FIT1013 – Digital Futures: IT for Business
Tutorial 3 – Advanced Functions

Objectives:

- Use the IF, AND and OR functions
- Nest the IF function
- Use the VLOOKUP, HLOOKUP, IFERROR functions
- Use conditional formatting
- Summarise data using the COUNTIF, SUMIF, and AVERAGEIF functions

1. Relative, absolute and mixed addressing/referencing

The parts of a cell reference which are to be absolute (unchanging) are prefixed by a $ sign. The following table provides examples of the different types of referencing:

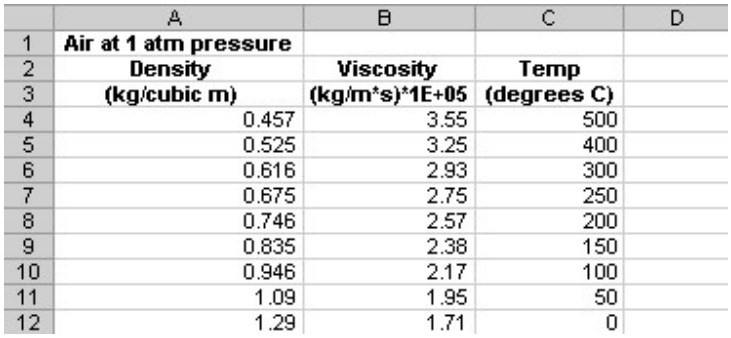
Type	Cell Reference	Meaning
Relative	A10	When copied to another row and column, both the row and column in the cell reference are adjusted to reflect the new location.
Absolute	A10	Both column and row references remain the same when you copy this cell reference
Mixed	A$10	The column reference changes when you copy this cell reference to another column because it is relative. The row reference does not change because it is absolute.
Mixed	$A10	The row reference changes when you copy this cell reference to another row because it is relative. The column reference does not change because it is absolute.

2. The **VLOOKUP, MATCH, ISNA, IF and COUNTIF Functions**

The **VLOOKUP** function searches for a value in the leftmost column of a table and returns a value in the same row from a column you specify in the table. If a value cannot be found, an error value #N/A (value not available) is returned.

Syntax:

VLOOKUP(lookup_value, table_array, col_index_num, range_lookup)

Lookup_value	Value to be found in the first column of table_array It can be a value, a reference or a text string
Table_array	Table of information in which data is looked up
Col_index_num	Column number in table_array from which the matching value must be returned
Range_lookup	Logical value that specifies whether you want VLOOKUP to find an exact match or an approximate match If TRUE or omitted, an approximate matched is returned If FALSE, VLOOKUP will find an exact match If not found, an error value #N/A (value not available) is returned
Examples	

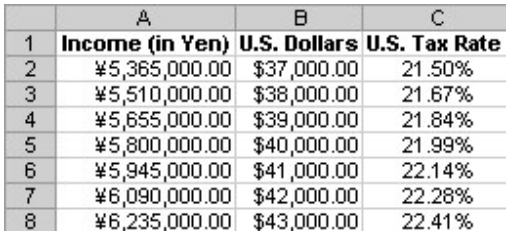
	A	B	C	D
1	**Air at 1 atm pressure**			
2	**Density**	**Viscosity**	**Temp**	
3	**(kg/cubic m)**	**(kg/m*s)*1E+05**	**(degrees C)**	
4	0.457	3.55	500	
5	0.525	3.25	400	
6	0.616	2.93	300	
7	0.675	2.75	250	
8	0.746	2.57	200	
9	0.835	2.38	150	
10	0.946	2.17	100	
11	1.09	1.95	50	
12	1.29	1.71	0	

VLOOKUP(1, A4:C12, 1, True) equals 0.946
VLOOKUP(1, A4:C12, 2) equals 2.17
VLOOKUP(1, A4:C12, 3, True) equals 100
VLOOKUP(0.746, A4:C12, 3, False) equals 200
VLOOKUP(0.1, A4:C12, 2, False) equals #N/A error because 0.1 does not appear in left most column of the table_array

The **MATCH** function returns the relative position of an item in an array that matches a specified value in a specified order. Use MATCH instead of VLOOKUP functions when you need the position of an item in a range instead of the item itself. If a value cannot be found, an error value #N/A (value not available) is returned.

Syntax:
MATCH(lookup_value, lookup_array, match_type)

Lookup_value	Value to be matched in lookup_array It can be a value, a cell reference
Lookup _array	Column or row containing the values
Match_type	Number –1, 0 or 1 Specifies how Excel matches lookup_value with values in lookup_array If match_type is 1 or omitted, MATCH finds the largest value that is <= lookup_value. Lookup_array must be in ascending order If match_type is 0, MATCH finds the first value that is exactly equal to lookup_value. Lookup_array can be in any order If match_type is –1, MATCH finds the smallest value that is >= lookup_value. Lookup_array must be placed in descending order If not found, an error value #N/A (value not available) is returned.

Examples	
	
	MATCH(39000, B2:B8, 1) equals 3
	MATCH(38000, B2:B8, 0) equals 2
	MATCH(40500, B2:B8, 0) equals #N/A error because 40500 cannot be found the range B2:B8
	MATCH(39000, B2:B8, -1) equals #N/A error because the range B2:B8 is ordered incorrectly for match type –1 (order must be descending)

	A	B	C
1	**Income (in Yen)**	**U.S. Dollars**	**U.S. Tax Rate**
2	¥5,365,000.00	$37,000.00	21.50%
3	¥5,510,000.00	$38,000.00	21.67%
4	¥5,655,000.00	$39,000.00	21.84%
5	¥5,800,000.00	$40,000.00	21.99%
6	¥5,945,000.00	$41,000.00	22.14%
7	¥6,090,000.00	$42,000.00	22.28%
8	¥6,235,000.00	$43,000.00	22.41%

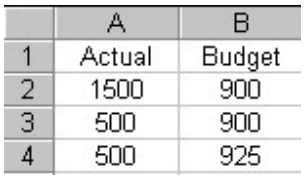
The **ISNA** function returns the logical value TRUE if value is #N/A (value not available), otherwise it returns FALSE.

Syntax: *ISNA(value)*
Example:
Suppose A2 contains a MATCH function and the value returned by the MATCH function is #N/A error
ISNA(A2) equals TRUE

The **IF** function returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.

Syntax:
IF(*logical_test, value_if_true, value_if_false*)

Logical_test	A logical expression (condition) as either True or False
Value_if_true	The value returned if the logical test is True
Value_if_false	The value returned if the logical test is False

Examples	
	
	IF(A2>B2, "Over Budget", "OK") equals "Over Budget"
	IF(A3>B3, "Over Budget", "OK") equals "OK"

The **COUNTIF** function counts the number of cells within a range that meet the given criteria.

Syntax
COUNTIF(range, criteria)

Range	Range of cells from which you want to count cells
Criteria	Criteria in the form of a number, expression, or text that defines which cells will be counted
Example	Suppose A1:A5 contain 15, 10, 20, 40, 40 COUNTIF(A1:A5,"=40") equals 2

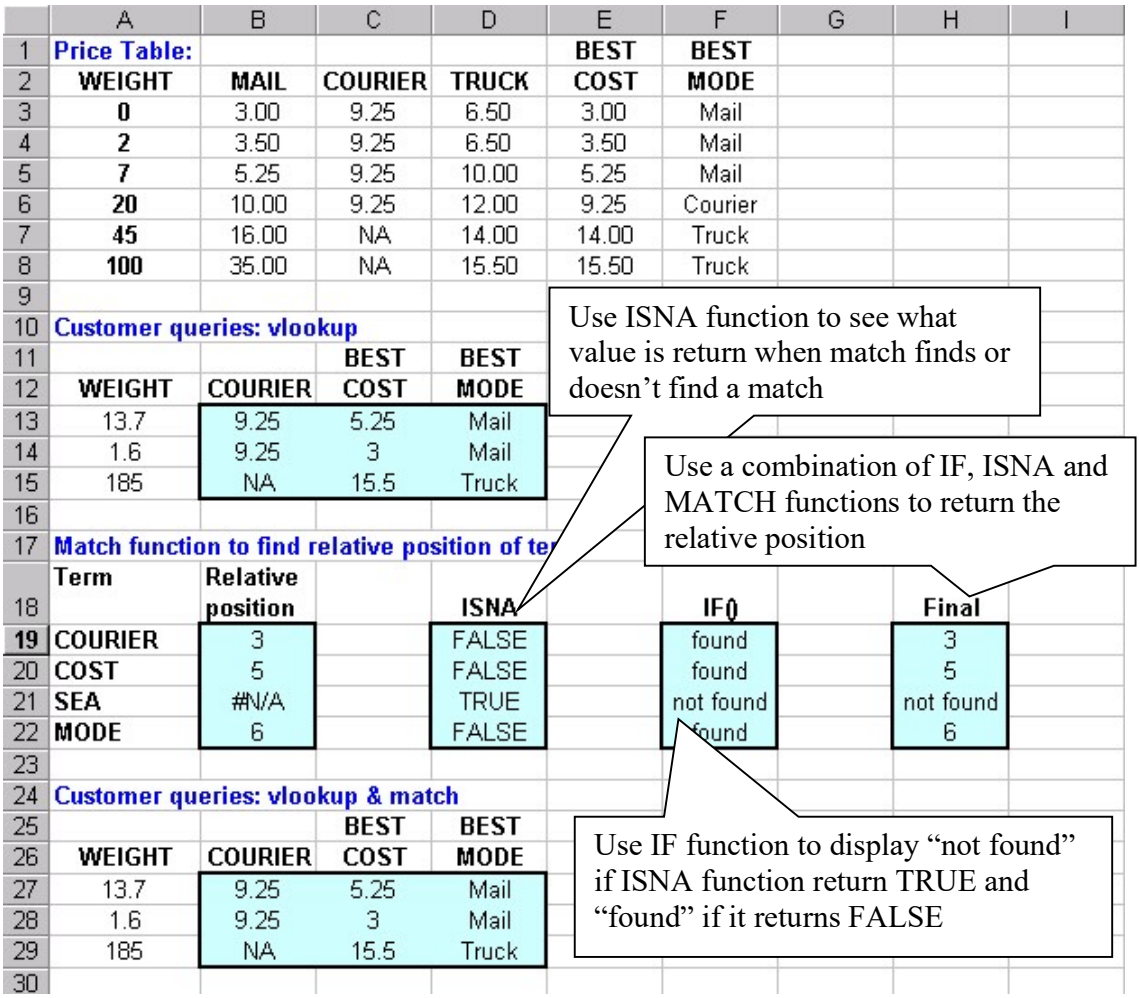
Other functions:
Details of other functions mentioned in this tutorial can be found in your textbook and lecture materials.

Exercises

Download the Excel file Tute 3.xslx

- The screen shots included below are solutions for you to check against your work.
- This excel workbook contains 2 worksheets: postage and class. To go to each worksheet, click on the appropriate tab.

Exercise 1: postage worksheet



	A	B	C	D	E	F	G	H	I
1	**Price Table:**				**BEST**	**BEST**			
2	**WEIGHT**	**MAIL**	**COURIER**	**TRUCK**	**COST**	**MODE**			
3	**0**	3.00	9.25	6.50	3.00	Mail			
4	**2**	3.50	9.25	6.50	3.50	Mail			
5	**7**	5.25	9.25	10.00	5.25	Mail			
6	**20**	10.00	9.25	12.00	9.25	Courier			
7	**45**	16.00	NA	14.00	14.00	Truck			
8	**100**	35.00	NA	15.50	15.50	Truck			
9									
10	**Customer queries: vlookup**								
11			**BEST**	**BEST**					
12	**WEIGHT**	**COURIER**	**COST**	**MODE**					
13	13.7	9.25	5.25	Mail					
14	1.6	9.25	3	Mail					
15	185	NA	15.5	Truck					
16									
17	**Match function to find relative position of te**								
18	**Term**	**Relative position**		**ISNA**		**IF()**		**Final**	
19	**COURIER**	3		FALSE		found		3	
20	**COST**	5		FALSE		found		5	
21	**SEA**	#N/A		TRUE		not found		not found	
22	**MODE**	6		FALSE		found		6	
23									
24	**Customer queries: vlookup & match**								
25			**BEST**	**BEST**					
26	**WEIGHT**	**COURIER**	**COST**	**MODE**					
27	13.7	9.25	5.25	Mail					
28	1.6	9.25	3	Mail					
29	185	NA	15.5	Truck					
30									

The Price table contains cost of postage by mail, courier and truck for the appropriate weight. Also for each weight range, is the best cost and best mode to take.

You are required to perform the following:

1. For each package (cells: A13, A14 and A15), use VLOOKUP function to determine the cost to send the package by courier
    a. determine the lowest cost to send the package
    b. determine the lowest cost mode to the package
    c. determine the best mode to send the package

2. For each of the terms in cells A19:A22, find its relative position in the lookup array contained in A2:F2.

3. In cells H19:H22, use a combination of IF, ISNA and MATCH functions to return the relative position of each term in A19:A22 and a message “not found” if the term is not in the lookup array

4. In cells B27:D29, use the VLOOKUP function and the MATCH function to complete the entries

Exercise 2: class worksheet

The class worksheet contains information about the students enrolled in a particular subject and their results in a test:
A3:A17 contains a list of the students IDs of the students who attended the test.
D3:D17 contains the corresponding test marks.
F3:H22 contains a list of all students enrolled in the subject, the name of the student and the tutorial number they attend.
Define the following range:
Name the range A3:A17 to **Attendees**
Name the range F3:H22 to **Classlist**
Name the range B19:B20 to **Criteria**

	A	B	C	D	E	F	G	H	I
1	Test Results:					CLASSLIST			
2	**ID**	**Name**	**Tutorial Number**	**Test Mark**		**ID**	**Name**	**Tutorial Number**	**Test attendance**
3	3315	Adrian Koh	2	55		**3301**	Henry Wu	1	Present
4	3312	Angela Davis	1	68		**3305**	Simon Smith	3	Present
5	3307	Kevin Allen	3	43		**3303**	Robin Short	2	Present
6	3311	Francis McCourt	2	90		**3302**	Raymond Lee	3	Present
7	3317	Max Hopper	3	65		**3304**	Sylvia Leang	2	Present
8	3306	Julia Khan	2	66		**3306**	Julia Khan	2	Present
9	3304	Sylvia Leang	2	39		**3308**	James Short	1	Absent
10	3320	Brenda Behan	3	51		**3307**	Kevin Allen	3	Present
11	3319	Martin Donohue	2	64		**3310**	Tim Roberts	3	Absent
12	3318	Belinda Bevis	1	87		**3309**	James Hird	1	Absent
13	3313	Andrea Goldsmith	2	95		**3311**	Francis McCourt	2	Present
14	3302	Raymond Lee	3	73		**3312**	Angela Davis	1	Present
15	3303	Robin Short	2	75		**3316**	Jill Adams	2	Absent
16	3301	Henry Wu	1	44		**3314**	Roger Thomas	3	Absent
17	3305	Simon Smith	3	35		**3315**	Adrian Koh	2	Present
18						**3313**	Andrea Goldsmith	2	Present
19		**Tutorial Number**				**3320**	Brenda Behan	3	Present
20		2				**3318**	Belinda Bevis	1	Present
21		tutorial average:				**3317**	Max Hopper	3	Present
22		69.14285714				**3319**	Martin Donohue	2	Present
23								**Number Absentees:**	5
24									

You are required to provide formulas for the following cells:

- B3 should contain a formula which provides the name of the student corresponding to the ID in cell A3. The formula should be written in such a way that it is easily copied to cells B4:B17.

- C3 should contain a formula which provides the tutorial number of the student corresponding to the ID in cell A3. The formula should be written in such a way that it is easily copied to cells C4:C17.

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- I3 should contain a formula which enters the word 'present' in cell I3 if the student with ID number in F3 attended the test, and 'absent' if the student did not attend the test. The formula should be written in such a way that it is easily copied to cells I4:I22.

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- I23 should give the total number of students absent from the test.

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- Use B19:B20 to define a criteria region which can be used in a Dfunction (such as DAverage) to provide the average mark in cell B22 for the specified tutorial number in B20. Provide the formula for cell B22.

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