

# Fundamentals of Programming with VBA

Data Boot Camp

Lesson 2.1





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

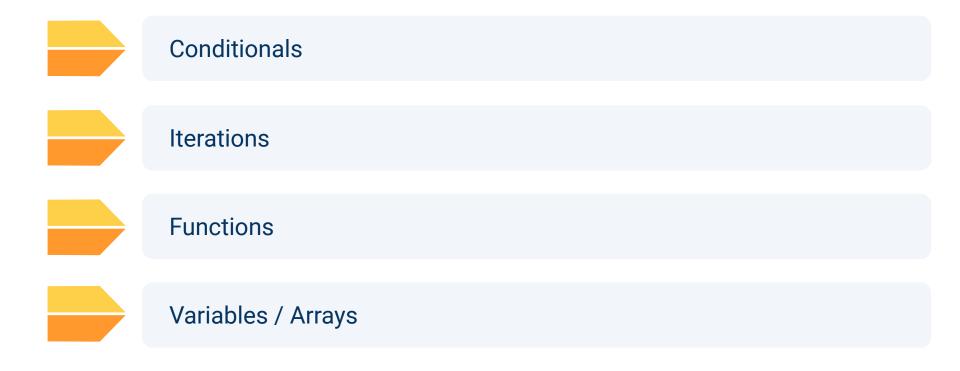
In a way, using Excel has introduced you to a sort of proto-programming. When writing scripts in VBA, you will rely on functions (methods) that do something to or with arguments.



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# **Fundamental Tools of Programming**

These structures are found in nearly all programming languages:



How a Computer Thinks (Procedurally)

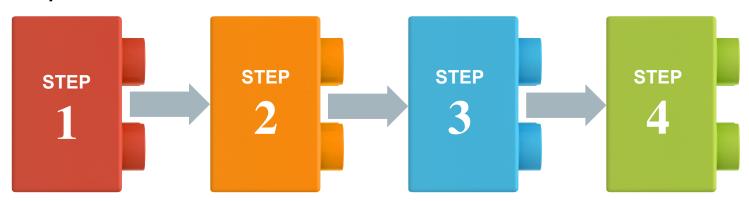
Every problem in software development begins with a complex and abstract real-world need.



# 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**



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

# To Make a Sandwich



#### To Make a Sandwich

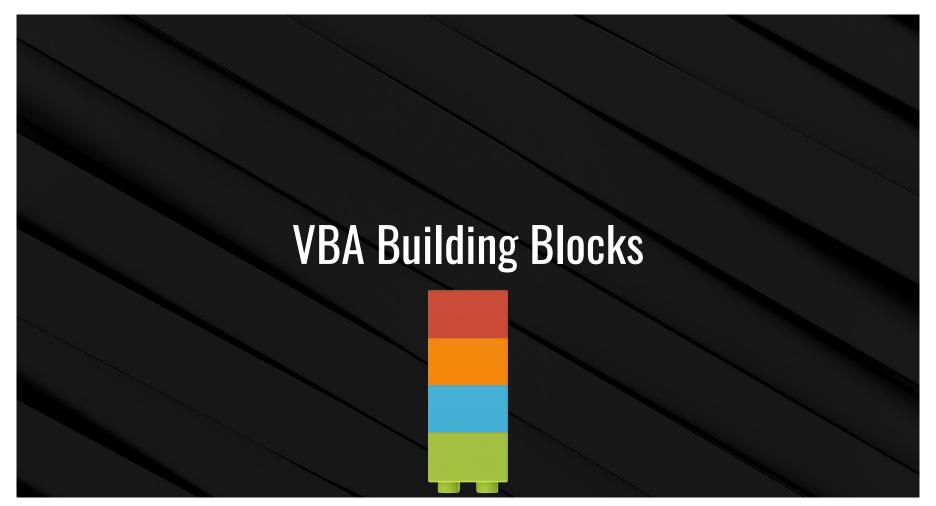
#### Logical Procedure:

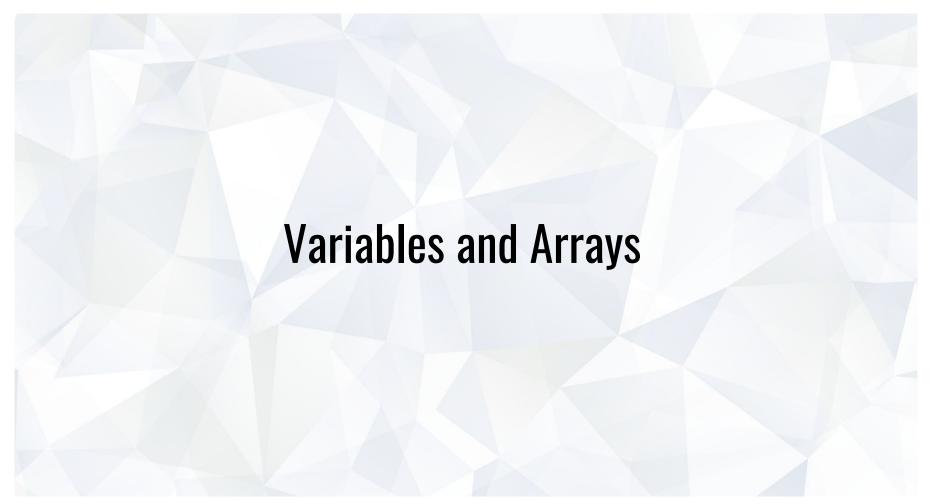
- Get bread, peanut butter, and jelly from pantry.
- Lay out bread on table.
- Open jars of peanut butter and jelly.
- O4 Get spreading knife.
- Use knife to spread peanut butter.
- Use knife to spread jelly.
- O7 Combine bread to create sandwich.

# 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

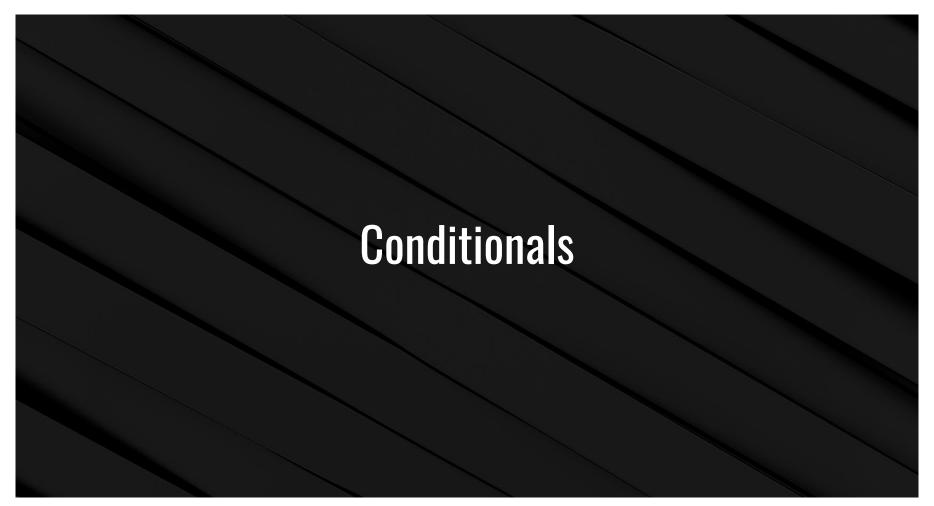
#### **Variable Assignment**

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

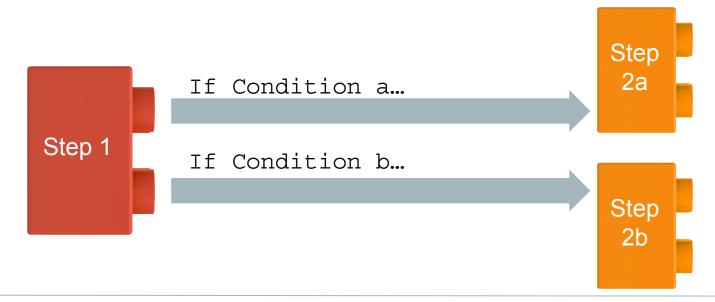


## **Conditionals: If This, Then That**



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

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



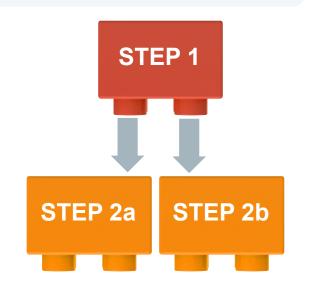
#### **Conditionals: If This, Then That**



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
   spreadMore()
End if
```





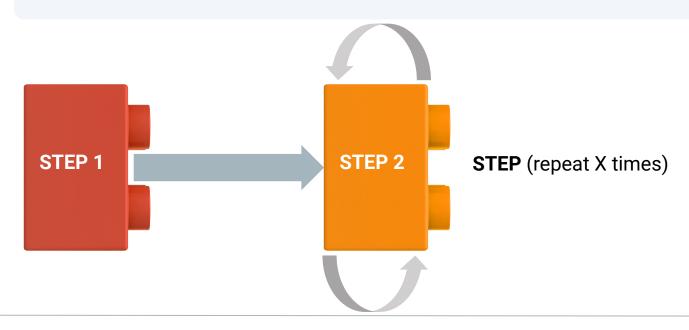
#### Iteration: Round and Round We Go!



**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.



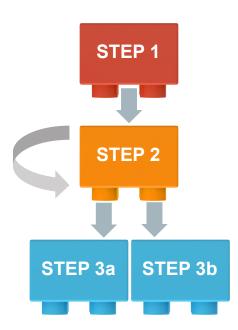
#### Iteration: Round and Round We Go!

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!

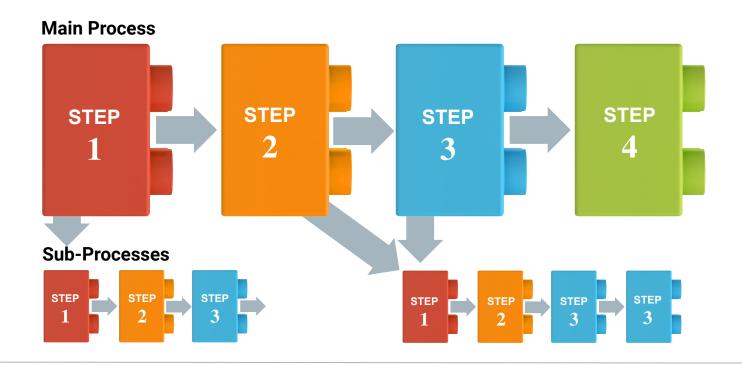
```
' Get Ingredients
     dim ing1, ing2, ing3 as String
     ing1 = "Peanut Butter"
     ing2 = "Jelly"
     ing3 = "Bread"
      ' Repeat the spreading process a max of 5 times
     for i = 1 to 5
10
          ' Each time, check that you haven't spread too much.
11
         if pbThickness >= 1.0 then
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.



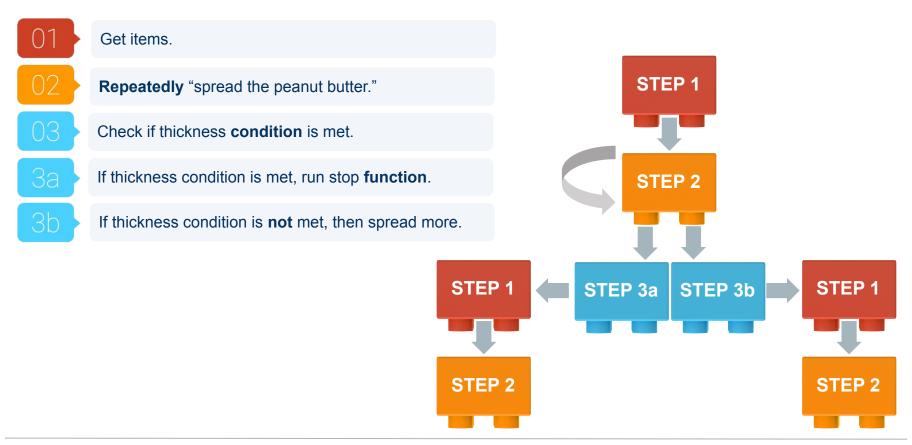


#### To Make a Sandwich

#### Logical Procedure:

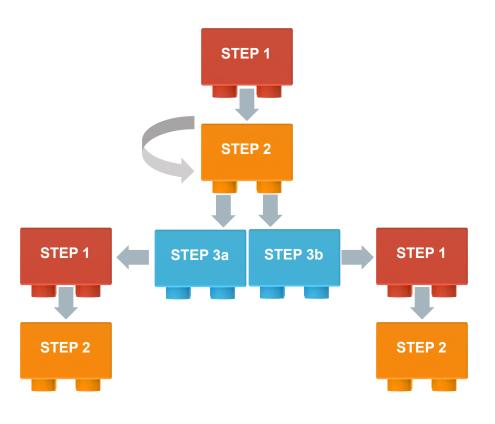
Get bread, peanut butter, and jelly from pantry. Lay out bread on table. 03 Open jars of peanut butter and jelly. 04 Get spreading knife. Use knife to spread peanut butter. ()5Use knife to spread jelly. 06 Combine bread to create sandwich.

# 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



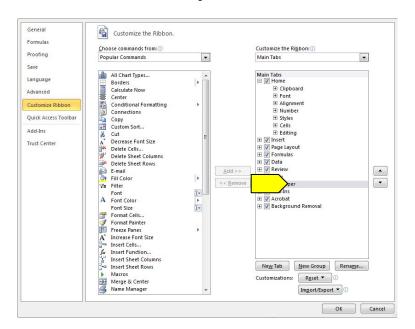


### Add Developer Tools: Windows

01 Go to File > Excel Options.

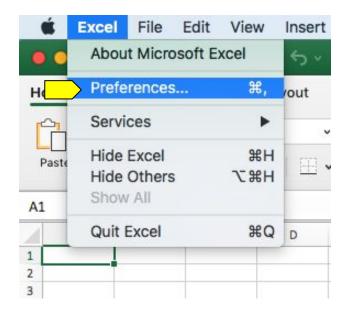


Then go to **Customize Ribbon**, choose **Main Tabs** in the right pane, and make sure **Developer** is checked.



### Add Developer Tools: Mac

01 Go to Excel > Preferences.



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

