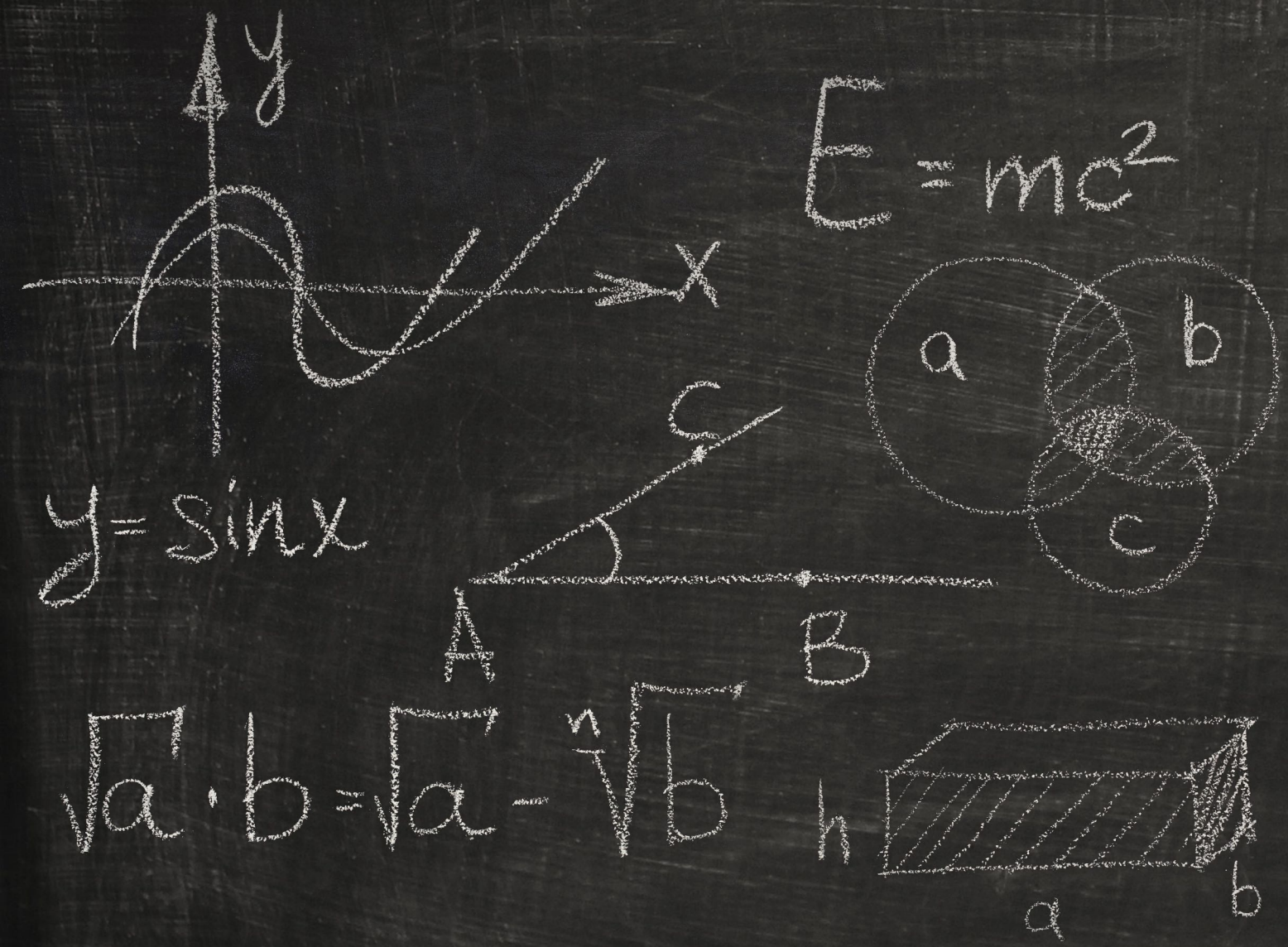
A Quick Guide to Functions in Excel



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Introduction: What is a Function?

A function is a pre-programmed formula that generates a value in a cell.

Function Names and their Purpose

Excel contains over 500 worksheet functions. Each function has a name and is used for a specific purpose. For example…

The SUM function is used to add up a range of cells

The TODAY function will display the current date in the cell that it is entered into. It generates its value from the computer's internal clock and updates automatically

The PMT function calculates the periodic (daily, monthly or annual) repayment on a loan

This document is not a comprehensive guide to every Excel function. Its purpose is to provide you with an overview of several commonly-used functions. This document was produced to accompany a specific training session that I delivered.

Parameters

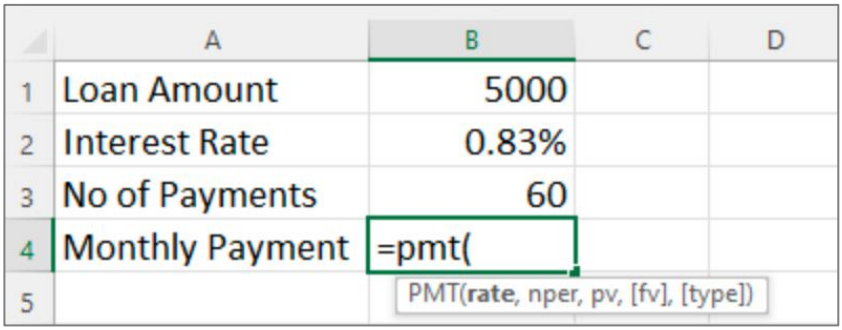
Every function requires one or more parameters – a piece of information that you provide to enable the function to generate its value. A parameter can be a cell reference, a numeric value, a date or a text value.

Entering a Function into a Cell

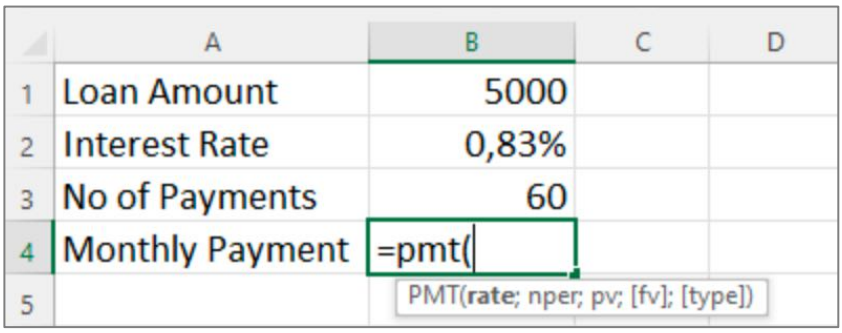
Start the cell entry with an equals sign (=)
Then type the name of the function (function names are **not** case sensitive)
Then type an open bracket
Then type the parameter(s)
Finally type a closing bracket

If the function requires more than one parameter, use a comma (,) to separate them (note – there are a few countries that use a semi-colon (;) as the parameter separator.

How do you know whether to use a comma or semi-colon? When you start typing a function into a cell, you should see a "help pop-up" appear just below the cell:



In the screenshot above, you can see that the "parameter separator" is a comma, whilst in the screenshot below, the "parameter separator" is a semi-colon.



It is essential that the parameters are entered in the correct order. Consider the following:

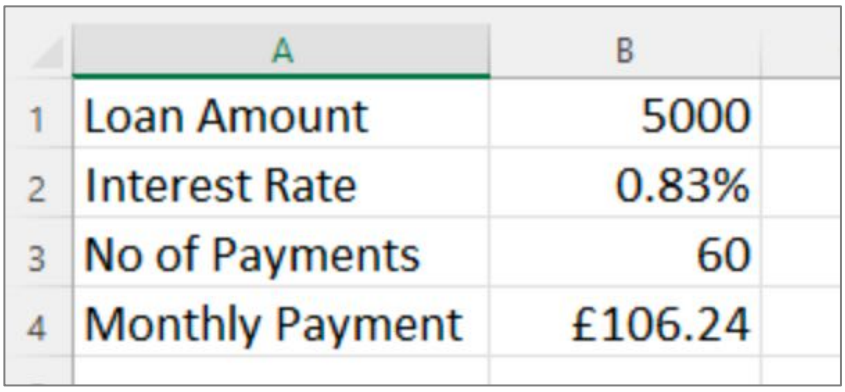
The PMT function, used to calculate the periodic (i.e. monthly or annual) repayment on a loan requires 3 Parameters: Interest Rate, Number of Payments, Loan Amount.

These have to be entered in that order because that is how the function has been programmed.

In the screenshot below, B4 contains the following: =PMT(B2,B3,B1)

Because Excel interprets the first parameter as the interest rate, the second as the number of payments and the third as the loan amount, it generates an answer of £106.24

In other words, if you needed to borrow £5,000 and pay it back over 5 years (60 monthly payments) at a monthly interest rate of 0.83% (annual interest rate in the example is 10%. 10% divided by 12 (months) is 0.83%) you would pay £106.24 per month.



But what if you'd entered the parameters in the wrong order? What if you'd entered:

=PMT(B1,B2,B3)

Excel would interpret that as borrowing £60 and paying it back over 10 months at an interest rate of 5000%!

FYI: The monthly repayment in A4 would display as £4,378,419

The COUNTIF Function

Purpose: Count the number of times something appears in a range

Syntax: =COUNTIF(Range Containing Criteria, Criteria)

The criteria can be a text, a number, a date or a cell reference

Criteria that is text or dates must be enclosed in double quotes

Criteria that uses the following symbols must be enclosed in double quotes:

Greater than (>)
Less than (<)
Greater than or equal to (>=)
Less than or equal to (<=)

COUNTIF Examples

Name	Meal Choice	Cost
Ted	Chicken	20
Pete	Steak - Well Done	25
Andrea	Vegetarian	10
Kay	Chicken	15
Alison	Steak - Rare	20
Faith	Chicken	10
Mike	Steak - Medium	15
Elaine	Chicken	10
Lola	Chicken	10
David P	Vegetarian	10
David B	Chicken	15
Vicky	Steak - Medium	20
Karen	Steak - Medium	25

=COUNTIF(B2:B14,"Steak - Medium")	counts how many times the phrase *Steak – Medium* appears in B2:B14
=COUNTIF(C2:C14,25)	counts how many times the number 25 appears in C2:C14
=COUNTIF(C2:C14,">15")	counts how many times the number in C2:C14 is more than 15
=COUNTIF(B2:B14,"Steak*")	counts the number of cells in the range B2:B14 start with the word *Steak* (* acts as a wildcard, meaning steak followed by any characters)

The COUNTIFS Function

Purpose: Count the number of times something appears in a range. The COUNTIFS function can take one or more criteria

Syntax: =COUNTIFS(Criteria Range1, Criteria1, Criteria Range2, Criteria2,etc)

The criteria can be a text, a number, a date or a cell reference

Criteria that is text or dates must be enclosed in double quotes

Criteria that uses the following symbols must be enclosed in double quotes:

Greater than (>)
Less than (<)
Greater than or equal to (>=)
Less than or equal to (<=)

COUNTIFS Examples

Name	Model	Renewal
Ted	iPhone 13 Pro Max	30 April 2022
Pete	iPhone	30 April 2022
Andrea	iPhone 13 Pro	31 July 2022
Kay	iPhone 11 Pro	28 February 2023
Alison	iPhone 13 Pro	31 July 2022
Faith	Samsung Galaxy S22 Ultra	31 December 2022
Mike	iPhone Pro	31 March 2023
Elaine	iPhone 13 Pro	30 April 2022
Lola	Samsung Galaxy S22 Ultra	31 August 2022
David P	Samsung Galaxy Z Fold3 5G	30 June 2023
David B	iPhone 13	30 September 2022
Vicky	iPhone SE	28 February 2023
Karen	Samsung Galaxy S22 Pro	31 December 2022

=COUNTIFS(B2:B14,"iPhone 13 Pro", C2:C14,"31 July 2022")

The above function counts the number of iPhone 13 Pro's that are due for renewal at the end of July 2022

=COUNTIFS(B2:B14,"iPhone*", C2:C14,"30 April 2022")

The above function counts the number of iPhones (any model) that are due for renewal at the end of April 2022

=COUNTIFS(C2:C14,"30 April 2022")

The above function counts the number of times 30 April 2022 appears in C2:C14

The SUMIF Function

Purpose: add up numbers in a range that match a criteria

Syntax: =SUMIF(Range Containing Criteria, Criteria, Range Containing Numbers)

The criteria can be a text, a number, a date or a cell reference

Criteria that is text or dates must be enclosed in double quotes

Criteria that uses the following symbols must be enclosed in double quotes:

Greater than (>)
Less than (<)
Greater than or equal to (>=)
Less than or equal to (<=)

SUMIF Examples

Order Date	Flavour	State	Revenue	Sales Rep
01 January 2022	Vanilla	Massachusetts	£115.56	Tom
01 January 2022	Pecan	Massachusetts	£111.28	Adam
01 January 2022	Pecan	Massachusetts	£205.44	Adam
02 January 2022	Strawberry	Indiana	£196.88	Kathy
02 January 2022	Chocolate	Indiana	£209.72	Kathy
02 January 2022	Vanilla	Indiana	£154.08	Kathy
02 January 2022	Pecan	Indiana	£119.84	Adam
02 January 2022	Vanilla	Delaware	£235.40	Tom
02 January 2022	Pecan	Delaware	£231.12	Tom
02 January 2022	Strawberry	Delaware	£124.12	Kathy

=SUMIF(E2:E11,"Kathy",D2:D11)	adds up the numbers in D2:D11 where *Kathy* appears in E2:E11
=SUMIF(A2:A11,"02 January 2022",D2:D11)	adds up the numbers in D2:D11 where the date in A2:A11 is 2nd January 2022
=SUMIF(D2:D11,">200",D2:D11)	adds up the numbers in D2:D11 for the transactions where revenue is more than £200

The SUMIFS Function

Purpose: add up numbers in a range that match one or more criteria.

Syntax: =SUMIFS(Numbers, Criteria Range1, Criteria1, Criteria Range2, Criteria2,etc)

The criteria can be a text, a number, a date or a cell reference

Criteria that is text or dates must be enclosed in double quotes

Criteria that uses the following symbols must be enclosed in double quotes:

Greater than (>)
Less than (<)
Greater than or equal to (>=)
Less than or equal to (<=)

SUMIFS Examples

Order Date	Flavour	State	Revenue	Sales Rep
01 January 2022	Vanilla	Massachusetts	£115.56	Tom
01 January 2022	Pecan	Massachusetts	£111.28	Adam
01 January 2022	Pecan	Massachusetts	£205.44	Adam
02 January 2022	Strawberry	Indiana	£196.88	Kathy
02 January 2022	Chocolate	Indiana	£209.72	Kathy
02 January 2022	Vanilla	Indiana	£154.08	Kathy
02 January 2022	Pecan	Indiana	£119.84	Adam
02 January 2022	Vanilla	Delaware	£235.40	Tom
02 January 2022	Pecan	Delaware	£231.12	Tom
02 January 2022	Strawberry	Delaware	£124.12	Kathy

=SUMIFS(D2:D11,C2:C11,"Indiana")

The above function adds up the numbers in D2:D11 where Indiana appears in C2:C11

=SUMIFS(D2:D11,C2:C11,"Indiana",E2:E11,"Kathy")

The above function adds up the numbers in D2:D11 where Indiana appears in C2:C11 and Kathy appears in E2:E11

The VLOOKUP Function

Purpose: Look for a value in a column and return a value from the same row of another column

Syntax: =VLOOKUP(LookupValue, Lookup Range, ColumnID, Exact or Inexact Match)

VLOOKUP Examples

	A	B	C	D	E	F	G	H	I
1	Employee ID:	TET-488		Number	EmployeeID	Name	Model	Colour	Contract Renewal
2	Name:			+44 7700 900584	TET-123	Harry	iPhone 13 Pro Max	Silver	August-2022
3	Renewal:			+44 7700 900841	TET-321	John	iPhone 12	Black	August-2022
4				+44 7700 900401	TET-544	Adam	iPhone 13 Pro	Gold	September-2022
5				+44 7700 900880	TET-083	Mike	iPhone 11 Pro	Space Grey	October-2022
6				+44 7700 900161	TET-013	Cath	iPhone 13 Pro	Silver	October-2022
7				+44 7700 900094	TET-488	Graham	iPhone 11	White	December-2022
8				+44 7700 900706	TET-993	Kerry	iPhone 12	Black	March-2023
9				+44 7700 900702	TET-155	Paula	iPhone 13 Pro	Gold	April-2023

In B2, I need to display the name of the employee that matches the EmployeeID in B1. The formula in B2 will be: **=VLOOKUP(B1,E2:F9,2,FALSE)**

Let's break the formula down…

B1 This contains the value or item to be searched for

E2:F9 This is the Lookup Range. VLOOKUP searches down the first column only (i.e. E2:E9). However, the range must also include the column that contains the "result" (in this example that is column F)

2 This tells Excel which column in the Lookup Range the result/answer is coming from. The Lookup Range is a 2-column range (E2:F9) and the result is coming from the 2nd column

FALSE This tells Excel that the value in B1 must match exactly a value in E2:E9 (note VLOOKUP is NOT case-sensitive so *TET-488* and *tet-488* would be considered exact)

The alternative to False is True which means inexact match. If an exact match cannot be found, Excel looks for the closest match. In other words, if TET-488 cannot be found in column E, TET-321 would be the closest match. This would return John as the name, which is not correct.

By using FALSE, if an exact match is not found, the VLOOKUP returns #NA as the answer, which alerts us to the fact we have a problem (i.e. we are looking for an EmployeeID that does not exist)

The IFNA Function

Purpose: Where a formula or functions returns #NA, use the IFNA function to display an alternative value instead, making the worksheet more user-friendly and not appear to contain errors

Syntax: =IFNA(formula causing NA, Alternative Value)

IFNA Example

	A	B	C	D	E	F	G	H	I
1	Employee ID:	TET-488		Number	EmployeeID	Name	Model	Colour	Contract Renewal
2	Name:			+44 7700 900584	TET-123	Harry	iPhone 13 Pro Max	Silver	August-2022
3	Renewal:			+44 7700 900841	TET-321	John	iPhone 12	Black	August-2022
4				+44 7700 900401	TET-544	Adam	iPhone 13 Pro	Gold	September-2022
5				+44 7700 900880	TET-083	Mike	iPhone 11 Pro	Space Grey	October-2022
6				+44 7700 900161	TET-013	Cath	iPhone 13 Pro	Silver	October-2022
7				+44 7700 900094	TET-488	Graham	iPhone 11	White	December-2022
8				+44 7700 900706	TET-993	Kerry	iPhone 12	Black	March-2023
9				+44 7700 900702	TET-155	Paula	iPhone 13 Pro	Gold	April-2023

In B2, I need to display the name of the employee that matches the EmployeeID in B1. The formula in B2 will be: **=VLOOKUP(B1,E2:F9,2,FALSE)**

If B1 contains an EmployeeID that does not exist in E2:E9, VLOOKUP will return #NA which looks "messy".

Change B2 to: **=IFNA(VLOOKUP(B1,E2:F9,2,FALSE),"Unknown Employee")**

This will display the text **Unknown Employee** in B2, but only if the VLOOKUP results in #NA

The VLOOKUP Function (TRUE Parameter)

In B3, I need to display the renewal date of the phone owned by the employee whose ID is in B1. The formula in B3 will be: **=VLOOKUP(B1,E2:I9,5,FALSE)**

	A	B	C	D	E	F
1	Name:	Mike		Salary Range	Band Low	Tax Rate
2	Salary:	$60,001		0 - 50000	$0	30%
3	Tax Bracket:			50001 - 60000	$50,001	35%
4				60001 - 70000	$60,001	40%
5				70000+	$70,001	50%

In the example above, I need to display the tax rate in B3. This will be based on the salary in B2. However, it is unlikely that the salary will match one of the values in column E (whilst in the screenshot there is an exact match, 99% of employees will not have a salary that is an exact match with one of the values in column E)

The formula in B3 will be: **=VLOOKUP(B2,E2:F5,2,TRUE)**

Let's break the formula down…

B2 This contains the value or item to be searched for

E2:F5 This is the Lookup Range

2 This tells Excel which column in the Lookup Range the result/answer is coming from.

TRUE This tells Excel that the value in B2 can match exactly a value in E2:E5 but if it doesn't, instead of returning #NA, it should look for the value that is the "next smallest"

In other words, if the salary in B2 was 60,000, the next smallest value in column E would be 50,001 so the result would be 35%

IMPORTANT: If you specify TRUE as the 4th parameter, the lookup range must be sorted in ascending order based on the values in the first column. Otherwise you may not get the correct answer.

About Mike Thomas

Mike Thomas is a subject matter expert in a range of technologies, although his primary focus and passion is Excel and Power BI.

In a career spanning 30+ years, he has delivered thousands of training courses on a wide variety of technology-related topics.

In 2012 Mike founded theexceltrainer.co.uk where he hosts written and video-based Excel and Power BI tutorials. He also runs a YouTube Channel and has recorded several video-based training courses for other organisations.

Mike is a Fellow of The Learning and Performance Institute and has worked with and for many global and UK-based companies and organizations across a diverse range of sectors.

In addition to training, he also designs and develops Microsoft Office-based solutions that automate key business tasks and processes.

Away from the Microsoft world, Mike is co-host of the MacBites podcast and a co-presenter of MacBites After Hours, a live technology show hosted on YouTube.

Connect with Mike via the links below

- YouTube
- The Excel Trainer Website
- LinkedIn

The Excel:trainer

theexceltrainer.co.uk