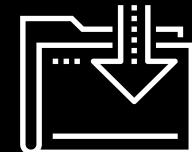




# Fundamentals of Programming with VBA

Data Boot Camp  
Lesson 2.1

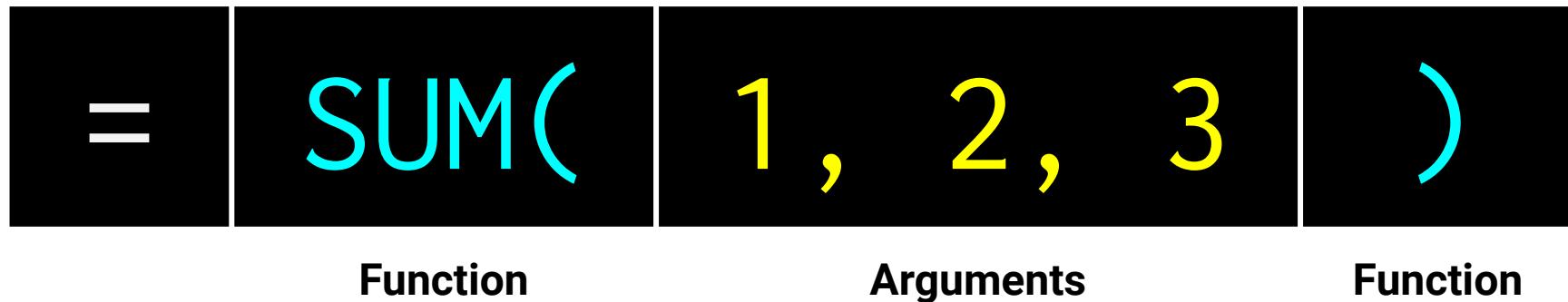


# Intro to Programming Logic

# Ooh, Coding! (Sort of...)

---

In a way, using Excel has introduced you to a sort of proto-programming. When writing scripts in 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

When you pack some functionalities  
that you will use later on



Variables / Arrays

Segment of memory

# How a Computer Thinks (Procedurally)

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

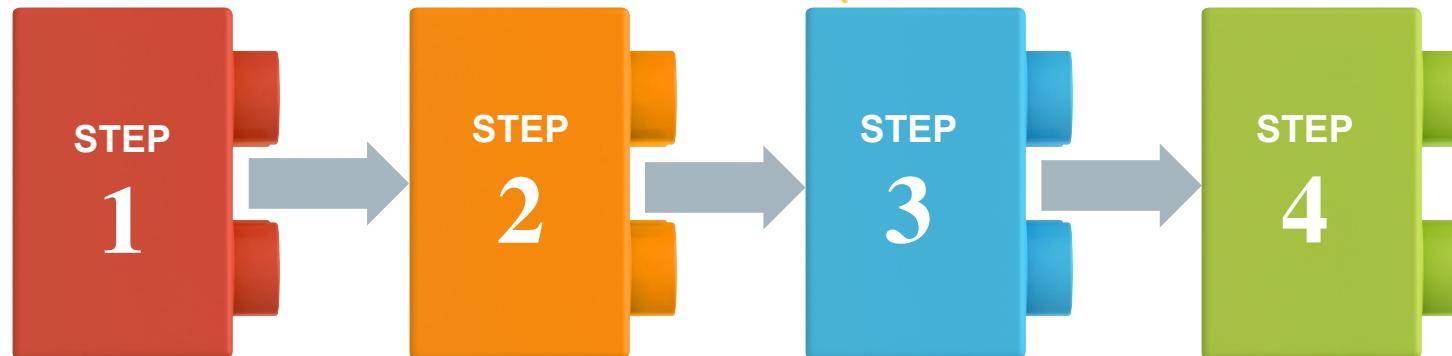


# How a Computer Thinks (Procedurally)

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

It's all about decomposing the problem

Complex Real-World Problem



Computer will solve 1 problem at a time. The functions are read from top to bottom.

# How Code Is Written (Procedurally)

---

## Code (Python)

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

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

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

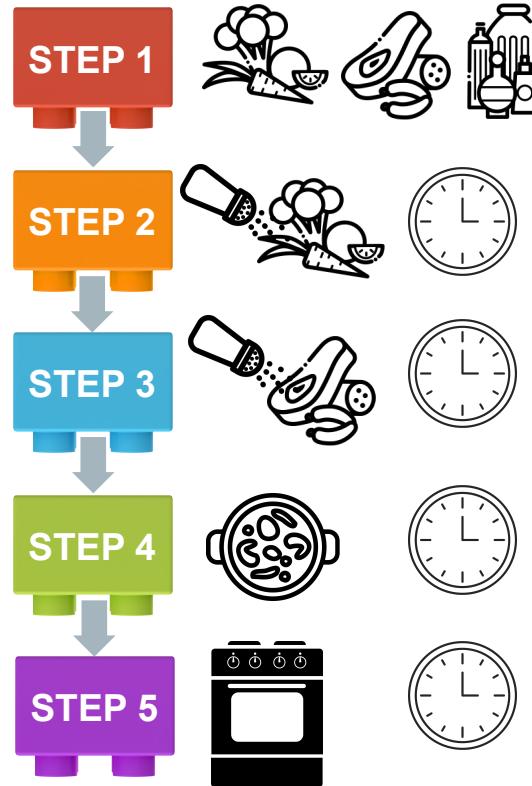
# STEP 4
# -----
resetContraption()
```



# 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 a Sandwich

---



# To Make a Sandwich

---

Logical Procedure:

- 01 Get bread, peanut butter, and jelly from pantry.
- 02 Lay out bread on table.
- 03 Open jars of peanut butter and jelly.
- 04 Get spreading knife.
- 05 Use knife to spread peanut butter.
- 06 Use knife to spread jelly.
- 07 Combine bread to create sandwich.

# Fundamental Tools Can Help Make the Sandwich

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

|                    |   |
|--------------------|---|
| Conditionals       | If peanut butter is crunchy, use less.  |
| Iterations         | While there is more peanut butter, add more jelly.  |
| Functions          | <i>The same function can be applied to any condiment</i><br>Spread the condiment using a knife. |
| Variables / Arrays | The ingredients are bread, peanut butter and jelly.<br><i>Arrays = ingredients in this case</i> |

# VBA Building Blocks



# Variables and Arrays

# Variables: The Nouns of Code

VBA Advantage = embedded  
in Excel



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.  
Then they can be **assigned** a value.

Syntax = the way it's written in a programming language

Variable Declaration

Variable Assignment

dim =  
proc give  
me something

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

```
ing1 = "Peanut Butter"  
ing2 = "Jelly"  
budget = 5.00
```

# Array: A Collection of Items

---

Arrays are effectively **groups** of related items. They present another way to store and reference similar pieces of information.

Item 0

Item 1

Item 2

```
[ "Peanut Butter", "Jelly", "Bread" ]
```

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

```
ingredients(0) = "Peanut Butter"
```

```
ingredients(1) = "Jelly"
```

```
ingredients(2) = "Bread"
```

# Conditionals

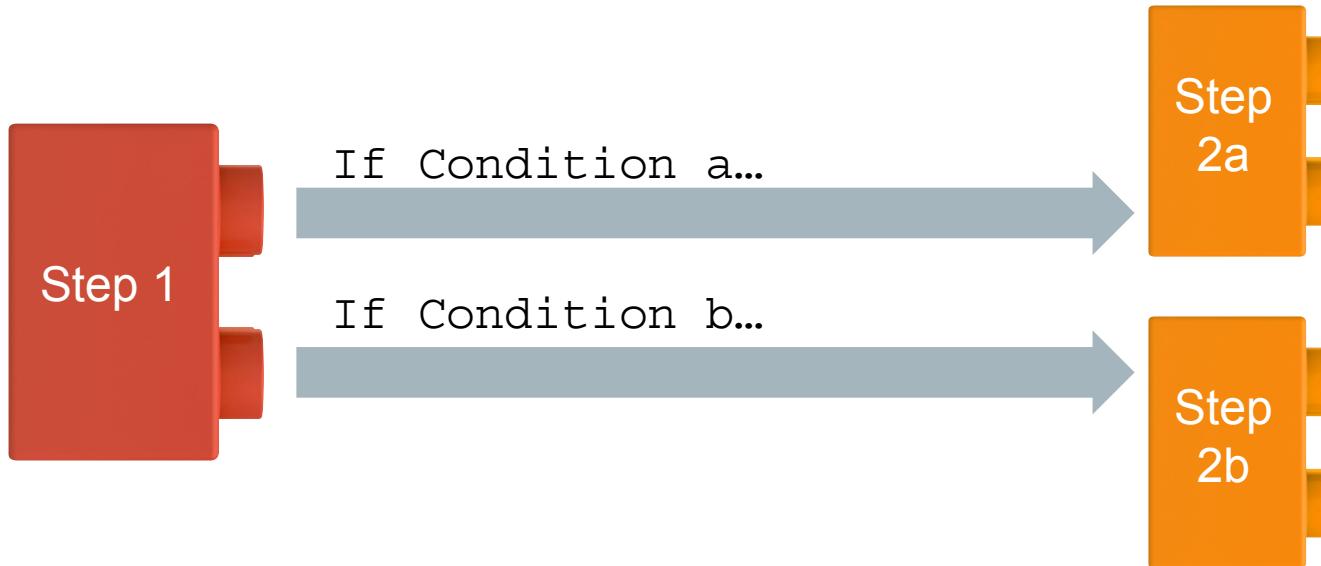
# Conditionals: If This, Then That



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

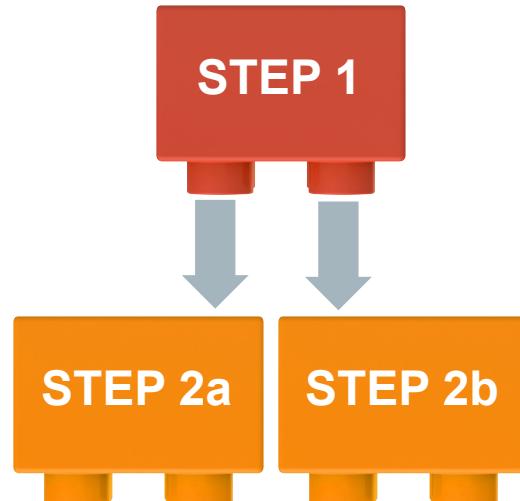


In VBA, conditionals are declared using the keywords **If**, **Then**, **Elseif**, **Else**, and **End if**.



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

```
If (pbThickness > 1.0) Then  
    stopSpreading()  
    Else  
        spreadMore()  
End if
```

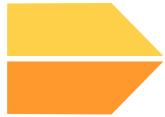


# Iteration (Looping)

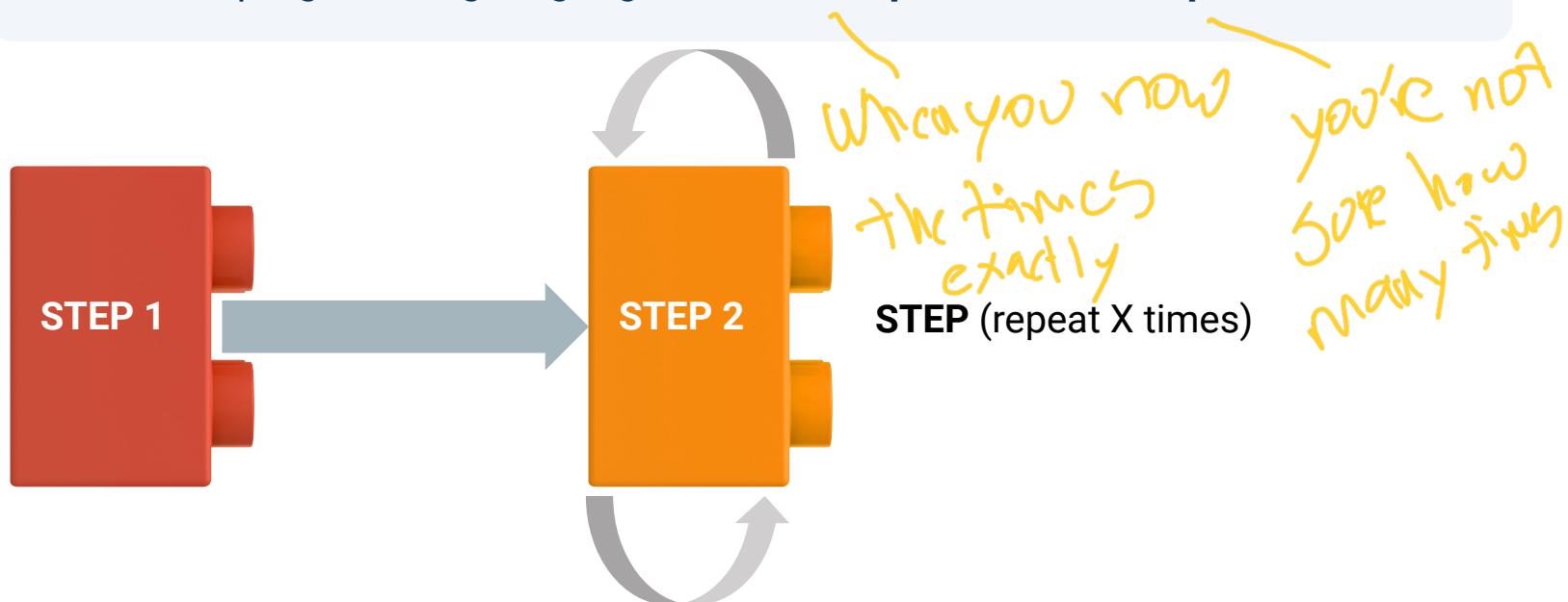
# Iteration: Round and Round We Go!



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



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



# Iteration: Round and Round We Go!

---

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

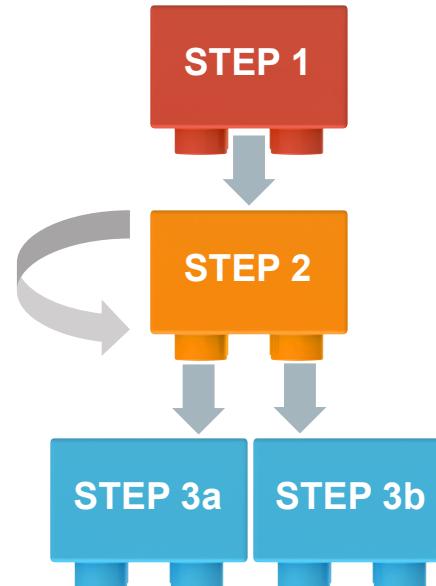
```
' Repeat the same step until i becomes 20
For i = 0 to 20
    ' Each time spread more
    spreadMore()
    ' Add one to the value of i each time
Next i
```

*For and next  
we always use*

# Build the Program!

---

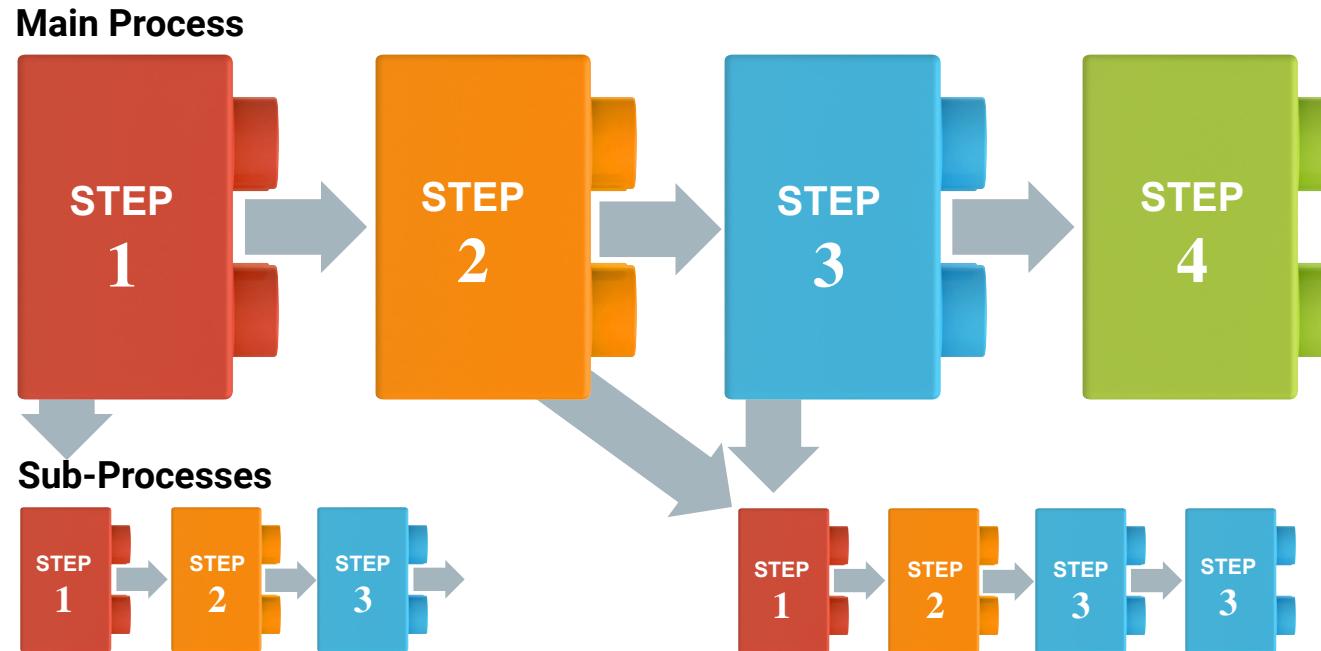
```
1  ' Get Ingredients
2  dim ing1, ing2, ing3 as String
3  ing1 = "Peanut Butter"
4  ing2 = "Jelly"
5  ing3 = "Bread"
6
7  ' Repeat the spreading process a max of 5 times
8  for i = 1 to 5
9
10     ' Each time, check that you haven't spread too much.
11     if pbThickness >= 1.0 then
12
13         ' If you have spread too much, stop spreading.
14         stopSpreading()
15
16         ' Otherwise...
17     else:
18
19         ' Keep spreading.
20         spreadMore()
21     end if
22
23 next i
```



# Functions

# Functions: When One Block Can't Do It All!

In essence, **functions** are a sort of sub-process. They let you create premade, reusable blocks of code that can be called on demand.



# Putting It All Together

# To Make a Sandwich

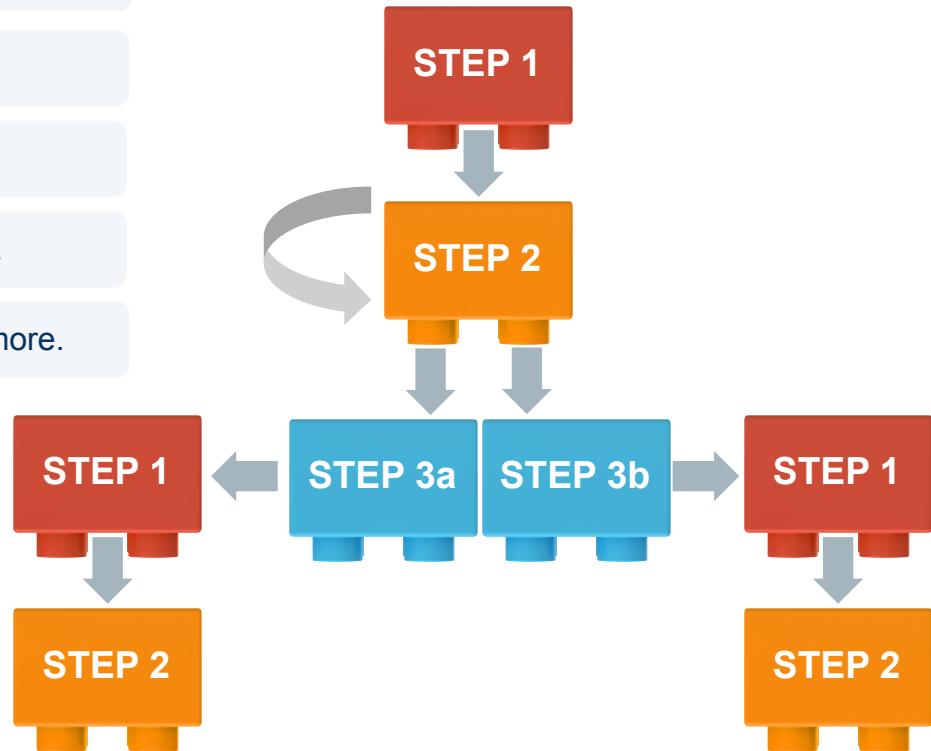
---

Logical Procedure:

- 01 Get bread, peanut butter, and jelly from pantry.
  - 02 Lay out bread on table.
  - 03 Open jars of peanut butter and jelly.
  - 04 Get spreading knife.
  - 05 Use knife to spread peanut butter.
  - 06 Use knife to spread jelly.
  - 07 Combine bread to create sandwich.
- 

# To Make a Sandwich (Full Logic)

- 01 Get items.
- 02 Repeatedly “spread the peanut butter.”
- 03
  - 3a If thickness condition is met, run stop function.
  - 3b If thickness condition is **not** met, then spread more.



# To Make a Sandwich (in Code)

```
Sub PeanutButter():

    ' Get Ingredients
    dim ing1, ing2 as String
    ing1 = "Peanut Butter"
    ing2 = "Jelly"

    ' Repeat the spreading process a max of five times
    for i=0 to 5

        ' Each time, check that you haven't spread too much
        if (pbThickness > 1.0){

            ' If you have spread too much, stop spreading.
            stopSpreading()
        }

        ' Otherwise
        else

            ' Keep spreading...
            keepSpreading()

        end if

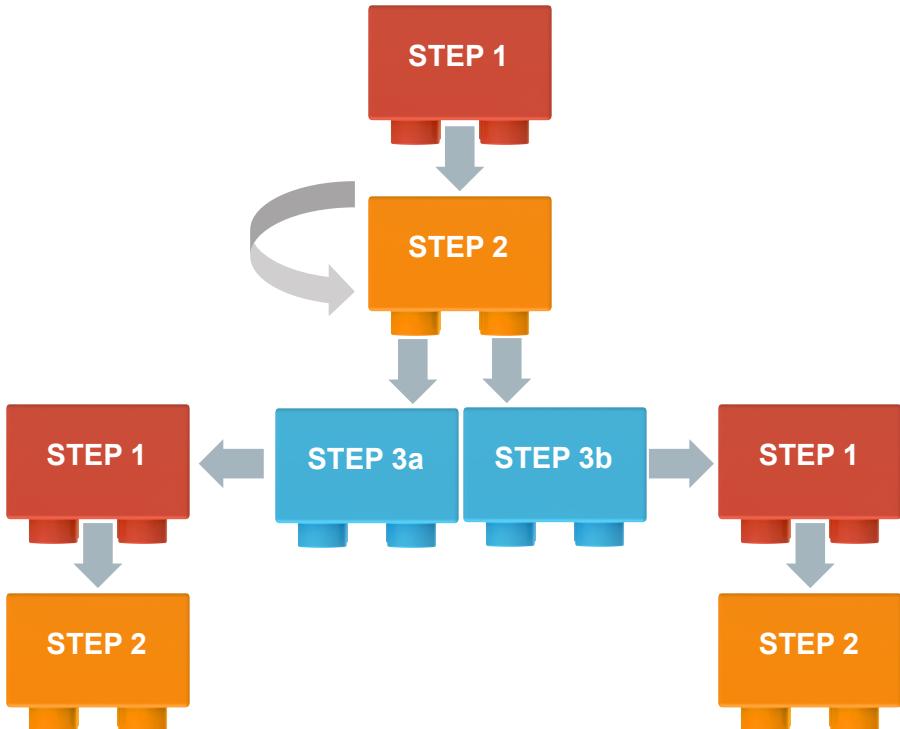
    next i

End Sub

' Define the spreadMore function
Sub SpreadMore():

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

End Sub
```



# Big Picture!

---

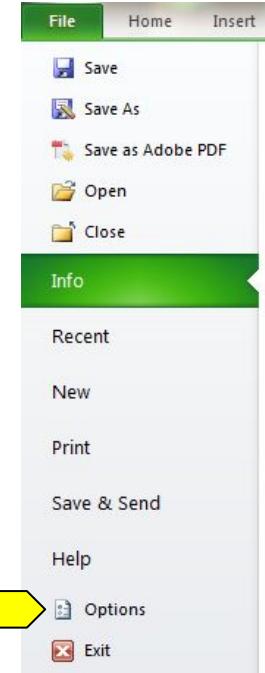
Coding = creating building blocks and putting them together



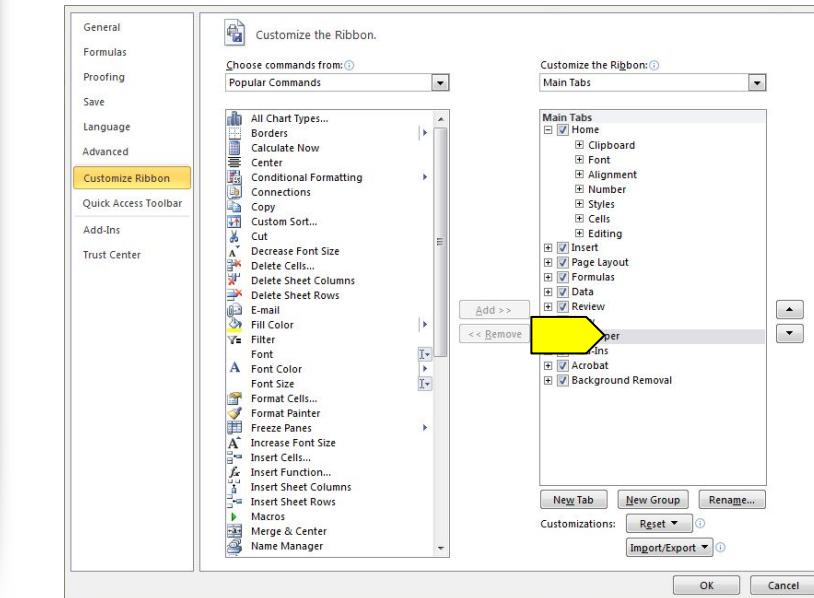
# Let's Get Coding!

# Add Developer Tools: Windows

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

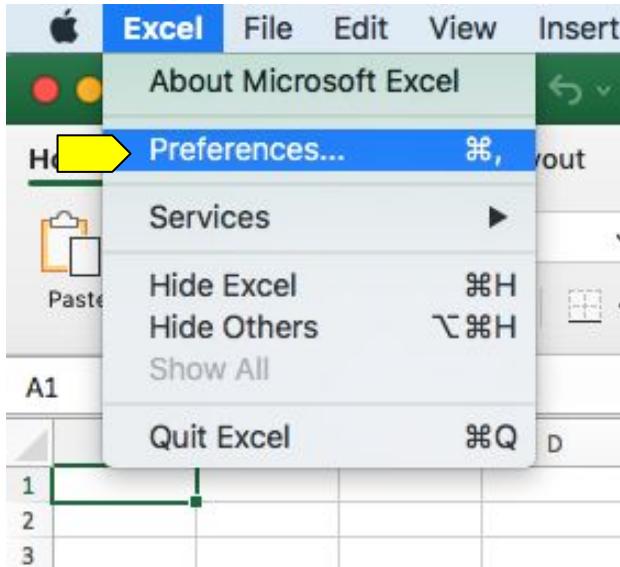


02 Then go to **Customize Ribbon**, choose **Main Tabs** in the right pane, and make sure **Developer** is checked.

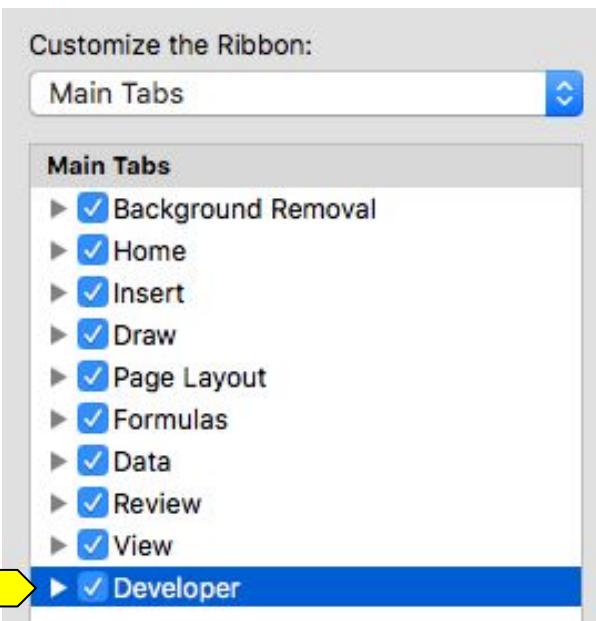


# Add Developer Tools: Mac

01 Go to **Excel > Preferences**.



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



# Questions?

Questions?

