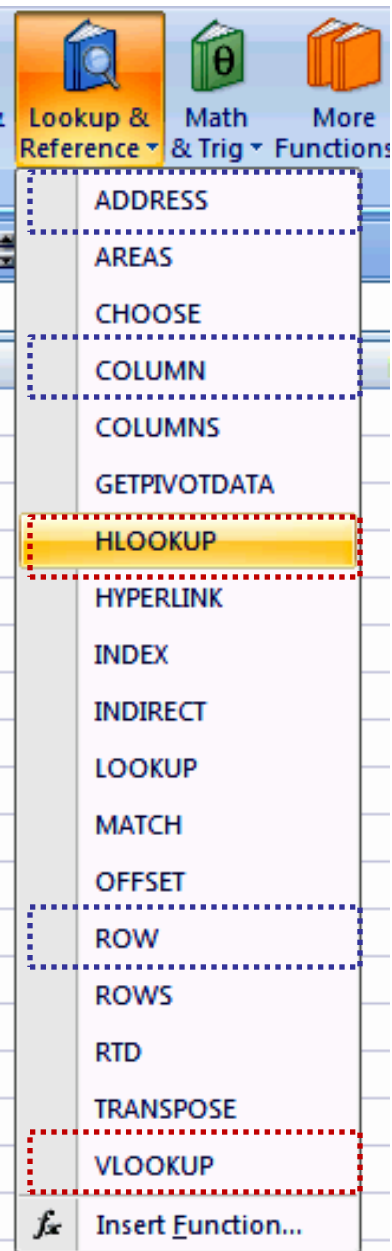


# Lookup and Reference Functions



**Lookup functions** are often used to retrieve information from a list of data (table) and use it in some other part of the WS or WB. In general they are equivalent to some combination of multivalued IF-functions.

This year we are going to study two main Lookup functions: **Hlookup and Vlookup**

**Reference functions** return informations about the cell reference as text values, such as the entire address, the row or column.

Examples of reference functions are: **Column, Row and Address.**

- We will start by looking at some Reference functions.

Syntax:

**= ADDRESS(row,col,[ref],[a1],[sheet])**

This function returns a cell or range reference

**row:** is the row number to use in the cell reference.

**col:** is the column number to use in the cell reference.

**ref:** specifies the type of reference to return. **1 or omitted**= absolute reference, **2**=fixed row, relative column, **3**= fixed column, relative row, **4**=relative reference.

**a1:** can take the logical values TRUE or FALSE. **TRUE or omitted**=the cell reference is given in the standard style, **FALSE**= the cell reference is given in so-called R1C1-style.

**sheet:** is text specifying the name of the worksheet to be used as the external reference. If **sheet** is omitted, no sheet name is used.

## Examples:

=ADDRESS(1,2)

Returns an **absolute reference** for the cell situated at **row 1**, **column 2** → **\$B\$1**

=ADDRESS(1,2,3)

Returns a **mixed reference** for the same cell as above → **\$B1**

=ADDRESS(1,2,4,FALSE)

Returns a **relative reference** for the cell as above in R1C1-style → **R[1]C[2]**


=ADDRESS(1,2,2,FALSE,"[Book1]Sheet1")

Returns a **mixed reference** for the same cell as above to the **WS Sheet1**, **WB Book1**


→ **[Book1]Sheet1!R1C[2]**

- Other reference functions are:

**=COLUMN(A1:C8)**

returns the column number of the first column in the range  **1**

**=COLUMNS(A1:C8)**

returns the number of columns in the given range  **3**

**=ROW(A1:C8)**

as above with column(s) replaced by row(s)

**=ROWS(A1:C8)**

Let us now turn to Lookup functions. We will be looking at the **VLOOKUP** and **HLOOKUP** functions, which are very similar.

## Syntax:

=VLOOKUP(**value**, **table**, **col\_index**,[match])

=HLOOKUP(**value**, **table**, **ro\_index**,[match])

**value** ≡ The value to be located in the first column of a vertical table (or the first row of a horizontal table). It can be numeric, text or a cell reference.

**table** ≡ The range reference or name of the lookup table.

**col(ro)\_index** ≡ The column (row) of the table from which the value is to be returned.

**match** ≡ Is a logical value, i.e. TRUE or FALSE, which specifies whether you want an exact or approximate value. It is optional with default value TRUE. If TRUE the functions returns the largest value which is less or equal than the lookup value. For FALSE it only returns exact matches. If there is no exact match → #N/A

Examples: Consider the following table

	A	B	C	D
1	1	2	1	AA
2	2	4	3	BB
3	3	6	5	CC
4	4	8	7	DD
5	5	10	9	EE
6	6	12	11	FF
7	7	14	13	GG
8	8	16	15	HH
9	9	18	17	II
10	10	20	19	JJ

~~=VLOOKUP(6,A1:D10,2) → 12~~

~~=VLOOKUP(4,A1:D10,3) → 7~~

~~=VLOOKUP(8,A1:D10,4) → HH~~

~~=VLOOKUP(3.2,A1:D10,3) → 5~~

~~=VLOOKUP(16,A1:D10,2) → 20~~

=VLOOKUP(16,A1:D10,2,FALSE) → #N/A

=VLOOKUP(8,A1:D10,5) → #REF!

=HLOOKUP(1,A1:B10,5) → 5

=HLOOKUP(8,A1:B10,3) → 6

=HLOOKUP(2,A1:A10,10) → 10

We could now use the VLOOKUP function to improve the currency conversion table of Lab-session 2, exercise 2.

	D	E	F
5	Euro	Pounds	Dollar
6	€ 0,1000	£0,0933	\$0,1477
7	€ 0,2000	£0,1867	\$ 0,2953
8	€ 0,3000	£0,2800	\$ 0,4430
9	€ 0,4000	£0,3733	\$ 0,5906
10	€ 0,5000	£0,4667	\$ 0,7383
11	€ 0,6000	£0,5600	\$ 0,8859
12	€ 0,7000	£0,6533	\$ 1,0336
13	€ 0,8000	£0,7466	\$ 1,1812
14	€ 0,9000	£0,8400	\$ 1,3289
15	€ 1,0000	£0,9333	\$ 1,4765
16	€ 2,0000	£1,8666	\$ 2,9530
17	€ 3,0000	£2,7999	\$ 4,4295
18	€ 4,0000	£3,7332	\$ 5,9060
19	€ 5,0000	£4,6665	\$ 7,3825
20	€ 6,0000	£5,5998	\$ 8,8590
21	€ 7,0000	£6,5331	\$ 10,3355
22	€ 8,0000	£7,4664	\$ 11,8120
23	€ 9,0000	£8,3997	\$ 13,2885
24	€ 10,0000	£9,3330	\$ 14,7650
25	€ 20,0000	£18,6660	\$ 29,5300
26	€ 30,0000	£27,9990	\$ 44,2950
27	€ 40,0000	£37,3320	\$ 59,0600
28	€ 50,0000	£46,6650	\$ 73,8250
29	€ 60,0000	£55,9980	\$ 88,5900

If the table is located in the range **D6:F29**, then we can extract information from the table by, for example writing:

	H	I	
5	0,7		
6	=VLOOKUP(H5;D6:F29;2)		
7	=VLOOKUP(H5;D6:F29;3)		

This will produce:

H
0,70
0,6533
1,0336

In pounds

In dollars

A geologist wants to grade some ore samples found on four different sites based on their rare metal content. Ore with a rare metal content of 50-59 ppm is given a low grade, 60-79 ppm is medium grade, 80-99 ppm is high grade and anything greater or equal 100 ppm is very high grade.

The following worksheet performs this task.

	A	B	C	D	E
1		Quality			
2	ppm	50	60	80	100
3	grade	low	medium	high	very high
4					
5	site	ppm	grade		
6	A	55	low		
7	D	111	very high		
8	C	60	medium		
9	B	77	medium		
10	A	44	#N/A		
11	B	88	high		
12	C	99	high		
13	C	56	low		
14	D	102	very high		
15					

The lookup values are in column B6:B14.

The lookup table is the range B2:E3.

The values to be selected depending on the grade are in the row B3:E3.

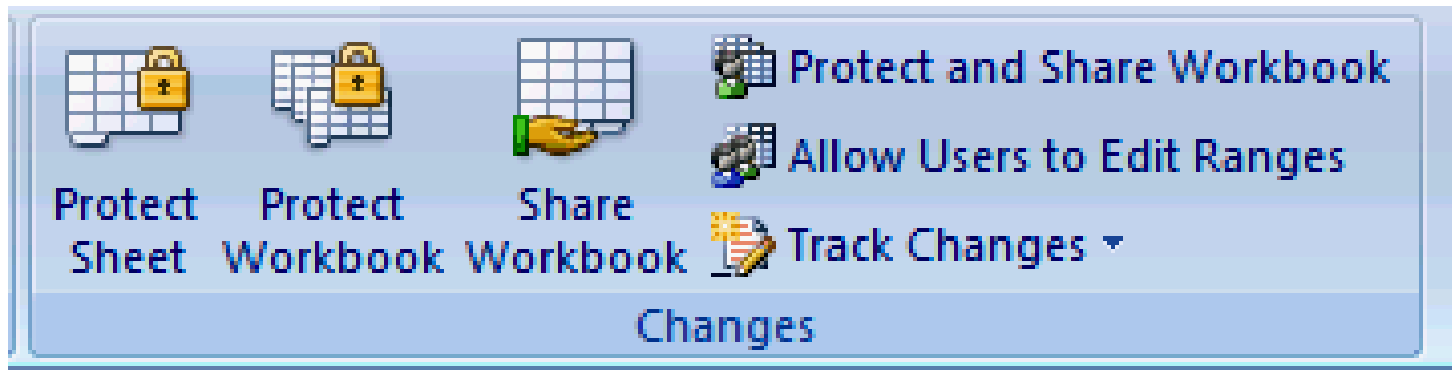
The **HLOOKUP** functions are in the column C6:C14.



► **Protecting** and **hiding** worksheet informations:

When writing workbooks or worksheets you may want to protect parts of them to make sure that your work will not be changed by accident (or deliberately). Possibly some of the informations on the WS might be confidential and should only be visible to certain users.

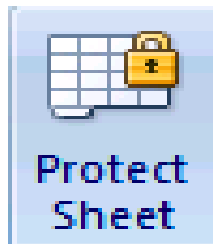
Excell allows you to do this by selecting the “Review Tab” and choosing the appropriate option in the “changes” menu:



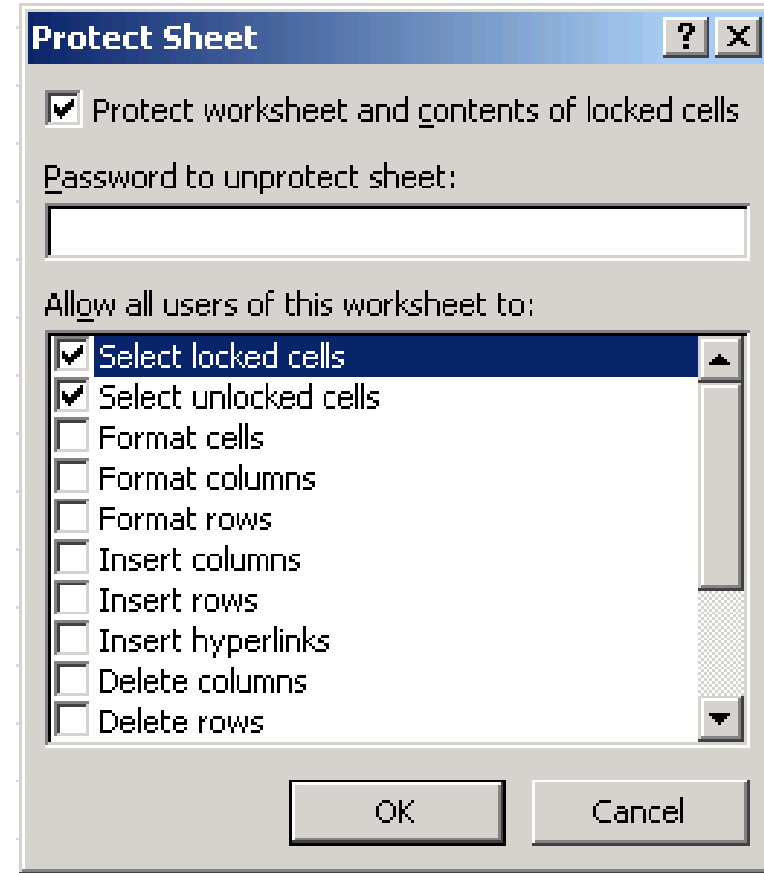
You can choose now which type of data you want to protect and whether you want to protect just a particular WS or the whole WB. Optionally you can type a password, such that only with the use of this password the entire WS/WB will be unprotected.

For example, suppose we want to protect the current WS from changes:

Select

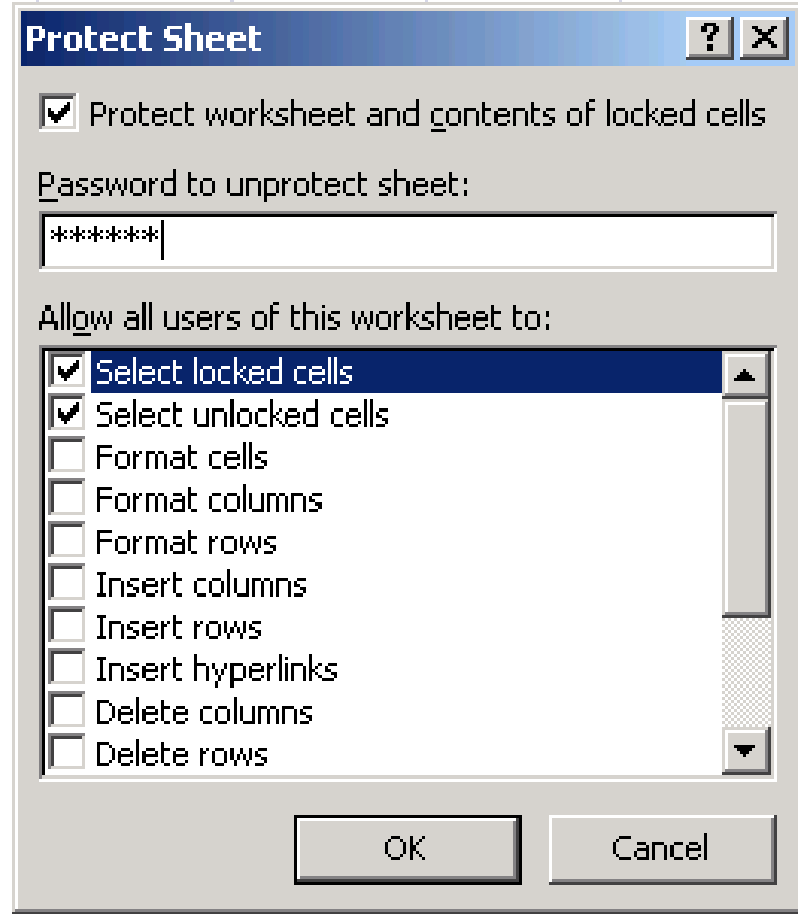


In the “protect sheet” window you can now select which actions you want to allow other users to perform on your WS.

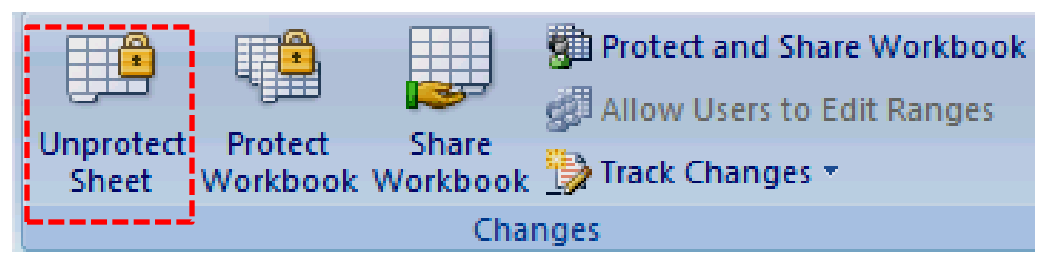


You are asked to enter a **Password**. Once you have done that, only those users that know the **Password** will be able to carry out any of the changes that you have chosen to block.

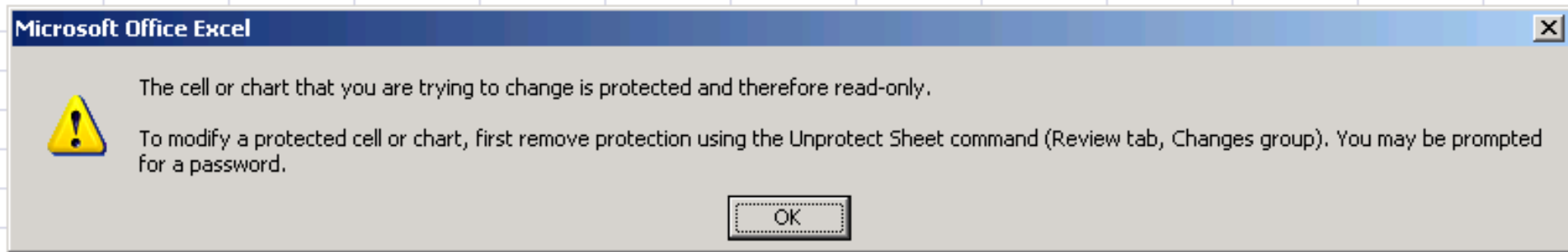
You will then be asked to reenter your Password



Once you have done this the “change” menu will change to:



Now if you try to type anything on the worksheet you will get the following message:



You will then be able to unblock the WS by selecting “**Unprotect sheet**” and entering the password

Example: I have protected the sheet with the solutions to exercise 1, Lab sheet 4. In order to unblock the sheet you will need to enter my first name and first surname, both starting with capital letter and separated by a blank space as Password!