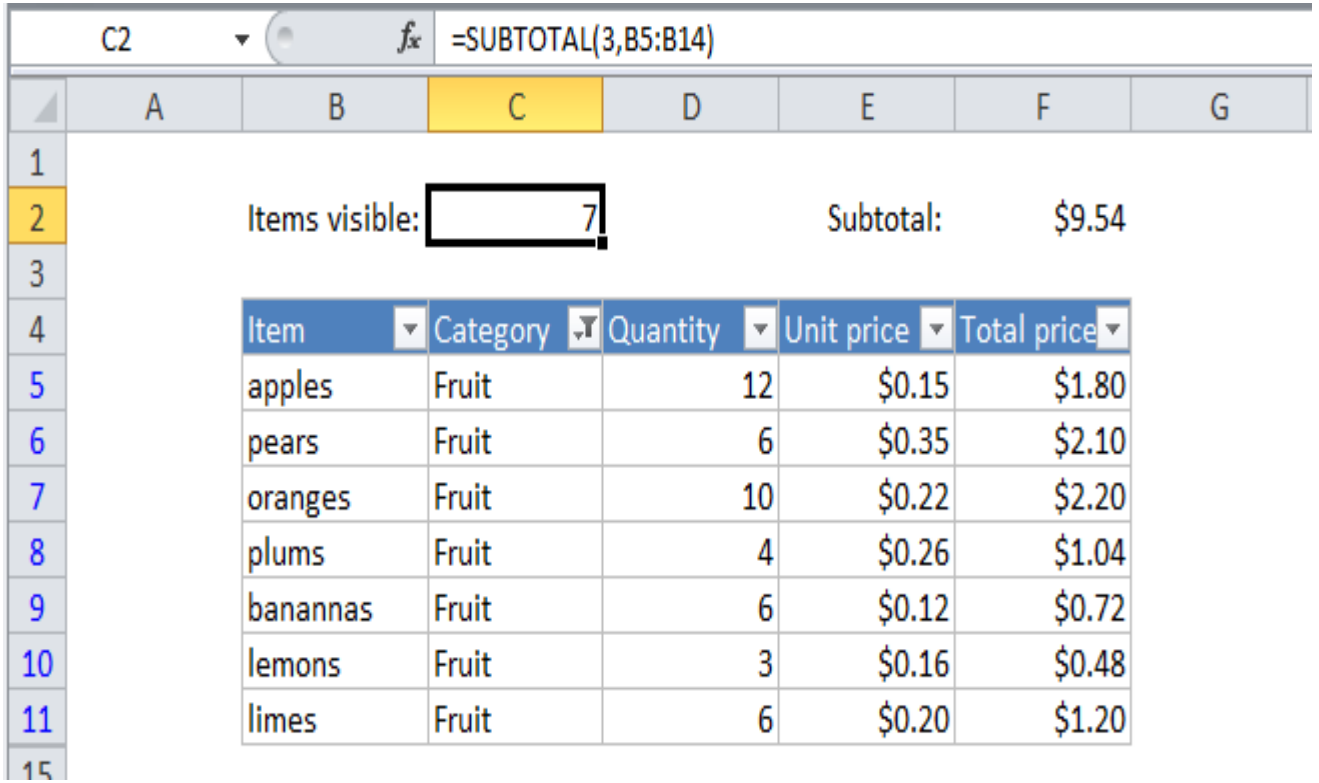
SUBTOTAL Function

Summary:
The Excel SUBTOTAL function returns an aggregate result for supplied values. SUBTOTAL can return a SUM, AVERAGE, COUNT, MAX, and others (see table below), and SUBTOTAL function can either include or exclude values in hidden rows.

Purpose:
Get a subtotal in a list or database

Return value:
A number representing a specific kind of subtotal

Syntax:
=SUBTOTAL (function_num, ref1, [ref2], ...)



Item	Category	Quantity	Unit price	Total price
apples	Fruit	12	$0.15	$1.80
pears	Fruit	6	$0.35	$2.10
oranges	Fruit	10	$0.22	$2.20
plums	Fruit	4	$0.26	$1.04
banannas	Fruit	6	$0.12	$0.72
lemons	Fruit	3	$0.16	$0.48
limes	Fruit	6	$0.20	$1.20

Arguments:

function_num - A number that specifies which function to use in calculating subtotals within a list. See table below for full list.
ref1 - A named range or reference to subtotal.
ref2 - [optional] A named range or reference to subtotal.

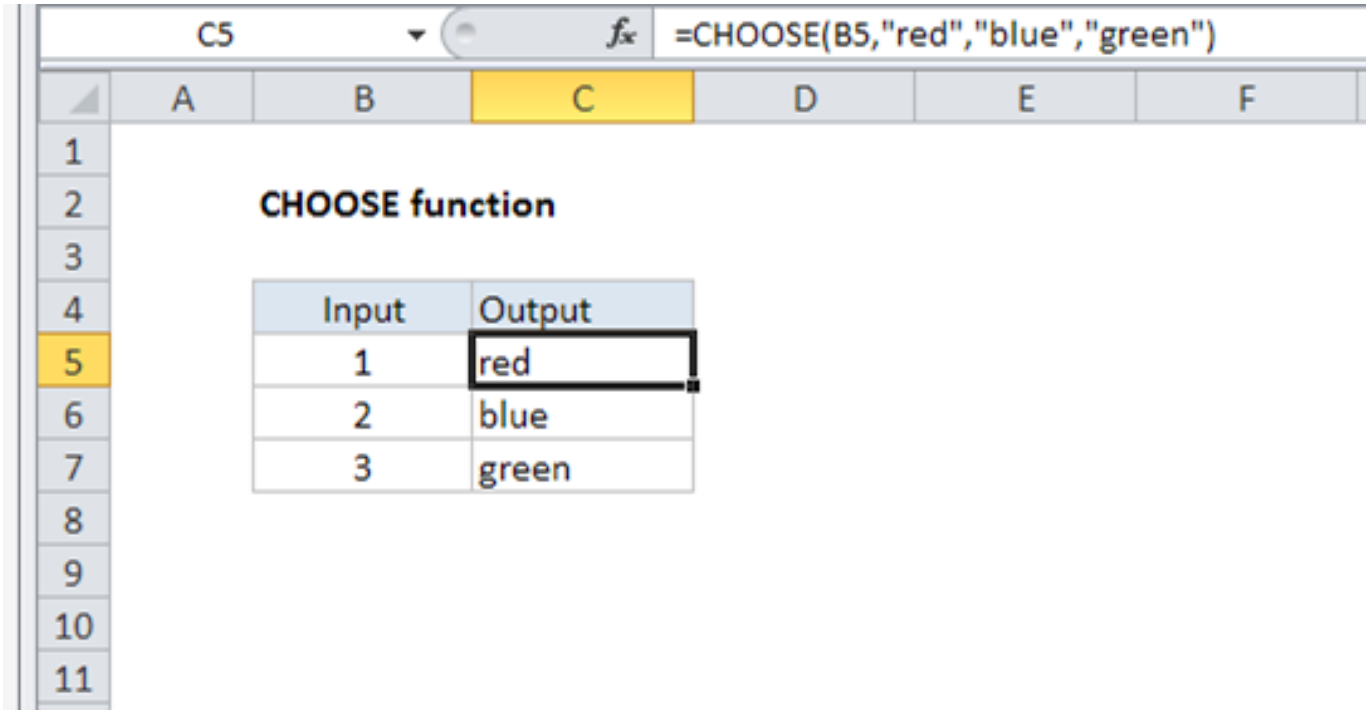
CHOOSE Function

Summary:
The Excel CHOOSE function returns a value from a list using a given position or index. For example,
CHOOSE(2,"red","blue","green") returns "blue", since blue is the 2nd value listed after the index number. The values provided to CHOOSE can include references.

Purpose:
Get a value from a list based on position

Return value:
The value at the given position.

Syntax:
=CHOOSE (index_num, value1, [value2], ...)

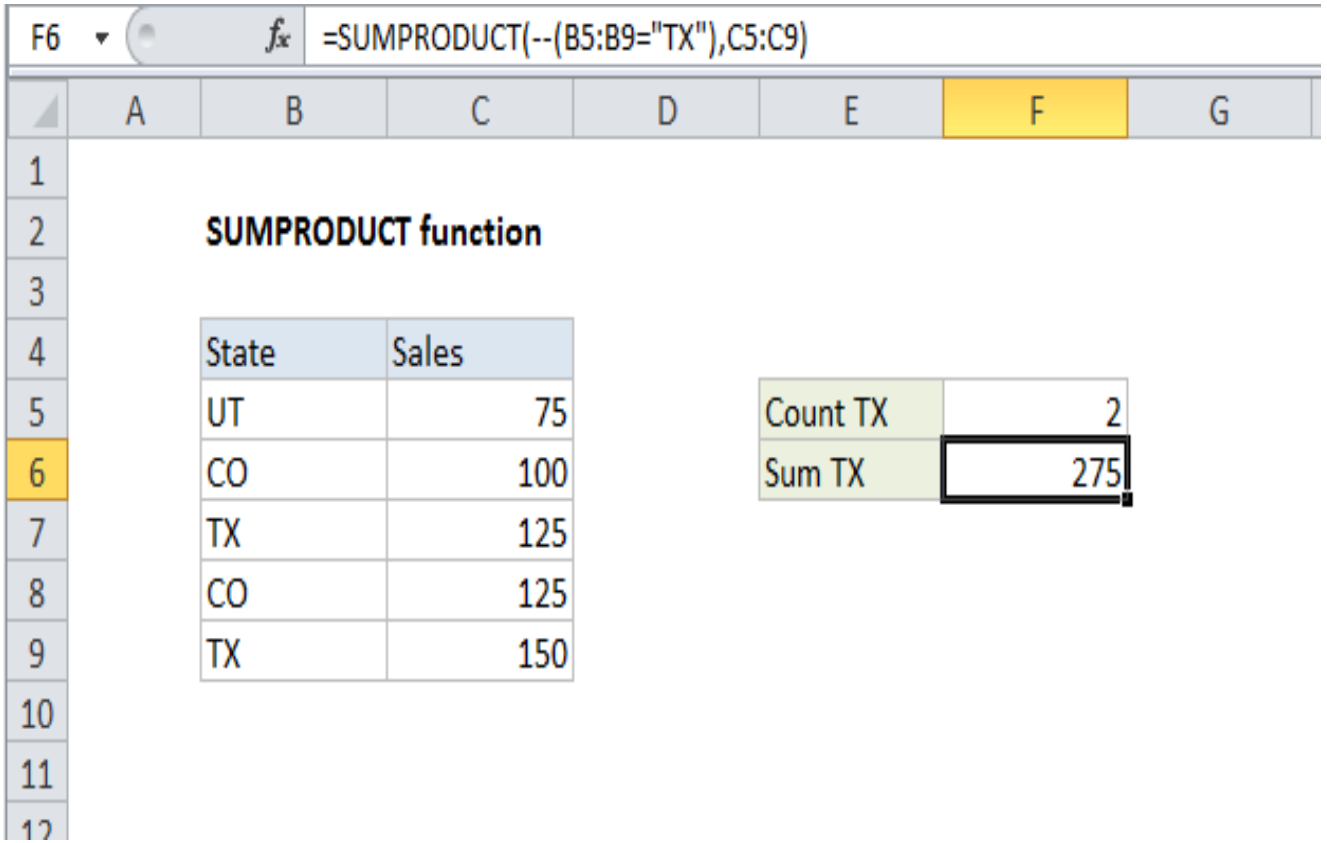


Arguments:

index_num - The value to choose. A number between 1 and 254.
value1 - The first value from which to choose.
value2 - [optional] The second value from which to choose.

SUMPRODUCT Function

Summary:
The SUMPRODUCT function multiplies ranges or arrays together and returns the sum of products. This sounds boring, but SUMPRODUCT is an incredibly versatile function that can be used to count and sum like COUNTIFS or SUMIFS, but with more flexibility. Other functions can easily be used inside SUMPRODUCT to extend functionality even further.



Purpose:
Multiply, then sum arrays

Return value:
The result of multipled and summed arrays

Syntax:
=SUMPRODUCT (array1, [array2], ...)

Arguments:

array1 - The first array or range to multiply, then add.
array2 - [optional] The second array or range to multiply, then add.

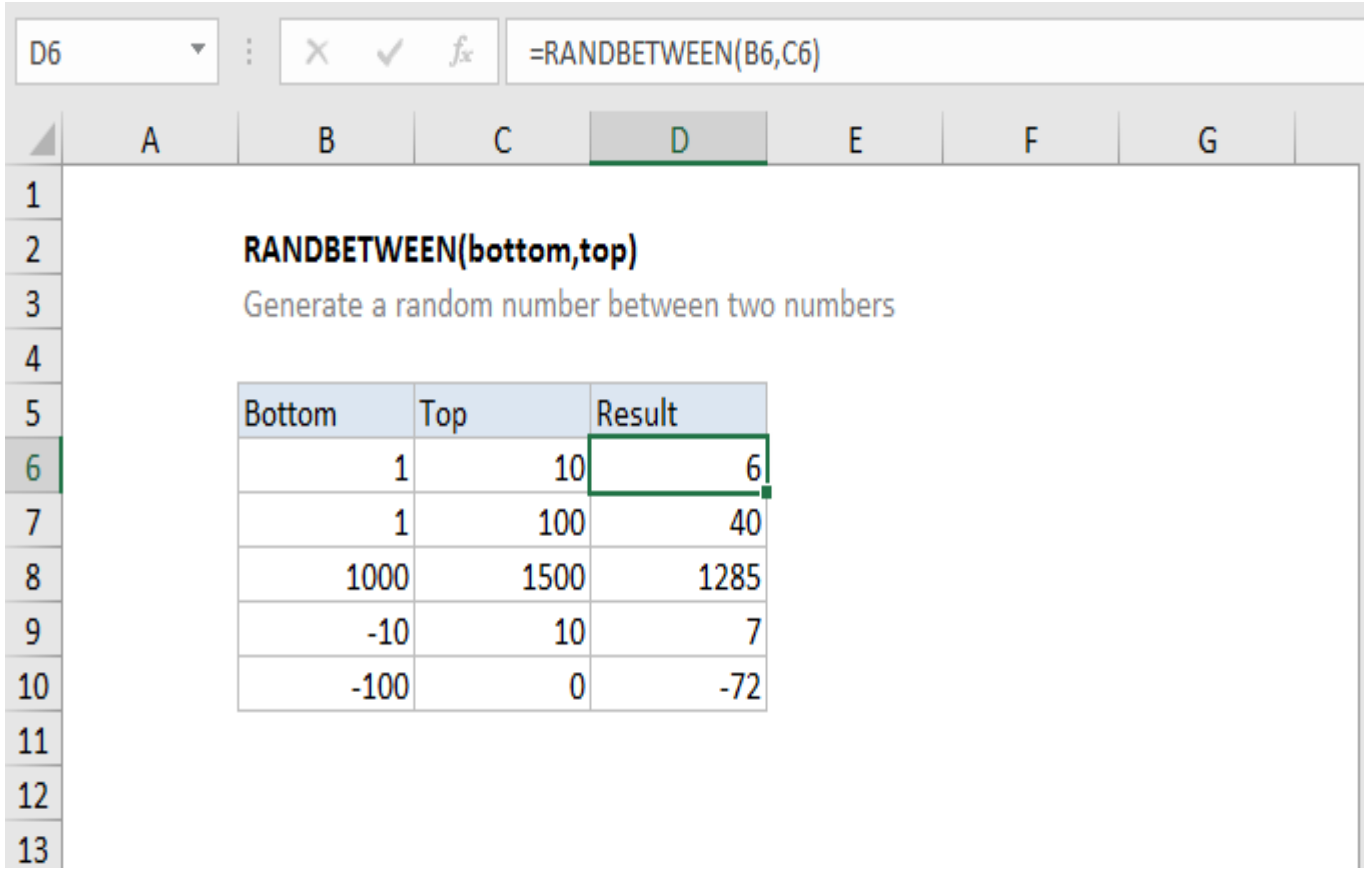
RANDBETWEEN Function

Summary:
The Excel RANDBETWEEN function returns a random integer between given numbers. RANDBETWEEN recalculates when a worksheet is opened or changed.

Purpose:
Get a random integer between two values

Return value:
An integer

Syntax:
=RANDBETWEEN (bottom, top)



Arguments:

bottom - An integer representing the lower value of the range.
top - An integer representing the lower value of the range.

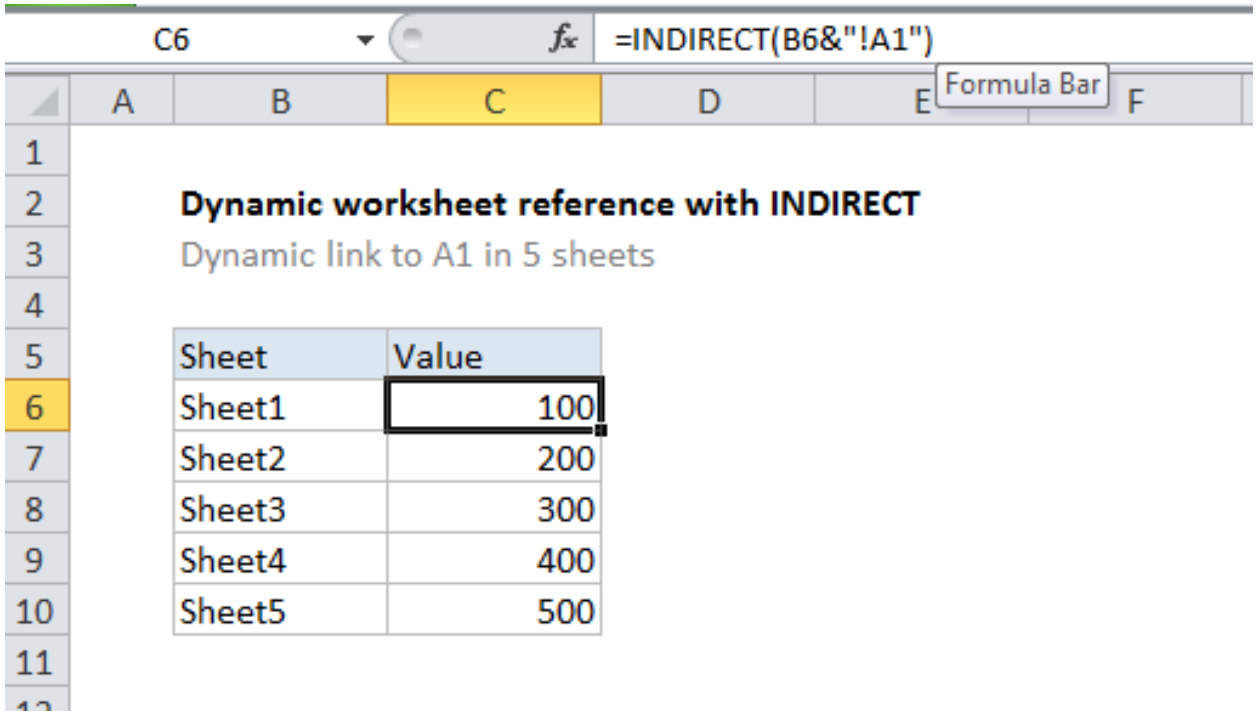
INDIRECT Function

Summary:
The Excel INDIRECT function returns a valid reference from a given text string. Use INDIRECT when you need to convert a reference assembled as text into a proper reference.

Purpose:
Create a reference from text

Return value:
A valid worksheet reference.

Syntax:
=INDIRECT (ref_text, [a1])



Arguments:

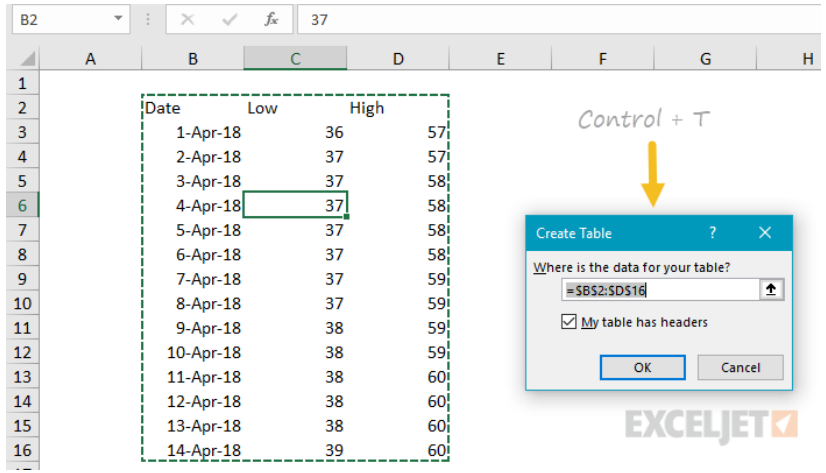
ref_text - A reference supplied as text.
a1 - [optional] A boolean to indicate A1 or R1C1-style reference. Default is TRUE = A1 style.

Excel Tables

Excel Tables have a confusingly generic name, but they are packed with useful features. If you need a range that expands to include new data, and if you want formulas that automatically stay up to date, Excel Tables are for you. This article provides an overview.

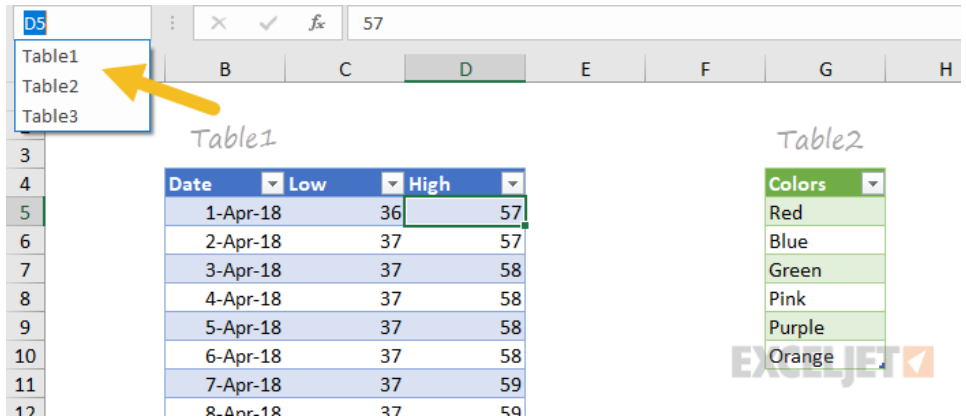
1. Creating a Table is Fast

You can create an Excel Table in less than 10 seconds. First, remove blank rows and make sure all columns have a unique name, then put the cursor anywhere in the data and use the keyboard shortcut Control + T. When you click OK, Excel will create the table.



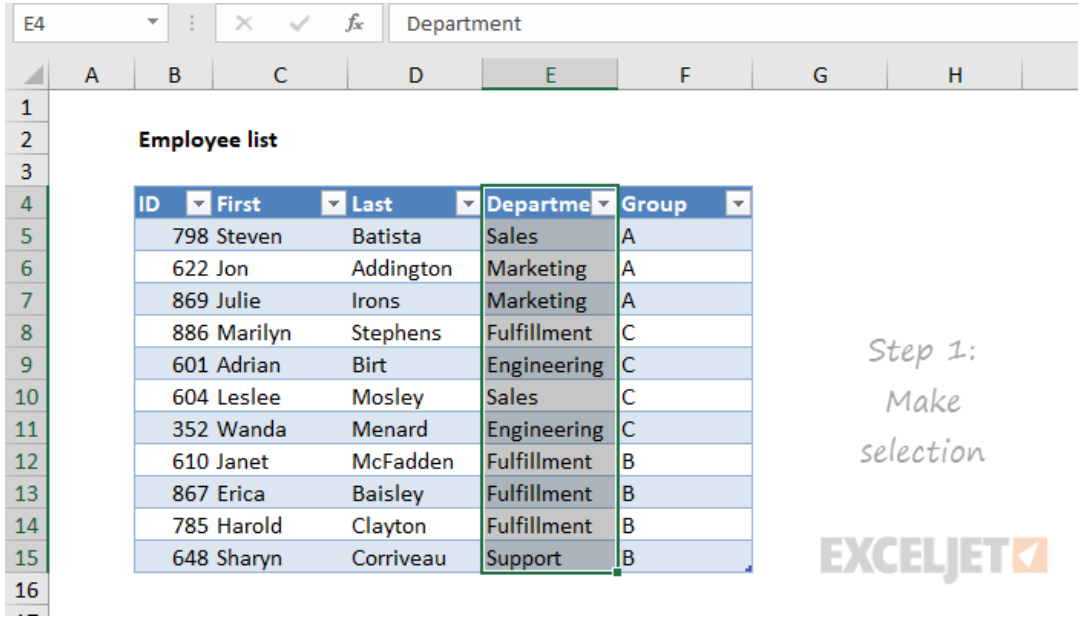
2. Navigate Directly to Tables

Like named ranges, tables will appear in the namebox dropdown menu. Just click the menu, and select the table. Excel will navigate to the table, even if it's on a different tab in a workbook.



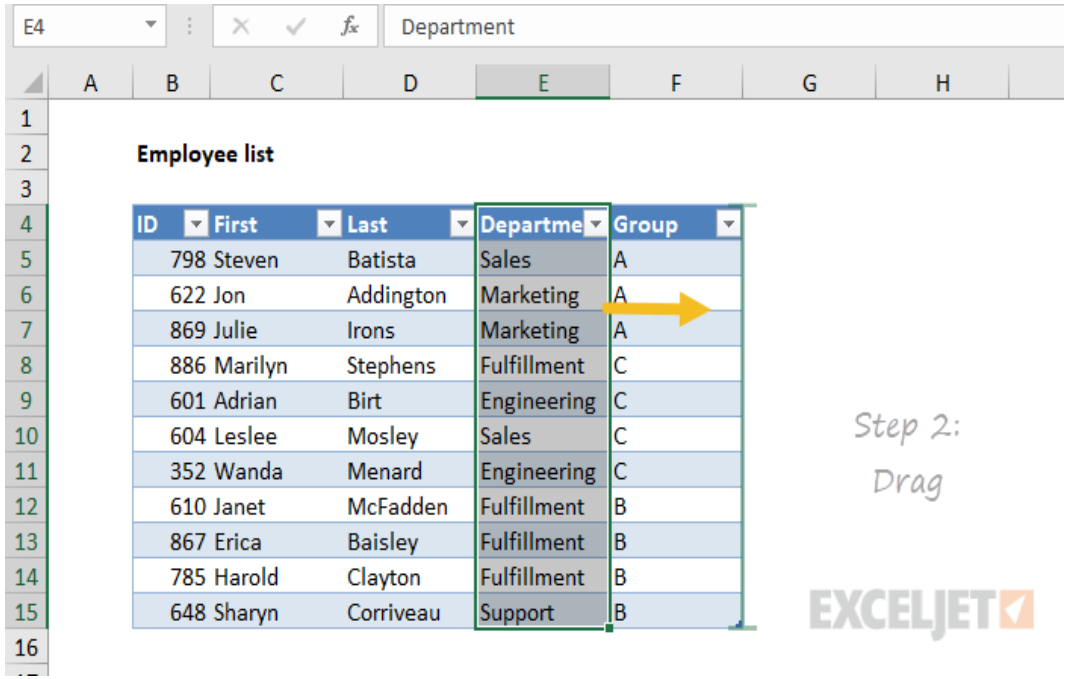
3. Tables Provide Special Shortcuts

When you convert regular data to an Excel Table, almost every shortcut you know works better. For example, you can select rows with shift + space, and columns with control + space. These shortcuts make selections that run precisely to the edge of the table, even when you can't see the edge of the table. Watch the video below for a quick rundown.



4. Painless Drag and Drop

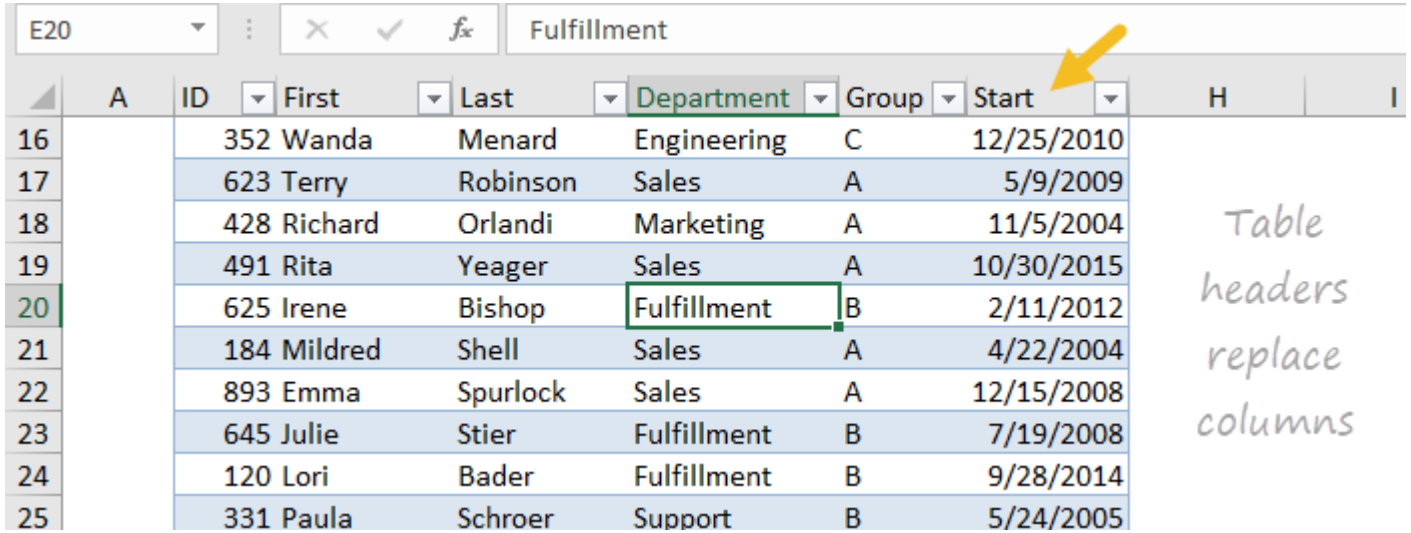
Tables make it much easier to rearrange data with drag and drop. After you've selected a table row or column, simply drag to a new location. Excel will quietly insert the selection at the new location, without complaining about overwriting data.



Note: you must select the *entire* row or column. For columns, that includes the header.

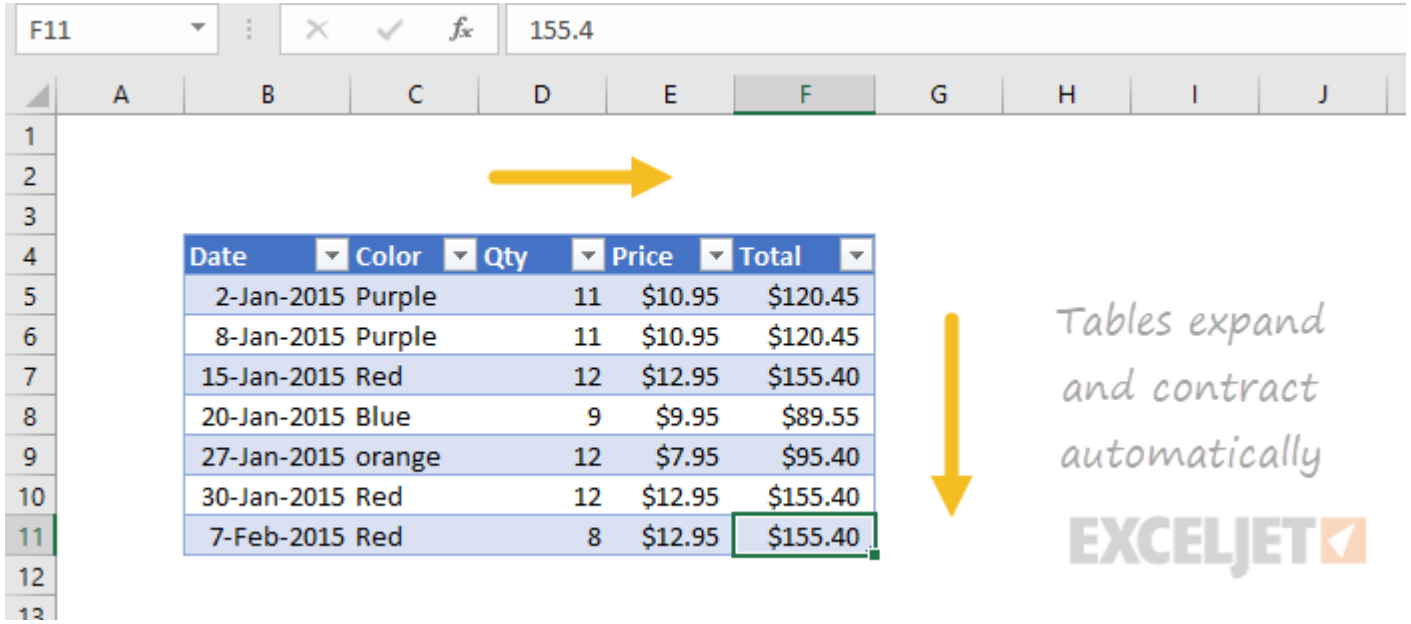
5. Table Headers Stay Visible

One frustration when working with a large set of data is that table headers disappear as you scroll down the table. Tables solve this problem in a clever way. When column headers scroll off the top of the table, Excel silently replaces worksheet columns with table headers.



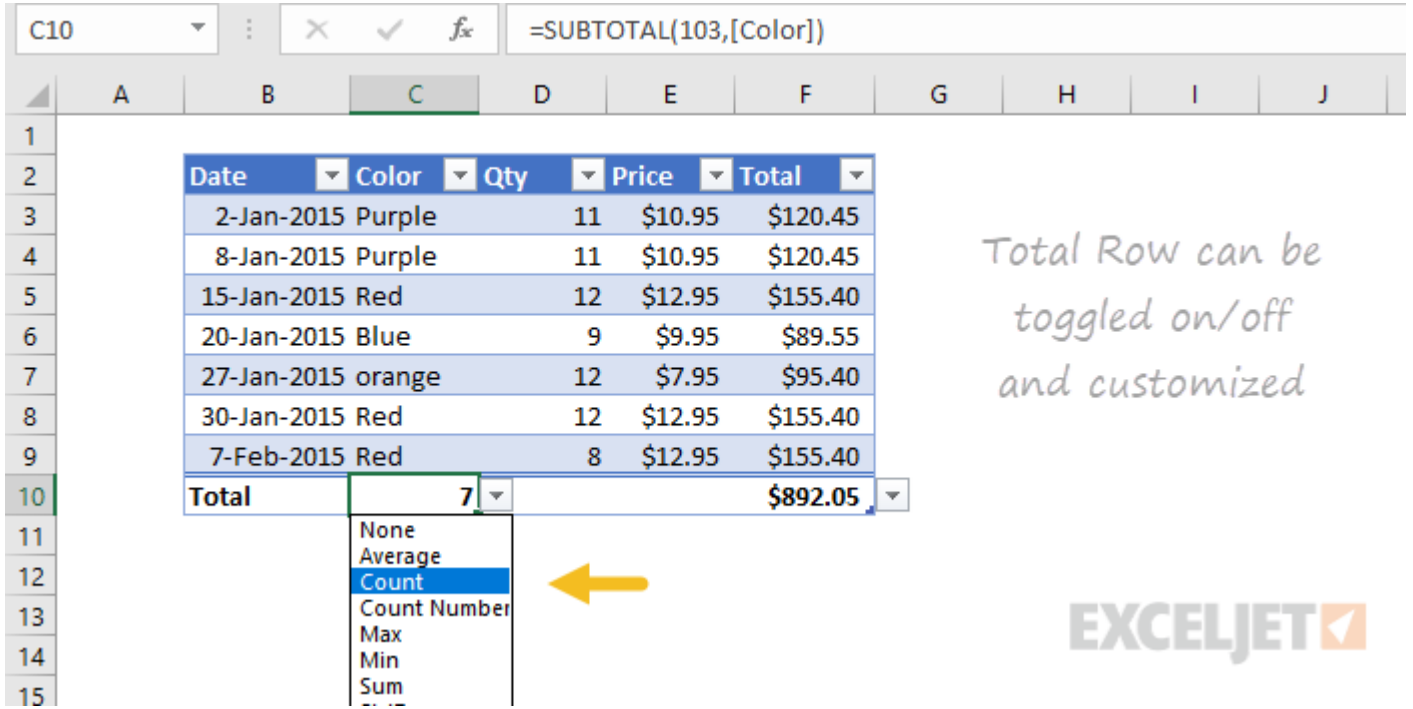
6. Tables Expand Automatically

When new rows or columns are added to an Excel Table, the table expands to enclose them. In a similar way, a table automatically contracts when rows or columns are deleted. When combined with structured references (see below) this gives you a dynamic range to use with formulas.



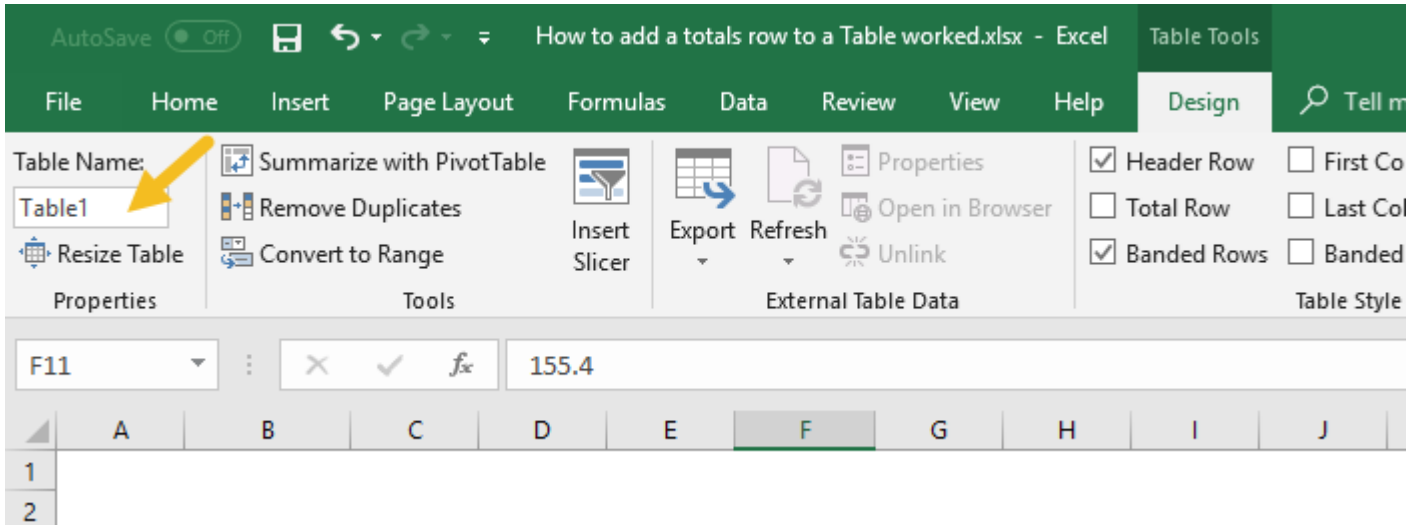
7. Totals Without Formulas

All tables can display an optional Total Row. The Total Row can be easily configured to perform operations like SUM and COUNT without entering a formula. When the table is filtered, these totals will automatically calculate on visible rows only. You can toggle the Total Row on and off with the shortcut control + shift + T.



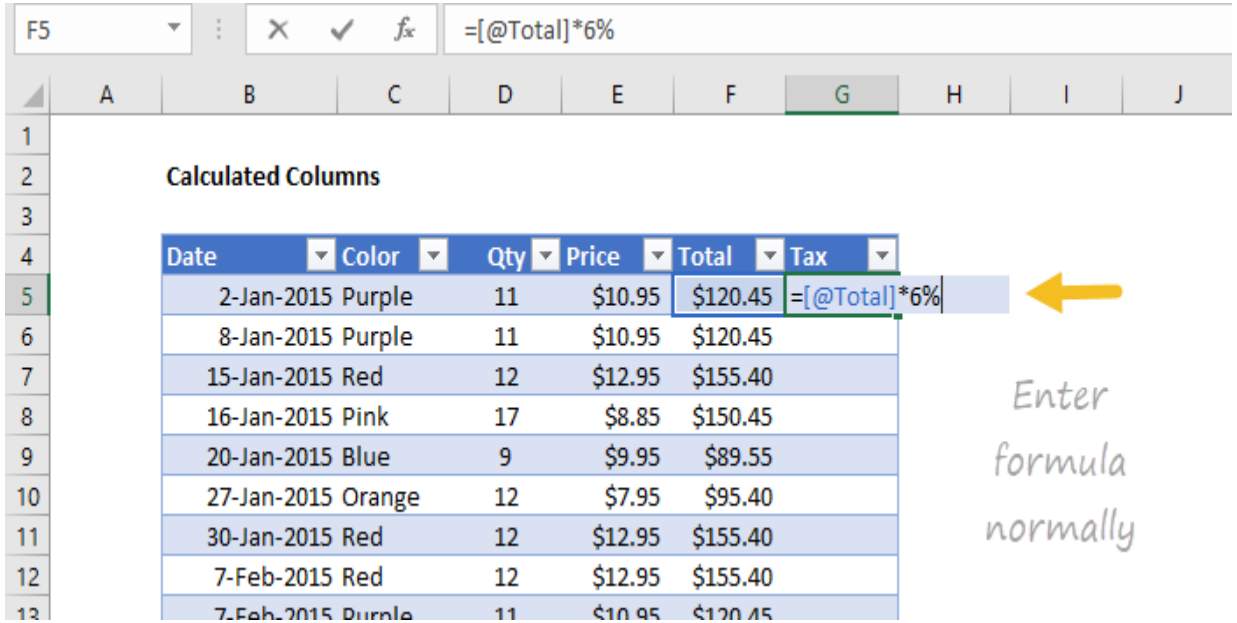
8. Rename a Table Anytime

All tables are automatically assigned a generic name like Table1, Table2, etc. However, you can rename a table at any time. Select any cell in the table and enter a new name on the Table Tools menu.

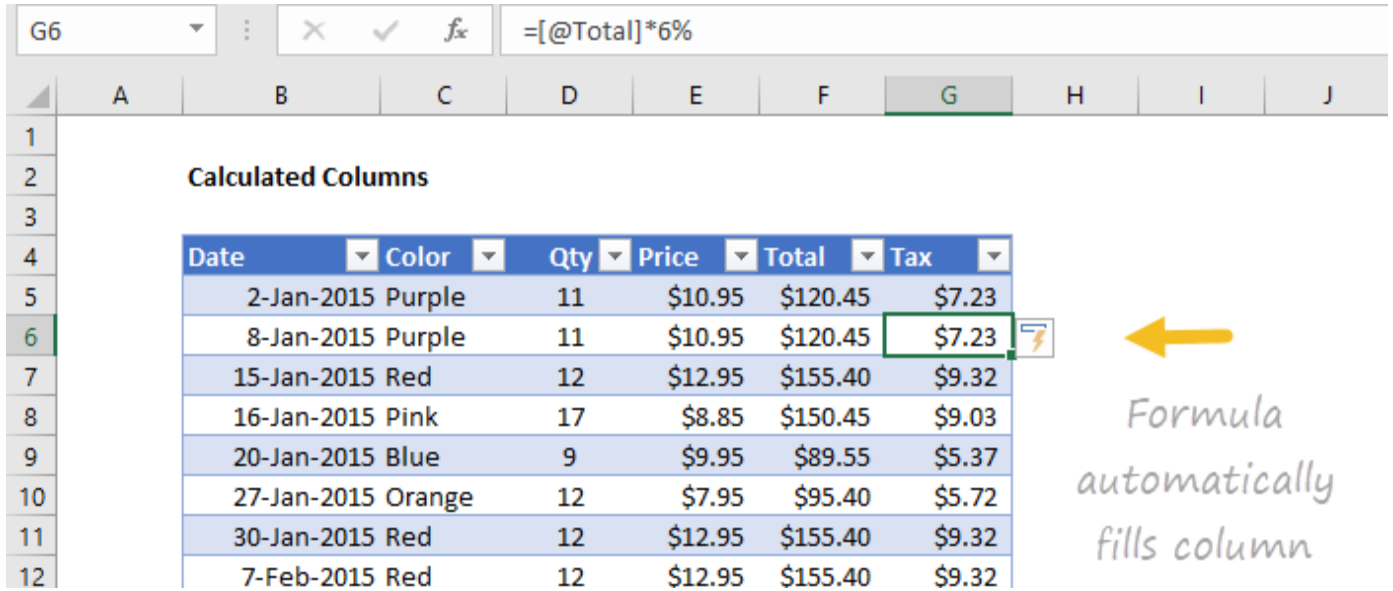


9. Fill Formulas Automatically

Tables have a feature called calculated columns that makes entering and maintaining formulas easier and more accurate. When you enter a standard formula in a column, the formula is automatically copied throughout the column, with no need for copy and paste.



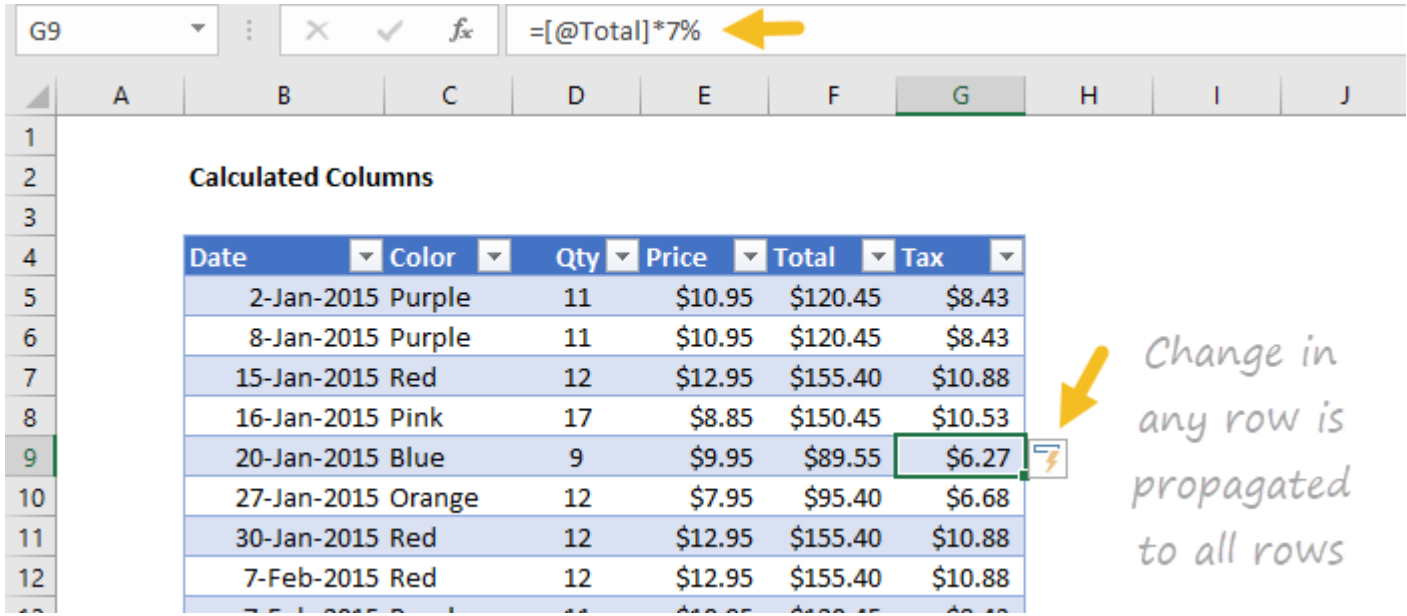
Date	Color	Qty	Price	Total	Tax
2-Jan-2015	Purple	11	$10.95	$120.45	=[@Total]*6%
8-Jan-2015	Purple	11	$10.95	$120.45	
15-Jan-2015	Red	12	$12.95	$155.40	
16-Jan-2015	Pink	17	$8.85	$150.45	
20-Jan-2015	Blue	9	$9.95	$89.55	
27-Jan-2015	Orange	12	$7.95	$95.40	
30-Jan-2015	Red	12	$12.95	$155.40	
7-Feb-2015	Red	12	$12.95	$155.40	



Date	Color	Qty	Price	Total	Tax
2-Jan-2015	Purple	11	$10.95	$120.45	$7.23
8-Jan-2015	Purple	11	$10.95	$120.45	$7.23
15-Jan-2015	Red	12	$12.95	$155.40	$9.32
16-Jan-2015	Pink	17	$8.85	$150.45	$9.03
20-Jan-2015	Blue	9	$9.95	$89.55	$5.37
27-Jan-2015	Orange	12	$7.95	$95.40	$5.72
30-Jan-2015	Red	12	$12.95	$155.40	$9.32
7-Feb-2015	Red	12	$12.95	$155.40	$9.32

10. Change Formulas Automatically

The same feature also handles formula changes. If you make a change to the formula anywhere in a calculated column, the formula is updated throughout the entire column. In the screen below, the tax rate has been changed to 7% in one step.

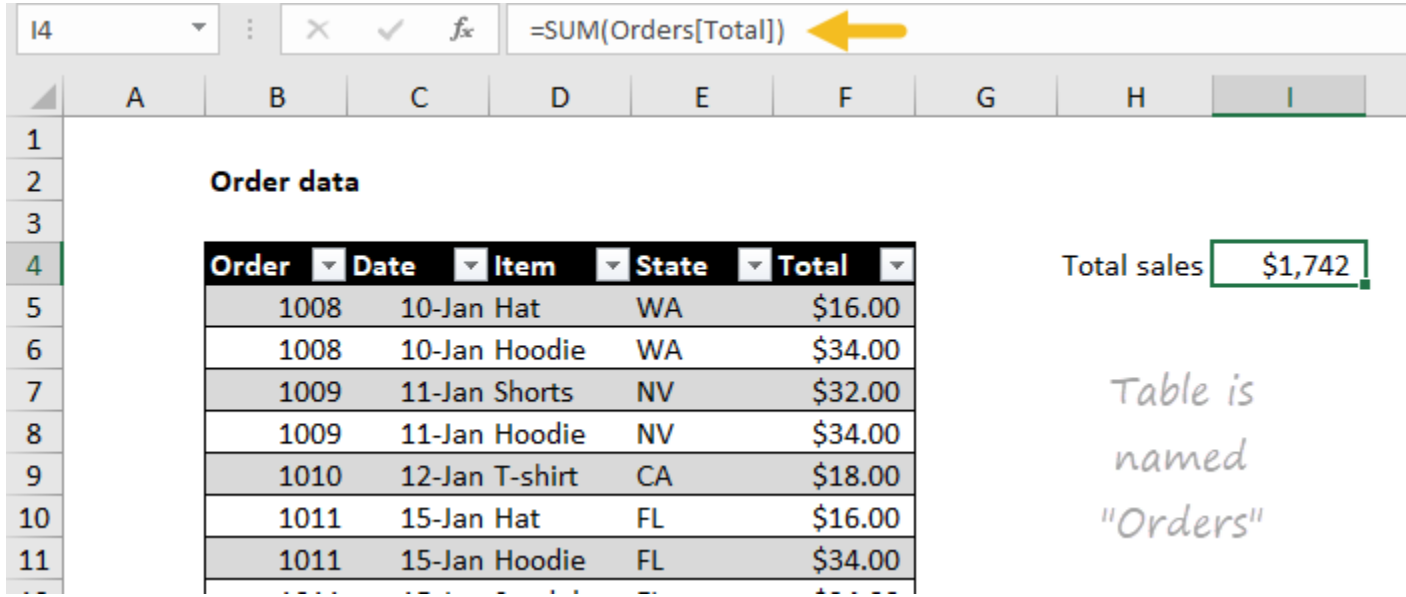


Date	Color	Qty	Price	Total	Tax
2-Jan-2015	Purple	11	$10.95	$120.45	$8.43
8-Jan-2015	Purple	11	$10.95	$120.45	$8.43
15-Jan-2015	Red	12	$12.95	$155.40	$10.88
16-Jan-2015	Pink	17	$8.85	$150.45	$10.53
20-Jan-2015	Blue	9	$9.95	$89.55	$6.27
27-Jan-2015	Orange	12	$7.95	$95.40	$6.68
30-Jan-2015	Red	12	$12.95	$155.40	$10.88
7-Feb-2015	Red	12	$12.95	$155.40	$10.88

11. Human-Readable Formulas

Tables use a special formula syntax to refer to parts of a table by name. This feature is called "structured references". For example, to SUM a column called "Amount" in a table called "Orders", you can use a formula like this:

```
=SUM(Orders[Amount])
```



Order	Date	Item	State	Total
1008	10-Jan	Hat	WA	$16.00
1008	10-Jan	Hoodie	WA	$34.00
1009	11-Jan	Shorts	NV	$32.00
1009	11-Jan	Hoodie	NV	$34.00
1010	12-Jan	T-shirt	CA	$18.00
1011	15-Jan	Hat	FL	$16.00
1011	15-Jan	Hoodie	FL	$34.00

12. Easy Dynamic Ranges

The single biggest benefit of tables is that they automatically expand as new data is added, creating a dynamic range. You can easily use this dynamic range in your formulas. For example, the table in the screen below is named "Properties". The following formulas will always return correct values, even as data is added to the table:

```
=ROWS(Properties)
=MAX(Properties)
=MIN(Properties)
```