BASIC XLOOKUP

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XLOOKUP, a dynamic array function (available only with Excel 365 or later), is a significant enhancement over VLOOKUP (see separate document) which many users found confusing and frustrating to implement.

It's not uncommon to need to look up information from a master list or table.
If you're familiar with VLOOKUP, you may be aware of its restrictions, such as only being able to handle "left-to-right" lookups, i.e. lookup value must be in the 1st column of the lookup array and the return value must be to the right of the lookup value. Also, VLOOKUP suffered from the oft-confusing 4th parameter ("True is approximate, False is exact ? HUH ?!") XLOOKUP nicely avoids all that.

Here's a summary of the pros and cons between VLOOKUP and XLOOKUP:

Feature / Aspect	VLOOKUP	XLOOKUP
Lookup direction	Only looks right	no such restriction
Column number	needs a hard-coded # or a reference to it	none needed
Inserting columns	Can break due to static index	not an issue
Exact match default	Defaults to approximate match	Defaults to exact match which is more common
Error handling	Needs IFERROR or IFNA wrapper	Built-in "not found" handler
Multiple return values	Not supported	Can return multiple columns
Backward compatibility	Works in older Excel versions	Excel 365 / Excel 2019+ only
Performance (large sets)	Slower with large datasets	Faster and more efficient
Syntax simplicity	4 required parameters	3 required parameters

If you have Excel 365 or later, XLOOKUP is the clear winner.

Here are a couple of examples that will help you understand when and how to use the 2 most common types of lookups using XLOOKUP:

1. Range (Approximate) Lookup
2. Exact Lookup

The detail is below, but the bottom-line on the 2 types of lookups is: when the lookup value is text, you'll use Exact; when the lookup value is numeric (and you can't match that value directly), you'll use Range.

Range Lookup

Suppose you wish to assign letter grades to students based on a range of test scores. A score of 90 or above is an 'A', 80 or above is a 'B', and so forth. Below, Figure1 range of scores is shown in A5:A10, and the associated grades to assign are in B5:B10, as follows:

Figure1:

	A	B
1	**RANGE LOOKUP**	
2		
3		
4	Score range	Grade to assign
5	90-100	A
6	80-89	B
7	70-79	C
8	60-69	D
9	50-59	E
10	0-49	Fail

The next step is to rearrange the score range into a range of single scores which effectively define the levels for assigning the letter grades – see below:

Figure 2:

	A	B	C	D
1	**RANGE LOOKUP**			
2				
3				
4	Score range	Grade to assign	**Scores sorted**	**Grade**
5	90-100	A	0	Fail
6	80-89	B	50	E
7	70-79	C	60	D
8	60-69	D	70	C
9	50-59	E	80	B
10	0-49	Fail	90	A

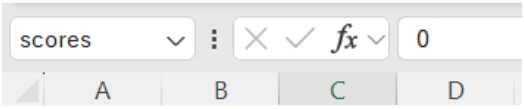
In the range C5:C10, the score levels are arranged in ascending order (low-to-high.) The associated letter grades are in D5:D10. Those 2 ranges will be used by the XLOOKUP function below.
Before we starting writing the formulas, those 2 ranges should be given names or labels; while this step is not mandatory, it makes life a whole lot easier if you do.

Figure 3:

	A	B	C	D
1	**RANGE LOOKUP**			
2				
3		*named ranges >*	scores	grade
4	Score range	Grade to assign	**Scores sorted**	**Grade**
5	90-100	A	0	Fail
6	80-89	B	50	E
7	70-79	C	60	D
8	60-69	D	70	C
9	50-59	E	80	B
10	0-49	Fail	90	A

We'll assign the name 'scores' to C5:C10, and 'grade' to D5:D10.
Assigning names to a cell range is very easy – simply follow these steps:

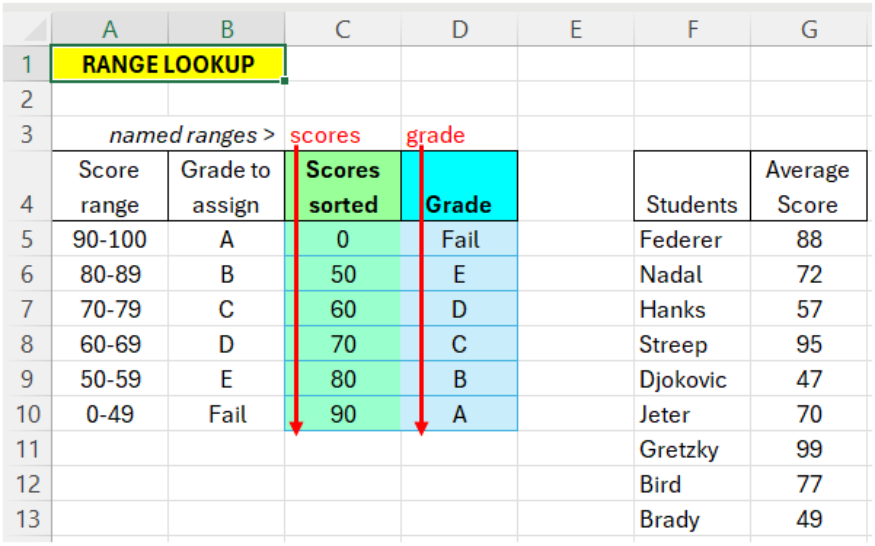
1. Select the range C5:C10
2. Click inside the name box (the white area above column letter A) and type: scores, then press Enter



3. Select the range D5:D10, click inside the name box, type: grade, then press Enter

The red arrows in Figure 3, above, indicate the ranges that are named.

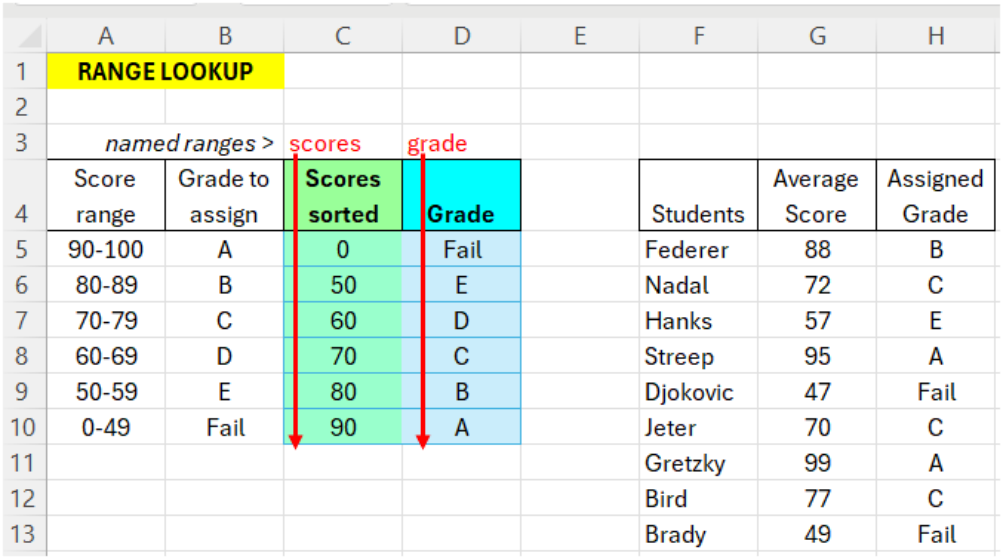
Figure 4:



	A	B	C	D	E	F	G
1	**RANGE LOOKUP**						
2							
3		*named ranges >*	scores	grade			
4	Score range	Grade to assign	**Scores sorted**	**Grade**		Students	Average Score
5	90-100	A	0	Fail		Federer	88
6	80-89	B	50	E		Nadal	72
7	70-79	C	60	D		Hanks	57
8	60-69	D	70	C		Streep	95
9	50-59	E	80	B		Djokovic	47
10	0-49	Fail	90	A		Jeter	70
11						Gretzky	99
12						Bird	77
13						Brady	49

In Figure 4 above, there is a list of students in F5:F13 and their average scores for the report card period in G5:G13. The idea is to enter formulas in column H, using the XLOOKUP function, that will lookup the grade.

Figure 5:



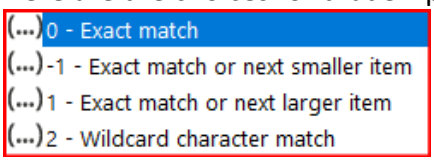
	A	B	C	D	E	F	G	H
1	**RANGE LOOKUP**							
2								
3		*named ranges >*	scores	grade				
4	Score range	Grade to assign	**Scores sorted**	**Grade**		Students	Average Score	Assigned Grade
5	90-100	A	0	Fail		Federer	88	B
6	80-89	B	50	E		Nadal	72	C
7	70-79	C	60	D		Hanks	57	E
8	60-69	D	70	C		Streep	95	A
9	50-59	E	80	B		Djokovic	47	Fail
10	0-49	Fail	90	A		Jeter	70	C
11						Gretzky	99	A
12						Bird	77	C
13						Brady	49	Fail

In Figure 5 above, the assigned grades are now showing in H5:H13; the formula in H5 is:

=XLOOKUP(G5,scores,grade,,-1)

The 1st parameter in the function is the "lookup value" in G5, referencing Federer's score of 88.
The 2nd parameter is the "lookup range" which is simply the range in which the lookup value is found. Any of the scores in column G will be found in the range named 'scores'.
The 3rd parameter is the "return range" which is the range from which you want the result returned, i.e. the letter grade, which is found in the range named 'grade'.
The 4th parameter specifies what you want to show in case the lookup value cannot be found. In this case, that won't apply (the lookup value will always be found) so this parameter is being skipped.
The 5th parameter = -1 which specifies "exact match or next smaller item."

Here are the choices for that 5th parameter:



The default value = 0, specifying exact match.
In the case of Federer's score 88, that wouldn't work because 88 cannot be found in the scores range. However, 88 can be found between the scores in C9:C10 which are 80, 90. The corresponding grades for that range are B, A, therefore "next smaller item" refers to the grade that corresponds to the smaller of the 2 scores: 80-90, i.e. B. The formula above using XLOOKUP returns 'B'.

Replicating the formula in H5 down across the remaining names returns the correct letter grades.
Note that the range C5:D10 is sorted ascendingly based on the scores in column C. Sorting them descendingly would yield the exact same correct results, unlike VLOOKUP which wouldn't work in that case.

Exact Lookup

Figure1:

	F	G	H	I
1				
2	**Payroll form for week 22**			
3	Name	Position	# hrs worked	Hourly Rate
4	DeNiro	entry level	49	
5	Pacino	supervisor	28	
6	Streep	admin	46	
7	Streisand	supervisor	32	
8	Freeman	analyst	42	
9	Hanks	manager	29	
10	Jeter	admin	19	
11	Gretzky	entry level	36	
12	Bird	analyst	19	
13	Mantle	entry level	41	
14	Maris	admin	21	
15	Bogart	entry level	16	
16	Tracy	manager	50	
17	Hepburn	analyst	50	

Suppose you needed to complete a weekly payroll form which contains a list of staff names and their positions, including the # hrs worked that week. You'd need to find each employee's hourly rate. That info is available from a master list provided by the HR dept, see Figure2, below:

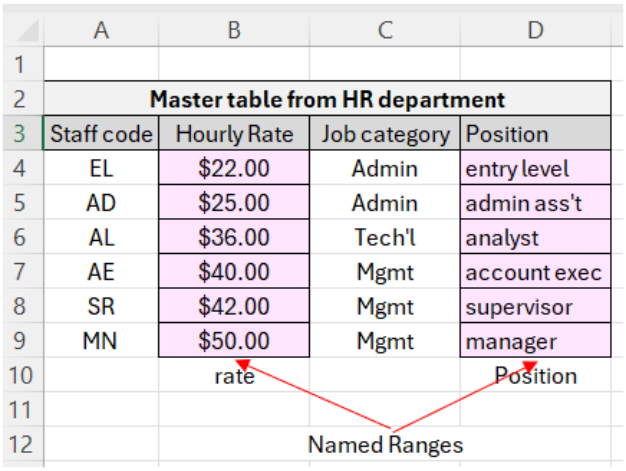
Figure 2:

	A	B	C	D
1				
2	**Master table from HR department**			
3	Staff code	Hourly Rate	Job category	Position
4	EL	$22.00	Admin	entry level
5	AD	$25.00	Admin	admin ass't
6	AL	$36.00	Tech'l	analyst
7	AE	$40.00	Mgmt	account exec
8	SR	$42.00	Mgmt	supervisor
9	MN	$50.00	Mgmt	manager

We need a formula to lookup each employee's hourly rate based on their positions noted in column G.
We'll enter that fomula in column I, right next to the # hrs worked in column H.
But just like in the 1st example above, we need to assign names to the applicable cell ranges we're going to need for the XLOOKUP function, specifically, the range of rates in B4:B9 and the range of positions in D4:D9.

Simply select each range in turn, and enter names into the name box, e.g. rate and position.

Figure 3:



The highlighted ranges in columns B and D are named, rate and position, respectively.

Figure 4:

	F	G	H	I
1				
2	Payroll form for week 22			
3	Name	Position	# hrs worked	Hourly Rate
4	DeNiro	entry level	49	$22.00
5	Pacino	supervisor	28	$42.00
6	Streep	admin	46	can't find
7	Streisand	supervisor	32	$42.00
8	Freeman	analyst	42	$36.00
9	Hanks	manager	29	$50.00
10	Jeter	admin	19	can't find
11	Gretzky	entry level	36	$22.00
12	Bird	analyst	19	$36.00
13	Mantle	entry level	41	$22.00
14	Maris	admin	21	can't find
15	Bogart	entry level	16	$22.00
16	Tracy	manager	50	$50.00
17	Hepburn	analyst	50	$36.00

In Figure 4 above, the hourly rates have been looked up; here's the 1st formula in cell I4:

```
=XLOOKUP(G4,position,Rate,"can't find")
```

The 1st parameter is the lookup value; this is a reference to DeNiro's position.
The 2nd parameter is the lookup array which is the range in which DeNiro's position can be found; that range is named 'position'. If a name had not been assigned to the range of positions previously, then the 2nd parameter would have to be as follows: $D$4:$D$9.
This is obviously more cumbersome than using a named range.
The dollar signs in front of the column and row references ensure those are absolute references, which is necessary since the formula in I4 will be replicated down to row 17.
The 3rd parameter is the result array which is the range in which the result we want, i.e. the rates, can be found. Again, without the named range 'rate', you'd have to enter $B$4:$B$9.
The 4th parameter specifies what result you want if the lookup value can't be found; if this parameter is left blank, #N/A will result if it can't be found.

In our case, there are 3 instances where the position could not be found in the range named 'position'.
That's because the list of positions in column G show "admin" when the HR master list shows "admin ass't".

There are a couple of options for fixing this.
1 - change all instances of "admin" in column G to "admin ass't".
2 - use a wildcard symbol with the XLOOKUP function; this would accommodate positions such as "admin", "admin ass't", "administration", "administrator", in fact, anything at all beginning with "admin".

With option 2, here is the formula:

```
=XLOOKUP(G4&"*",position,Rate,"can't find",2)
```

The 1st parameter (lookup value) now contains a wildcard symbol – the asterisk * (meaning any characters.)
G4&"*" means: whatever's in cell G4 followed by the *.
The ampersand symbol (&) literally concatenates the * symbol to the end of whatever's in G4.
Since that symbol is a text character, it must be encased in double quotes.
The 2nd, 3rd, and 4th parameters are the same as before,
Now we use a 5th parameter which specifies the type of match we need; we need a wildcard match so that parameter is set = 2.

Now all the "can't finds" are replaced with the proper hourly rates.