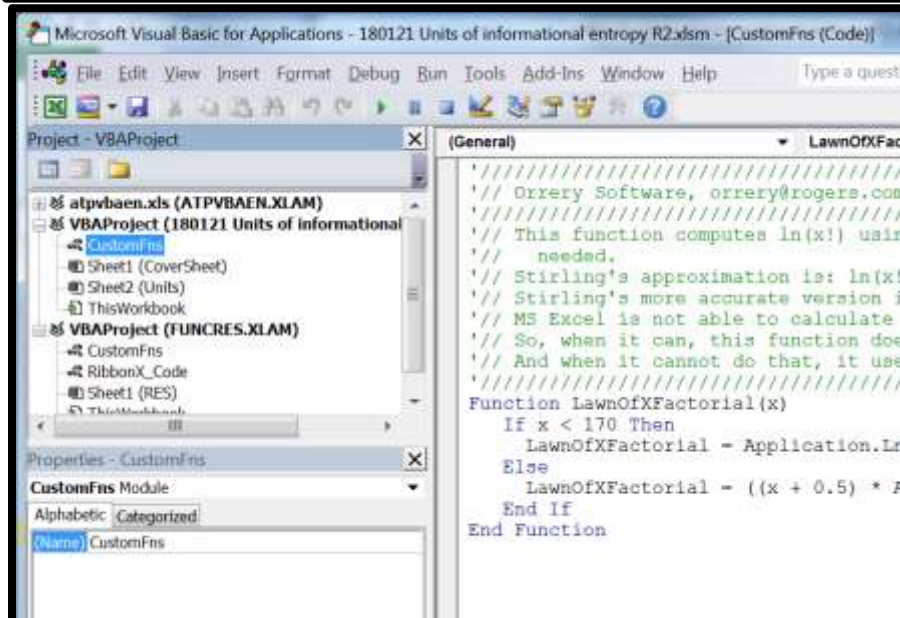
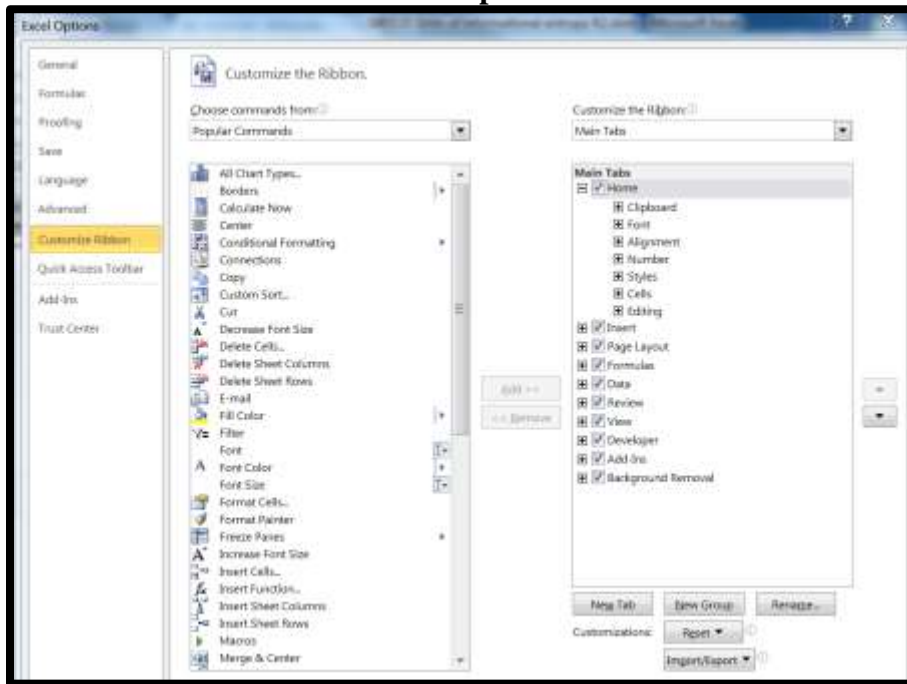


NOTE TO FILE:  
Garvin H Boyle  
R3:180119

## Building Custom Functions in MS Excel

### Frontispiece



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## 1 - References

- A. 150527 PPR - Definition of EI R17.pdf
- B. 180119 Create custom functions in Excel - Office Support.pdf
- C. 180121 Factorial – Wikipedia.pdf
- D. 180119 Stirling's approximation – Wikipedia.pdf

## 2 - Background

When doing calculations of entropy in an MS Excel spreadsheet, it is necessary to create a custom function. Such calculations are needed to support the study of entropy as described in the Ref A (draft) paper.

Ref B is an excerpt from a website where the steps are described. Refs C and D are source documents for the functions used in the example.

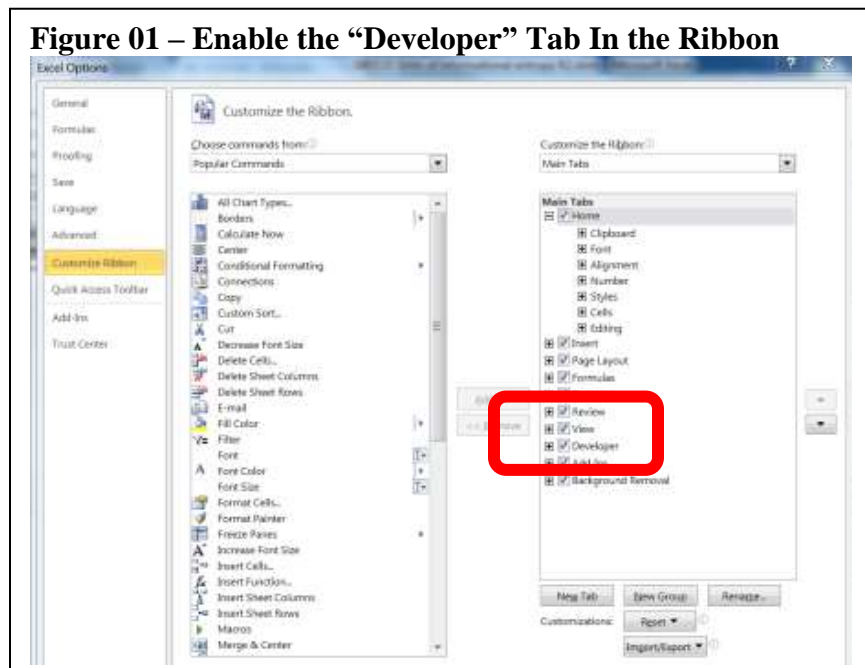
## 3 - Purpose

The purpose of this diary note is to describe briefly how to create a custom function in a spreadsheet in MS Excel 2010, expanding slightly on the instructions in the Ref B document.

## 4 - Discussion

### 4.1 - Ensure that the “Developer” menu item is accessible on menu:

- File / Options / Customize Ribbon.
- There is a drop-down box to the right, select the “Main Tabs” option.
- Tick the box for “Developer” to add it to the “Main Tabs”.
- Click on “OK”.
- It should appear in the main ribbon right after “View” and just before “Team”.

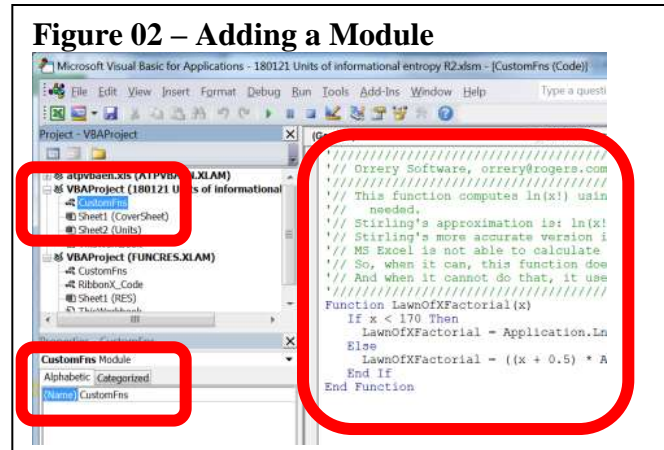


## 4.2 - Ensure that you are able to save the programs you write.

- Use the “File” command to save as a “Macro-enabled workbook”.
- File / Save As / and choose the type “.xlsm”.

## 4.3 - Create a module and make a basic program:

- Press Alt+F11 to open the Visual Basic Editor (VBE).
- A directory list appears on the pane to the left. Open it. There you will see any modules that contain, for example, any macros created earlier.
- On the menu bar choose “Insert/Module”.
- A folder called “Modules” may be added to the project, and a code module called “Module 1” or something similar will be added to the folder. Left click on the new module.



- The new module appears in a new pane on the right, having its own icon in the tray at the bottom of the screen. It is, nevertheless, part of this Excel file, I believe. It also appears in a small pane on the left below, with an entry box in which you can change the name. Select Module1, or whatever the new module is. Change the name of the module to CustomFns.
- In the window that appears to the right that contains the module, enter the following code, or something similar:

```

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
'// Orrery Software, orrery@rogers.com, Garvin H Boyle.
'// This function computes ln(x!) (using the Stirling approximation when needed).
'// The Stirling approximation is: ln(x!) is approximated by ( x * ln(x) ) - x
'// MS Excel is not able to calculate x! if x > 170.
'// So, when it can, this function does the exact calculation.
'// And when it cannot do that, it uses the Stirling 2-term approximation
'//////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
Function LawnOfXFactorial( x )
    If x < 170
        Then
            LawnOfXFactorial = Application.Ln( Application.Fact( x ) )
        Else
            LawnOfXFactorial = ( x * Application.Ln( x ) ) - x
        End If
End Function

```

## 4.4 - Save the file and exit from Visual Basic:

- File / Save
- Click the red X in the top right corner.
- This takes you back to the spreadsheet.

#### 4.5 - To use this function in your spreadsheet:

- When you enter an “=” sign the first letter of the function you want, and the name will appear in a dropdown list; double click it.
  - Put in the parameters in the correct order, BUT you will NOT be prompted, so you must remember the order.
-