

The VLOOKUP Function in Excel 2000

The VLOOKUP function in *Excel* provides a way to set up a table of values within a spreadsheet, and then have *Excel* find a value from that table and insert it into a given place on your spreadsheet. This handout assumes you have basic knowledge of using *Excel 2000*. If not, consult our other handout, *Using Excel 2000* first.

For example, you may want to set up a spreadsheet of student grades. You would like to have the final grades appear next to each student's name based on your grade scale. Using VLOOKUP, you can have *Excel* display a letter grade in one column of your spreadsheet based on the student's final grade in another column. For VLOOKUP to work, in addition to the student scores already in the spreadsheet, you must also create a table within the same spreadsheet indicating your scale for the grades. VLOOKUP "looks up" this table and returns the final grade to the column you have specified.

Let's say you have the following spreadsheet of student grades:

	A	B	C
1		Final Percentage	Final Grade
2			
3	Badenov, Boris	59%	
4	Bush, George	78%	
5	Clinton, William	83%	
6	Gore, Al	78%	
7	Moose, Bullwinkle	92%	
8	Nader, Ralph	67%	
9			
10			

In the column labeled **Final Grade** you want to have *Excel* place a final letter grade.

In order to do this, you must first set up a "lookup table," which is the table *Excel* will use to generate a value in the column for **Final Grade**. This is relatively easy to do, but the following must first be taken into account:

- For your lookup table, you want to place the value you want to look up (in this case, the final grade percentage) in one column, and the value you want *displayed* (in this case, the letter grade) in a separate column next to the corresponding value that is being looked up.
- The column of lookup values must be placed in *ascending* order.
- *Excel* will first try to find an *exact match* in your lookup table. If it finds one, it returns the item you specify next to that lookup value. If it does not find an exact match, it returns the item from the next *lowest* number on your lookup table. Looking at some examples best shows this.

For our spreadsheet, let's use a simple grade scale:

90 - 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
Below 60%	F

Here is what our lookup table will look like in the spreadsheet:

10		
11	Table for Grades	
12	0%	F
13	60%	D
14	70%	C
15	80%	B
16	90%	A
17		


Remember, this must appear *somewhere* on our worksheet that we are using--it does not really matter where. Also, remember that the lookup numbers on a VLOOKUP table must be in *ascending* order, which in this case is the opposite of the way we usually think of a grade scale. So, they are from the lowest percentage to the highest. To better visualize things, here is what the entire spreadsheet looks like so far:

	A	B	C	D
1		Final Percentage	Final Grade	
2				
3	Badenov, Boris	59%		
4	Bush, George	78%		
5	Clinton, William	83%		
6	Gore, Al	78%		
7	Moose, Bullwinkle	92%		
8	Nader, Ralph	67%		
9				
10				
11	Table for Grades			
12	0%	F		
13	60%	D		
14	70%	C		
15	80%	B		
16	90%	A		
17				
18				

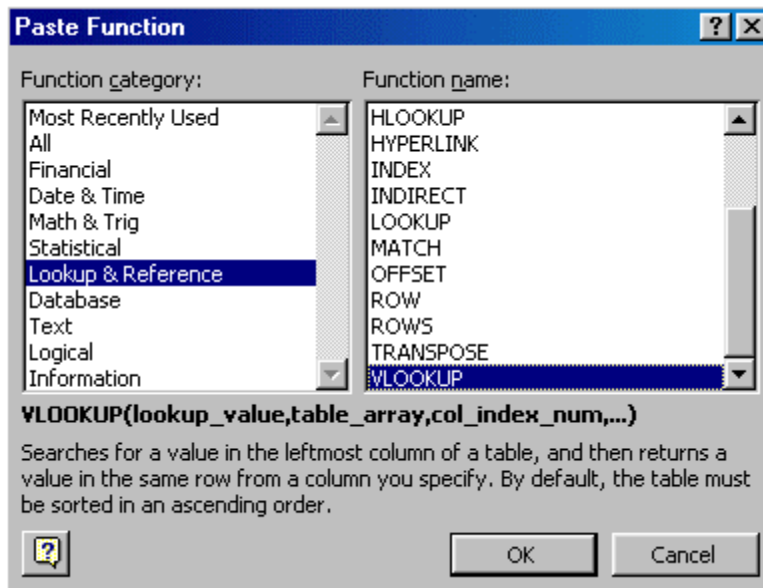
Here is our student grade data that gives the final percentage the student has earned in class.

Here is the newly created lookup table that the VLOOKUP function requires to work. (The title in cell A11 is not required; all VLOOKUP needs for this spreadsheet is the data in cells A12 through B16.)

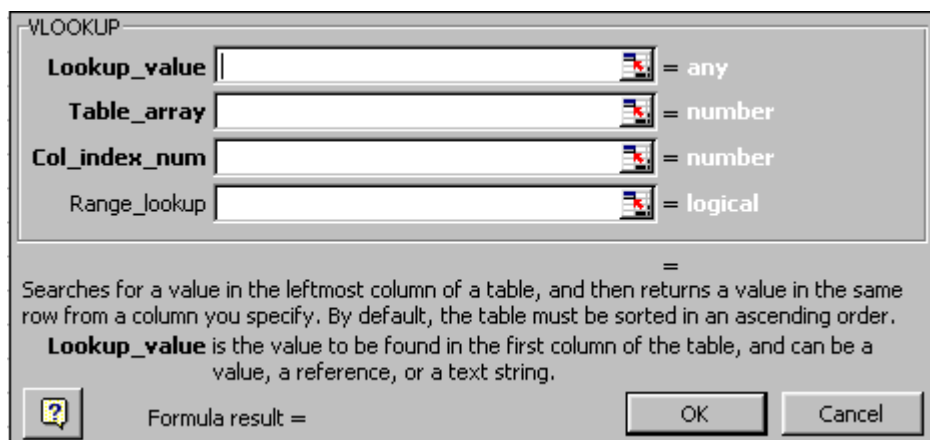
When setting up a lookup table, keep in mind that *Excel* looks for an *exact match* first, then failing that will return the corresponding value from the next *lowest* number. This is why many VLOOKUP tables start at zero. For example, let's say a student gets a final grade of **71%**. *Excel* will try to find an exact match for 71% in the above table. There is no exact match. So, *Excel* will then go to the next *lowest* number on the table--in this case, 70%. Next to 70% is the grade of **C**, which is the grade *Excel* will record on your spreadsheet. So, the student with 71% will get a grade of **C**--which is exactly what the grade should be based on our grade scale.

Once you've established a lookup table, you're ready to do the VLOOKUP function itself. As is the case with any other formula or function in *Excel*, you want to place your cursor in the cell where you want the formula *results* to appear. In the case of our sample spreadsheet on the previous page, that would be within cell **C3**. Then, click the **Paste Function** button on the *Excel* toolbar: .

Next, go to the **Lookup & Reference** category in the **Paste Function** dialog box, click on **VLOOKUP**, and click **OK**:



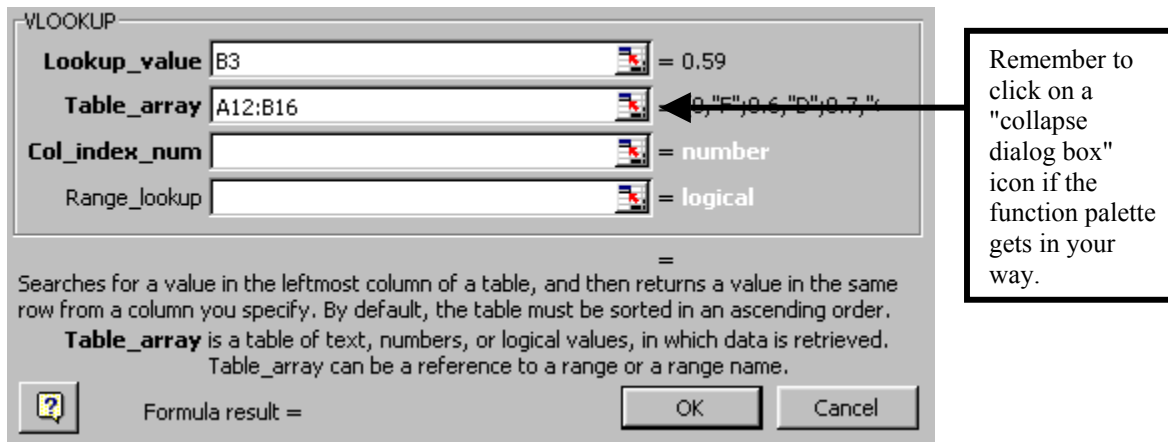
You will then get the following function palette:



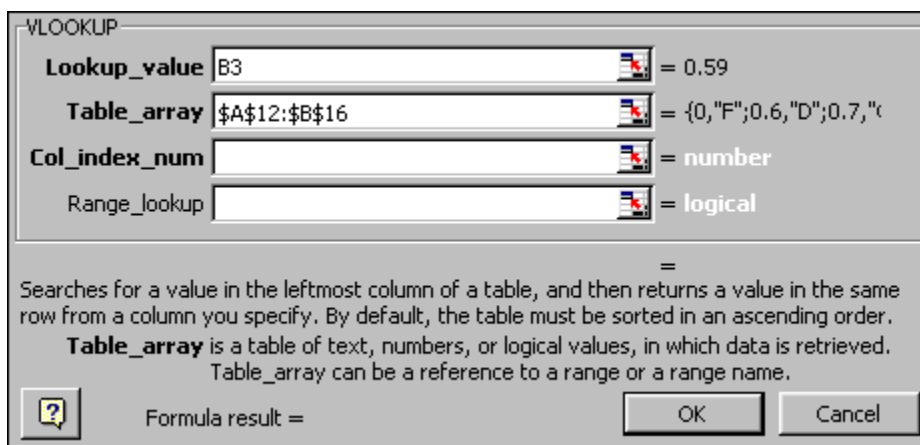
Like other function palettes, the required fields are in **bold face type**.

First, in the **Lookup_value** box, you need to specify the cell that you want *Excel* to "lookup" as part of this function. Do not confuse this with the lookup table, which is the next box down. Given that we are putting our function's formula in cell **C3**, this means we want *Excel* to look at the percentage (final grade percentage) we have in cell **B3**. (Refer to the spreadsheet on page 1.). Therefore, we can type **B3** in that box.

Next, we have to specify the **Table_array**. This means the cells where our lookup table was placed within our spreadsheet. Notice that there is a "collapse dialog box" to the right of each of these windows in this function palette, so if this function palette is in the way, click the "collapse dialog box" and just click and drag over the cells where your lookup table was placed. Here is what it should look like after this step:



Be careful that you do not include any extraneous text when you tell *Excel* where your lookup table is. Click and drag only over the cells with the numbers and the data--not text. In this case, we were careful not to include our lookup table text of "Table for Grades" within the cell range. Also, remember the same rules for copying formulas and functions apply here, too--we want to make this table array an *absolute reference* so that when we copy the function formula down a column, *Excel* won't change the cell values for where this table is. Therefore, the final step in the **Table_array** window is pressing the **F4** function key on the keyboard to turn all cell references into an *absolute address*:



Finally, we need to specify the **Col_index_num**--which means "column index number." In other words, in this lookup table, which column contains the *value we want returned to the spreadsheet*? Please note this does *not* mean the column on the spreadsheet itself (such as column A, B, C, D, etc.), but rather a column number *within* the lookup table itself, starting from the left. In most cases, you will be typing the number **2** here--since your values will usually be in the second column from the left:

VLOOKUP

Lookup_value: B3 = 0.59

Table_array: \$A\$12:\$B\$16 = {0,"F";0.6,"D";0.7,"C";0.8,"B";0.9,"A"}

Col_index_num: 2 = 2

Range_lookup: = logical

= "F"

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. By default, the table must be sorted in an ascending order.

Col_index_num is the column number in table_array from which the matching value should be returned. The first column of values in the table is column 1.

Formula result = F

OK Cancel

Finally, you can click the **OK** button, and check out the first result on your spreadsheet:

	A	B	C	D
1		Final Percentage	Final Grade	
2				
3	Badenov, Boris	59%	F	
4	Bush, George	78%		
5	Clinton, William	83%		
6	Gore, Al	78%		
7	Moose, Bullwinkle	92%		
8	Nader, Ralph	67%		
9				
10				
11	Table for Grades			
12	0%	F		
13	60%	D		
14	70%	C		
15	80%	B		
16	90%	A		
17				

Notice that student Boris Badenov--who had a final percentage of 59%--indeed gets an "F" as his final grade based on the VLOOKUP function. (Note in the screenshot above what the formula bar looks like when your cursor is in a cell that contains a VLOOKUP. Like other functions, it starts with the function name, with the rest in parentheses.)

The final step is copying the formula down the column as you ordinarily would:

C3 = =VLOOKUP(B3,\$A\$12:\$B\$16,2)				
	A	B	C	D
1		Final Percentage	Final Grade	
2				
3	Badenov, Boris	59%	F	
4	Bush, George	78%	C	
5	Clinton, William	83%	B	
6	Gore, Al	78%	C	
7	Moose, Bullwinkle	92%	A	
8	Nader, Ralph	67%	D	
9				

Once copied down, notice that the final grades all correspond to the way we intended, based on our lookup table:

C17 =			
	A	B	C
1		Final Percentage	Final Grade
2			
3	Badenov, Boris	59%	F
4	Bush, George	78%	C
5	Clinton, William	83%	B
6	Gore, Al	78%	C
7	Moose, Bullwinkle	92%	A
8	Nader, Ralph	67%	D
9			
10			
11	Table for Grades		
12	0%	F	
13	60%	D	
14	70%	C	
15	80%	B	
16	90%	A	
17			

Other uses for VLOOKUP could include a tax table. For example, say you have to indicate on your spreadsheet the taxes that are paid based on the following information:

Salary	Tax Rate
Up to \$14,999	3%
15000 - 24,999	4%
25,000 - 39,999	5%
\$40,000 and above	6%

You can incorporate this information into the following type of spreadsheet:

	A	B	C
1		Annual Salary	Tax Paid
2			
3	Badenov, Boris	\$ 15,800	
4	Bush, George	\$ 45,600	
5	Clinton, William	\$ 17,800	
6	Gore, Al	\$ 26,000	
7	Moose, Bullwinkle	\$ 10,300	
8	Nader, Ralph	\$ 33,000	
9			

Taking into account the "rules" for creating a lookup table, we can then create a tax lookup table elsewhere in this same spreadsheet. Remember, you want the lowest values for each range in a lookup table. Here is what our spreadsheet now looks like with the addition of a lookup table:

	A	B	C	D
1		Annual Salary	Tax Paid	
2				
3	Badenov, Boris	\$ 15,800		
4	Bush, George	\$ 45,600		
5	Clinton, William	\$ 17,800		
6	Gore, Al	\$ 26,000		
7	Moose, Bullwinkle	\$ 10,300		
8	Nader, Ralph	\$ 33,000		
9				
10				
11		Tax Table		
12				
13		\$ -	3%	
14		\$ 15,000.00	4%	
15		\$ 25,000.00	5%	
16		\$ 40,000.00	6%	
17				

Here is the original data in our spreadsheet.

Here is the lookup table that must be created for VLOOKUP to work. The title in cell B11 is only for our own reference--it is *not* required for VLOOKUP to work, and in fact must be ignored when using the VLOOKUP function.

Next, we position our cursor in cell C3 (again, where we want our first formula results to appear), click the **paste function** button, and select **VLOOKUP**. Here is what the function palette will look like when completed:

VLOOKUP

Lookup_value: B3 = 15800

Table_array: \$B\$13:\$C\$16

Col_index_num: 2

Range_lookup: []

Searches for a value in the leftmost row from a column you specify.

Col_index_num is the column number in table_array from which the matching value should be returned. The first column of values in the table is column 1.

Formula result =0.04

OK Cancel

Looking at the **Formula result** at the bottom of this function palette, we see that the result will be 0.04. This is what it should be for Boris Badenov, who, based on our tax table, should be paying a 4% tax rate. Therefore, we click OK and copy the formula down:

	A	B	C	D
1		Annual Salary	Tax Paid	
2				
3	Badenov, Boris	\$ 15,800	0.04	
4	Bush, George	\$ 45,600	0.06	
5	Clinton, William	\$ 17,800	0.04	
6	Gore, Al	\$ 26,000	0.05	
7	Moose, Bullwinkle	\$ 10,300	0.03	
8	Nader, Ralph	\$ 33,000	0.05	
9				
10				
11		Tax Table		
12				
13		\$ -	3%	
14		\$ 15,000.00	4%	
15		\$ 25,000.00	5%	
16		\$ 40,000.00	6%	
17				

We are not quite finished yet, however. The percentages are correct, but we want the actual tax paid to be shown in the **Tax paid** column, not just the rate. So, place the cursor back in cell **C3**, where we created our formula. We can now edit our VLOOKUP formula so that the results are multiplied by the annual salary (cell **B3**) in our example, using the regular symbol (*) for multiplication. We can do this directly in the formula bar. Here is what our revised formula will look like in *Excel*:

	A	B	C	D	E
1		Annual Salary	Tax Paid		
2					
3	Badenov, Boris	\$ 15,800	0.04		
4	Bush, George	\$ 45,600	0.06		
5	Clinton, William	\$ 17,800	0.04		
6	Gore, Al	\$ 26,000	0.05		
7	Moose, Bullwinkle	\$ 10,300	0.03		
8	Nader, Ralph	\$ 33,000	0.05		
9					
10					

The formula bar now shows:

VLOOKUP(B3,\$B\$13:\$C\$16,2)*B3

It has the original VLOOKUP formula we just completed, only we manually added the ***B3** in order to multiply our VLOOKUP formula result (the tax rate) by the annual salary in B3. After pressing ENTER (or clicking the check mark in the formula bar) to complete the formula, we copy our new formula down the column:

	A	B	C	D
1		Annual Salary	Tax Paid	
2				
3	Badenov, Boris	\$ 15,800	632	
4	Bush, George	\$ 45,600	2736	
5	Clinton, William	\$ 17,800	712	
6	Gore, Al	\$ 26,000	1300	
7	Moose, Bullwinkle	\$ 10,300	309	
8	Nader, Ralph	\$ 33,000	1650	
9				
10				
11		Tax Table		
12				
13		\$ -	3%	
14		\$ 15,000.00	4%	
15		\$ 25,000.00	5%	
16		\$ 40,000.00	6%	
17				

All we have to do now is select the cells with the mouse and convert them to the currency format by clicking the button in the formatting toolbar (**\$**), and we're done!

	A	B	C	D
1		Annual Salary	Tax Paid	
2				
3	Badenov, Boris	\$ 15,800	\$ 632	
4	Bush, George	\$ 45,600	\$ 2,736	
5	Clinton, William	\$ 17,800	\$ 712	
6	Gore, Al	\$ 26,000	\$ 1,300	
7	Moose, Bullwinkle	\$ 10,300	\$ 309	
8	Nader, Ralph	\$ 33,000	\$ 1,650	
9				
10				
11		Tax Table		
12				
13		\$ -	3%	
14		\$ 15,000.00	4%	
15		\$ 25,000.00	5%	
16		\$ 40,000.00	6%	
17				

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