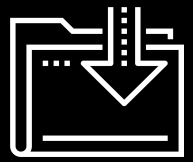
Fundamentals of Programming with VBA

Data Boot Camp

Lesson 2.1



Intro to Programming Logic

Coding (Sort Of)

Using Excel has introduced you to a sort of proto-programming. When writing scripts in Visual Basic for Applications (VBA), you will rely on `functions` (methods) that do something to or with `arguments`.

Fundamental Tools of Programming

These structures are found in nearly all programming languages:

Conditionals

Iterations

Functions

Variables and arrays

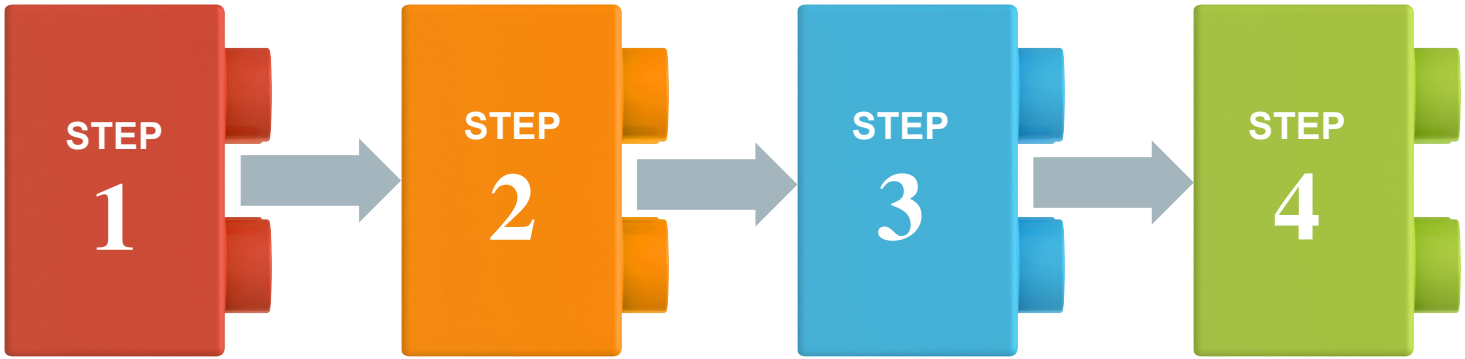
How a Computer Thinks (Procedurally)

Every problem in software development begins with a complex and abstract real-world need.

How a Computer Thinks (Procedurally)

For a computer to interpret it, the real-world problem must be broken down into a set of procedural steps.

Complex Real-World Problem



How Code Is Written (Procedurally)

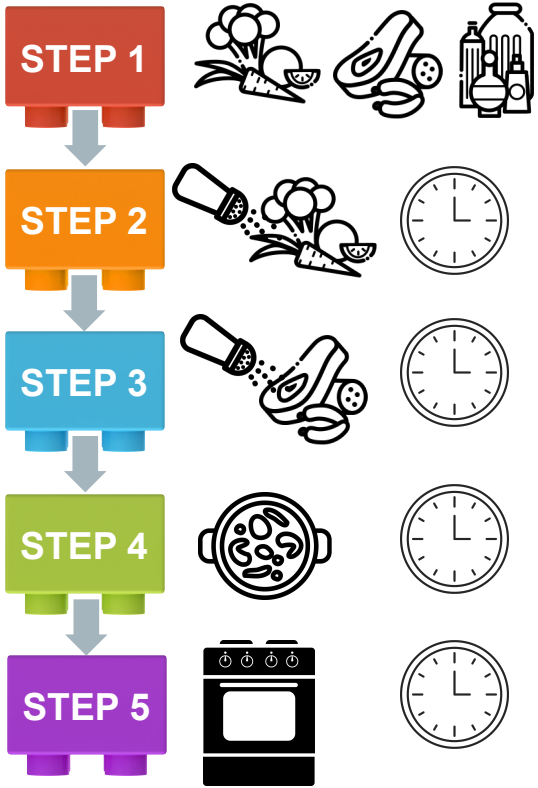
Code (Python)

```
# STEP 1
# ------------------------
thingamagig = 500
doodad = 200

# STEP 2
# ------------------------
combinedThing = thingamagig + doodad

# STEP 3
# ------------------------
runContraption(combinedThing)

# STEP 4
# ------------------------
resetContraption()
```

When Procedures Aren't Enough, We Need More Tools

Code (Python)

```
# STEP 1
# ------------------------
ingredient1 = vegetables
ingredient2 = meats
ingredient3 = spices

# STEP 2
# ------------------------
season(vegetables)

# STEP 3
# ------------------------
season(meats)

# STEP 4
# ------------------------
stirfry(vegetables)

# STEP 5
# ------------------------
roast(meats)
```



To Make Vegemite on Toast

To Make Vegemite on Toast

Logical Procedure:

01 Get bread from toaster, and get butter and vegemite from pantry.

02 Lay out bread on table.

03 Open butter and vegemite.

04 Get spreading knife.

05 Use knife to spread butter.

06 Use knife to spread vegemite.

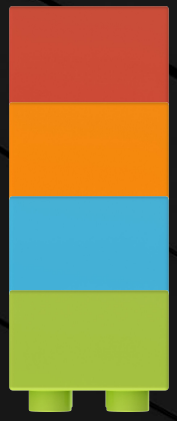
07 Combine bread to create sandwich.

Fundamental Tools Can Help Make our Vegemite on Toast

We use these tools as building blocks to make an ideal sandwich procedure:

Conditionals	If the butter is salted, use less.
Iterations	While there is more butter, add more vegemite.
Functions	Spread the condiment by using a knife.
Variables and Arrays	The ingredients are bread, butter and vegemite.

VBA Building Blocks



Variables and Arrays

Variables: The Nouns of Code

Variables are effectively the items in a procedure.

They can be **physical things** (like an ingredient) or **abstractions** (like a counter).

In VBA, items can be **declared** as variables by using `dim` followed by the type. They can then be **assigned** a value.

Variable Declarations

```
dim ing1 as String
dim ing2 as String
dim budget as Double
```

Variable Assignments

```
ing1 = "Butter"
ing2 = "Vegemite"
budget = 5.00
```

Arrays: Collections of Items

An array is effectively a **group** of related items. It presents another way to store and reference similar pieces of information.

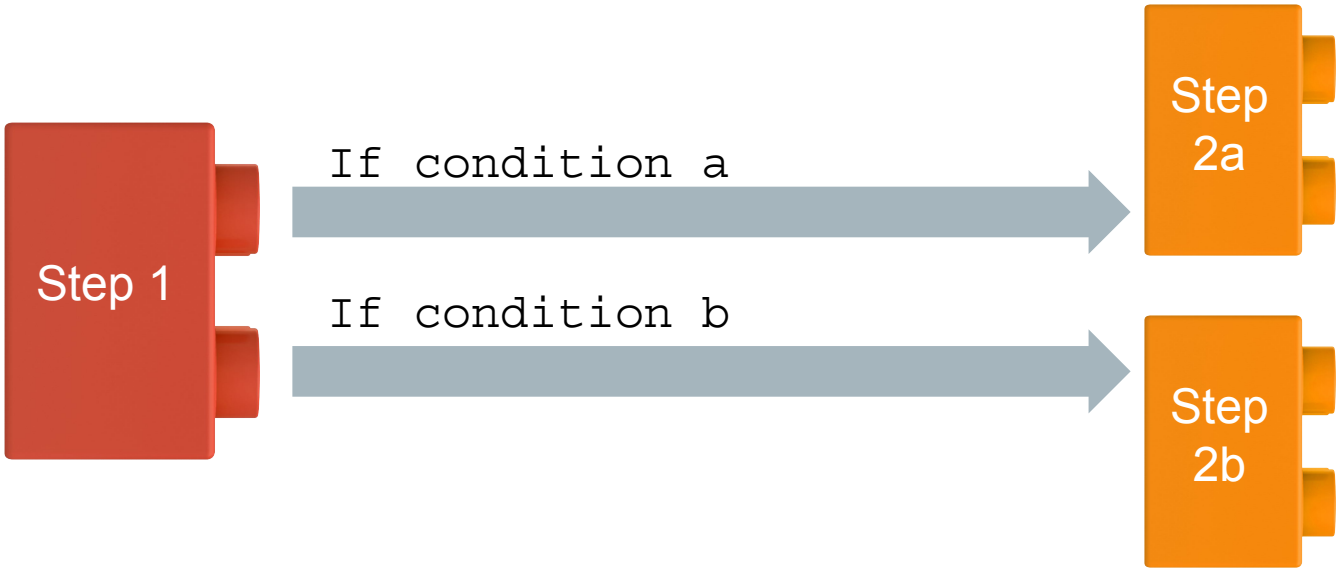

```
dim ingredients(0 to 2) as String

ingredients(0) = "Butter"
ingredients(1) = "Vegemite"
ingredients(2) = "Bread"
```

Conditionals

Conditionals: If This, Then That

Conditionals can control the flow of logic based on certain conditions being met.

In most languages, you use **if/else** code for this purpose.

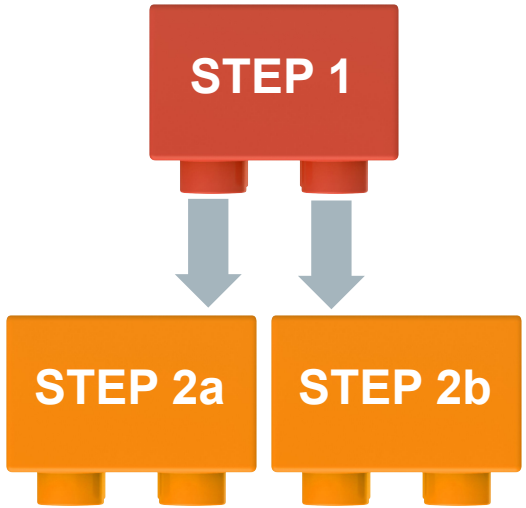


Conditionals: If This, Then That

In VBA, conditionals are declared by using the keywords **If**, **Then**, **Elseif, Else**, and **End if**.

VBA lets us create far more sophisticated conditional logic than we can with Excel formulas alone.

```
If (pbThickness > 1.0) Then
   stopSpreading()

Else
   spreadMore()

End if
```

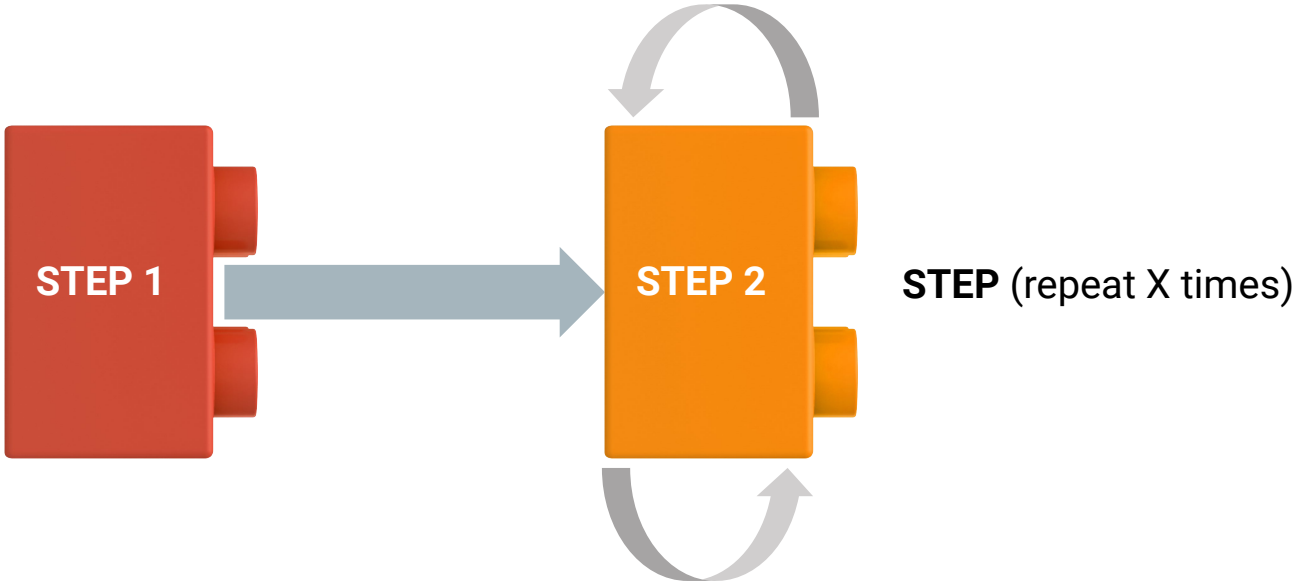


Iteration (Looping)

Iteration

Iteration is the concept of using a loop to repeatedly perform a group of tasks a number of times.

Almost all programming languages use **for loops** and **while loops** for iteration.



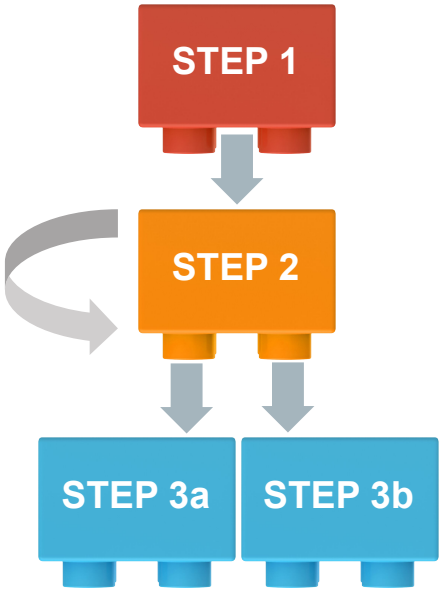
Iteration

This code will make more sense later. Basically, it's the VBA way of repeating the same block multiple times.

```
' Repeat the same step until i becomes 20
For i = 0 to 20

    ' Each time spread more
    spreadMore()

' Add one to the value of i each time
Next i
```

Build the Program

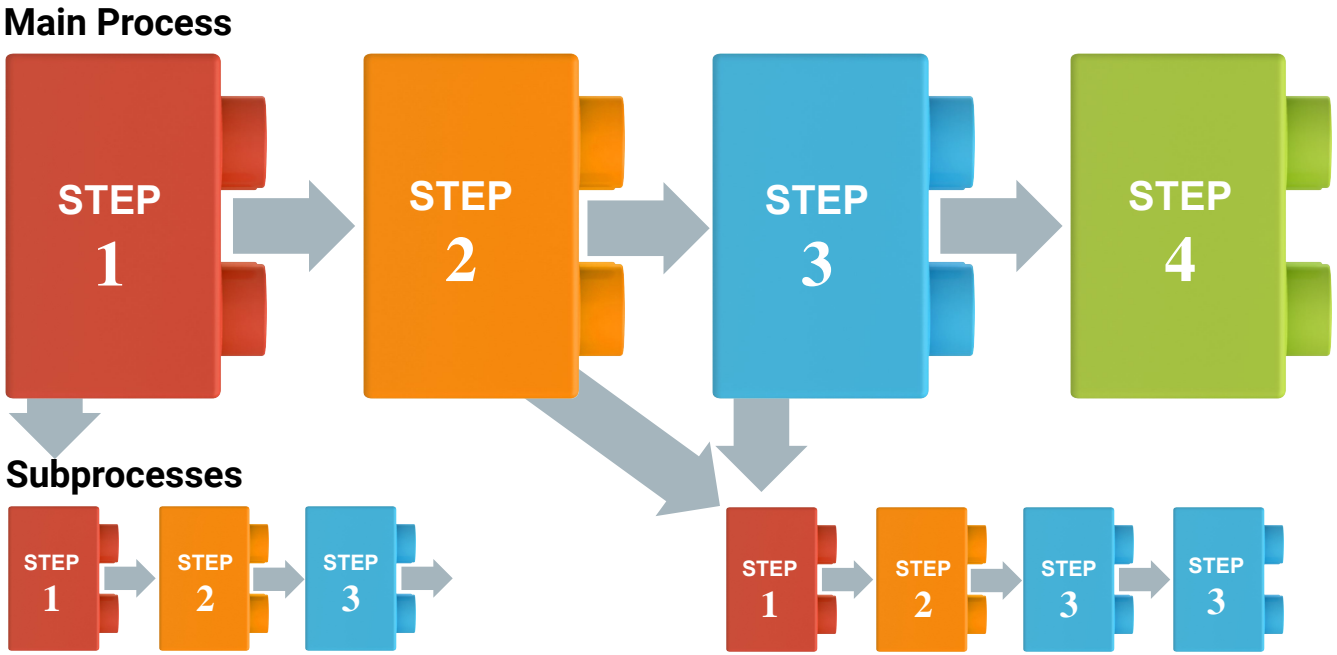
```
' Get ingredients
dim ing1, ing2, ing3 as String
ing1 = "Butter"
ing2 = "Vegemite"
ing3 = "Bread"

' Repeat the spreading process a max of 5 times
for i = 1 to 5

    'Each time, check that you haven't spread too much
    if bThickness >= 1.0 then

        ' If you have spread too much
        stopSpreading()

    ' Otherwise...
    else:

        ' Keep spreading.
        spreadMore()
    end if

next i
```



Functions

Functions: When One Block Can’t Do It All

In essence, a **function** is a sort of subprocess. With functions, you can create premade, reusable blocks of code that can be called on demand.



Putting It All Together

To Make Vegemite on Toast

Logical Procedure:

01 Get bread from toaster, and get butter and vegemite from pa[illegible].

02 Lay out bread on table.

03 Open butter and vegemite.

04 Get spreading knife.

05 Use knife to spread butter.

06 Use knife to spread vegemite.

07 Combine bread to create sandwich.

To Make Vegemite on Toast (Full Logic)

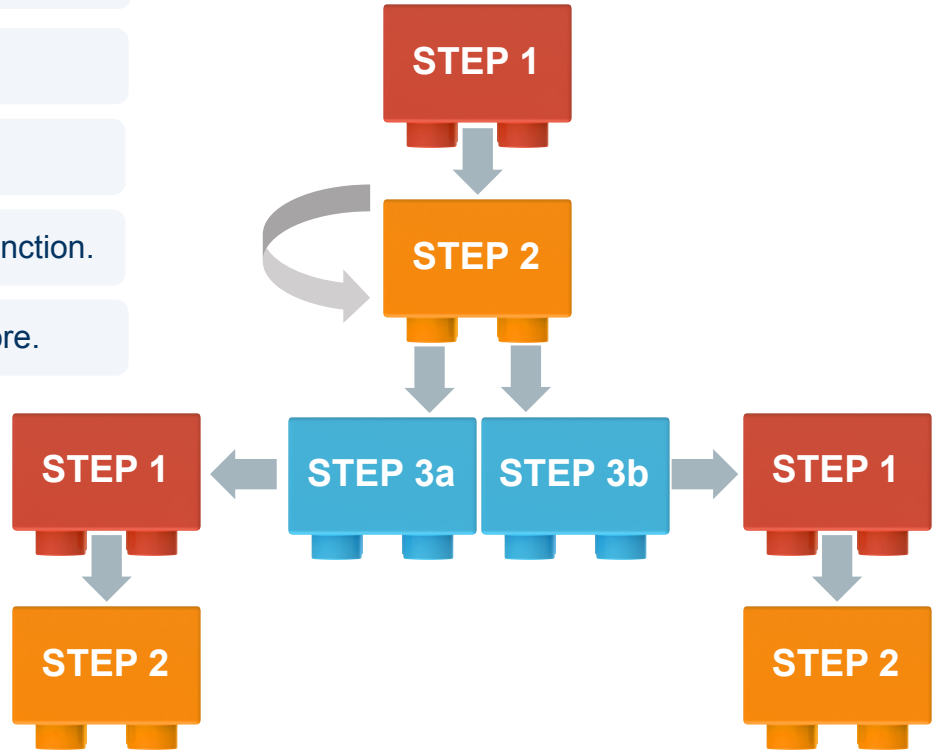
01 Get items.

02 Repeatedly spread the butter.

03 Check if the thickness condition is met.

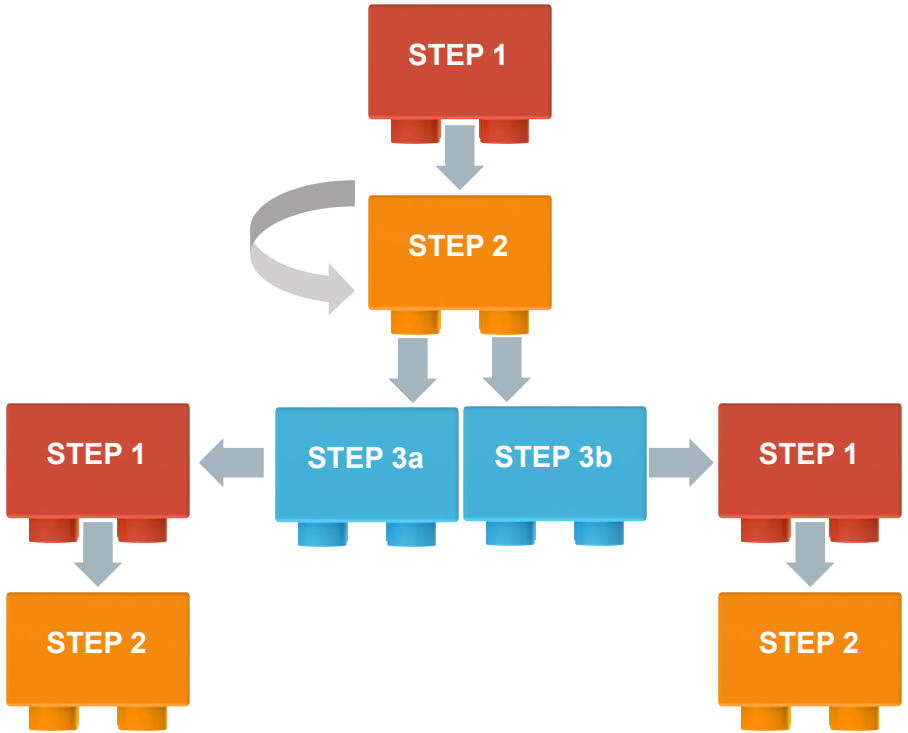
3a If the thickness condition is met, run the stop function.

3b If the thickness condition is not met, spread more.



To Make Vegemite on Toast (in Code)

```
Sub Butter():

    ' Get ingredients
    dim ing1, ing2, ing3 as String
    ing1 = "Butter"
    ing2 = "Vegemite"
    ing3 = "Bread"

    ' Repeat the spreading process a max of 5 times
    for i = 1 to 5

        'Each time, check that you haven't spread too much
        if bThickness >= 1.0 then

            ' If you have spread too much
            stopSpreading()

        ' Otherwise...
        else:

            ' Keep spreading.
            SpreadMore()
        end if

    next i

End Sub

' Define the spreadMore function
Sub SpreadMore():

    ' Use another set of sub-functions to move the knife
    dipIntoButter()
    horizontalShiftKnife()

End Sub
```



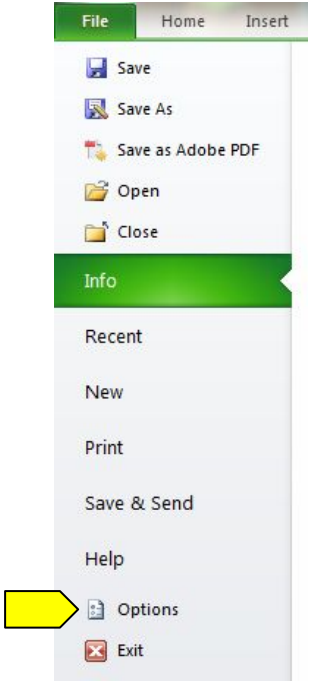
Coding Overview

Coding = creating building blocks and putting them together

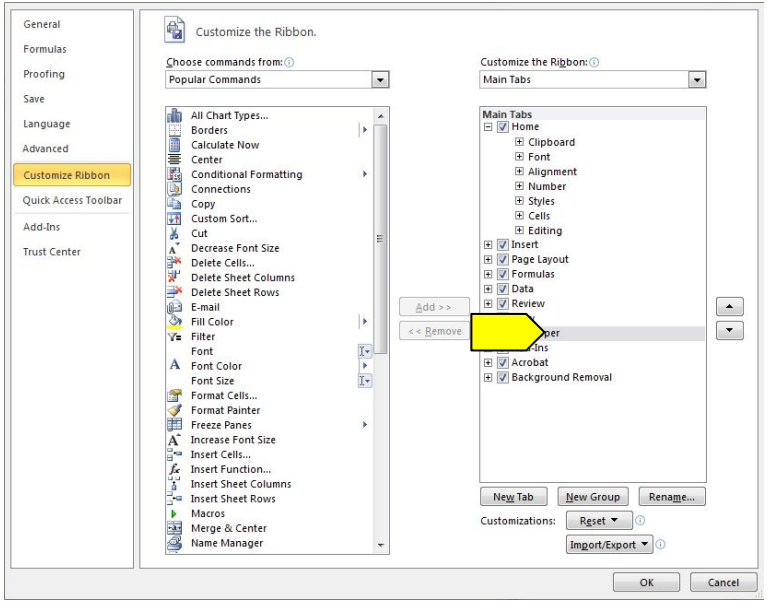
Let’s Get Coding!

Add Developer Tools: Windows

01 Go to **File** > **Excel Options**.

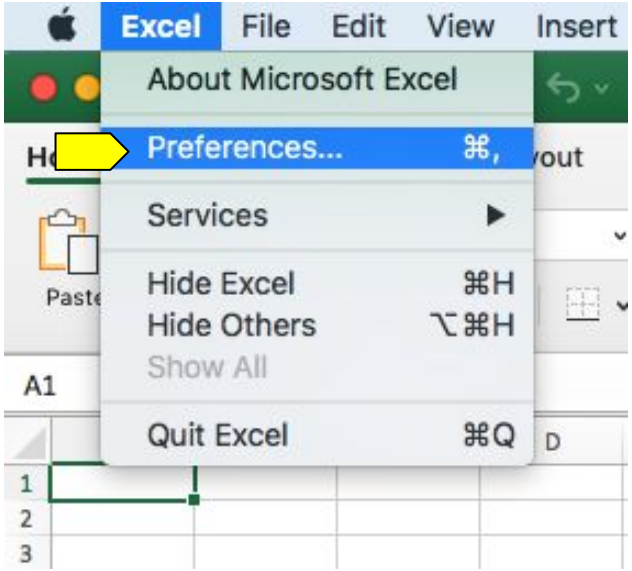


02 Go to **Customize Ribbon**, select **Main Tabs** in the right pane, and then make sure that **Developer** is checked.

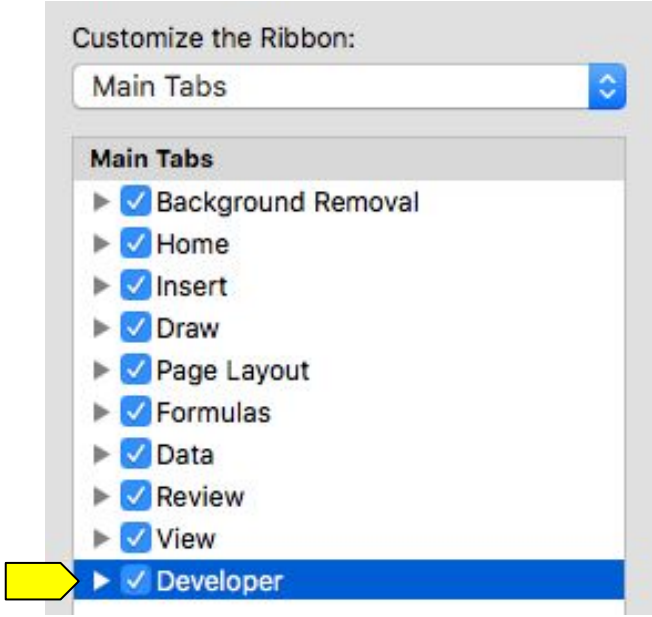


Add Developer Tools: Mac

01 Go to **Excel** > **Preferences**.



02 Go to **Ribbon & Toolbar**, select **Main Tabs** in the right pane, and then make sure **Developer** is checked.



Questions?

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