Turtles, Color, and Shapes (Continued)

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Outline

Code Website

All code presented in this talk is posted at this website.

`https://github.com/jcchurch/PythonUCode2/`

Adults: Go to this site for providing assistance.

What can we do with a computer?

What can you do with a computer?

- Watch movies
- Play games
- Write stories
- Make art
- Video calls with family
- Browse the Internet
- Do your homework!

Computers

Two key parts of a computer.

- Hardware (You can touch hardware.)
- Software (It's inside the hardware.)
  - Programmers write software using a computer language.
  - Computers can only do what they are told.

Our First Python Program

```
name = input('What is your name?   ')
print('Hi, ', name)
```

How do you brush your teeth?

How do you brush your teeth?

How do you brush your teeth?

How do you brush your teeth?

- I get my toothbrush.
- I get my toothpaste.
- I squeeze the toothpaste onto the toothbrush.
- I put the toothpaste away.
- I brush my teeth for 30 seconds.
- I turn on the water.
- I wash my toothbrush under the water.
- I push my toothbrush away.
- I get my cup.
- I fill my cup with water.
- I turn off the water.
- I rinse my mouth out with water.
- I put my cup away.

Brush Your Teeth

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- Who knew that brushing your teeth would be so complicated?
- Some tasks require lots of little steps.
- But your parents just say, "Brush your teeth."
- In programming, a named sequence of actions is called a **function**.

Our First Function

In Python, functions between with **def** and then a name, and then parentheses, and then a colon. After that, you type the steps to complete that name's task. Indent each line in the function with four spaces.

```
def sayHi():
    name = input('What is your name?   ')
    print('Hi, ', name)

sayHi()
sayHi()
```

Let's write this program in Python and save it as **sayhi.py**.

Running This Program

When you run this program, you will be asked for two names.

```
What is your name?   James
Hi,  James
What is your name?   Michelle
Hi,  Michelle
```

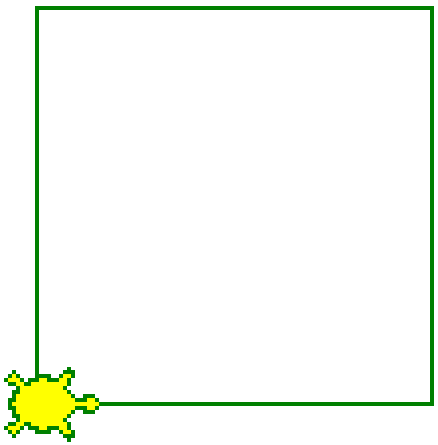
Turtles

Drawing with Turtles: ucodeshapes.py

```
import turtle

def drawSquare(t):
    t.down()
    t.forward(100)
    t.left(90)

window = turtle.Screen()

t = turtle.Turtle()
t.shape('turtle')
t.color('green', 'yellow')

drawSquare(t)

window.mainloop()
```

Drawing the Square

- We want to create a function which draws a square.
- A square has 4 sides and 4 corners.
- Finish writing the function **drawSquare**.



Drawing the Square

My solution

```
def drawSquare(t):
    t.down()
    t.forward(100)
    t.left(90)
    t.forward(100)
    t.left(90)
    t.forward(100)
    t.left(90)
    t.forward(100)
    t.left(90)
```

Save and run your code to make sure that it still works.

What is a parameter?

- A parameter is used to customize a function.
- def drawSquare(t):
- In our example, the parameter is **t**.
- We can call our function with any turtle to draw a square.

Drawing the Square

The size of our square is always 100 units. This too can be customized.

```
def drawSquare(t, size):
    t.down()
    t.forward(size)
    t.left(90)
    t.forward(size)
    t.left(90)
    t.forward(size)
    t.left(90)
    t.forward(size)
    t.left(90)
```

We need to fix drawSquare now.

- Our function now has two parameters, so our function call must have two parameters.
- Change **drawSquare(t)** to **drawSquare(t, 100)**
- Change **drawSquare(t, 100)** to **drawSquare(t, 50)** and see what happens.
- Change **drawSquare(t, 100)** to **drawSquare(t, 200)** and see what happens.

Save and run your code to make sure that it still works.

Making More Turtles

Can we use a function to make more turtles? Yes!
Change this:

```
t = turtle.Turtle()
t.shape('turtle')
t.color('green', 'yellow')
```

To this:

```
def makeTurtle(color1, color2):
    t = turtle.Turtle()
    t.shape('turtle')
    t.color(color1, color2)
    return t

t = makeTurtle('green', 'yellow')
```

Two Turtles!

return is how we tell a function to give back a turtle when the function ends.
We can make a new red turtle on the line after we make a green turtle:

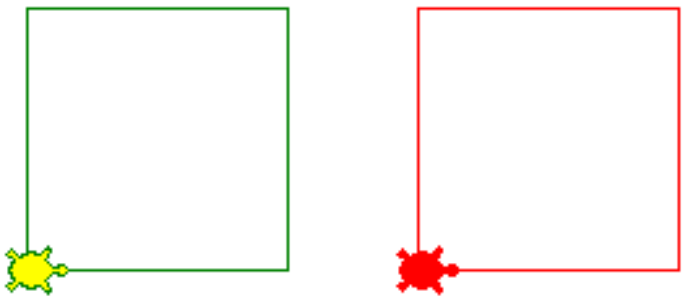
```
r = makeTurtle('red', 'red')
```

Save and run your code to make sure that it still works.

t gets a square. r gets a square.

Use your **drawSquare** function to let r draw a square.

```
r.up()
r.forward(150)
drawSquare(r, 100)
```



Save and run your code to make sure that it still works.

Multiple Squares

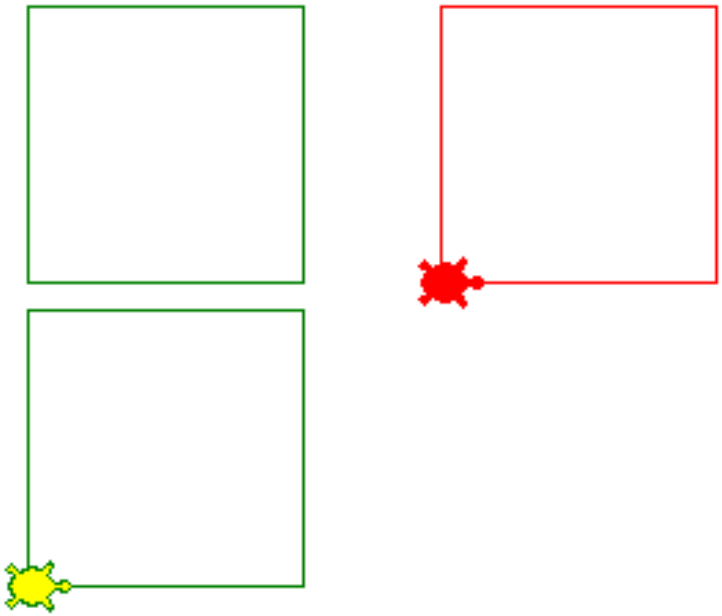
Under the line of code **drawSquare(t, 100)**, add these lines:

```
t.right(90)
t.forward(110)
t.left(90)
drawSquare(t, 100)
```

Save and run your code to make sure that it still works.

Three Squares

Your green and yellow turtle should have drawn a third square.



Play Time

- Everyone has two turtles.
- Turtles can draw squares of any size
- Let's spend about 30 minutes making art using our turtles!
- Feel free to make more turtles!
- Remember: t.up() raises the tail. t.down() lowers the tail.
- t.forward(100) moves forward 100 units
- t.left(90) turns left 90 degrees
- t.right(90) turns right 90 degrees

(End of Part 1.)

Turtle Races

- Did you know that turtles like to race?
- We can write a program to help them race.

turtlerace.py

Make a new file called **turtlerace.py** and start the program like this:

```
import turtle
import random

window = turtle.Screen()

def makeTurtle(color1, color2):
    t = turtle.Turtle()
    t.shape('turtle')
    t.color(color1, color2)
    return t

def move(t, x, y):
    t.up()
    t.goto(x, y)
```

windForward

Turtles race by moving randomly across the screen.

```
def windForward(t):
    t.down()
    t.left(90)
    t.forward(random.randrange(100))
    t.right(90)
    t.forward(random.randrange(200))
    t.right(90)
    t.forward(random.randrange(100))
    t.left(90)
    t.forward(random.randrange(200))
```

Create and Position the Turtles

This creates four turtles named r, l, m, and d. Their colors are red, blue, orange, and purple.

```
r = makeTurtle('red', 'red')
l = makeTurtle('blue', 'blue')
m = makeTurtle('orange', 'orange')
d = makeTurtle('purple', 'purple')
```

Next, move them into position.

```
move(r, -300, -300)
move(l, -300, -100)
move(m, -300, 100)
move(d, -300, 300)
```

We race!

This is a **loop**. What we are saying in this loop is "Do this 4 times: windForward r, l, m, and d".

```
for i in range(4):
    windForward(r)
    windForward(l)
    windForward(m)
    windForward(d)

window.mainloop()
```

Save and run your code to make sure that it still works. Turtles should be racing across your screen!