

Revision lecture

Main things to remember:

- Excel Built-in functions:
 - IF structures
 - Time & date functions
 - Vlookup and Hlookup functions
- User defined functions:
 - Syntax
 - VBA built-in functions
 - Using Excel built-in functions inside VBA programs
 - Variable types
 - Defining variables inside VBA programs
 - IF and Select case structures in VBA

• Today we will review all these things by going through the January 2009 exam:

1) i) Write down the command line for a combination of Excel built-in functions which produces the following function

$$f(x) = \begin{cases} x^2 - 2x + 1 & \text{for } 0 \leq x \leq 1 \\ \sqrt{2x(x-1)} & \text{for } 1 < x \leq 2 \\ 2|x-3| & \text{for } x > 2 \\ 1 & \text{otherwise} \end{cases} \quad (1)$$

Use your function to compute $f(-2)$ and $f(5)$. Recall that the absolute value can be obtained in Excel by using the built-in function `abs` (12.5 points).

Taking $x=A1$ we can write this function as:

```
=IF(AND(A1>=0, A1<=1), x^2-2*x+1, IF(AND(A1>1,A1<=2),  
sqrt( 2*x*(x-1)),IF(x>2, 2*abs(x-3), 1)))
```

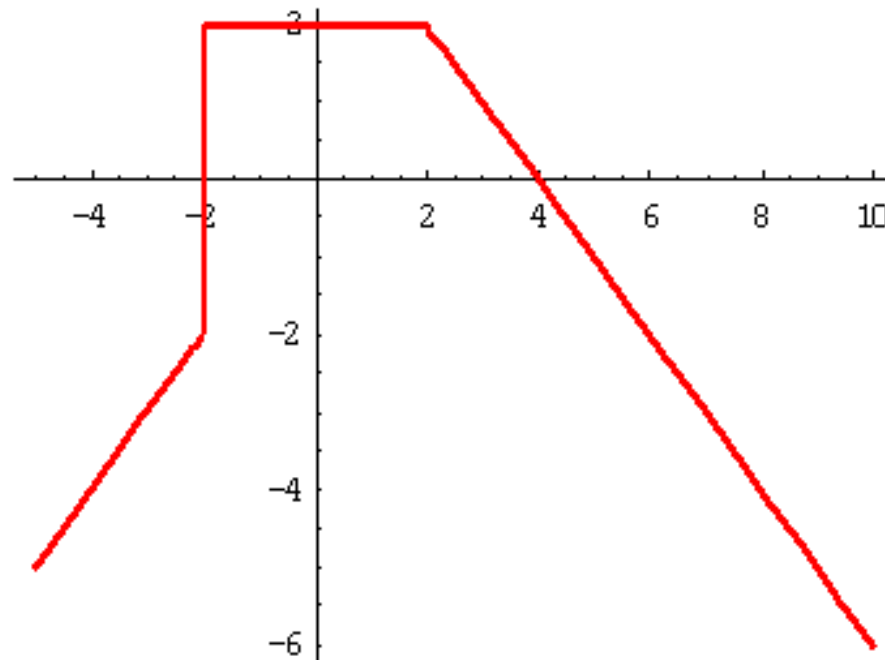
and $f(-2)=1$, $f(5)=4$

ii) Write down the function (in a form similar to equation (1)) that is produced by the following combination of Excel built-in functions:

$$= \text{IF}(x \leq 2, \text{IF}(x \geq -2, 2, x), 4 - x).$$

Produce a sketch of this function in your answer booklet (12.5 points).

$$g(x) = \begin{cases} 2 & \text{for } -2 \leq x \leq 2 \\ x & \text{for } x < -2 \\ 4 - x & \text{for } x > 2 \end{cases}$$



- 2) Consider the tables below and suppose that you enter the data on the first table into the range A1:B4 of your Excel worksheet and the data on the second table into the range C1:D4.

Country	Population
Russia	143.7
Germany	83.2
UK	60.8

Country	Population
China	1300
India	1060
Indonesia	238.4

The first table lists the three most populated European countries and their populations (in millions) whereas the second table lists the three most populated Asiatic countries and their populations (in millions).

Write a user defined function called **people** that takes as input the name of a continent and the name of a country and does the following:

- if the continent is Europe or Asia and the country is in one of the tables, the function should return the population of the corresponding country,
- if the continent is neither Europe nor Asia, the function should return the message: “pick another continent”,
- if the continent is Europe or Asia, but the country is not in one of the tables, the function should return the message: “pick another country”.

The function should employ a **VLOOKUP** structure and two nested **IF** with **ELSEIF** structures. Define the variable types of the input and output of the function and of any other variables you may use in your program (25 points).

The solution is:

```
Function people(continent As String, country As String) As Variant
If continent = "Europe" Then
If country = "Russia" Then
people = Application.WorksheetFunction.VLookup("Russia", [a1:b3], 2, False)
ElseIf country = "Germany" Then
people = Application.WorksheetFunction.VLookup("Germany", [a1:b3], 2, False)
ElseIf country = "UK" Then
people = Application.WorksheetFunction.VLookup("UK", [a1:b3], 2, False)
Else
people = "pick another country"
End If
ElseIf continent = "Asia" Then
If country = "China" Then
people = Application.WorksheetFunction.VLookup("China", [c1:d3], 2, False)
ElseIf country = "India" Then
people = Application.WorksheetFunction.VLookup("India", [c1:d3], 2, False)
ElseIf country = "Indonesia" Then
people = Application.WorksheetFunction.VLookup("Indonesia", [c1:d3], 2, False)
Else
people = "pick another country"
End If
Else
people = "pick another continent"
End If
End Function
```

- 3) Write a user defined function called **library** that would help a librarian locate a book, given the book's reference number. The function should take the reference number of a book as input, and give its location as output, according to the following description:
- if the book reference number is between 100 and 199 (both values included), the function should return: "the book is in the basement",
 - if the reference number is between 200 and 500 (both values included) or over 900, the function should return: "the book is in the main floor",
 - if the reference number is between 501 and 900 (both values included), except for the values 700 to 750 (both values included), the function should return: "the book is in the upper floor",
 - if the reference number is between 700 and 750 (both values included) then the function returns the message: "the book is in the archives"
 - finally, for any other number the function should return the value: "wrong reference number"

The function should use a **SELECT CASE** structure. Define the variable types for the input and output of the function (25 points).

The input of the function is a reference number (Integer type variable) and the output is a message (string type variable)

```
Function library(x As Integer) As String
Select Case x
Case 100 To 199: library = "the book is in the basement"
Case 200 To 500, Is > 900: library = "the book is in the main floor"
Case 501 To 699, 751 To 900: library = "the book is in the upper floor"
Case 700 To 750: library = "the book is in the archives"
Case Else: library = "wrong reference number"
End Function
```

Notice that the comma plays the role of an OR statement!

- 4) i) Write a user defined function called **since** which, given a date in the past as input, returns the number of years that have passed since that date (**7 points**).
- ii) The following table provides information about the six Moon landings that have taken place so far: the upper row indicates the name of the “mission” and the lower row the dates when the landings occurred.

Apollo 11	Apollo 12	Apollo 14	Apollo 15	Apollo 16	Apollo 17
20/07/1969	11/11/1969	02/02/1971	30/07/1971	04/04/1972	11/11/1972

Suppose we write this table in the range A1:F2 of the Excel worksheet.

Write a user defined function called **moon** which, given the name of the mission as input, returns the number of years since that mission took place. The function should employ an HLOOKUP structure that would read up the data from the table above. It should also make use of the function **since** defined in part i) (**9 points**).

- iii) Write a user defined function called **mooneyear** that uses a **SELECT CASE** structure and, taking a date as input, does the following:
- if the value of the function **since** for that date is between 48 and 29 (both values included), then the function should return: “there was a moon mission in this decade”.
 - in any other case it should return the message: “there was no moon mission in this decade”

(9 points)

For all three functions, define the variable types of the input and output of the function, as well as of any other variables you may use in your program.


```
Function since(x As Date) As Integer
since = Year(Now()) - Year(x)
End Function
```

Current date!

```
Function moon(mission As String) As Integer
Dim y As Date
y = Application.WorksheetFunction.HLookup(mission, [a1:f2], 2, False)
moon = since(y)
End Function
```

Extracts a date
from the 2nd row
of the table!

```
Function moonyear(d As Date) As String
Dim y As Integer
y = since(d)
Select Case y
Case 29 To 48: moonyear = "there was a moon mission in this decade"
Case Else: moonyear = "there was no moon mission in this decade"
End Select
End Function
```

Some Advice on January's Test

- The test is **open-book**. You can bring any notes, past papers, photocopies, lab sheets, solutions etc. to the test (books are however not allowed!)
- **Everything has to be brought to the test in printed form**. There will be no internet access during the test so you **will not be able to access Moodle** or any other internet site during the test.
- **USB keys** and any other electronic storage devices are **not allowed** in the test.
- During the test the only software that can be used is **Excel and VBA** and their help options (but not the on-line help option!)

- As you have seen in the examples, the test questions are sometimes long and therefore it is crucial that you **use the 90 minutes given effectively.**
- During the test **you will have a computer at your disposal.** However, this does not mean that you have to test all your answers in the computer.
- The only answers that I will mark are those **written on your answer booklet.** I will not have access to any work you do on the computer.
- Therefore, if you know the answer to a question, it may be quicker to write the code directly in the answer booklet, rather than trying it also on the computer.

- The structure of the exam and topics covered will be similar to the example we just saw.
- Any further information about the exam is available from Lecture 1 notes and my personal web site.
- Past papers can also be found on my personal web site, which can be accessed from Moodle.

HAVE A GOOD BREAK!!