

Turtles, Color, and Shapes

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Outline

- 1 Code Website
- 2 Python
- 3 Turtles
- 4 Colors and Shapes

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

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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.)

- 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.

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')`

Python Programming

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?  ')\nprint('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?  ')\nprint('Hi, ', name)\nprint('Hi, ', name)\nprint('Hi, ', name)\nprint('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?  ')\nprint('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**.

```
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, they 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)

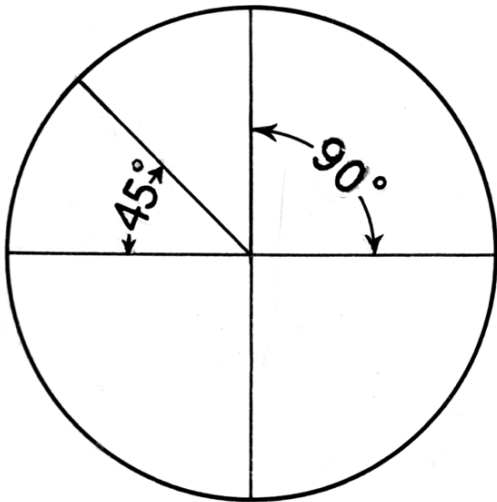
window.mainloop()
```

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

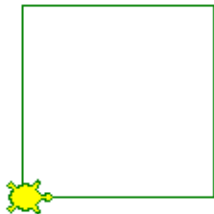
Find the line in your code that says **t.forward(100)**. Add two lines after that line:

```
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()

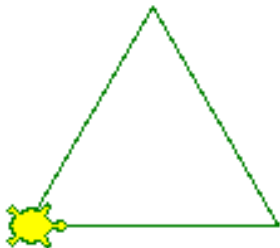
t = turtle.Turtle()
t.shape('turtle')
t.color('green', 'yellow')

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.

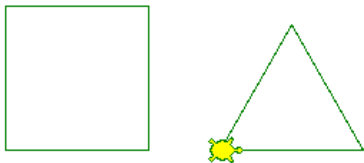
Drawing a Triangle

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.

Draw Your Initial

- 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.
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 - Test your program. Did it make the move you wanted?
 - Repeat until finished.

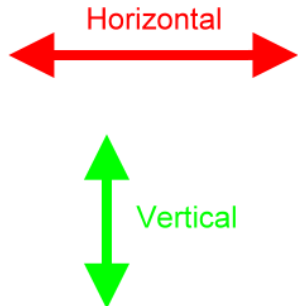
Colors and Shapes

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.

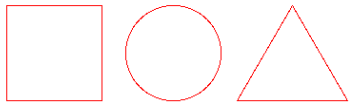


Our First Shapes

```
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.

