Table Lookups in Excel

DATA ANALYTICS BOOTCAMP

Lesson Objectives

1. Understand LOOKUP functions in Excel
    a. VLOOKUP
    b. XLOOKUP
2. Use and apply INDEX + MATCH to perform table lookups

VLOOKUP()

=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

- Lookup value : this is the search key, what the function is searching for
- Table array: this is the search range, the range of cells being searched
  - The lookup value must be in the first column of this range
- Column index: the column index number, with respect to the search range, where the return value will be found once finding the search key
  - The 1st column of the search range is index value 1
- Range lookup: designates an approximate (TRUE) or exact (FALSE) match of your lookup value; the default value is TRUE, meaning an approximate match is how it will search if you omit this optional argument
  - If the first column isn't sorted in numerical or alphabetical order, omitting the range_lookup value or entering TRUE may result in an unexpected output

VLOOKUP() Examples

=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

Input	Output
=VLOOKUP(48, B2:D4, 2)	129
=VLOOKUP(14, B2:D4, 2)	#N/A
=VLOOKUP("Django Unchained", A2:E4, 3)	162
=VLOOKUP(150, B2:E4, 4)	78.7
=VLOOKUP(150, B2:E4, 4, FALSE)	#N/A

This is an example of the "unexpected result" that can happen when using approximate matching on unsorted data!

	A	B	C	D	E
1	Title	Budget (Millions)	Gross(Millions)	Release Date	Profit
2	The Ring	$48	$129	10/18/2002	$68.1
3	Django Unchained	$100	$162	12/25/2012	$45.8
4	Scream	$14	$103	12/20/1996	$78.7

VLOOKUP() Examples

Let's take a break from our movies data so that we can explore a scenario where the approximate match is very helpful - letter grades associated with a range of numerical values.

=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

Input	Output
=VLOOKUP(48, A2:B6, 2)	F
=VLOOKUP(98, A2:B6, 2)	A

	A	B
1	Minimum Grade	Letter Grade
2	0	F
3	60	D
4	70	C
5	80	B
6	90	A

XLOOKUP()

=XLOOKUP(lookup_value, lookup_array, return_array, [if_not_found], [match_mode], [search_mode])

- Lookup value : this is the search key, what the function is searching for
- Lookup array: the range to search for the lookup value, generally part or all of a certain column
- Return array: the range where the return value will be found, generally part or all of a different column
- If not found: optional, text to return if a valid match is not found
- Match mode: optional, specify the match type, see documentation for details
- Search mode: optional, specify the search mode, see documentation for details

Note: XLOOKUP() is not available in Google Sheets

XLOOKUP() Examples

=XLOOKUP(lookup_value, lookup_array, return_array, [if_not_found], [match_mode], [search_mode])

Input	Output
=XLOOKUP(48, B2:B4, E2:E4)	68.1
=XLOOKUP(162, C2:C4, A2:A4)	Django Unchained
=XLOOKUP(162, A3:E3, A2:E2)	129
=XLOOKUP("Goodfellas", A2:A4, E2:E4, "not found", 0)	not found

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4	Scream	$14	$103	12/20/1996	$78.7

Cell Address Functions - MATCH()

MATCH(lookup_value, lookup_array, [match_type])

- Returns the ***position*** of the first match of a value in a column or columns
- Lookup value : the value to search for
- Lookup array : where to search for the lookup value
- Match type : a number indicating how Excel matches the lookup value
  - 1 : Exact or next smallest (default, if not specified)
  - 0 : Exact
  - -1 : Exact or next largest
  - When using a match type other than exact, need to have data ordered (ascending for 1, descending for -1) to avoid unexpected behavior

Cell Address Functions - MATCH() Example

MATCH(lookup_value, lookup_array, [match_type])

Input	Output	Interpretation
=MATCH("Scream", A2:A4, 0)	3	"Scream" appears in the 3rd index position of the lookup array
=MATCH("Profit", A1:E1, 0)	5	"Profit" appears in the 5th index position of the lookup array

	A	B	C	D	E
1	Title	Budget (Millions)	Gross(Millions)	Taxes(Millions)	Profit
2	The Ring	$48	$129	$12.9	$68.1
3	Django Unchained	$100	$162	$16.2	$45.8
4	Scream	$14	$103	$10.3	$78.7

Cell Address Functions - INDEX()

INDEX(array, row_number, [column_num])

- Returns the cell value in a given array at a given position
- Array : the range of cells of interest
- Row number : the row number in the array from which to return a value
- Column number : if the designated array holds more than one column, column number in the array from which to return a value

INDEX() is most often seen used in combination with MATCH()

Cell Address Functions - INDEX() Example

INDEX(array, row_number, [column_num])

Input	Output	Interpretation
=INDEX(A2:A4, 3)	Scream	Scream is located in the 3rd row of the array
=INDEX(A1:E4, 2, 3)	129	Here we see an example of specifying the row and column numbers
=INDEX(A1:E4, 2)	#REF!	This is what happens when you put in a 2D array but do not specify a column number

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Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(C2:C4, MATCH("Scream", A2:A4, 0))
Output	

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1	**Title**	**Budget (Millions)**	**Gross(Millions)**	**Taxes(Millions)**	**Profit**
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Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(C2:C4, MATCH("Scream", A2:A4, 0))
Output	103

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4	Scream	$14	$103	$10.3	$78.7

Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(B2:E4, MATCH("The Ring", A2:A4, 0), MATCH("Profit", B1:E1,0))
Output	

	A	B	C	D	E
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Output	

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Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(B2:E4, MATCH("The Ring", A2:A4, 0), MATCH("Profit", B1:E1,0))
Output	

	A	B	C	D	E
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Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(B2:E4, MATCH("The Ring", A2:A4, 0), MATCH("Profit", B1:E1,0))
Output	

	A	B	C	D	E
1	Title	Budget (Millions)	Gross(Millions)	Taxes(Millions)	Profit
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Cell Address Functions - INDEX() + MATCH() Example

Input	=INDEX(B2:E4, MATCH("The Ring", A2:A4, 0), MATCH("Profit", B1:E1,0))
Output	68.1

	A	B	C	D	E
1	Title	Budget (Millions)	Gross(Millions)	Taxes(Millions)	Profit
2	The Ring	$48	$129	$12.9	$68.1
3	Django Unchained	$100	$162	$16.2	$45.8
4	Scream	$14	$103	$10.3	$78.7

Using Formulas - Copying

- You can easily copy formulas into adjacent cells
- Simply highlight the cell, click the bottom right corner, and drag

	A	B	C	D	E
1	Title	Budget ($M)	Gross ($M)	Release Date	Profit ($M)
2	The Ring	48	129	10/18/2002	= C2 - B2
3	Django Unchained	100	162	12/25/2015	
4	Scream	14	103	12/20/1996	

Using Formulas - Copying

- In this example, dragging downward will auto fill each cell with the profit formula

	A	B	C	D	E
1	Title	Budget ($M)	Gross ($M)	Release Date	Profit ($M)
2	The Ring	48	129	10/18/2002	= C2 - B2
3	Django Unchained	100	162	12/25/2015	= C3 - B3
4	Scream	14	103	12/20/1996	= C4 - B4

Using Formulas - Absolute Referencing

- Absolute references keep the row, column, or entire cell the same even when copied
- Here we have an example of an absolute reference that keeps the entire cell the same

	A	B	C	D	E
1	**Title**	**Budget ($M)**	**Gross ($M)**	**Release Date**	**Time Since Release**
2	The Ring	48	129	10/18/2002	= A5 - D2
3	Django Unchained	100	162	12/25/2015	= A5 - D3
4	Scream	14	103	12/20/1996	= A5 - D4
	= TODAY()				

Cell Reference Types

Formula	Reference Type
= A1	Relative Column / Relative Row
= $A1	Absolute Column / Relative Row
= A$1	Relative Column / Absolute Row
= A1	Absolute Column / Absolute Row

Note: Highlighting a cell with a cell reference in it and pressing F4 will cycle through these reference types