Introduction to VBA for Excel-Tutorial 7

In this tutorial, we will learn about worksheet functions. Similar to Excel built0in function, such as sum(), max(), min(), etc., you can write (program) your own Excel executable functions to perform certain set of computations. For sake of illustration, let's say that the square-root function [sqrt()] is not available in the built-in library in Excel and of course I can imagine you would like very much to add this function. Instead of writing a sub procedure as we have been composing thus far, you can write a Function.

So, what is difference between function and sub procedure?

The procedure is set of commands that the user or another procedure can execute. The user, in this case, needs a mean of execution such as Control Button or keyboard shortcut. On contrast, the function returns a single value (or array) based on input arguments passed in by the user. For example, if you would like to use the built-in square-root function in Excel to calculate $\sqrt{4}$, then you go a cell and type:

=sqrt(4)

And press Enter, and in the same cell you selected the results show. In this example, *sqrt* is the function name and *4* is the argument of the function and were passed in by the user. So, can the function have only one argument? Of course No, I'm sure you can recall other built-in functions that require two or more arguments. For example, round function such as

=Round(number,num_digits)

again, *round* is the function name and *number* and *num_digits* are required two arguments. The question, why bother to create an additional function beside the some 340 function already exist in Excel? This question, to me, is simply answered philosophically and practically: to make our lives worth living!

Before we dig in the first example, it is worth noting that all programming skills and syntaxes you have learned thus far are valid and will be used in the same manner in creating function as it was used on creating a procedure.

Example:

Let's say, you would like to create your own custom function to calculate the square-root, such that:

$$\sqrt{A} = \frac{1}{2}(x_i + \frac{A}{x_i})$$
 $i = 1, 2, 3....$

where, x_0 is the initial guess and A is the number of which is the square root to be calculated. For this example, take the convergence to be. In the effort of planning this code, you should consider

three aspects; (1) Need a loop to iterate till convergence achieved, (2) Need to calculate and update the convergence after each step and (3) Need to keep track of the results from the previous iteration. The code would be:

```
Option Explicit

Function sqrt_new(A As Double, xo As Double)

Dim delta As Double

Dim old As Double

Dim ans As Double

delta = 100

ans = xo

Do While delta > 1

ans = 0.5 * (ans + A / ans)

delta = Abs(ans - old)

old = ans

Loop

sqrt_new = ans

End Function
```

Notes:

- 1- The inputs or the arguments of the function are included in the bracket and each variable is declared as its appropriate datatype. The declaration is optional.
- 2- Implemented Do-While-Loop; because we don't know the number of iterations required to achieve convergence. Please note that at the end of each loop we cast the new results (i.e. ans) into a transfer variable (i.e. old) to allow the calculation on convergence on the next iteration.
- 3- The most important difference between Function and Sub is the output. Note that the last line is setting the function name (i.e. sqrt_new) to the calculated results. Without this line, the answer would be always equal to zero,

Once the function is written and debugged, you can use this function through the Excel interface such as:

√ (> × ✓ f _x =sqrt_new(4,1)				
А	В	С	D	E
=sqrt_new(4,1)				

where, A=4 and the initial guess $x_0 = 1$. Once you type in this formula and press Enter, Excel will output 2.05 as the results. To achieve better accuracy, simply set the convergence to a smaller number.

Not only you can use the Function from Excel, but you can call the Function in sub procedure.

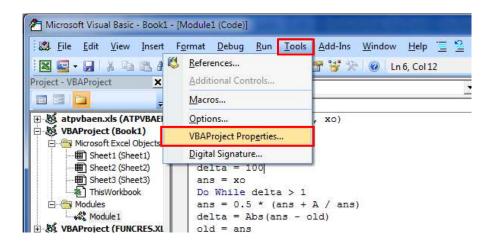
Sub testing func() Dim A As Double, xo As Double, root As Double A = InputBox("Enter Positive Number") xo = InputBox("Enter Guess") root = sqrt_new(A, xo) MsgBox root End Sub

In this case, the sub procedure is placed in the same Module as the Function. However, the variables are defined using the same variable names as those used in the function, this not required. You can name the variables any name as far as you place the right variable in the right location (i.e. first argument vs second argument).

Deploying Functions (Creating Add-in)

After you checked your function, you may want to distribute this function to everyone in the office to display your superior skills. Follow the steps to fame:

- 1- Open the worksheet where the future add-in function is in.
- 2- Activate VBE and select the module where the function is in.
- 3- Click Debug/Compile. This is a final check to make sure the code would compile correctly and save you the embarrassment, especially with your boss.
- 4- If you would like to set a password for your project, so no one can tamper with your code, Click on Tools/VBA Project Properties (note: that if your project has been previously named the label would be *Project_name* Properties):

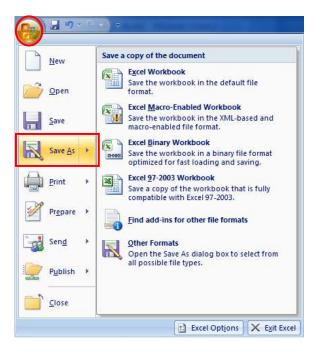


VBE will display Project Properties dialog box, Select the Protection tab, check the Lock project for viewing box, and enter credentials in the password textbox.

AProject - Project Prope General Protection	rties	×
Lock project		
Lock project for vi	lewing	
- Password to view project	4	
Password to view project	t properties	
Confirm password		

Word of cautions: this password is not easy to recover, so don't make it to complicated that you can forget it easily. Remember, you won't work on the same function sometimes for years.

5- In Excel, Click the Application (Office) button and click Save As



6- Select file type .xlam (Excel 2007 Add-in) from Save as Type dropdown menu, then Insert the File Name then click Save

🔀 Save As	Excel Workbook (*.xlsx) Excel Macro-Enabled Workbook (*.xlsm			
	Excel Binary Workbook (*.xlsb)			
📿 🔾 🗸 🔒 « Ro	Excel 97-2003 Workbook (*.xls)			Π
	XML Data (*.xml)			
Organize 🔻 Ne	Single File Web Page (*.mht;*.mhtml)			Π
Organize 👻 Ne	Web Page (*.htm;*.html)			
	Excel Template (*.xltx)			1
	Excel Macro-Enabled Template (*.xltm)			
🥃 Libraries	Excel 97-2003 Template (*.xitri)			
Documents	Text (Tab delimited) (*.txt)			ľ
	Unicode Text (*.txt)			If
🚽 🌒 Music	XML Spreadsheet 2003 (*.xml)			14
Pictures				ľ
	Microsoft Excel 5.0/95 Workbook (*.xls)			
🛃 Videos	CSV (Comma delimited) (*.csv)			
	Formatted Text (Space delimited) (*.prn)		
🖳 Computer	Text (Macintosh) (*.txt)			
	Text (MS-DOS) (*.txt)			
🚢 Local Disk (C:)	CSV (Macintosh) (*.csv)			
- RECOVERY (D	CSV (MS-DOS) (*.csv)			
	DIF (Data Interchange Format) (*.dif)			- H
- HP_TOOLS (F	SYLK (Symbolic Link) (*.slk)			
File name:	Excel Add-In (*.xlam)			
The fidine.	Excel 97-2003 Add-In (*.xla)			
Save as type:	Excel Add-In (*.xlam)			-
Authors:	avoussef	Tags: Add a	120	
Authors:	gyoussei	Tays: Add a	i tay	
				_
🔺 Hide Folders		Tools 🔻	Save Cancel	

Note: Excel will automatically select the correct default directory for the Add-Ins which is (C:\Documents and Settings\<username>\Application Data\Microsoft\AddIns)

	lder		Bee	• 🕐
Libraries Documents Music Pictures Videos Computer Local Disk (C:) RECOVERY (D:)	Name Reference classexample.xlam Reference classexample.xlam Reference classexample.xlam	11	Date modified 8/2/2011 7:01 PM 8/2/2011 5:55 PM 8/2/2011 5:52 PM	Type Microsoft Microsoft
HP TOOLS (F:)	* *	201		2
	ok1.xlam			84
File name: Boo Save as type: Exc				

- 7- Close all open workbooks and Open a new workbook
- 8- Click Office Button/Excel Options/Add-Ins/Excel Add-Ins from Manage dropdown menu then Click Go

son Add ins 8 8 - V BA allion Add ins m Wizard da 1 Mizard Daola al Smart tag lintig actars	Location CS., son Different 24. through Analysis (ABALYS32.01) CA., Office124.1brang Analysis ATPV64EN.81AM CS., ming (Microsoft AddIns/solar assample.stam son 81.xtam CS., dij Microsoft Office10Pros127.0TPRHD. DLL CA., let unironsoft inseed Smort Tag (MORL DLL wareboot alam CNUSersSignousseft Desittop resonance as in CS., len (norsooft anamod Smart Tag (MDRL DLL CS., len (norsooft anamod Smart Tag (MDRL DLL)	Type Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en Excel Add-en
& K - VBA allion Add ins Witzend da Hittsj Spola al (Smart bag lintsj	CS., Son Dffreet 24. Browy Analysis ATMAR 2012 Ch., Officet 24. Browy Analysis ATMAR 2012 Ch., Officet 24. Browy Analysis ATMAR 2014 Ch., att Mittersoft Addbm/sciences angle. dam son 8 stan Ch., att Mittersoft Addbm/sciences angle. dam son 8 stan Ch., att Mittersoft Addbm/sciences angle. dam ch., att Mittersoft Addbm/sciences angle. Ditt ch., att Mittersoft Addbm/sciences angle. Ditt ch., att Mittersoft Addbm/science Tag MDPL. Ditt Ch., att Mittersoft Addbm/science Tag MDPL. Ditt Ch., att Mittersoft Addbm/science Tag MDPL. Ditt.	Essel Add-in Essel Add-in Essel Add-in Essel Add-in Desamint Dropector Snel Tag Essel Add-in Essel Add-in
& K - VBA allion Add ins Witzend da Hittsj Spola al (Smart bag lintsj	Ch., Office12LBranyLandysisATPV8AENLLAM Ch., ming/Microsoff/AddIni/clanasample.slam sumExtan Ch., anyMicrosoff/AddIni/clanasample.slam Ch., anyMicrosoff shared/Smart Tag/MOFLDL aurobactalam Ch.Lervignousch/Desittopresemple.stm Ch.Lervignousch/Desittopresemple.stm Ch.Lervignousch/Desittopresemple.stm	Excel Add-in Excel Add-in Excel Add-in Document Impector Swart Tag Excel Add-in Excel Add-in
k - VBA allion Addi Ins en Wizard da Hittij Toola al (Smart tag listij	Ch., Office12LBranyLandysisATPV8AENLLAM Ch., ming/Microsoff/AddIni/clanasample.slam sumExtan Ch., anyMicrosoff/AddIni/clanasample.slam Ch., anyMicrosoff shared/Smart Tag/MOFLDL aurobactalam Ch.Lervignousch/Desittopresemple.stm Ch.Lervignousch/Desittopresemple.stm Ch.Lervignousch/Desittopresemple.stm	Excel Add-in Excel Add-in Excel Add-in Document Impector Swart Tag Excel Add-in Excel Add-in
ation Addives m Wizard da Liftsi Coola al (Smart bag linta)	C/L, ming/Microsoft/Addmit/clanessample.olam confliction C/L-d/Microsoft Office/Dfloat/2/OFFRHD. Bit C/L-ternionosoft insered/Seast Tag/MOR_DLI eurobed alam C/Likers/groupsef/Decktopressingle.astin C/Likers/groupsef/Decktopressingle.astin C/Likers/groupsef/Decktopressingle.astin C/Likers/groupsef/Decktopressingle.astin C/Likers/groupsef/Decktopressingle.astin	Excel Add-in Excel Add-in Document Empector Sneart Tag Excel Add-in Excel Add-in
m Witzerd eta 1 Hirts Foots of (Smart hag list)(SoniExtain Ch. dijWessort Offick/Dfloat2X/FFRHD.BLL Ch. Levinicrosoft insect/Snart TagMORLDLL eurobediaten Chlisers/groupset/Destropresomple.arbn Ch. Levinicrosoft Destropresomple.arbn Ch. Levinicrosoft insect/Snart TagMDPLDLL	Excel Add-in Document trapector Swart Tag Excel Add-in Excel Add-in
ata 1 Hirtsi Toolin al (Smart tag linth)	SoniExtain Ch. dijWessort Offick/Dfloat2X/FFRHD.BLL Ch. Levinicrosoft insect/Snart TagMORLDLL eurobediaten Chlisers/groupset/Destropresomple.arbn Ch. Levinicrosoft Destropresomple.arbn Ch. Levinicrosoft insect/Snart TagMDPLDLL	Excel Add-in Document trapector Swart Tag Excel Add-in Excel Add-in
ata 1 Hirtsi Toolin al (Smart tag linth)	CY, J()/Messaelt Office/Dfball2/OffBHD.BLL CY, Jerunicosoft shared/Smart Tag/MOFLDLL euroboot.alan Ch/Sersignousseft/Decitopresempte.alan CY, Jerunicosoft shared/Smart Tag/MDFLDLL	Document Impector Smart Tag Excel Add-in Excel Add-in
i listsj foods al (Smart tag listsj	Chullerunimosoft shared:Smart TaglMOFLDLL aurobaol.stan Chulersigno ussef.Desktogrussample.alsm Chulersigno ussef.Desktogrussamt TaglMDFLDLL	Swart Tag Excel Add-in Excel Add-in
tools al (Smart tag listi)	eurotool siam Critisersigrousseft/Desktopriexemple alsin Critiserimizzonoft shared/Smart Tag/MDPLDLL	Excel Add-in Excel Add-in
al (Smart hag linti)	Critikersigrousseft/Desktoprexomplearism Critikersingrousseft shared (Smart Tag MDPLDL)	Excel Add-in
방송이 왜 가지가 들어?	Cr., ler/microsoft shared Smart Tag MDPLDLL	and the second second second
방송이 왜 가지가 들어?		Smart Text
a nhana		
		Excel Add-IB
	C14/Microtoff Office/Office12/OFFRHD.DLL	Document Inspector
end Columns	Ch. 6//Microsoft Office/Office12/OFFRHD/DU	Document inspector
teats.	C16//Microsoft Office/Office12/OFFRHD.DU	Document Inspector
		Excel Add-in
	and the second second performance from the second	Document Inspector
-		Excel Add-in
Outlook e-mail recipienti()		Smart Tag
		Excel Add-in
	CA, a Roaming Microsoft Addiniterting dam	Excel Add-in
Analysis ToolPak		
	wasatt Office Officer 21 Ibrand answerig alla 1952 XU	
Contractions internation	a source and a surger should be added a second rate	
Presides data analysis has	an for statistical and excise entry analysis	
Firefails man analysis on	and the manufacture and any strategic strategics	
	Authook e-mail recipients) Analysis ToolPak Microsoft Corporation CliProgram Files (M6/Mil	nt CS, 4/Microsoft Office/Dffi

9- Excel will prompt you with Add-Ins dialog box, Select the add-in you want to add and click OK.

	Add-Ins	? ×
Examples of Custom Add-Ins	Add-Ins available: Analysis ToolPak Analysis ToolPak - VBA Classexample Conditional Sum Wizard Euro Currency Tools Example Geo Internet Assistant VBA Lookup Wizard Solver Add-in Testing Analysis ToolPak Provides data analysis tools for engineering analysis	

Enjoy!