Turtles, Color, and Shapes

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Outline

Code Website

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

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

Adults: Go to this site for providing assistance.

What can you do with a computer?

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- Watch movies
- Play games
- Write stories
- Make art
- Browse the Internet

What can you do with a computer?

What can you do with a computer?

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

Computers

Two key parts of a computer.

- Hardware (You can touch hardware.)
- Software (It's inside the hardware.)

Software

- Programmers write software using a computer language.
- Computers can only do what they are told.

Why learn to code?

- Coding is fun!
- Coding is a valuable job skill.

Python

Look at these commands. What do you think they do? Using Python, try the following commands.

- 2 + 2
- 7 + 3
- 7 - 3
- print('hello')
- print('goodbye')

Let's write our first program!
To create a new program, click **File** and **New File**.

Our First Python Program

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

- To save a file, click **File** and **Save**. Save this program as **YourName2.py**. (If your name is Sarah, save this as **Sarah2.py**)
- To run your program, click **Run** and **Run Module**.

Change Your Program

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

- To save a file, click **File** and **Save**. Save this program as **YourName2.py**. (If your name is Sarah, save this as **Sarah2.py**)
- To run your program, click **Run** and **Run Module**.

Change Your Program

Let's change our program!

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

- To save a file, click **File** and **Save**. Save this program as **YourName3.py**. (If your name is Sarah, save this as **Sarah3.py**)
- To run your program, click **Run** and **Run Module**.

MadLibs

```
person = input('A person: ')
noun = input('A noun: ')
verb = input('A verb: ')
print('One day,',person,'went to a party.')
print('A big mean',noun,'stood in their way.')
print('So',person,'did a',verb,'and as able to get past!')
```

Save this program as **MadLib.py**. Run it.

Turtles

Turtle Art

- Turtles like to make art with their tail.
- When their tail is down, they draw.
- When their tail is up, the don't draw.

Turtle Art

- Turtles move forward.
- Turtles turn left.
- Turtles turn right.

Drawing with Turtles

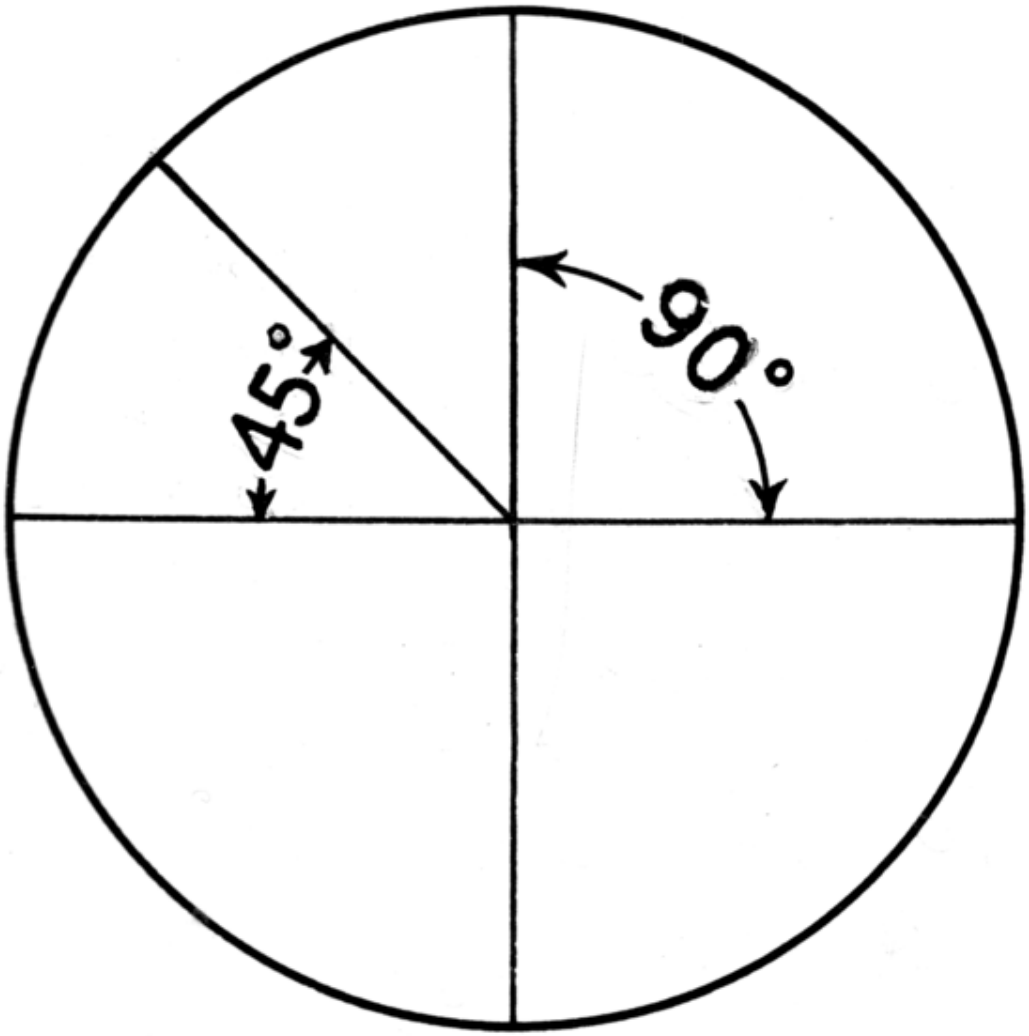
```
import turtle

window = turtle.Screen()

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

t.down()
t.forward(100)

window.mainloop()
```

Save this program as **MyTurtle1.py**. Run it.

Turning

- We want to draw a square.
- The turtle must turn.
- Turtles turn using degrees.
- A corner turn is 90 degrees.

Degrees



Drawing with Turtles

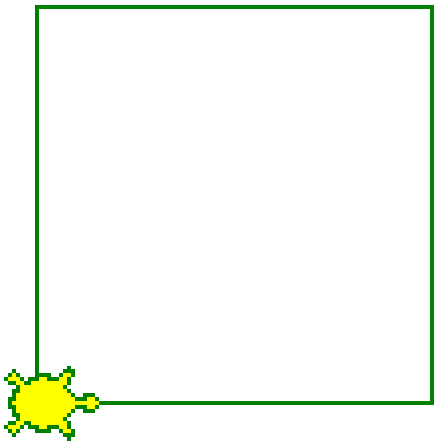
Find the line in your code that says **t.forward(100)**. Add two lines after that line:

```
t.left(90)
t.forward(100)
```

Save this program as **MyTurtle1.py**. Run it.

Drawing the Square

A square has 4 sides and 4 corners. How do we finish this program in order to make a square? Think-Write-Test-Repeat.



Once you've solved the problem, save this program as **MyTurtle1.py**. Run it.

Drawing the Square

My solution

```
t.down()
t.left(90)
t.forward(100)
t.left(90)
t.forward(100)
t.left(90)
t.forward(100)
t.left(90)
t.forward(100)
```

Save this program as **MyTurtle1.py**. Run it.

Triangles

Can we do triangles? Yes! It requires some math.

- There are three sides to a triangle.
- There are three corners to a triangle.
- In order to turn inward, we have to turn 90 degrees plus another 30 degrees.
- What is $90 + 30$?

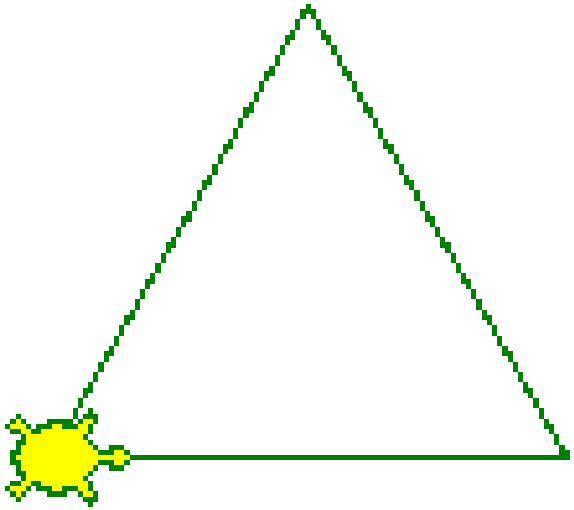
Drawing a Triangle

Make your program look like this again. Save this as **MyTurtle2.py**.

```
import turtle

window = turtle.Screen()

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

t.down()
t.forward(100)

window.mainloop()
```

Drawing with Turtles

A triangle has 3 sides and 3 corners. How do we finish this program in order to make a triangle?



Once you've solved the problem, save this program as **MyTurtle2.py**. Run it.

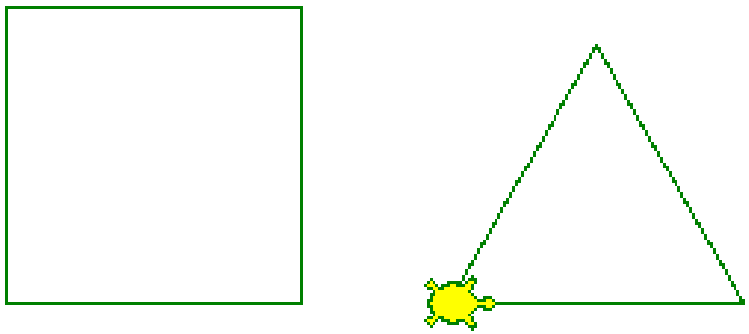
Drawing a Triangle

My solution

```
t.down()
t.forward(100)
t.left(120)
t.forward(100)
t.left(120)
t.forward(100)
t.left(120)
```

Drawing a Square and a Triangle

Challenge: Draw a square and a triangle in the same program.



To do this, you'll need to draw the square, lift the turtle's tail using **t.up()**, move forward a distance of 150 units, then draw the triangle. Once you've solved the problem, save this program as **MyTurtle3.py**. Run it.

Draw Your Initial

Let's spend some time playing with our turtles.

- Challenge: write your first initial using your turtle.
- My first initial is J. I'm going to make my turtle draw a J.
- Advice: This is going to be difficult. Think-Write-Test-Repeat
  - Think about the turtle's next move.
  - Write that move.
  - Test your program. Did it make the move you wanted?
  - Repeat until finished.

Colors and Shapes

This next phase will be extra challenging for our younger participants. Our youngest should continue working with turtles.

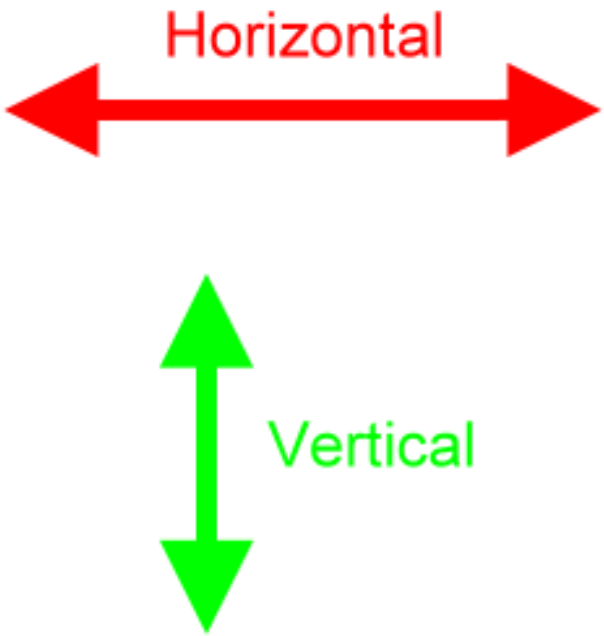
Colors and Shapes

For our next part, we need to download a file to our programming folder.

`http://bit.ly/PythonShapes`

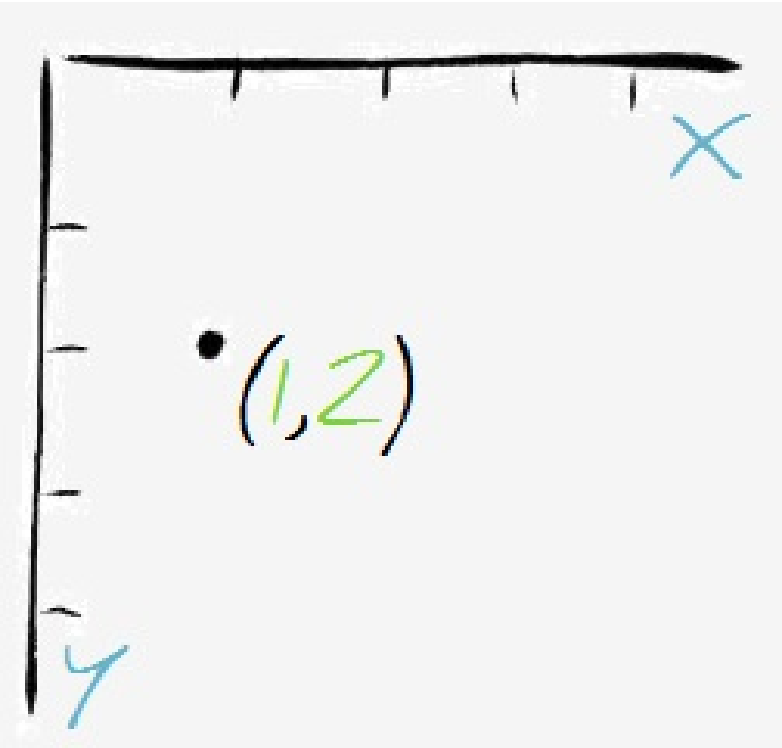
Adults: I need your help downloading this file to everyone's computer. This file is called **shapes.py** on the code website.

Horizontal and Vertical



The Coordinate Plane

- Everything on a window is at a coordinate.
- A coordinate is a pair of numbers representing the horizontal distance and the vertical distance from the origin.
- The top-left coordinate is called the origin. It's code is (0,0).
- Every pixel is at a different coordinate. Horizontal first, vertical second.

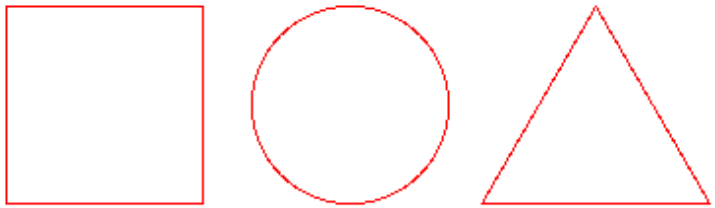


Our First Shapes

```
from shapes import *

window = createCanvas(600, 600)

drawRectangle(window, 25, 50, 125, 150, 'red')
drawCircle(window, 200, 100, 50, 'red')
drawTriangle(window, 325, 50, 100, 'red')

mainloop()
```

Save this program as **MyShapes1.py**. Run it.

Output of MyShapes1.py



Our First Shape: Rectangles

```
drawRectangle(window, 25, 50, 125, 150, 'red')
```

- 25: left horizontal
- 50: top vertical
- 125: right horizontal
- 150: bottom vertical

There are two coordinates here: (25,50) and (125, 150). The computer can use these two coordinates to draw a shape.

Our First Shape: Circles

```
drawCircle(window, 200, 100, 50, 'red')
```

- 200: center horizontal
- 100: center vertical
- 50: radius

There is one coordinate: (200,100). The '50' is the size.

Our First Shape: Triangle

```
drawTriangle(window, 325, 50, 100, 'red')
```

- 325: top corner horizontal
- 50: top corner vertical
- 100: the height

There is one coordinate: (325,50). The 100 is the height!

Filled Shapes

```
from shapes import *

window = createCanvas(600, 600)

drawFilledRectangle(window, 25, 50, 125, 150, 'red')
drawFilledCircle(window, 200, 100, 50, 'red')
drawFilledTriangle(window, 325, 50, 100, 'red')

mainloop()
```

Save this program as **MyShapes2.py**. Run it.

Output of MyShapes2.py

Filled Shapes and Colors

```
from shapes import *

window = createCanvas(600, 600)

drawFilledRectangle(window, 25, 50, 125, 150, 'orange')
drawFilledCircle(window, 200, 100, 50, 'blue')
drawFilledTriangle(window, 325, 50, 100, 'green')

mainloop()
```

Save this program as **MyShapes3.py**. Run it.

Output of MyShapes3.py

We can use these colors for our shapes: 'brown', 'white', 'black', 'red', 'green', 'blue', 'cyan', 'yellow', 'orange', and 'magenta'.
For some colors, you can add 'light' in front of a color, such as 'lightblue'.

Play Time!

For the rest of our UCode Session, we will play with the colors and shapes. Try making a picture of your house using rectangles, circles, and triangles.