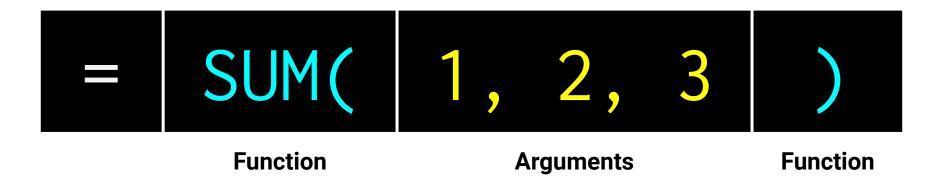


# Intro to Programming Logic

### 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.



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How a Computer Thinks (Procedurally)

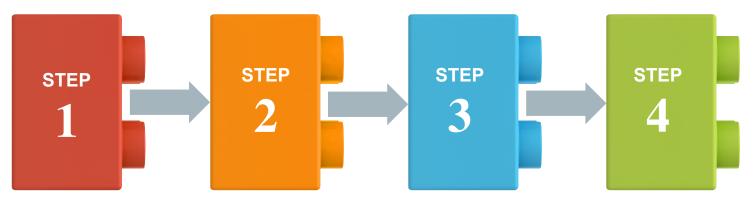
Every problem in software development begins with a complex and abstract real-world need.



# 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.

#### **Complex Real-World Problem**



5

### **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
                                        STEP 1
ingredient1 = vegetables
ingredient2 = meats
ingredient3 = spices
                                        STEP 2
# STEP 2
season(vegetables)
                                        STEP 3
# STEP 3
season(meats)
# STEP 4
                                         STEP 4
stirfry(vegetables)
                                        STEP 5
roast(meats)
```

# **Fundamental Tools of Programming**

These structures are found in nearly all programming languages:

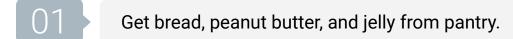


# To Make a Sandwich



#### To Make a Sandwich

#### Logical Procedure:



- 02 Lay out bread on table.
- Open jars of peanut butter and jelly.
- 04 Get spreading knife.
- Use knife to spread peanut butter.
- Use knife to spread jelly.
- O7 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.

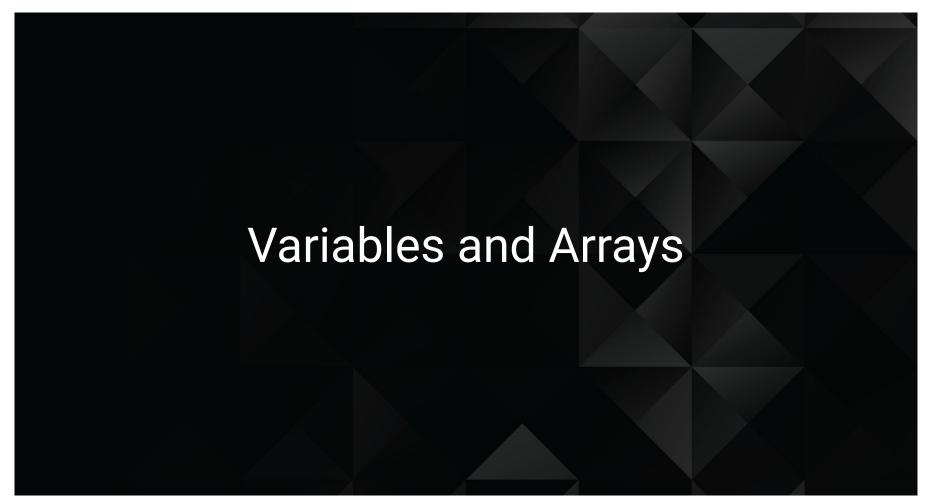


Functions - Spread the condiment using a knife



Variables / Arrays - The ingredients are bread, peanut butter and jelly.





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

#### Variable Declaration

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

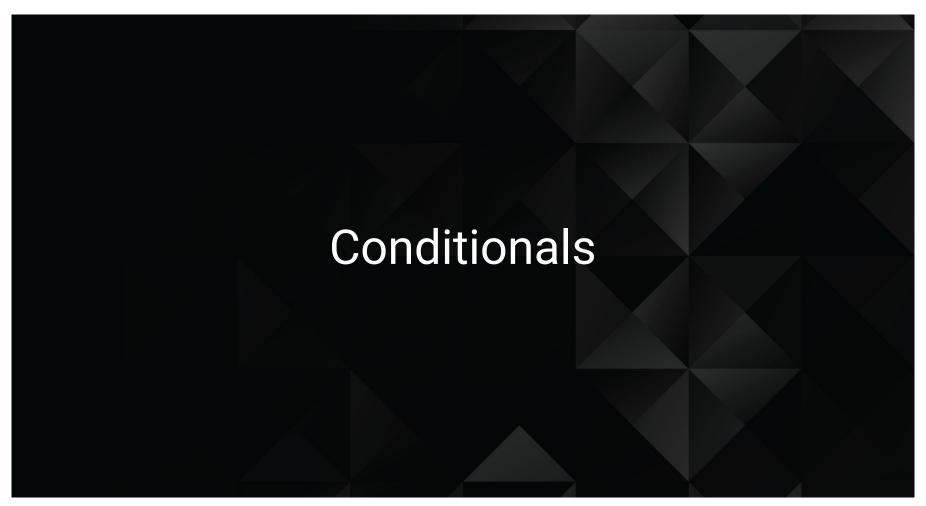
#### Variable Assignment

```
ing1 = "Peanut Butter"
ing1 = "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",
                                         "Bread"
                       "Jelly",
dim ingredients(0 to 2) as String
ingredients(0) = "Peanut Butter"
ingredients(1) = "Jelly"
ingredients(2) = "Bread"
```



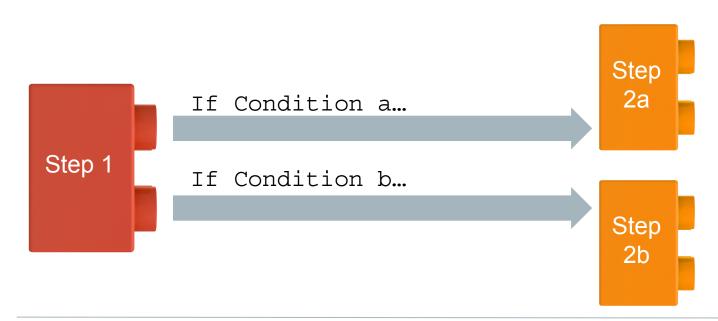
### **Conditionals: If This, Then That**



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**

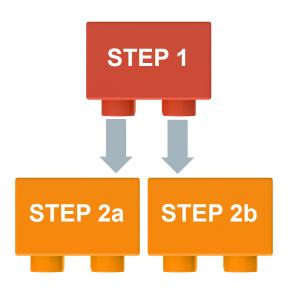


In VBA, conditionals are declared using the keywords If, Then, Elseif, Else, and End if.



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

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





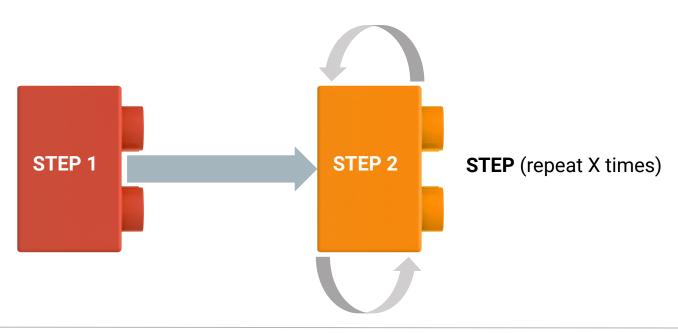
#### **Iteration: Round and Round We Go!**



**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.



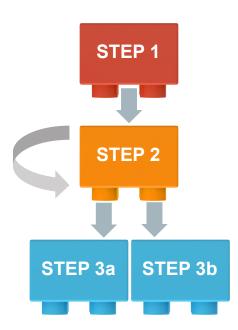
#### Iteration: Round and Round We Go!

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
```

### Build the Program!

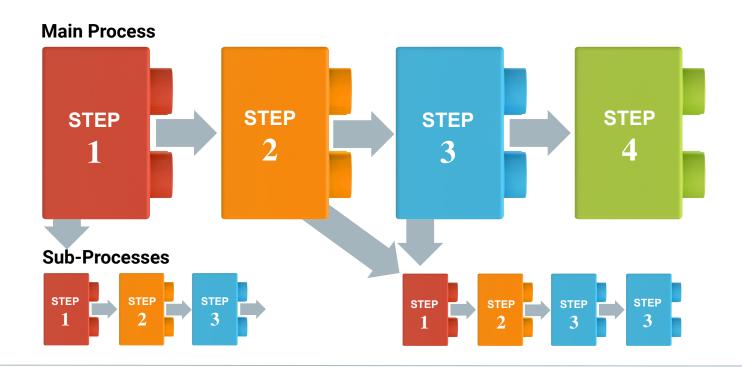
```
' Get Ingredients
     dim ing1, ing2, ing3 as String
     ing1 = "Peanut Butter"
     ing2 = "Jelly"
     ing3 = "Bread"
      ' Repeat the spreading process a max of 5 times
     for i = 1 to 5
10
          ' Each time, check that you haven't spread too much.
11
         if pbThickness >= 1.0 then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

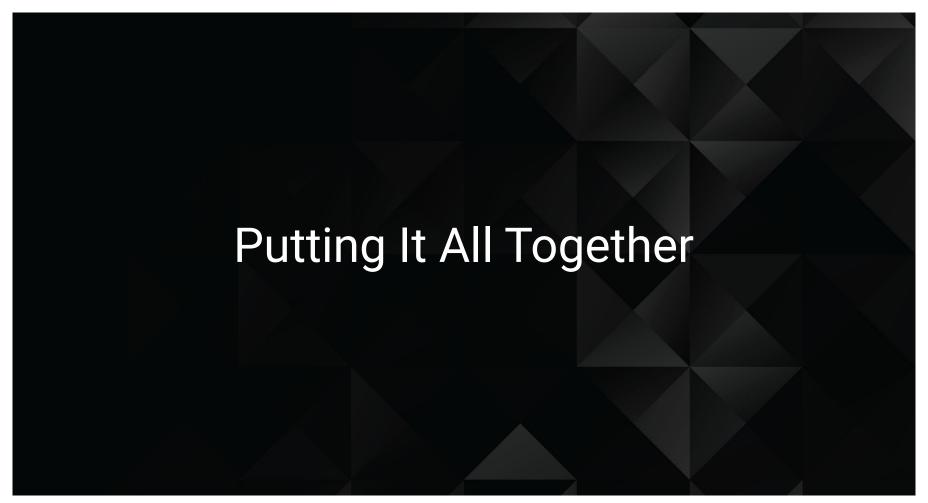




#### Functions: When One Block Can't Do It All!

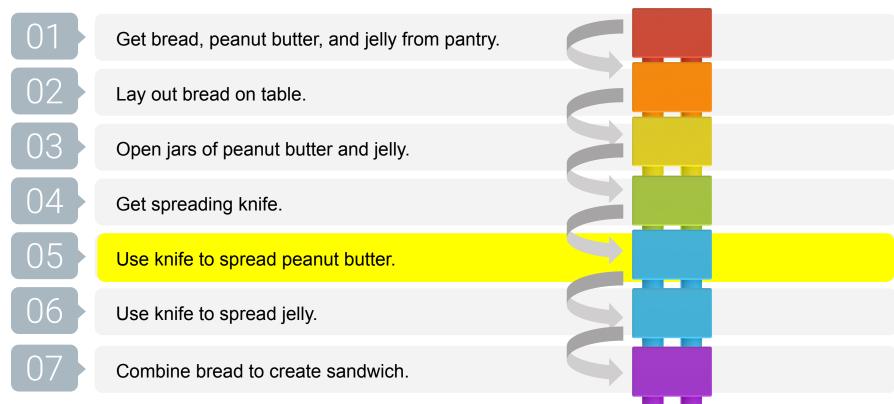
In essence, **functions** are a sort of sub-process. They let you create premade, reusable blocks of code that can be called on demand.



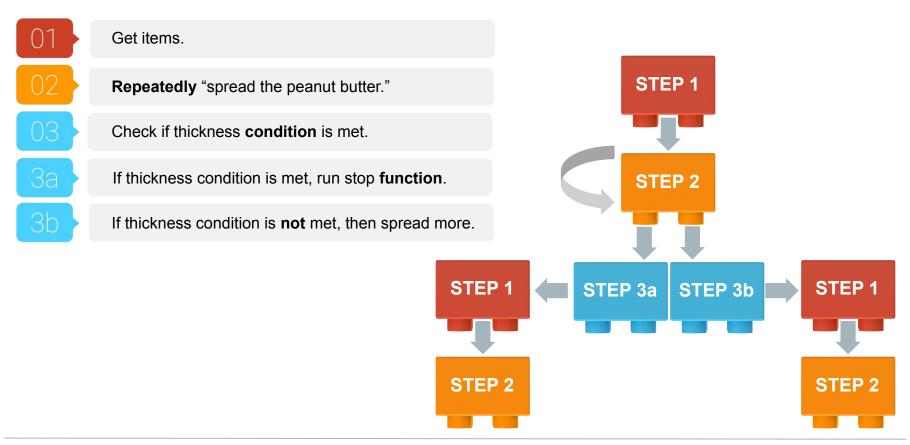


#### To Make a Sandwich:

#### Logical Procedure:

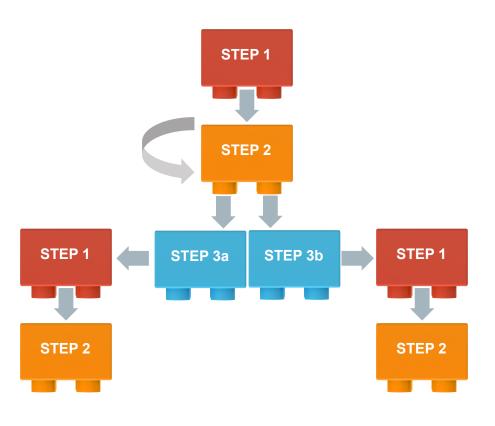


# To Make a Sandwich (Full Logic)



### To Make a Sandwich (in Code)

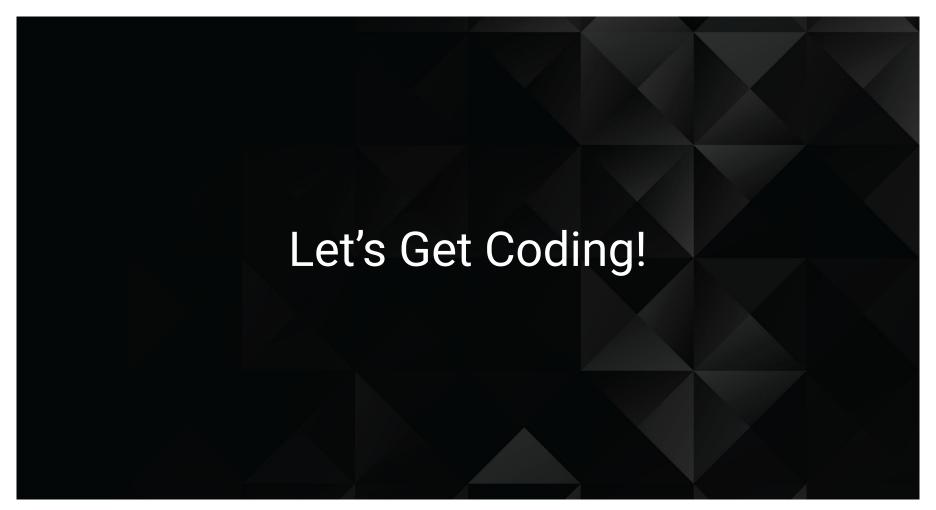
```
Sub PeanutButter():
 dim ing1, ing2 as String
 ing1 = "Peanut Butter"
 ing2 = "Jelly"
   if (pbThickness > 1.0){
     stopSpreading()
     keepSpreading()
 next i
End Sub
Sub SpreadMore():
 dipIntoPb()
 horizontalShiftKnife()
End Sub
```



# **Big Picture!**

Coding = creating building blocks and putting them together





### Add Developer Tools: Windows

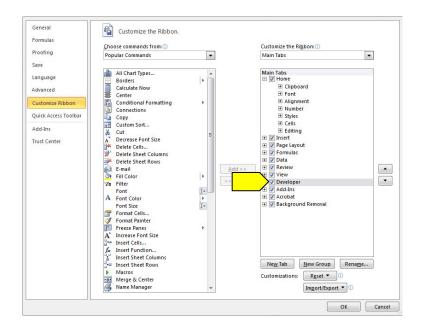
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Go to File > Excel Options.





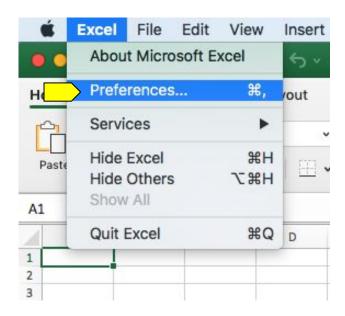
Then go to **Customize Ribbon**, choose **Main Tabs** in the right pane, and make sure **Developer** is checked.



#### Add Developer Tools: Mac

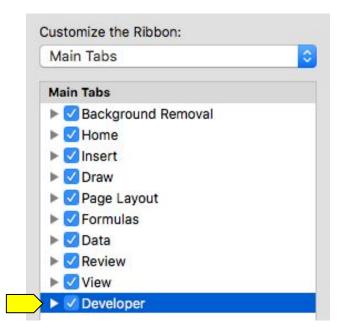
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Go to Excel > Preferences.





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



# Questions?