

Lookup Functions

Excel provides two functions, VLOOKUP and HLOOKUP, which are commonly used to retrieve data from a reference table. They both work in the same way, their names indicating the orientation of the data in the reference table. VLOOKUP is used when the data is arranged in columns (V for Vertical) and HLOOKUP is used when the data is arranged in rows (H for Horizontal).

Using VLOOKUP

To use VLOOKUP you need a table of reference data that contains at least two columns. The first column will contain the data that you will use to identify the row so that the VLOOKUP function can be used to return data from subsequent columns in the same row. The illustration (Fig. 1) shows the kind of data that you might use. It contains information about a company's employees. The first column contains the employee's ID number. VLOOKUP can use this number to identify a specific employee and return a piece of data from one of the other columns. When using VLOOKUP the table of reference data can be located on the same worksheet, on a different worksheet in the same workbook, or in a different workbook.

| | A | B | C | D | E | F | G | H | I | J | K |
|----|----|-------|-----------|-----------|------------------------|---------|------------|------------|--------|------------|------------|
| 1 | ID | Title | Firstname | Lastname | JobTitle | Salary | BirthDate | HireDate | Gender | Office | Department |
| 2 | 1 | Mr | Martin | Green | Chairman | 103,000 | 27/09/1950 | 01/11/1995 | M | London | Management |
| 3 | 2 | Miss | Deborah | Collett | Regional IT Manager | 47,000 | 24/02/1969 | 04/09/1999 | F | Birmingham | IT |
| 4 | 3 | Mr | Luke | Willis | Senior IT Engineer | 22,750 | 20/12/1968 | 16/12/2000 | M | Berkeley | IT |
| 5 | 4 | Mr | Samuel | Pienaar | Production Assistant | 16,250 | 14/02/1954 | 06/03/2002 | M | London | Production |
| 6 | 5 | Miss | Clare | James | Secretary | 26,000 | 07/08/1984 | 23/03/2003 | F | London | Production |
| 7 | 6 | Mr | James | Ruane | Research Assistant | 19,000 | 06/10/1981 | 14/03/1999 | M | London | Research |
| 8 | 7 | Miss | Tamsin | Graef | Head of Administration | 36,750 | 07/10/1960 | 23/03/2000 | F | Berkeley | Admin |
| 9 | 8 | Mr | Stuart | Sweetland | Research Assistant | 17,250 | 28/03/1960 | 18/06/2006 | M | Birmingham | Research |
| 10 | 9 | Mr | John | Gardner | Head of Production | 35,250 | 13/03/1958 | 13/09/2006 | M | New York | Production |
| 11 | 10 | Miss | Amy | Calaminus | Production Manager | 26,750 | 07/08/1974 | 15/04/1996 | F | New York | Production |

Fig. 1 A table of data suitable for VLOOKUP.

Finding an Exact Match

Suppose you want to enter an employee's ID number into a cell on a worksheet and have Excel enter that person's salary in the next cell using VLOOKUP. Enter a sample ID number into one cell (cell A2 in this example Fig. 2) and enter the VLOOKUP function into another cell (cell B2 in this example). Excel will prompt you for the information it needs to complete the function.

| | A | B | C | D | E | F | G |
|---|---|-------------------------------------------------------------------|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | 8 | =VLOOKUP(| | | | | |
| 3 | | VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup]) | | | | | |
| 4 | | | | | | | |

Fig. 2 Entering the VLOOKUP function.

The VLOOKUP function accepts three or four arguments (one of the arguments is optional):

- **Lookup Value** is the address of the cell containing the value you are going to use to identify the row of data (in this example the value is located in cell A2).
- **Table Array** is the address of the range of cells containing the reference data. This can be a cell reference or a named range.
- **Col Index Num** is the number of the column within the reference data that contains the item that you want the function to return, the first column being column 1.
- **Range Lookup** specifies whether you want Excel to look for an approximate match (enter *True*) or an exact match (enter *False*). *True* is assumed if this argument is omitted.

I want to find the *Salary* of the person whose ID number is 8 so my function looks like this (Fig. 3):

| | A | B | C | D | E | F | G | H |
|---|---|-------------------------------------------------------------------|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | 8 | =VLOOKUP(A2,'Staff List'!A2:K1085,6,FALSE) | | | | | | |
| 3 | | VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup]) | | | | | | |

| | A | B |
|---|---|-------|
| 1 | | |
| 2 | 8 | 17250 |
| 3 | | |

Fig. 3 The completed VLOOKUP function.

Excel has found a cell containing the value 8 in column 1 of the reference table and returned the value (17250) that it found in column 6 of the reference table.

Notes:

- When you are looking for an exact match the data does not have to be sorted into any particular order. For an approximate match the data must be sorted by column 1.
- If there is more than one example of the lookup value in the reference table the function will return the data for the first instance it finds.
- If the lookup value is not found in the reference table and an exact match is required the function will return the error code **#N/A**.
- If you are going to copy the function down a column remember to specify the **Table Array** argument as an absolute reference or a range name so that its address does not change.

Finding an Approximate Match

Sometimes you cannot be sure of finding an exact match in the reference table. In this case you can tell Excel to look for an approximate match. An example would be assigning a grade to a mark. Suppose you are assigning grades to the results of a test where the maximum mark is 100 and the grades range from A to F.

The VLOOKUP function is used in exactly the same way but the **Range Lookup** argument is set to **TRUE**. In addition, the data in the reference table must be sorted by the first column, usually in ascending order as in this example (Fig. 4). Note that the **Table Array** argument has been specified as an absolute reference so that it did not change when it was copied down the column.

| | A | B | C | D | E | F | G |
|---|----------|------|-------|---|------|-------|---|
| 1 | Student | Mark | Grade | | Mark | Grade | |
| 2 | Philippa | 91 | A | | 0 | F | |
| 3 | Natasha | 39 | F | | 50 | E | |
| 4 | Michael | 88 | B | | 60 | D | |
| 5 | Sarah | 61 | D | | 70 | C | |
| 6 | Andrew | 52 | E | | 80 | B | |
| 7 | Abhijit | 13 | F | | 90 | A | |
| 8 | Marie | 75 | C | | | | |

Fig. 4 Using VLOOKUP to find an approximate match.

Using HLOOKUP

In principle HLOOKUP works in exactly the same way as VLOOKUP but its reference data is arranged horizontally in rows rather than in columns as in VLOOKUP. In this example (Fig. 5) the table that assigns a grade to a range of marks is laid out in rows. Excel looks for an approximate match for the **Lookup Value** in row 1 of the table and, in this example, returns what it finds in row 2. The data in row 1 is sorted in ascending order from left to right.

| | A | B | C | D | E | F | G | H | I | J | K |
|---|----------|------|-------|---|-------|---|----|----|----|----|----|
| 1 | Student | Mark | Grade | | Mark | 0 | 50 | 60 | 70 | 80 | 90 |
| 2 | Philippa | 91 | A | | Grade | F | E | D | C | B | A |
| 3 | Natasha | 39 | F | | | | | | | | |
| 4 | Michael | 88 | B | | | | | | | | |
| 5 | Sarah | 61 | D | | | | | | | | |
| 6 | Andrew | 52 | E | | | | | | | | |
| 7 | Abhijit | 13 | F | | | | | | | | |
| 8 | Marie | 75 | C | | | | | | | | |

Fig. 5 Using HLOOKUP to find and approximate match.

This example uses just two rows of data and is looking for an approximate match but, like VLOOKUP in the first example, HLOOKUP can be used to search a reference table containing many rows and asked to find an exact match.