MICROSOFT EXCEL 2010
LOOKUP FUNCTIONS AND DATA RETRIEVAL

Training Handout

Abstract

This training and reference guide provides definitions, examples and illustrations to help the user learn how to apply Lookup and Data Retrieval functions to their Excel 2010 data. Starlight Education trainers contributed their expertise in the subject matter to ensure this guide is easy to comprehend.

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For Educational Purposes

CONTENTS

Functions to Retrieve Data

Excel 2010 can help you find information in a table of data by using one of the lookup functions.

Use VLookup to find data in a table by searching for a value in the first column of the table and then returning the corresponding value in another column.

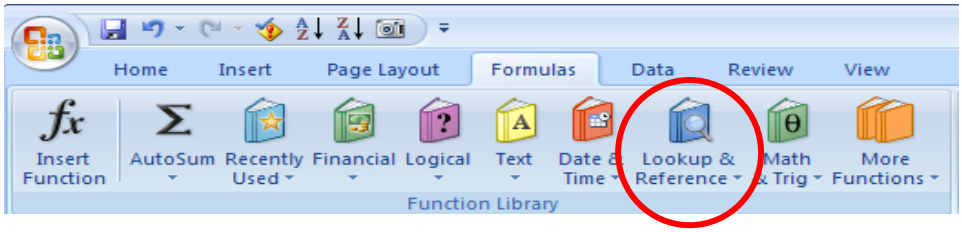
Use HLookup with data organized in rows to find a matching value in the top row of a table and to return the corresponding value from one of the rows below.

The most powerful and flexible way to look up data in Excel is the *INDEX-MATCH* method.

The S*umIfs, CountIfs*, *AverageIfs* functions calculate data in cells in multiple ranges that meet specific criteria.

VLookup	*Searches for a value in the leftmost column of a table, and then returns a value in the same row from a column you specify in the table. Use VLookup when your comparison values are located in a column to the left of the data you want to find.*
HLookup	*HLOOKUP is just like VLOOKUP, except it finds things in a table or range by column, that is, horizontally*
Index	*Returns the value of a specified cell or array of cells within an array.*
Match	*Returns the relative position of an item in an array that matches a specified value in a specified order. Use Match instead of one of the lookup functions when you need the position of an item in a range instead of the item itself.*
SumProduct	*A built-in Array Formula. SumProduct is very effective when you need to manage multiple column criteria and retrieve results from numeric fields.*
SumIf and SumIfs	*The SumIf Function adds the cells specified by a given criteria.* *The SumIfs Function adds the cells in a range that meet multiple criteria.*
CountIf and CountIfs	*The CountIf Function counts the number of cells within a range that meet the given criteria* *The CountIfs Function counts the cells in a range that meet multiple criteria*
AverageIf and AverageIfs	*The AverageIf returns the average (arithmetic mean) of all the cells in a range that meet a given criteria.* The AverageIfs returns the average (arithmetic mean) of all cells that meet multiple criteria.

The Formulas Tab on the Ribbon



Click on the drop-down arrow next to Lookup & Reference to select the function you wish to use

The syntax for the VLookup or HLookup function requires "3" fields of information and one optional field.

Field Name	Required or Optional	Description
Lookup Value	Required	The Lookup Value is the value for which you want to find matching data and must be sorted ascending and appear in the first column of the lookup table. It can be a value, a text string, or a cell reference.
Table array	Required	The table array is the lookup table in which the lookup value is stored; this is a range of cells, identified either in the usual "A1:B2" format, or given a range name (named ranges are preferred).
Column Index #	Required	An index number is the number of columns (VLOOKUP) or rows (HLOOKUP) Excel must count over to find the matching value.
Range Lookup	Optional	Specify either an exact match or an approximate match. If TRUE or omitted, the function looks for an approximate match. If FALSE, the function looks for an exact match with the lookup value.

For example, the **LOOKUP** term can search a data set to provide answers to business questions:

- The phone number of a given employee
- The price of a given product ID
- The highest sales in a given quarter

Price Table	
BB-7865	$ 54.99
EM-3741	$ 125.99
GR-0876	$ 99.99
JH-0678	$ 33.98
ST-2472	$ 63.99
TY-9868	$ 169.99
WE-5493	$ 44.99
WH-0677	$ 54.75

The **Price Table** (which is the name of the data range) is an example of a vertical table, containing columns of data. The part number is sorted ascending and located in the leftmost column of the table. Excel will search for a value in the left column and then return a value in the same row from a column you specify.

```
=VLookup(A2,Price_Table,2,False)
```

The Match and Index Functions

Boost the Clout of Your Calculations: Combine Formulas

There may be times when you want to retrieve data from a table and the lookup value does **not** meet the standard requirements of a VLookup.

In other words, the field that contains the lookup value may not be in the leftmost field of the table or the lookup field does not meet the Sort requirement. In cases like this, the user can combine the Index and Match formulas to obtain any information from any table.

The **Match** function requires a Lookup Value, the Lookup Array, and the Match Type.

Lookup Value	***The value you want to find***
Lookup Array	*The range of cells containing possible lookup values*
Match Type	*An optional argument that can have the values of 0, 1, -1. If you want an exact match, specify 0. If you want the function to search for the largest value that is less than or equal to the lookup value, specify 1. If you want the function to search for the smallest value that is greater than or equal to the lookup value, specify -1. If you specify 1, the range should be sorted in ascending order. If you specify -1, the range should be sorted in descending order. If you omit the argument, the function assumes that the value is 1.*

The **Index** function requires an Array, the Row Number and the Column Number.

Array	***The group of cells in which to look for the value.***
Row Number	*The row from which a value is to be returned. If the specified range contains only one row, you can omit the row number*
Column Number	*The column from which a value is to be returned. If the specified range contains only one column, you can omit the column number*

The table in Figure 1 on page 5 displays the result of the **Index** and **Match** functions to locate earnings for an employee.

To make the function work more efficiently, the user provided a range name for the table, "**Employee info**".

Instead of referring to a row number, a the INDEX function uses a nested **MATCH** function to lookup the employee name (Annie Philips). The **MATCH** function references Column A (Emp_names), with the "0" parameter to find an exact match.
After closing the **MATCH** argument, the function reverts to the last requirement in the **INDEX** function, which is the Column Number. The earnings are in column 6.
Thus, the function reads:

=INDEX (Employee_info, MATCH ("Annie Philips", Emp_names, 0), 6)

Earnings for Annie Philips

60000

Name	Employee identification number	SSN	Region	Department	Earnings
Annie Philips	E006	856-85-8586	West	Human resources	$60,000
Diana Stone	E030	225-51-2998	East	Marketing	$60,000
Jamie Morrison	E019	712-35-4665	East	Human resources	$62,000
Sandy Stewart	E033	674-39-8005	East	Marketing	$65,000
Michael Lee	E014	785-87-9898	North	Sales	$68,000
Rob Dukes	E031	397-64-6797	West	Accounts	$70,000

Figure 1 INDEX and MATCH FUNCTION to lookup data in a table array.

SumProduct

Multiplies corresponding components in the given arrays, and returns the sum of those products.

Syntax: SUMPRODUCT (array1, array2, array3,)

array1, array2, array3 ... are 2 to 255 arrays whose components you want to multiply and then add. The array arguments must have the same dimensions. If they do not, SumProduct returns the #VALUE error value.

Array 1	Array 1		Array 2	Array 2
3	4		2	7
8	6		6	7
1	9		5	3

=SUMPRODUCT(A2:B4, C2:D4) **Multiplies all the components of the two arrays and then adds the products — that is, 3*2 + 4*7 + 8*6 + 6*7 + 1*5 + 9*3. (156)**

SumIf and SumIfs

In Excel, the SumIf function adds all numbers in a range of cells, based on a given criteria.

The syntax for the SumIf function is: SumIf (range, criteria, and sum range)

Range	The range of cells that you want to apply the criteria against
Criteria	Used to determine which cells to add.
Sum Range	the cells to sum

Running Number	Invoice Number	Date	Customer Name	Market	Quantity	Income
1	118	10/10/1997	The Widget Company	Africa	150	25,129.90
2	109	01/10/1997	The Widget Company	Asia	40	8,040.00
3	133	01/10/1999	The Widget Company	USA	331	48,441.63
4	138	06/10/1999	The Widget Company	USA	392	56,237.43
5	123	03/10/1998	The Widget Company	Western Europe	210	32,850.02
6	113	05/10/1997	WorldWide Books	Africa	89	13,095.00
7	122	02/10/1998	WorldWide Books	Africa	198	31,290.86
8	131	11/10/1998	WorldWide Books	Africa	307	45,323.30
9	107	11/10/1996	WorldWide Books	Asia	15	29,280.00

Based on the Excel Spreadsheet above:

=SumIf (D2:D9,"WorldWide Books", G2:G9) would return the value of: 118,989.16

Once someone learns about SUMIF, they often wonder how to sum the records that meet two conditions. You might want a function in to find the Income of WorldWide Books sold in the Africa Market. This was not possible with SUMIF. In Excel 2007, Microsoft has added three plural "S" versions, specifically **SUMIFS, COUNTIFS, and AVERAGEIFS**. These functions allow you to enter up to 127 different criteria. The syntax is slightly reversed from SUMIF. You start with the range of numbers you want to sum, then enter pairs of arguments, such as Criteria Range and Criteria Value.
=SUMIFS(Sum Range, Criteria Range 1, Criteria 1, …)

Based on the Excel Spreadsheet above:

=SUMIFS (G2:G10, D2:D10,"WorldWide Books", E2:E10,"Africa") would return the value of $89,709.16. The formula is broken down as follows:

G2:G10	Sum Range
D2:D10	Criteria_Range1
"WorldWide Books"	Criteria1
E2:E10	Criteria_Range2
"Africa"	Criteria2

CountIf and CountIfs

In Excel, the **CountIf** function counts the number of cells in a range, that meets a given criteria.

The syntax for the CountIf function is: CountIf (range, criteria)

Range is the range of cells that you want to count based on the *criteria*.

Criteria is the parameter entered to determine which cells to count.

Running Number	Invoice Number	Date	Customer Name	Market	Quantity	Income
1	118	10/10/1997	The Widget Company	Africa	150	25,129.90
2	109	01/10/1997	The Widget Company	Asia	40	8,040.00
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8	131	11/10/1998	WorldWide Books	Africa	307	45,323.30
9	107	11/10/1996	WorldWide Books	Asia	15	29,280.00

Based on the Excel Spreadsheet above:

=CountIf (D2:D9,"WorldWide Books") would return the value of: 4

If you wanted to count the number of records for **The Widget Company** in the **USA** market ("2" items of criteria), the formula would be:

=COUNTIFS (D2:D10, D2, E2:E10, E4)

AverageIf and AverageIfs

The syntax for the AverageIf function is: AverageIf (range, criteria, and average_range)

Range	The range of cells that you want to apply the criteria against
Criteria	Used to determine which cells to add.
Average_Range	the cells to average

In the table above, we want to know the average income for **The Widget Company**.

=AverageIf (D2:D10, D2, G2:G10)

If you wanted to average number of records for **The Widget Company** in the **USA** market ("2" items of criteria), the formula would be:

=AVERAGEIFS (G2:G10, D2:D10, D2, E2:E10, E4)