**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 an 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. Provide a listing of your program code below:

import turtle

myPen=turtle.Turtle()

myPen.color("Red")

myPen.circle(50)

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

import turtle

myPen=turtle.Turtle()

myPen.speed(1000)

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.color("Green")

myPen.up()

myPen.down()

myPen.forward(200)

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(195)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.left(180)

myPen.color("Blue")

myPen.forward(200)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.color("blue")

myPen.forward(197.5)

myPen.color("green")

myPen.forward(197.5)

myPen.left(90)

myPen.forward(200)

myPen.left(180)

myPen.forward(100)

myPen.right(90)

myPen.up()

myPen.forward(200)

myPen.down()

myPen.circle(50)

myPen.up()

myPen.forward(195)

myPen.left(90)

myPen.down()

myPen.color("blue")

myPen.forward(600)

myPen.left(90)

myPen.forward(395)

myPen.left(90)

myPen.forward(500)

myPen.left(180)

myPen.forward(800)

myPen.right(90)

myPen.forward(395)

myPen.right(90)

myPen.forward(300)

myPen.right(90)

myPen.forward(197.5)

myPen.right(90)

myPen.forward(300)

myPen.right(180)

myPen.up()

myPen.forward(1100)

myPen.right(90)

myPen.down()

myPen.circle(100)

**Level 2: Using a Loop**

1. Google the keywords “Python Turtle Methods”.
   1. Explain how the “goto” method works and how you could use it when drawing repeated shapes.
   2. List some other useful methods not listed in “Part III” at the end of the PythonWorksheetII document.

The goto method teleports the turtle to a coordinate, it can be used in drawing repeated shapes because it can take the turtle to a new spot and then continue the pattern.

Some other useful methods are

myPen.speed()

fillcolor

clone

1. Create a repeating pattern on your screen. The pattern must meet the following requirements:
   1. The basic pattern must be made up of several individual Turtle methods (e.g. changes of colour, changes of direction, size, motion, etc.)
   2. The basic pattern must be repeated several times with a shift in starting position each time.

import turtle

myPen=turtle.Turtle()

myPen.speed(100000000000000000000)

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.color("Green")

myPen.up()

myPen.down()

myPen.forward(200)

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(195)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.left(180)

myPen.color("Blue")

myPen.forward(200)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.color("blue")

myPen.forward(197.5)

myPen.color("green")

myPen.forward(197.5)

myPen.left(90)

myPen.forward(200)

myPen.left(180)

myPen.forward(100)

myPen.right(90)

myPen.up()

myPen.forward(200)

myPen.down()

myPen.circle(50)

myPen.up()

myPen.forward(195)

myPen.left(90)

myPen.down()

myPen.color("blue")

myPen.forward(600)

myPen.left(90)

myPen.forward(395)

myPen.left(90)

myPen.forward(500)

myPen.left(180)

myPen.forward(800)

myPen.right(90)

myPen.forward(395)

myPen.right(90)

myPen.forward(300)

myPen.right(90)

myPen.forward(197.5)

myPen.right(90)

myPen.forward(300)

myPen.right(180)

myPen.up()

myPen.forward(1100)

myPen.right(90)

myPen.down()

myPen.circle(100)

myPen.up()

myPen.goto(500,-700)

myPen.down()

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.color("Green")

myPen.up()

myPen.down()

myPen.forward(200)

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(195)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.left(180)

myPen.color("Blue")

myPen.forward(200)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.color("blue")

myPen.forward(197.5)

myPen.color("green")

myPen.forward(197.5)

myPen.left(90)

myPen.forward(200)

myPen.left(180)

myPen.forward(100)

myPen.right(90)

myPen.up()

myPen.forward(200)

myPen.down()

myPen.circle(50)

myPen.up()

myPen.forward(195)

myPen.left(90)

myPen.down()

myPen.color("blue")

myPen.forward(600)

myPen.left(90)

myPen.forward(395)

myPen.left(90)

myPen.forward(500)

myPen.left(180)

myPen.forward(800)

myPen.right(90)

myPen.forward(395)

myPen.right(90)

myPen.forward(300)

myPen.right(90)

myPen.forward(197.5)

myPen.right(90)

myPen.forward(300)

myPen.right(180)

myPen.up()

myPen.forward(1100)

myPen.right(90)

myPen.down()

myPen.circle(100)

myPen.up()

myPen.goto(500,610)

myPen.down()

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.color("Green")

myPen.up()

myPen.down()

myPen.forward(200)

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(195)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.left(180)

myPen.color("Blue")

myPen.forward(200)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.color("blue")

myPen.forward(197.5)

myPen.color("green")

myPen.forward(197.5)

myPen.left(90)

myPen.forward(200)

myPen.left(180)

myPen.forward(100)

myPen.right(90)

myPen.up()

myPen.forward(200)

myPen.down()

myPen.circle(50)

myPen.up()

myPen.forward(195)

myPen.left(90)

myPen.down()

myPen.color("blue")

myPen.forward(600)

myPen.left(90)

myPen.forward(395)

myPen.left(90)

myPen.forward(500)

myPen.left(180)

myPen.forward(800)

myPen.right(90)

myPen.forward(395)

myPen.right(90)

myPen.forward(300)

myPen.right(90)

myPen.forward(197.5)

myPen.right(90)

myPen.forward(300)

myPen.right(180)

myPen.up()

myPen.forward(1100)

myPen.right(90)

myPen.down()

myPen.circle(100)

1. Use a Python Loop to create your repeating pattern
   1. The Loop may be a Counted Loop or a Conditional Loop
   2. The indented block of code for the loop should be your basic pattern.
2. Provide a listing of your repeating pattern loop below.

for hi in"12345":

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.up()

myPen.forward(205)

myPen.down()

**Level 3: Defining a Function**

1. Google the keywords “Python Function Syntax”.
   1. Explain what the “def” keyword does

Marks the start of function header

* 1. Explain any special rules regarding the function name

It needs a name to uniquely identify it, same rules as python.

* 1. Explain what the parameters (or arguments) do

“Parameters (arguments) through which we pass values to a function. They are optional.”

* 1. Where should the colon “:” be placed

At the end of the function of header.

* 1. Explain how to write Python statements that make up the function body

One or more valid statements that have same indentation level.

* 1. Explain the “return” statement

Used to return a value from the function.

1. Provide an example of a simple function that uses one or more parameters.
   1. Write the function definition below

def function\_name(parameters):

"""docstring"""

statement(s)

* 1. Write some code to call the function below

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(95)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.up()

myPen.forward(205)

myPen.down()

1. Convert your basic pattern (from Level 2 above) into a function
2. The function name should be “my\_pattern”
3. The parameters should be the x and y starting position for your pattern
4. Your function does not need to use the “return” statement
5. def my\_pattern(x,y):

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.up()

myPen.forward(205)

myPen.down()

1. Use a your basic pattern function and a Python Loop to create your repeating pattern
   1. The Loop may be a Counted Loop or a Conditional Loop
   2. Your function should be called from within the loop.
2. Provide a listing of your function definition and repeating pattern loop below.

import turtle

myPen=turtle.Turtle()

myPen.speed(0)

def my\_pattern(x,y):

myPen.color("Blue")

myPen.circle(50)

myPen.forward(95)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(200)

myPen.left(90)

myPen.forward(100)

myPen.left(90)

myPen.forward(100)

myPen.up()

myPen.goto(x,y)

myPen.down()

xx=0

yy=0

for hi in "12345":

xx=xx+100

yy=yy+100

my\_pattern(xx,yy)