

## VBA and Macro creation (using Excel)

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## OBJECT ORIENTED PROGRAMMING: VBA

### Different objects types: classes

- Each programming environment comes with many different kinds of predefined objects.
  - An object type is called a class. A class is thus some type of object.
- All objects within a class hold the same kind of information (identical attributes) and can perform the same actions (identical methods).
- A class is the "cookie cutter"/template you use to create new object instances.

*Hollywood analogy: in Battlestar Galactica there are 12 "classes" of human robots. One of these 12 model types was the Sharon model.*



### Agenda for Today

## Object-Oriented Programming Creating Macros with VBA

### What is O-O programming?

- A programming style that uses "objects" to comprise programs.
- Objects:
  - In a pure O-O language, every **thing** in the program is an object.
  - An object is a data structure consisting of **attributes** (data fields) and **methods** (actions).
    - The **attributes** of the object hold its current information
    - The **methods** of the object determine what the object can do

### Creating and using objects

- You 1<sup>st</sup> need a class

```
class Sharon
```

```
Attributes: height, 3Dbodyshape, faceimage, currentlocation,  
currentlove, pastexperiencelog
```

```
Methods: ImitateHuman, fallInLove(person), doSecretMission(password)
```

- You then "declare" a new object and can subsequently assign its attribute value and invoke its methods.
- Example: declaring a new Sharon object, assigning a value, and calling a method

```
Sharon sharonNo55  
sharonNo55.currentlocation = "KA.493.X7.1034"  
sharonNo55.fallInLove(Helo)
```

## Object Oriented Programming Fundamentals

Appropriate object classes (their **attributes** and **methods**) heavily depend on the problem you are working on.

Example: A system for a bank:

- **Objects:** Customers, Accounts, etc.
- **Attributes:** First Name, Last Name, SSN, Address, etc.
- **Methods:** Withdraw, Open an account, Deposit, Cash check, etc.

## VBA: Visual Basic for Applications

VBA is a specialized version of Microsoft's well-known Visual Basic language

VBA is an Object-Oriented language within Microsoft Office suite:

- Excel, Word, Access, and Power Point.
- We will focus on Excel.
- Shortcut to access the VBA interface in Excel: **Alt+F11**

Excel treats everything in a spreadsheet as objects. So, VBA lets us play with all these objects.

- Object that we are interested in: Workbooks, worksheets, cells, rows, ranges.
- There are over 500 different class (type of objects) in Excel.

## Coding with VBA

There are two approaches to write a code in VBA:

- Standard Coding
- Macro Recording

The Macro approach "records" a series of mouse-clicks and keyboard strokes.

- **Advantage:** Corresponding VBA code is created automatically and recorded for you.
- **Disadvantage:** It's limited.

To tackle this limitation, we use a mixed approach:

- First, record a simple macro.
- Then, tweak it to achieve more complex tasks.

## Problem Definition

	C	D	E
6	0.75422	0.25528	0.14122
7	0.55342	0.47128	0.49924
8	0.88847	0.99791	0.42288
9	0.88847	0.11583	0.99752
10	0.66175	0.33327	0.33155
11	0.89925	0.45796	0.81155
12	0.75088	0.25822	0.75482
13	0.32985	0.29124	0.78281
14	0.24455	0.75758	0.44482
15		0.41728	0.88325
16	0.22084	0.88224	0.84942
17	0.89025	0.25124	0.78278
18	0.88885	0.88548	0.81122

## Problem Definition

We have data spanning 3 columns and 13 rows (C6:F18).

- Data should be stored in the given range in order to use it for other application.
- Unfortunately, there are some errors in the data entry process, so some of the rows are shifted to the right by one column.

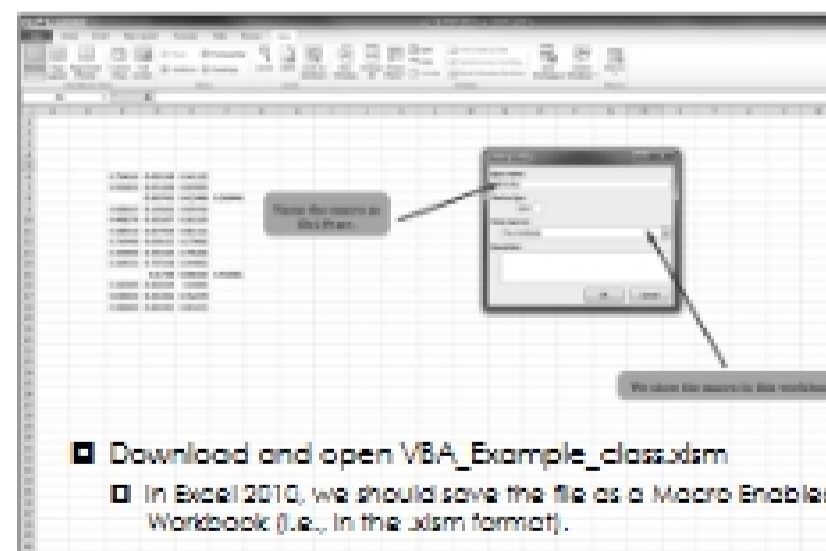
Our job is to correct all these mistakes:

- First, record a simple macro that correct a specific row (say Row 8).
- Then, tweak it to make correction in any given row.
- Finally, we let the code check any mistake and correct it.

While doing this, we learn how to

- Declare and name variables.
- Create Subroutines and Functions (We'll learn what they are shortly).
- Use conditional statements.
- Create repetitions.

## Our First Macro



### Our First Macro

Find the Macros option under the Excel 2010 View tab to record a VBA macro. Let's call our Macro "Shifter." We want our macro to do the following:

- Select the range D8:F8.
- Cut the selected cells.
- Select cell C8.
- Paste the cut cells.

To see the VBA code generated by your actions, go into VBA (Alt+F11) and then near the upper left of the window expand the Modules folder and double-click on Module1.



### Subroutines



Notice that the code starts with Sub command and ends with End Sub command.

Sub refers to the Subroutines.

- Subroutine: A portion of code within a larger program that performs a specific task and is relatively independent of the remaining code.
- We can use a subroutine in a different subroutine by "calling" it.
- e.g., Call Shifter().

### Execution of Subroutines



Each line of a subroutine is executed sequentially.

Let's see how our macro is executed.

(The first three green lines following each \* are simply comments/documentation.)

- The first line is Range("D8:F8").Select, and it selects the cells we want to select.
- The second line, Selection.Cut, cuts the selected cells.
- The third line, Range("C8").Select, selects the cell C8.
- Finally, the last line, ActiveSheet.Paste, pastes the cut values to the selected cell of the worksheet.

### Subroutines with Input Arguments

The limitation of Shifter is that it only corrects Row 8.

We can solve this by creating a subroutine which will take a row number as an input parameter.

Sub ShiftRowColumn (RowNum As Integer)

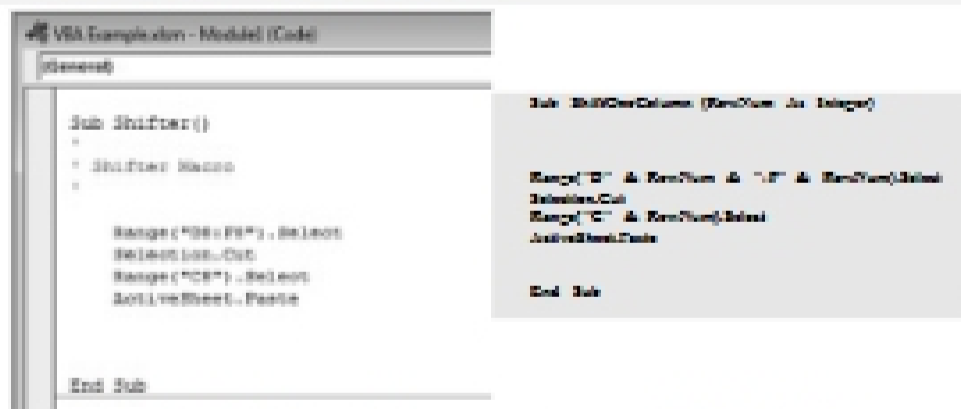
CODE BLOCK

End Sub

- RowNum is the input variable. We name it.
- An Integer part declares the data type of our input variable.
- Common Data Types:

Data Type	Description
Boolean	Logic values TRUE or FALSE value.
Integer	Integers between -32768 and 32767
Double	Double precision numbers, can hold fractional numbers. (The range of double number is very large)
String	A set of characters (like sentences)

### Shifting Any Given Column



How do we tell VBA to shift the row according to our input, RowNum?

- Currently, we select cells D8,E8,F8 by writing "D8:F8".
- We will construct that D8:F8 syntax, for our row # (i.e., RowNum)

Range("D" & RowNum & ":F" & RowNum).Select

- In Excel and VBA the & operator simply combines ("concatenates") text together

### Shifting Repeatedly

We now have a subroutine that can correct any given row.

We want to apply this subroutine to any rows between 6 and 18.

We use a loop (e.g., a FOR-NEXT Loop) for this task:

For-Next Loop Syntax

For varName=start\_val To end\_val Step step\_size

CODE BLOCK

Next varName

- The above code assigns the value of variable varName to start\_val.
- Then, executes the code inside the loop.
- After that, increases the value of variable varName by step\_size.
- And, runs the code again.
- Repeats that until the value of variable varName reaches end\_val.