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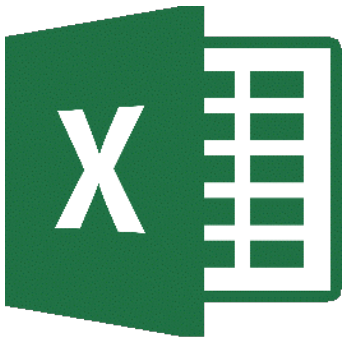
Office

Excel Math 5: More Logic

CountIf(), SumIf(), Ifs()



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Excel Math 5: More Logic – CountIf(), SumIf(), Ifs()

1.0 hour

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Logic Test (True/False functions)

Most of Microsoft Excel's logic functions will return a TRUE or FALSE, but simple True or False values can be found with comparisons using the equal, greater than, and less than symbols

Equal =	5=5	TRUE	5=10	FALSE
Not Equal <>	5<>5	FALSE	5<>10	TRUE
Greater Than >	5>5	FALSE	5>10	FALSE
Greater Than or Equal >=	5>=5	TRUE	5>=10	FALSE
Less Than <	5<5	FALSE	5<10	TRUE
Less Than or Equal <=	5<=5	TRUE	5<10	TRUE

You can also use the words TRUE or FALSE at any point in an equation.

Combining Logic Functions

We can use the logic functions AND, OR, and NOT statements to test several conditions at once and get a final TRUE/FALSE answer.

AND

Returns TRUE if all its arguments are TRUE

Syntax: AND(logical1, logical2, ...)

If the specified range contains no logical values, returns the #VALUE! error.

ALL Logic must be true result.

=AND(TRUE, TRUE)	TRUE
=AND(TRUE, FALSE)	FALSE
=AND(FALSE, FALSE)	FALSE

OR

Returns TRUE if any argument is TRUE

Syntax: OR(logical1, logical2, ...)

If the specified range contains no logical values, returns the #VALUE! error.

ANY Logic must be true result.

=OR(TRUE, TRUE)	TRUE
=OR(TRUE, FALSE)	TRUE
=OR(FALSE, FALSE)	FALSE

NOT

Reverses the value of its argument.

Syntax: NOT(logical)

=NOT(FALSE)	TRUE
=NOT(TRUE)	FALSE

IS Worksheet Functions

This set of functions return TRUE or FALSE based if the match the following conditions:

FUNCTION	RETURNS TRUE IF
ISBLANK	Value refers to an empty cell.
ISERR	Value refers to any error value except #N/A.
ISERROR	Value refers to any error value (#N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME?, or #NULL!).
ISLOGICAL	Value refers to a logical value.
ISNA	Value refers to the #N/A (value not available) error value.
ISNONTEXT	Value refers to any item that is not text. (Note that this function returns TRUE if the value refers to a blank cell.)
ISNUMBER	Value refers to a number.
ISREF	Value refers to a reference.
ISTEXT	Value refers to text.

	A1=5			A2=Div/0
=ISBLANK(A1)	FALSE		=ISBLANK(A2)	FALSE
=ISERR(A1)	FALSE		=ISERR(A2)	TRUE
=ISERROR(A1)	FALSE		=ISERROR(A2)	TRUE
=ISLOGICAL(A1)	FALSE		=ISLOGICAL(A2)	FALSE
=ISNA(A1)	FALSE		=ISNA(A2)	FALSE
=ISNONTEXT(A1)	TRUE		=ISNONTEXT(A2)	TRUE
=ISNUMBER(A1)	TRUE		=ISNUMBER(A2)	FALSE
=ISREF(A1)	TRUE		=ISREF(A2)	TRUE
=ISTEXT(A1)	FALSE		=ISTEXT(A2)	FALSE

IF Error Worksheet Functions

Newer versions of Microsoft Excel offer IFNA and IFERROR to simplify our equations.

IFNA

Returns the value you specify if a formula returns the #N/A error value; otherwise it returns the result of the formula.

IFNA(value, value_if_na)
The IFNA function syntax has the following arguments.

IFERROR

Returns the value you specify if a formula returns a #N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME?, or #NULL!. Error value; otherwise it returns the result of the formula.

IFERROR(value, value_if_error)
The IFERROR function syntax has the following arguments:

IF Worksheet Function

The TRUE or FALSE can be used as the "logic_test" in our conditional statements. We can vary the answer depending on the logic test result.

IF

Specifies a logical test to perform

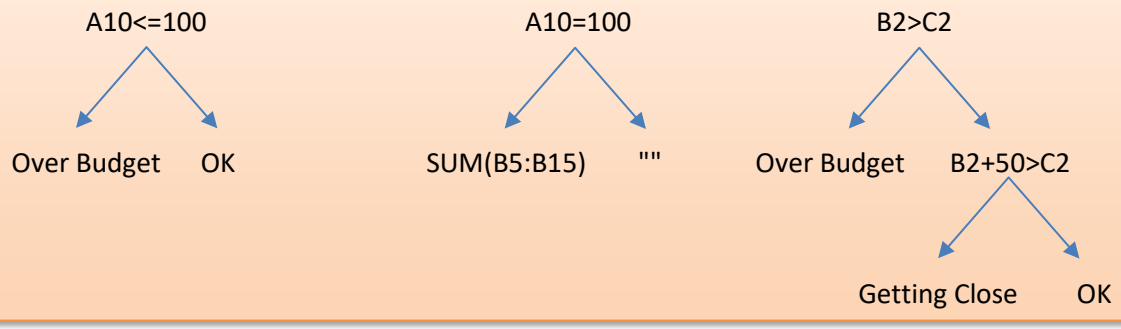
Syntax: IF(logical_test, value_if_true, value_if_false)

When the value_if_true and value_if_false arguments are evaluated, IF returns the value returned by those statements.

Examples:

=IF(A10<=100, "Within budget", "Over budget")
=IF(A10=100, SUM(B5:B15), "")
=IF(B2>C2, "Over Budget", IF(B2+50>C2,"Getting close","OK"))

It often helps to draw a Logic Tree



IFS

Specifies multiple logical tests to perform

The IFS function checks whether one or more conditions are met, and returns a value that corresponds to the first TRUE condition. IFS can take the place of multiple nested IF statements, and is much easier to read with multiple conditions.

Syntax: IF(logical_test1, value_if_true1, logical_test2, value_if_true2…)

Compare the functions to see which you feel is easier to read:

=IFS(A2>89, "A", A2>79, "B", A2>69, "C", A2>59, "D", TRUE, "F")
=IF(A2>89, "A", IF(A2>79, "B", IF(A2>69, "C", IF(A2>59, "D", "F"))))
=IFS(B2>C2, "Over Budget", B2+50>C2,"Getting close", TRUE, "OK")
=IF(B2>C2, "Over Budget", IF(B2+50>C2,"Getting close", "OK"))

Conditional Functions

COUNTIF

Counts the number of nonblank cells that meet the given criteria

Syntax: COUNTIF(range, criteria)

Range is the range of cells from which you want to count cells.

Criteria is the criteria in the form of a number, expression, or text that defines which cells will be counted. For example, criteria can be expressed as 32, "32", ">32", "apples".

	A	B
1	Apples	32
2	Oranges	53
3	Peaches	75
4	Apples	86

=COUNTIF(A1:A4, "apples")	2
=COUNTIF(B1:B4, ">55")	2

COUNTIFS

Counts the number of nonblank cells across multiple ranges and counts the number of times all criteria are met. *Search Range, Count if matches Criteria + Search Range, Count if matches Criteria + …*

Syntax: COUNTIFS(criteria_range1, criteria1, [criteria_range2, criteria2]…)

criteria_range1 Required. The first range in which to evaluate the associated criteria.

criteria1 Required. The criteria in the form of a number, expression, cell reference, or text that define which cells will be counted. For example, criteria can be expressed as 32, ">32", B4, "apples", or "32".

criteria_range2, criteria2, ... Optional. Additional ranges and their associated criteria. Up to 127 range/criteria pairs are allowed.You can use the wildcard characters— the question mark (?) and asterisk (*) — in criteria. A question mark matches any single character, and an asterisk matches any sequence of characters. If you want to find an actual question mark or asterisk, type a tilde (~) before the character.

SUMIF

Adds the cells specified by a given criteria

Syntax: SUMIF(range, criteria, sum_range)

Range is the range of cells you want evaluated.

Criteria is the criteria in the form of a number, expression, or text that defines which cells will be added. For example, criteria can be expressed as 32, "32", ">32", "apples".

	A	B
1	Value	Commission
2	$100, 000	$5, 000
3	$200, 000	$15, 000
4	$300, 000	$21, 000
5	$400, 000	$28, 000

Sum_range are the actual cells to sum. The cells in sum_range are summed only if their corresponding cells in range match the criteria. If sum_range is omitted, the cells in range are summed.

=SUMIF(A2:A5, ">250000", B2:B5)	$49, 000
=SUMIF(A2:A5, "<250000", B2:B5)	$20, 000

SUMIFs

Adds the cells specified by a given criteria (Multiple)

Syntax: SUMIFS(sum_range, criteria_range1, criteria1, [criteria_range2, criteria2], ...)

Sum_range - (required) The range of cells to sum.

Criteria_range1 - (required) The range that is tested using Criteria1.

*Criteria*_range1 and *Criteria1* set up a search pair whereby a range is searched for specific criteria. Once items in the range are found, their corresponding values in Sum_range are added.

Criteria1 - (required) The criteria that defines which cells in Criteria_range1 will be added. For example, criteria can be entered as 32, ">32", B4, "apples", or "32".

*Criteria*_range2, criteria2, … (optional)

Additional ranges and their associated criteria. You can enter up to 127 range/criteria pairs.

AVERAGEIF

Returns the average (arithmetic mean) of all the cells in a range that meet a given criteria.

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

Range - Required. One or more cells to average, including numbers or names, arrays, or references that contain numbers.

Criteria - Required. The criteria in the form of a number, expression, cell reference, or text that defines which cells are averaged. For example, criteria can be expressed as 32, "32", ">32", "apples", or B4.

Average_range - Optional. The actual set of cells to average. If omitted, range is used.

AVERAGEIFS

Returns the average (arithmetic mean) of all cells that meet multiple criteria.

Syntax: AVERAGEIFS(average_range, criteria_range1, criteria1, [criteria_range2, criteria2], ...)

Average_range Required. One or more cells to average, including numbers or names, arrays, or references that contain numbers.

Criteria_range1, criteria_range2, … Criteria_range1 is required, subsequent criteria_ranges are optional. 1 to 127 ranges in which to evaluate the associated criteria.

Criteria1, criteria2, ... Criteria1 is required, subsequent criteria are optional. 1 to 127 criteria in the form of a number, expression, cell reference, or text that define which cells will be averaged. For example, criteria can be expressed as 32, "32", ">32", "apples", or B4.

Conditional Function Summary

=CountIF(Range, Criteria)

CountIf counts all the values in the selection (range) that match your logic test (criteria)

=CountIFs(Range, Critera, Range, Criteria, …)

CountIfs is equivalent the sum of multiple CountIF statements.

=SumIF(SearchRange, Criteria, SumRange)

SumIf adds all the values in the SumRange, when your SearchRange matches your logic test (criteria)

=SumIF(SumRange, SearchRange, Criteria, SearchRange, Criteria, …)

SumIfs adds all the values in the SumRange when the criteria matches each SearchRange.

=AverageIf(range, criteria, [average_range])

AverageIf averages all the values in the Average_range, when your SearchRange matches your logic test

=AverageIF(AverageRange, SearchRange, Criteria, SearchRange, Criteria, …)

AverageIfs adds all the values in the AverageRange when the criteria matches each SearchRange.

SWITCH

The SWITCH function evaluates one value (called the expression) against a list of values, and returns the result corresponding to the first matching value.

You may choose this over an IF or vLookup statement when the values are an exact match.

SWITCH only performs an exact match, so you can't include logical operators like greater than (>) or less than (<) in the logic used to determine a match. You can work around this by

Syntax: SWITCH(Expression, Match1, Return1, Match2, Return2,…, ReturnForNoMatch)

Score	Value
3	Good
2	Okay
1	Not Good

A1 contains our score. To find the value of that score with Swtich:
=SWITCH(A1, 3, "Good", 2, "Okay", 1, "Not Good")

You can build the table and use the cell references instead of typing in the values.
=SWITCH(A1,F2,G2,F3,G3,F4,G4)