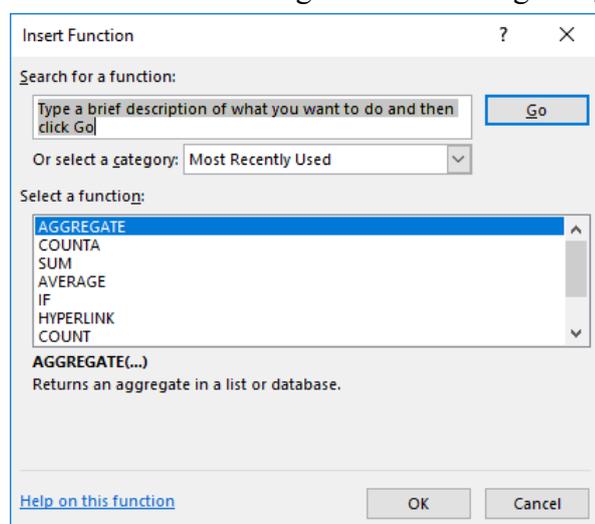


1. Using Function

In simplest terms, a function is a predefined formula. Many Excel functions are shorthand versions of frequently used formulas. For example, the SUM function adds a series of cell values by selecting a range by consolidate the formula =A1+A2+A3+A4+A5 to the formula =SUM(A1:A5).

1.1 Inserting Functions

When you want to use a built-in function, select **Formulas** tab, **Insert Function** to display the **Insert Function** dialog box. This dialog box gives you access to all built-in functions in Excel.



1.2 Error Values

An error value is the result of a formula that Excel can't resolve. The seven error values are

Error	Reason
#DIV/0!	You attempted to divide a number by zero. This error usually occurs when you create a formula with a divisor that refers to a blank cell.
#NAME?	You entered a name in a formula that isn't in the Define Name dialog box list. You might have mistyped the name or typed a deleted name. Excel also displays this error value if you do not enclose a text string in quotation marks.
#VALUE	You entered a mathematical formula that refers to a text entry.
#REF!	You deleted a range of cells whose references are included in a formula.
#N/A	No information is available for the calculation you want to perform.
#NUM!	You provided an invalid argument to a worksheet function. It also indicates that the result of a formula is too large or too small to be represented.
#NULL!	You included a space between two ranges in a formula to indicate an intersection, but the ranges have no common cells.

1.3 Mathematical Functions

1.3.1 The SUM Function

The SUM function totals a series of numbers. It takes the form =SUM(number1, number2, ...). The number arguments are a series of as many as 30 entries that can be numbers, formulas, ranges, or cell references that result in numbers. SUM ignores arguments that refer to text values, logical values, or blank cells.

1.3.2 The MOD Function

The MOD function returns the remainder of a division operation (modulus). It takes the arguments (number, divisor). The result of the MOD function is the remainder produced when number is divided by divisor. *For example, the function =MOD(9, 4) returns 1 (the remainder)..*

1.3.3 The COMBIN Function

The COMBIN function determines the number of possible combinations that can be taken from a pool of items. It takes the arguments (number, number_chosen), where number is the total number of items in the pool and number_chosen is the number of items you want to group in each combination. *For example, to determine how many different combination for Mark Six, type the formula =COMBIN(49, 6). The result indicates that 13983816 combinations could be created.*

1.3.4 The RAND Functions

The RAND function generates a random number between 0 and 1. It is one of the few Excel functions that do not take an argument. Note that you must still type the parentheses after the function name. The result of a RAND function changes each time you recalculate your worksheet. If you use automatic recalculation, the value of the RAND function changes each time you make a worksheet entry.

1.3.5 The ROUND, ROUNDDOWN, and ROUNDUP Functions

The ROUND function rounds a number to a specified number of decimal places, rounding digits less than 5 down and digits greater than or equal to 5 up. It takes the arguments (number, num_digits). If num_digits is a positive number, then number is rounded to the specified number of decimal points; if num_digits is negative, the function rounds to the left of the decimal point; if num_digits is 0, the function rounds to the nearest integer. *For example, the formula =ROUND(123.4567, -2) returns 100, and the formula =ROUND(123.4567, 3) returns 123.457. The ROUNDDOWN and ROUNDUP functions take the same form as ROUND. As their names imply, they always round down or up, respectively.*

1.3.6 The EVEN and ODD Functions

The EVEN function rounds a number up to the nearest even integer. The ODD function rounds a number up to the nearest odd integer. Negative numbers are correspondingly rounded down. *For example, the formula =EVEN(23.4) returns 24, and the formula =ODD(-4) returns -5.*

1.3.7 The FLOOR and CEILING Functions

The FLOOR function rounds a number down to the nearest given multiple, and the CEILING function rounds a number up to the nearest given multiple. These functions take the arguments (number, multiple). *For example, the formula =FLOOR(23.4, 0.5) returns 23, and the formula =CEILING(5, 1.5) returns 6.*

1.3.8 The INT Function

The INT function rounds numbers down to the nearest integer. When a number is negative, INT also rounds that number down to the next integer. *For example, the formulas =INT(100.01) and =INT(100.99999999) both return the value 100, even though the number 100.99999999 is essentially equal to 101. If each of the numbers in the examples were negative, the resulting value would be -101.*

1.3.9 The TRUNC Function

The TRUNC function truncates everything to the right of the decimal point in a number, regardless of its sign. It takes the arguments (number, num_digits). If num_digits isn't specified, it's set to 0. Otherwise, TRUNC truncates everything after the specified number of digits to the right of the decimal point. *For example, the formula =TRUNC(13.978) returns the value 13; the formula =TRUNC(13.978, 1) returns the value 13.9.*

1.4 Text Functions

Text functions in Excel are some of the most useful word-processing and data-management tools you'll find anywhere because they do things that word-processing programs can't do.

1.4.1 The TEXT Function

The TEXT function converts a number into a text string with a specified format. Its arguments are (value, format_text), where value represents any number, formula, or cell reference; and format_text is the format for displaying the resulting string. *For example, the formula =TEXT(98/4, "0.00") returns the text string 24.50. You can use any Excel formatting symbol (\$, #, 0, and so on) except the asterisk (*) to specify the format you want, but you can't use the General format.*

1.4.2 The DOLLAR Function

Like the TEXT function, the DOLLAR function converts a number into a string. DOLLAR, however, formats the resulting string as currency with the number of decimal places you specify. The arguments (number, decimals) specify a number or reference and the number of decimal places you want. *For example, the formula =DOLLAR(45.899, 2) returns the text string \$45.90. Notice that Excel rounds the number when necessary.*

If you omit decimals, Excel uses two decimal places. If you add a comma after the first argument but omit the second argument, Excel uses zero decimal places. If you use a negative number for decimals, Excel rounds to the left of the decimal point.

1.4.3 The LEN Function

The LEN function returns the number of characters in an entry. The single argument can be a number, a string enclosed in double quotation marks, or a reference to a cell. Trailing zeros are ignored. *For example, the formula =LEN("Test") returns 4.*

1.4.4 The ASCII Functions: CHAR and CODE

Every computer uses numeric codes to represent characters. The most prevalent system of numeric codes is ASCII (American Standard Code for Information Interchange). ASCII uses a number from 0 to 127 (or in some systems, to 255) to represent each number, letter, and symbol.

The CHAR and CODE functions deal with these ASCII codes. The CHAR function returns the character that corresponds to an ASCII code number; the CODE function returns the ASCII code number for the first character of its argument. For example, the formula =CHAR(83) returns the text "S". The formula =CODE("S") returns the ASCII code 83. If you type a literal character as the text argument, be sure to enclose the character in quotation marks; otherwise, Excel returns the #NAME? error value.

1.4.5 The Clean-Up Functions: TRIM and CLEAN

Leading and trailing blank characters often prevent you from correctly sorting entries in a worksheet or a database. If you use string functions to manipulate text in your worksheet, extra spaces can prevent your formulas from working correctly.

The TRIM function eliminates leading, trailing, and extra blank characters from a string, leaving only single spaces between words.

The CLEAN function is similar to TRIM, except it operates on only nonprintable characters, such as tabs and program-specific codes. CLEAN is especially useful if you import data from another program or operating system, because the translation process often introduces nonprintable characters that appear as symbols or boxes. You can use CLEAN to remove these characters from the data.

1.4.6 The EXACT Function

The EXACT function is a conditional function that determines whether two strings match exactly. The function ignores formatting, but it is case-sensitive, so uppercase letters are considered different than lowercase letters. If both strings are identical, the function returns TRUE. Both arguments must be literal strings enclosed in quotation marks, references to cells that contain text, numeric values, or formulas that evaluate to numeric values. *For example, if cell A5 and cell A6 of your worksheet both contain the text “Totals”, the formula =EXACT(A5, A6) returns TRUE.*

1.4.7 The Case Functions: UPPER, LOWER, and PROPER

Three functions manipulate the case of characters in text strings. The UPPER and LOWER functions convert text strings to all uppercase or all lowercase letters. The PROPER function capitalizes the first letter in each word, capitalizes any other letters in the text string that do not follow another letter, and converts all other letters to lowercase. For example, if cell A1 contains the text “hello World”, you can type the formula =UPPER(A1) to return “HELLO WORLD”. Similarly, the formula =LOWER(A1) returns “hello world”, and =PROPER(A1) returns “Hello World”.

1.5 Substring Text Functions

The following functions locate and return portions of a text string or assemble larger strings from smaller ones: FIND, SEARCH, RIGHT, LEFT, MID, SUBSTITUTE, REPLACE, and CONCATENATE.

1.5.1 The FIND and SEARCH Functions

You use the FIND and SEARCH functions to locate the position of a substring within a string. Both functions return the position in the string of the character you specify (Excel counts blank spaces and punctuation marks as characters). These two functions work the same way, except FIND is case sensitive and SEARCH allows wildcards. Both functions take the same arguments: (find_text, within_text, start_num). The optional start_num argument is helpful when within_text contains more than one occurrence of find_text. If you omit start_num, Excel reports the first match it locates. *For example, to locate the “x” in the string “Advanced Microsoft Excel”, you would type the formula =FIND("x", "Advanced Microsoft Excel"). The formula returns 21, because “x” is the 21st character in the string.*

If you’re not sure of the character sequence you’re searching for, you can use the SEARCH function and include wildcards in your find_text string. *Suppose you’ve used the names “Smith” and “Smyth” in your worksheet. To determine whether either name is in cell A1, type the formula =SEARCH("Sm?th", A1). If cell A1 contains the text “John Smith” or “John Smyth”, the SEARCH function returns the value 6 where is the starting point of the string Sm?th.*

1.5.2 The RIGHT and LEFT Functions

The RIGHT function returns the rightmost series of characters from a specified string; the LEFT function returns the leftmost series of characters. These functions take the same arguments: (text, num_chars). The num_chars argument indicates the number of characters to extract from the text argument.

These functions count blank spaces in the text argument as characters; if text contains leading or trailing blank characters, you might want to use a TRIM function within the RIGHT or LEFT function to ensure the expected result. *For example, suppose you type “Advanced Microsoft Excel” in cell A1 of your worksheet. The formula =RIGHT(A1,5) returns the word “Excel”.*

1.5.3 The MID Function

You can use the MID function to extract a series of characters from a text string. This function takes the arguments (text, start_num, num_chars). *For example, if cell A1 contains the text “Advanced Microsoft Excel”, you can type the formula =MID(A1, 10, 9) to extract the text “Microsoft” from the entry in cell A1.*

1.5.4 The REPLACE and SUBSTITUTE Functions

The REPLACE and SUBSTITUTE functions substitute new text for old text. The REPLACE function replaces one string of characters with another string of characters and takes the arguments (old_text, start_num, num_chars, new_text). *Suppose cell A1 contains the text “Advanced Microsoft Excel”. To replace the first four characters with the string “Beginning”, type the formula =REPLACE(A1, 1, 8, "Beginning"). The result is “Beginning Microsoft Excel”.*

With the SUBSTITUTE function, you specify the text to replace. The function takes the arguments (text, old_text, new_text, instance_num). The instance_num argument optionally replaces only the specified occurrence of old_text. If you don't include instance_num, Excel changes all occurrences of old_text to new_text. *Suppose cell A1 contains the text “Advanced Microsoft Excel” and you want to place it in cell A2 but change it to “Advanced Microsoft Word”. Type this formula in cell A2 =SUBSTITUTE(A1,"Excel","Word").*

1.5.5 The CONCATENATE Function

To assemble strings from up to 30 smaller strings or references, the CONCATENATE function is the function equivalent of the & character. *For example, if cell A1 contains the text “Hello” with a trailing space character, the formula =CONCATENATE(A1 "World") returns “Hello World”.*

1.6 Logical Functions

You use logical functions to test for specific conditions. These functions are often called logical operators in discussions of Boolean logic. You use logical operators to arrive at one of two conclusions: TRUE or FALSE. We'll discuss the most useful logical functions in this section.

1.6.1 The SUMIF and COUNTIF Function

With SUMIF, you can add specific values in a range, based on a criterion you supply. This performs all the calculations you need in one cell, and eliminates having to create a column of IF formula.

For example, you can type the formula =SUMIF(C12:C27, "Pass", A12:A27) to find the total of all numbers in A12:A27 in which the cell in the same row in column C contains the word "Pass".

Similarly, COUNTIF counts the cells that match specified criteria and takes the arguments (range, criteria). *For example, you can find the number of months in which sales fell below \$600 using a conditional test, as in the formula =COUNTIF(Sales, "<600").*

1.6.2 The IF Function

The IF function returns values based on supplied conditional tests. It takes the arguments (logical_test, value_if_true, value_if_false). *For example, the formula =IF(A1<22, 5, 10) returns 5 if the value in cell A1 is less than 22; otherwise, it returns 10.*

You can nest other functions and use text arguments to return nothing instead of zero if the result is false. *For example, the formula =IF(SUM(A1:A10)>0, SUM(A1:A10), " ") returns a null string (" ") if the conditional test is false.*

1.6.3 The AND, OR, and NOT Functions

The functions work with the logical operators =, >, <, >=, <=, and <>. The AND and OR functions can each have as many as 30 logical arguments. The NOT function takes only one argument which can be conditional tests, arrays, or references to cells that contain logical values).

The OR function returns the logical value TRUE if any one of the conditional tests is true; the AND function returns the logical value TRUE only if all the conditional tests are true. NOT instructs Excel to return the logical value TRUE if the argument is false or the logical value FALSE if the argument is true. The truth table for AND, OR and NOT functions are listed below:

x	y	x AND y
T	T	T
T	F	F
F	T	F
F	F	F

x	y	x OR y
T	T	T
T	F	T
F	T	T
F	F	F

x	NOT x
T	F
F	T

Suppose you want to return the text "Pass" only if a student has an average score above 75 and fewer than five unexcused absences. If we typed the formula =IF(AND(G4<5, F4>75), "Pass", "Fail"). This fails the student in row 5 because of the five absences. If you use OR instead of AND in the formula, all students would pass.

1.7 Information Functions

Information functions allow you to gather information about the contents of cells, their formatting, and the computing environment as well as perform conditional tests for the presence of specific types of values.

1.7.1 The TYPE and ERROR.TYPE Functions

The TYPE function determines whether a cell contains text, a number, a logical value, an array, or an error value. The result is a code for the type of entry in the referenced cell: 1 for a number (or a blank cell), 2 for text, 4 for a logical value (TRUE or FALSE), 16 for an error value, and 64 for an array. *For example, if cell A1 contains the number 100, the formula =TYPE(A1) returns 1. If A1 contains the text "Hello", the formula returns 2.*

Like the TYPE function, the ERROR.TYPE function detects the contents of a cell, except it detects different types of error values. The result is a code for the type of error value in the referenced cell: 1 for #NULL!, 2 for #DIV/0!, 3 for #VALUE!, 4 for #REF!, 5 for #NAME!, 6 for #NUM!, and 7 for #N/A. Any other value in the referenced cell returns the error value #N/A. *For example, if cell A1 contains a formula that displays the error value #NAME!, the formula =ERROR.TYPE(A1) returns 5. If A1 contains the text Microsoft Excel, the formula returns #N/A.*

1.7.2 The COUNTBLANK Function

The COUNTBLANK function counts the number of empty cells in the specified range, which is its only argument. However, this function is tricky because formulas that evaluate to null text strings, such as "=", or to zero might seem empty, but they aren't and therefore won't be counted.

1.7.3 Using the IS Information Functions

You can use the ISBLANK, ISERR, ISERROR, ISLOGICAL, ISNA, ISNONTTEXT, ISNUMBER, ISREF, and ISTEXT functions to determine whether a referenced cell or range contains the corresponding type of value. All IS Information functions take a single argument. *For example, the ISBLANK function takes the form =ISBLANK(value). If value refers to a blank cell, the function returns the logical value TRUE; otherwise, it returns FALSE.*

1.7.4 An ISERR Example

You can use ISERR to avoid getting error values as formula results. *For example, the FIND function returns the position at which a substring is found within a larger string. If the substring isn't there, FIND returns #VALUE!. Adding an ISERR function, such as =IF(ISERR(FIND("12A", A1)), " ", "Yes"). Because you're not interested in the error, which is simply a by-product of the calculation, this traps the error, leaving only the results that you are interested in.*

1.8 Date and Time Functions

1.8.1 The TODAY and NOW Functions

You can enter =TODAY() into a cell or a formula to insert the serial value of the current date. Similarly, you can enter =NOW() into a cell or formula to insert the current date and time. The result of the function is a serial date and time value that includes an integer (the date) and a decimal value (the time).

1.8.2 The YEAR, MONTH, and DAY Functions

The YEAR, MONTH, and DAY functions return the value of the year, month, and day portions of a serial date value. All three take a single argument, which can be a serial date value; a reference to a cell that contains either a date function or a serial date value; or a text date enclosed in quotation marks. *For example, if cell A1 contains the date 31/12/1999, the formula =YEAR(A1) returns the value 1999, the formula =MONTH(A1) returns the value 12, and the formula =DAY(A1) returns the value 31*

1.8.3 The HOUR, MINUTE, and SECOND Functions

Just as the YEAR, MONTH, and DAY functions extract the value of the year, month, and day portions of a serial date value, the HOUR, MINUTE, and SECOND functions extract the value of the hour, minute, and second portions of a serial time value. *For example, if cell A1 contains the time 12:15:35 PM, the formula =HOUR(A1) returns the value 12, the formula =MINUTE(A1) returns the value 15, and the formula =SECOND(A1) returns the value 25.*

1.8.4 The WEEKDAY Function

The WEEKDAY function returns the day of the week for a specific date and takes the arguments (serial_number, return_type). The serial_number argument can be a serial date value; a reference to a cell that contains either a date function or a serial date value; or text, such as 31/12/1999. The function returns a number that represents the day of the week that the specified date falls on. The optional return_type argument determines the way the result is displayed.

If return_type is	WEEKDAY returns
1 (default)	A number from 1 through 7 where 1 is Sunday and 7 is Saturday
2	A number from 1 through 7 where 1 is Monday and 7 is Sunday
3	A number from 0 through 6 where 0 is Monday and 6 is Sunday

1.9 Lookup Functions

Lookup functions help you use your own worksheet tables as sources of information to be used elsewhere in formulas. You can use three primary functions to look up information stored in a list or a table or to manipulate references: LOOKUP, VLOOKUP, and HLOOKUP.

VLOOKUP and HLOOKUP are nearly identical functions that look up information stored in tables you have constructed. VLOOKUP and HLOOKUP operate in either vertical or horizontal orientation (respectively), but LOOKUP works either way.

When you look up information in a table, you normally use a row index and a column index to locate a particular cell. Excel derives the first index by finding the largest value in the first column or row that is less than or equal to a lookup value you supply and then uses a row number or column number argument as the other index. Make sure the table is sorted by the row or column containing the lookup values. These functions take the following forms:

=VLOOKUP(lookup_value, table_array, col_index_num, range_lookup)

=HLOOKUP(lookup_value, table_array, row_index_num, range_lookup)

The LOOKUP function takes two forms, the first is called the vector form, and the second is called the array form:

=LOOKUP(lookup_value, lookup_vector, result_vector)

=LOOKUP(lookup_value, array)

LOOKUP Function Argument	Description
lookup_value	The value, cell reference, or text (enclosed in quotation marks) that you want to find in a table or a range.
table_array	A cell range or name that defines the table to look in.
row_index_num, col_index_num	The row or column number of the table from which to select the result, counted relative to the table (not according to the actual row and column numbers).
range_lookup	A logical value that determines whether the function matches the lookup_value exactly or approximately. Type FALSE to match the lookup_value exactly. The default is TRUE, which finds the closest match.
lookup_vector	A one-row or one-column range that contains numbers, text, or logical values.
result_vector	A one-row or one-column range that must be the same size as lookup_vector.
array	A range containing numbers, text, or logical values to compare with lookup_value.

1.9.1 The VLOOKUP and HLOOKUP Functions

For the VLOOKUP and HLOOKUP functions, whether a lookup table should be considered vertical or horizontal depends on where the comparison values (the first index) are located. If the values are in the leftmost column of the table, the table is vertical; if they are in the first row of the table, the table is horizontal. The comparison values can be numbers or text, but they must be arranged in ascending order. No comparison value should be used more than once in a table.

	A	B	C	D	E	F	G	H	I	J	K
1	Mark above	Grade									
2	0	U									
3	40	F									
4	50	E									
5	60	D									
6	70	C									
7	80	B									
8	90	A									
9											
10											
11	Input Mark:	75									
12											
13	Grade:	C									
14											

	A	B	C	D	E	F	G	H
1	Mark above	0	40	50	60	70	80	90
2	Grade	U	F	E	D	C	B	A
3								
4	Input Mark:	75						
5								
6	Grade:	C						
7								
8								

Remember that these lookup functions normally search for the greatest comparison value that is less than or equal to the lookup value, not for an exact match between the comparison values and the lookup value. If all the comparison values in the first row or column of the table range are greater than the lookup value, the function returns the #N/A error value. If all the comparison values are less than the lookup value, however, the function returns the value that corresponds to the last (largest) comparison value in the table, which might not be what you want. If you require an exact match, type FALSE as the range_lookup argument.

1.9.2 The LOOKUP Function

The array form of LOOKUP is similar to VLOOKUP and HLOOKUP but works with either a horizontal or a vertical table, using the dimensions of the table to figure out the location of the comparison values. If the table is taller than it is wide or the table is square, the function treats it as a vertical table and assumes that the comparison values are in the leftmost column. If the table is wider than it is tall, the function views the table as horizontal and assumes that the comparison values are in the first row of the table. The result is always in the last row or column of the specified table; you can't specify column or row numbers. Because HLOOKUP and VLOOKUP are more predictable and controllable, you'll generally find using them preferable to using LOOKUP.

The `lookup_vector` and `result_vector` arguments are often adjacent ranges, but they don't have to be when you use LOOKUP. They can be located in separate areas of the worksheet, and one range can be horizontal and the other vertical. The only requirement is that they must have the same number of elements.

The screenshot shows an Excel worksheet with the following data:

	A	B	C	D	E	F	G	H
1	Comment	Mark Above						
2	Unclassified	0						
3	Fail	40						
4	Poor	50						
5	Fair	60						
6	Average	70						
7	Good	80						
8	Excellent	90						
9								
10	Grade	U	F	E	D	C	B	A
11	No. of Student	10	20	30	40	30	20	10
12								
13	Input Mark:	75						
14								
15	Grade:	C						
16								
17								