**Outline**

Develop a better understanding of procedural sequencing by solving shape drawing challenges using the turtle environment.

**Objectives**

* Use correct terminology to describe programming concepts;
* Describe the types of data that computers can process and store (e.g., numbers, text);
* Explain the difference between constants and variables used in programming;
* Use variables, expressions, and assignment statements to store and manipulate numbers and text in a program

**Materials**

* Python Turtle Development Environment at: https://repl.it/
* PythonWorksheetII form the GitHub Repository
* Web links identified in the questions below

**Level 1: Drawing Basic Shapes With Python Turtle**

1. Open the document PythonWorksheetII from the class GItHub repository. Read over “Part III” at the end of the PythonWorksheetII document.
2. Create a new Repl by selecting the “Python with Turtle” language / environment.
3. Begin all of your turtle programs with the following code to create a “pen”:

import turtle

myPen = turtle.Turtle()

1. Create a program to draw a red circle.
   1. Demonstrate your program to Mr. Nestor
   2. Provide a listing of your program code below:

import turtle

turtle.pencolor('red')

turtle.circle(125)

1. Create a program to draw any three of the shapes described in “Part III” of   
   the PythonWorksheetII document.
   1. Demonstrate your programs to Mr. Nestor
   2. Provide a listing of your program code below:

Shape a) square

import turtle

myPen = turtle.Turtle()

for i in range(4):

myPen.forward(90)

myPen.right(90)

shape b) cross

import turtle

myPen = turtle.Turtle()

myPen.forward(30)

myPen.left(90)

myPen.forward(100)

myPen.right(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(30)

myPen.left(90)

myPen.forward(100)

myPen.right(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(30)

myPen.left(90)

myPen.forward(100)

myPen.right(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(30)

myPen.left(90)

myPen.forward(100)

myPen.right(90)

myPen.forward(100)

shape c) square with circle

import turtle

myPen = turtle.Turtle()

myPen.circle(150)

myPen.up()

myPen.down()

for i in range(4):

myPen.forward(150)

myPen.left(90)

myPen.forward(150)

**Level 2: Filled Shapes & Spirals**

1. Review the sample code for creating filled shapes at:   
   <http://www.pythoncode.co.uk/turtle-challenge-3>.
2. import turtle
3. myPen = turtle.Turtle()
4. myPen.forward(100)
5. myPen.left(60)
6. myPen.forward(100)
7. myPen.left(60)
8. myPen.forward(100)
9. myPen.left(60)
10. myPen.forward(100)
11. myPen.left(60)
12. myPen.forward(100)
13. myPen.left(60)

myPen.forward(100)

1. Complete the challenge described at: <http://www.pythoncode.co.uk/turtle-challenge-4>
   1. Demonstrate your programs to Mr. Nestor
   2. Provide a listing of your program code below:

import turtle

myPen = turtle.Turtle()

turtle.pencolor('red')

turtle.begin\_fill()

for i in range(4):

turtle.fd(90)

turtle.rt(90)

turtle.end\_fill()

1. Review the sample code for creating filled shapes at:   
   <http://www.pythoncode.co.uk/turtle-challenge-5>

import turtle

myPen = turtle.Turtle()

myPen.circle(50)

myPen.forward(10)

myPen.circle(50)

myPen.forward(10)

myPen.circle(50)

myPen.forward(10)

myPen.circle(50)

myPen.forward(10)

myPen.circle(50)

myPen.forward(10)

1. Complete the challenge described at: <http://www.pythoncode.co.uk/turtle-challenge-6>
   1. Demonstrate your programs to Mr. Nestor
   2. Provide a listing of your program code below:

import turtle

myPen = turtle.Turtle()

myPen.circle(50)

myPen.forward(10)

myPen.right(20)

copy and paste this code 15-20 times for full spiral

**Level 3: Four Quadrant Cross Challenge**

1. Complete the challenge described at: <http://www.101computing.net/python-turtle-challenge/>
2. Demonstrate your programs to Mr. Nestor
3. Provide a listing of your program code below:

myPen.color("red")

myPen.delay(5) #Set the speed of the turtle

for i in range(0,11):

yFrom=10-i

xTo=i

myPen.penup()

myPen.goto(0,20\*yFrom)

myPen.pendown()

myPen.goto(20\*xTo,0)

for i in range(0,11):

yFrom=10-i

xTo=i

myPen.penup()

myPen.goto(0,-20\*yFrom)

myPen.pendown()

myPen.goto(20\*xTo,0)

for i in range(0,11):

yFrom=10-i

xTo=i

myPen.penup()

myPen.goto(0,20\*yFrom)

myPen.pendown()

myPen.goto(-20\*xTo,0)

for i in range(0,11):

yFrom=10-i

xTo=i

myPen.penup()

myPen.goto(0,-20\*yFrom)

myPen.pendown()

myPen.goto(-20\*xTo,0)