CODE EXERCISES

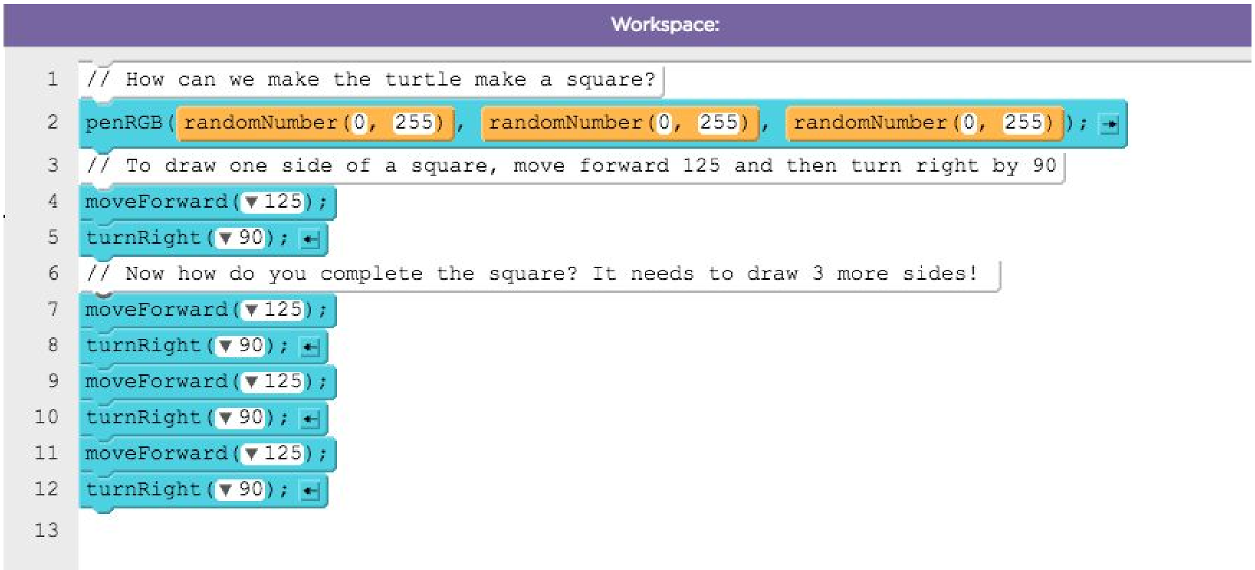
Learning how to code in App Lab can be difficult for facilitators & participants. “Using Variables” is a sample code exercise built in App Lab. It has both Student Code and Teacher Code. The Teacher Code has the completed code or the optimal code to draw a square. The Student Code has pieces missing. This is an example exercise to show how you can break down coding tasks into small activities to lead participants through App Lab.

Using Variables

This activity walks students through a simple program that will make App Lab draw a square with a line of code.

Answer: (Teacher Code)

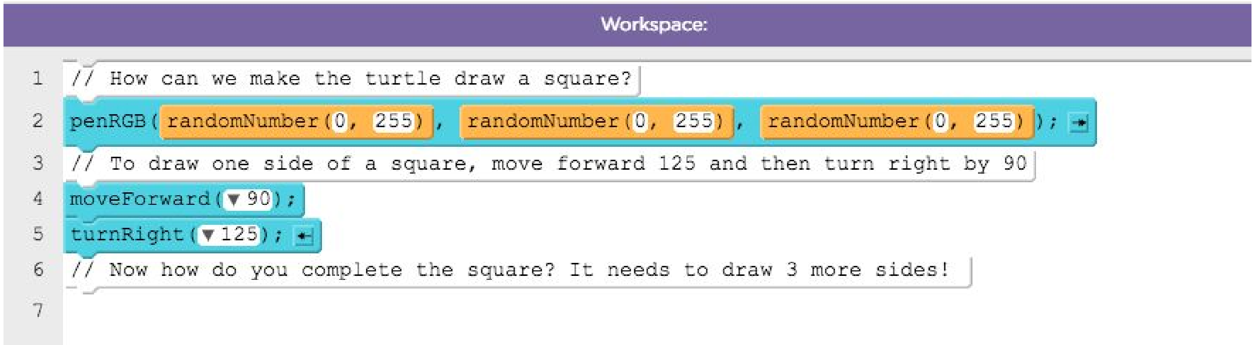
https://studio.code.org/projects/applab/CfjPLkAM7hdw1ybuHz-5wA



```
// How can we make the turtle make a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// To draw one side of a square, move forward 125 and then turn right by 90
moveForward(125);
turnRight(90);
// Now how do you complete the square? It needs to draw 3 more sides!
moveForward(125);
turnRight(90);
moveForward(125);
turnRight(90);
moveForward(125);
turnRight(90);
```

Activity script:

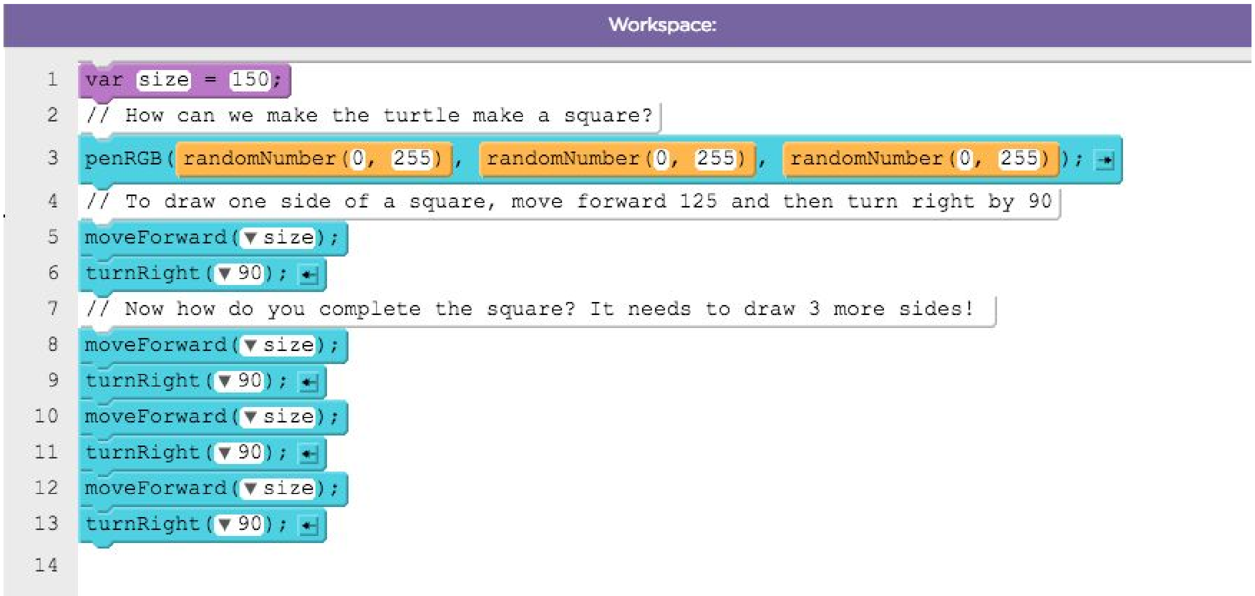
“How can we make the turtle draw a square?” (Student Code): https://studio.code.org/projects/applab/XPpVcL0nffsCMsEyBffqaA)



```
// How can we make the turtle draw a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// To draw one side of a square, move forward 125 and then turn right by 90
moveForward(90);
turnRight(125);
// Now how do you complete the square? It needs to draw 3 more sides!
```

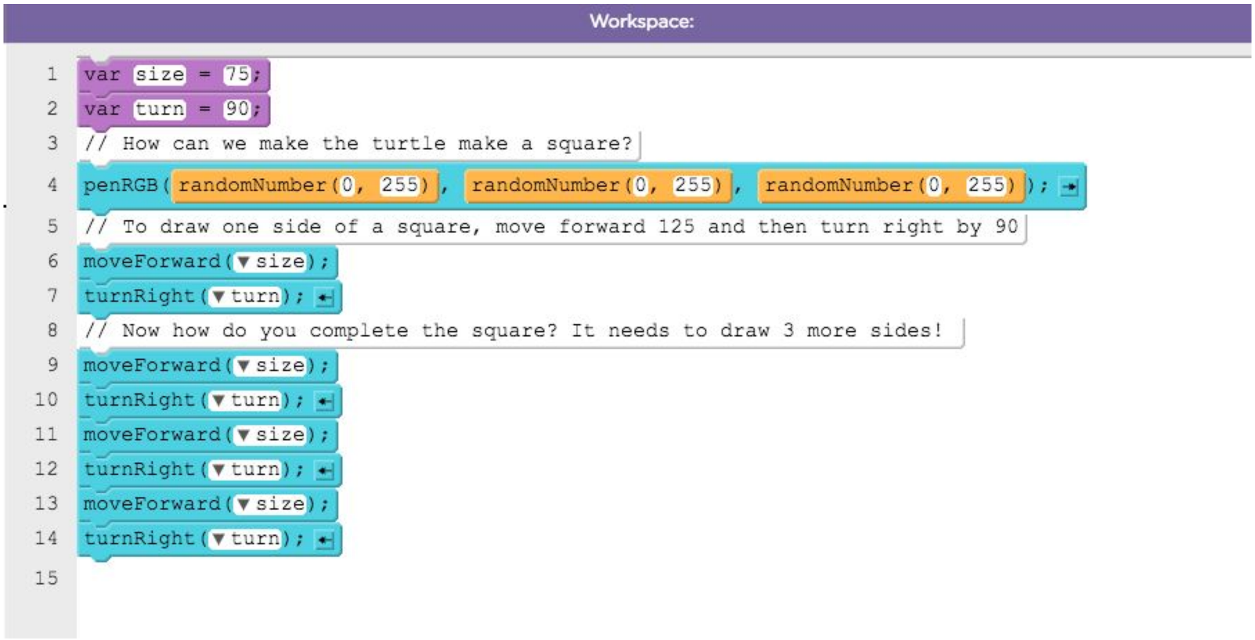
“Now what happens when you want to change the **size** of the square? We need to change how much we move forward. Let’s make the square bigger?” (Change **size** to 150 or some other value)

“Every time we want to change the square, we have to make that change in 4 places. To make this easier, we use “variables”. Variables are things that change. We are going to create a variable called “**size**” at the top of the code and set it to 150. Then replace all moveForward values with your **size** variable.”



```
var size = 150;
// How can we make the turtle make a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// To draw one side of a square, move forward 125 and then turn right by 90
moveForward(size);
turnRight(90);
// Now how do you complete the square? It needs to draw 3 more sides!
moveForward(size);
turnRight(90);
moveForward(size);
turnRight(90);
moveForward(size);
turnRight(90);
```

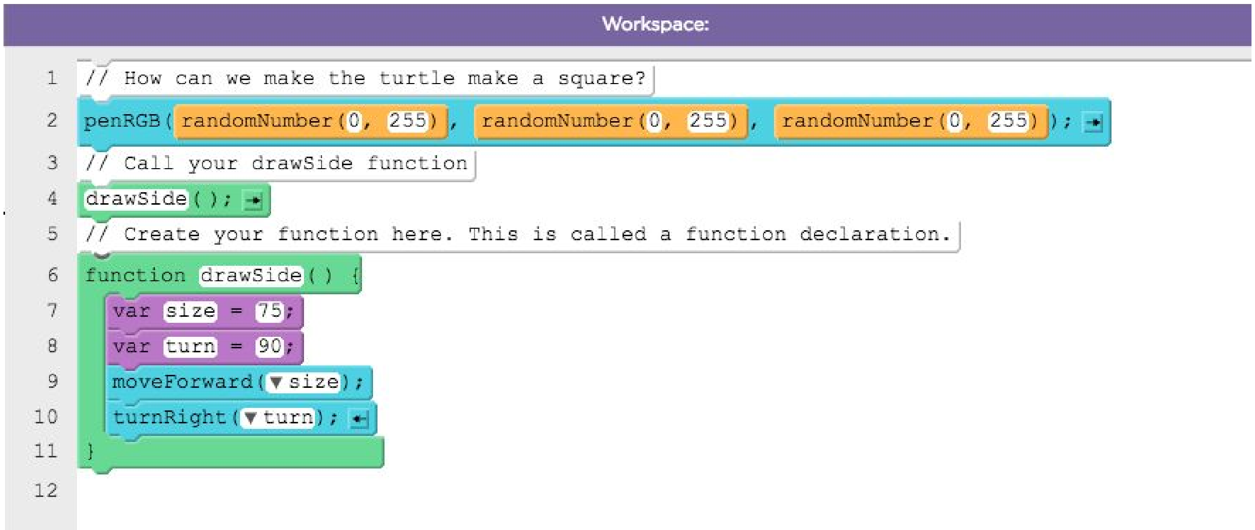
“Now let’s make the square smaller. How do we do this? We only need to change the value of **size** in one place, and then it changes everywhere! Change **size** to 75. Do you see any other value that you can make a variable for? That’s right - **turn**. We can make a variable for how much we need to **turn** each time. Create your **turn** variable and set its value to 90. Replace all **turn**Right values with your **turn** variable.”



```
var size = 75;
var turn = 90;
// How can we make the turtle make a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// To draw one side of a square, move forward 125 and then turn right by 90
moveForward(size);
turnRight(turn);
// Now how do you complete the square? It needs to draw 3 more sides!
moveForward(size);
turnRight(turn);
moveForward(size);
turnRight(turn);
moveForward(size);
turnRight(turn);
```

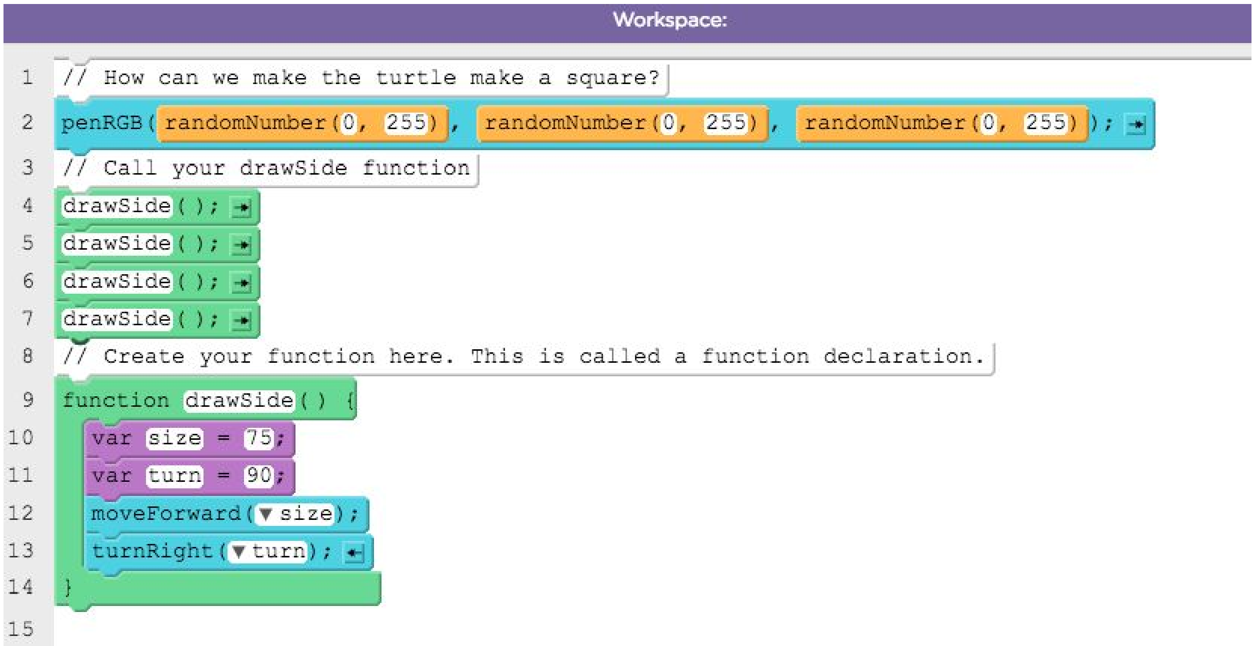
Making Functions

"Is there anything in our code that gets repeated a lot of times? We make functions to remove the repeating lines of code where we can. Create a function called **drawSide** and put your moveForward and turnRight code inside it. Don't forget to add your variables in your function too! Call your function (line 4) above the function declaration (lines 5-10)."



```
1   // How can we make the turtle make a square?
2   penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
3   // Call your drawSide function
4   drawSide();
5   // Create your function here. This is called a function declaration.
6   function drawSide() {
7     var size = 75;
8     var turn = 90;
9     moveForward(size);
10    turnRight(turn);
11  }
12
```

"Complete the square by calling your function 3 more times."



```
// How can we make the turtle make a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// Call your drawSide function
drawSide();
drawSide();
drawSide();
drawSide();
// Create your function here. This is called a function declaration.
function drawSide() {
  var size = 75;
  var turn = 90;
  moveForward(size);
  turnRight(turn);
}
```

Note: Add functions with parameters to this

Student: https://studio.code.org/projects/applab/-kI7xpMa__xbVi753KQXiw

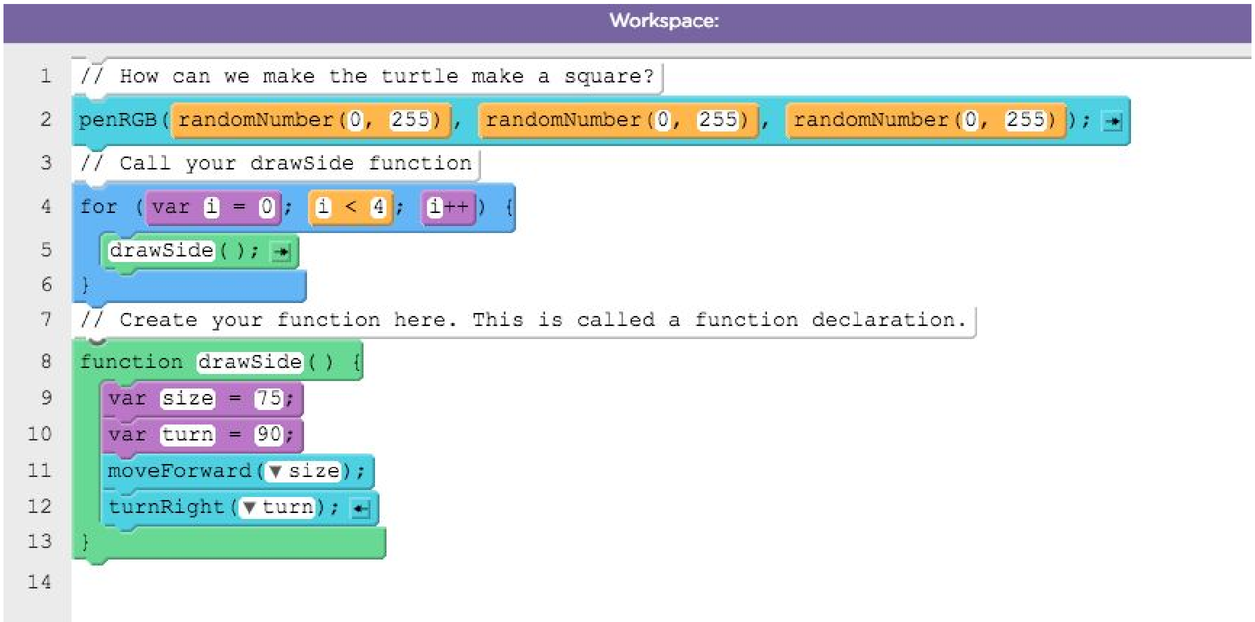
Teacher: https://studio.code.org/projects/applab/zPJUVF98frQzsuUR8ljWDA

Using Loops

Even though we used variables and wrote a function, we still have things that repeat a lot! We call our **drawSide** function 4 times in order to draw our square. We can clean this up even more by using a loop. There are 2 kinds of loops in App Lab.

For Loops

For loops, **loop** (repeat things) **FOR a certain number of times**. If we wanted to draw a square, we can use a for loop to call our drawSide function **4 times**.



```
// How can we make the turtle make a square?
penRGB(randomNumber(0, 255), randomNumber(0, 255), randomNumber(0, 255));
// Call your drawSide function
for (var i = 0; i < 4; i++) {
  drawSide();
}
// Create your function here. This is called a function declaration.
function drawSide() {
  var size = 75;
  var turn = 90;
  moveForward(size);
  turnRight(turn);
}
```

Student: https://studio.code.org/projects/applab/cuhzCxkhsvG5UrRlhl0orQ

Teacher: https://studio.code.org/projects/applab/E6zDo2bg1KU0FxTRHmxa3w

Draw Multiple squares 1:
https://studio.code.org/projects/applab/rl7EG4Trii-R_mMPVUaGmg

Draw Multiple Squares 2:
https://studio.code.org/projects/applab/3_3_dQc1GPHF3lTZOkixzA

Other Modular Lesson Ideas:

If you use the examples above as models, try the following lesson ideas and build your own coding exercises.

- (Functions) Functions with Parameters
- (Math) Math functions (important for conditional logic and randomization)
- (Variables) Using List variables
- (Variables) Using console.log() to debug your code (which could be a bigger module on debugging code with errors in it)
- (Control) Using Intervals
- (Data) Saving your user data into a database

RELATED CODE CONCEPTS

Using the model above, you can create more code exercises using the below concepts. Some coding concepts overlap, but include more or less challenging courses depending on the pace of the participant.

Framing for slower-paced participants

- (Variables) Basics
- (Functions) Functions without Parameters
  - https://studio.code.org/s/course3/stage/6/puzzle/1
- (Loops) For Loops
  - http://studio.code.org/s/course2/stage/8/puzzle/1
- (Functions) Functions with Parameters
- (Math) Math functions (important for conditional logic and randomization)
- (Variables) Using List variables
- (Variables) Using console.log() to debug your code (which could be a bigger module on debugging code with errors in it)
- (Loops) While Loops
- (Loops) Nested Loops
  - https://studio.code.org/s/course2/stage/19/puzzle/1
- (Control) Using Intervals
- (Data) Saving your user data into a database

Framing for faster-paced participants

- (Variables) Basics

  - http://studio.code.org/s/course4/stage/19/puzzle/1
- (Functions) Functions without Parameters
- (Loops) For Loops
  - http://studio.code.org/s/course4/stage/9/puzzle/1
  - http://studio.code.org/s/course4/stage/20/puzzle/1
- (Functions) Functions with Parameters
  - http://studio.code.org/s/course4/stage/16/puzzle/1
  - http://studio.code.org/s/course4/stage/21/puzzle/1
- (Math) Math functions (important for conditional logic and randomization)
- (Variables) Using List variables
- (Variables) Using console.log() to debug your code (which could be a bigger module on debugging code with errors in it)
- (Loops) While Loops
- (Loops) Nested Loops
  - http://studio.code.org/s/course3/stage/13/puzzle/1
- (Control) Using Intervals
- (Data) Saving your user data into a database