technocamps

Python Programming Workbook

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Overview

In this workshop, we will be introducing the concepts of programming through geometrical shapes using Python Turtle and how to design our own graphics using these concepts.

Learning Outcomes

1. Understanding the concepts of Algorithms and Programming.
2. Introduction to Python and Turtle library.
3. Ability to create simple geometrical shapes using Turtle library.
4. Understanding and programming iterations and conditions.

Attendee Prerequisites

1. Ability to create and save files.
2. IDLE installed.

Draw the Image

Follow the instructions to draw the image:

Geometry

Shape 1:

2 sets of equal sides

4 equal angles (90°)

2 lines of symmetry

Shape 2:

4 equal sides

4 equal angles (90°)

4 lines of symmetry

Shape 3:

3 equal sides

3 equal angles (60°)

What is Python?

Python is

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Draw a Square

Use the following instructions to draw a Square:

forward x: You can only go forward x steps e.g. forward 100 (move 100 steps forward)

right y: You can only turn right (clockwise) at the given y angle e.g. right 90 (turn clockwise 90 degrees). In case of right, remember that the Turtle just turns. It doesn't move.

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First Turtle Program

Write a program to create a square and name it as **square.py**
Write a program to create a rectangle and name it as **rectangle.py**

Hint: Remember the properties of a rectangle with respect to the sides.

Useful hints:

Every program should start with importing the turtle library

```
import turtle
```

Create the turtle object

```
pen = turtle.Turtle()
```

Command to set the shape of the turtle object to turtle

```
pen.shape(“turtle")
```

Command to go forward

```
pen.forward(50)
```

Command to turn right

```
pen.right(90)
```

Colour the Shapes

Modify the **square** program to draw the square with red lines and fill it with green colour.

Modify the **rectangle** program to draw the rectangle with orange lines and fill it with purple colour.

Useful hints:

Command to set the line colour

```
pen.color(“yellow")
```

Command to set the fill colour

```
pen.fillcolor(“green")
```

Command to indicate the beginning of the fill area

```
pen.begin_fill()
```

Command to indicate the end of the fill area

```
pen.end_fill()
```

Pen Exercises

Draw 2 shapes of your choice (square/rectangle/triangle) next to each other with some space between them.

Useful hints:

Command to lift the pen up to stop drawing

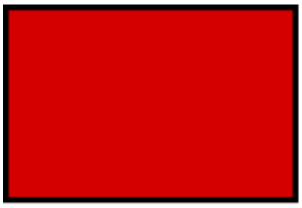
```
pen.penup()
```

Command to put the pen down to start drawing

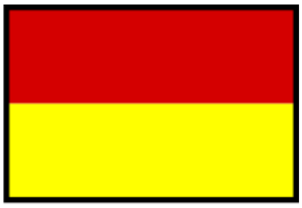
```
pen.pendown()
```

Fun Flags

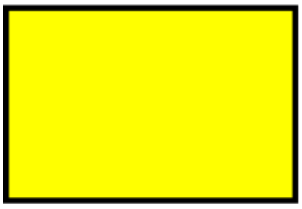
Using the Turtle commands we have learned so far, create one or more of the following lifeguard flags or a flag of the world.



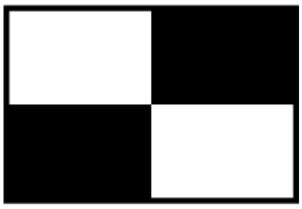
DANGER
No swimming



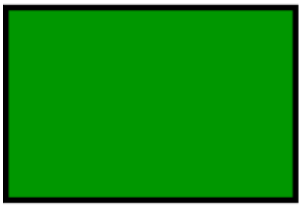
Lifeguard
on duty



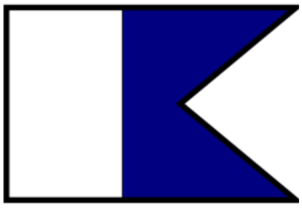
CAUTION
Seek advice



Surfing area
No swimming



Safe to swim



Diving in
progress

Let’s Loop

Modify these programs to use loops and identify the shapes.

```
#Program 1
import turtle
pen = turtle.Turtle()
pen.shape("turtle")
pen.color("green")
pen.forward(100)
pen.right(72)
pen.forward(100)
pen.right(72)
pen.forward(100)
pen.right(72)
pen.forward(100)
pen.right(72)
pen.forward(100)
```

Let's Loop

Modify these programs to use loops and identify the shapes.

```
#Program 2
import turtle
pen = turtle.Turtle()
pen.shape("turtle")
pen.color("green")
pen.forward(100)
pen.right(60)
pen.forward(100)
pen.right(60)
pen.forward(100)
pen.right(60)
pen.forward(100)
pen.right(60)
pen.forward(100)
pen.right(60)
pen.forward(100)
pen.right(60)
```

Loopy Designs

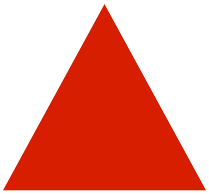
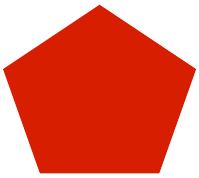
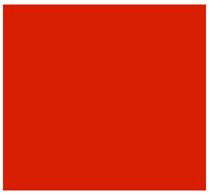
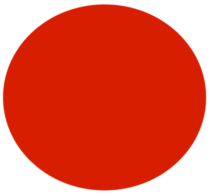
Using the loops, pen, and colour commands, try to program some fun designs. It need not be a specific geometrical shape.

Useful hints:

Syntax for a **for** loop in Python.

```
for i in range(<any number>):
    <loop body>
```

Angles

Polygons	Number of Sides	Size of each Exterior Angle
		
		
		
		

Draw any shape

Draw Any Shape

```
import turtle
pen = turtle.Turtle()
pen.shape(“turtle")
```

```
for i in range(sides):
    pen.forward(100)
    pen.right(360/sides)
```

```
pen.penup()
pen.backward(10)
pen.right(100)
pen.forward(100)
pen.pendown()
```

```
sides = int(input("how many sides do you
want?"))
```

Update the above code to do the following:

a) Ask the user for the colour they would like to use to fill their shape.

b) Store it in **usercolour** variable

c) Use the variable in fillcolor() command

Conditional Shapes

```
import turtle
pen = turtle.Turtle()
pen.shape(“turtle")
```

```
for i in range(sides):
    pen.forward(100)
    pen.right(360/sides)
```

```
pen.penup()
pen.backward(10)
pen.right(100)
pen.forward(100)
pen.pendown()
```

```
for i in range(2):
  pen.forward(sidea)
  pen.right(90)
  pen.forward(sideb)
  pen.right(90)
```

```
sides = int(input("how many sides do you
want?"))
```

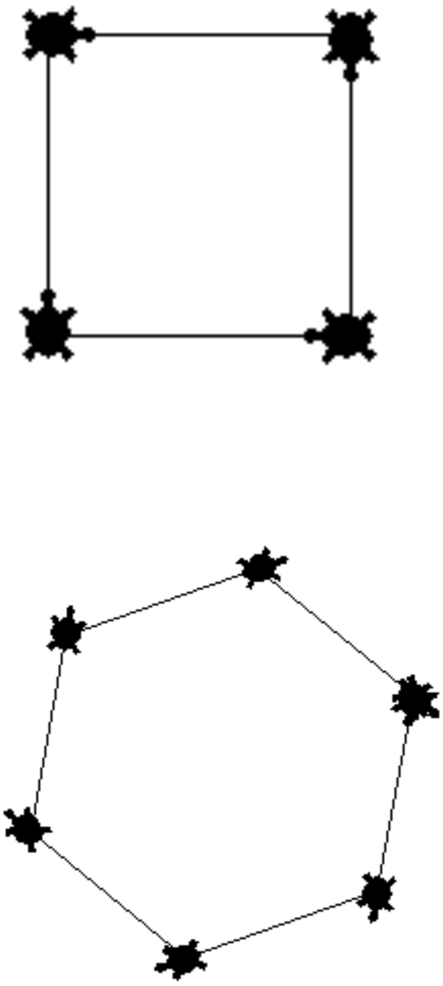
```
if (sides == __ ):
    side = <......>
    sideb= <......>
    <......>
else:
    <......>
```

Stamp Command

Stamp the Turtles

Using the commands we have learned today create random shapes and add pen.stamp() to the turtle on the screen on each edge of the shapes.

Sample shapes with stamps are provided below.



Turtle Review

```python
import turtle
pen = turtle.Turtle()
pen.shape("circle")
pen.width(2)
pen.penup()
randomnumber = int(input("Choose a number between 20-200"))
if (randomnumber < 20):
    print("20 is the least value you can choose")
else:
    if(randomnumber > 200):
        print("You cannot choose more than 200")
    else:
        for i in range(5, randomnumber, 2):
            pen.stamp()
            pen.forward(i)
            pen.right(24)
```

Turtle Review

For the program in the previous page, copy the piece of code which contains the following:

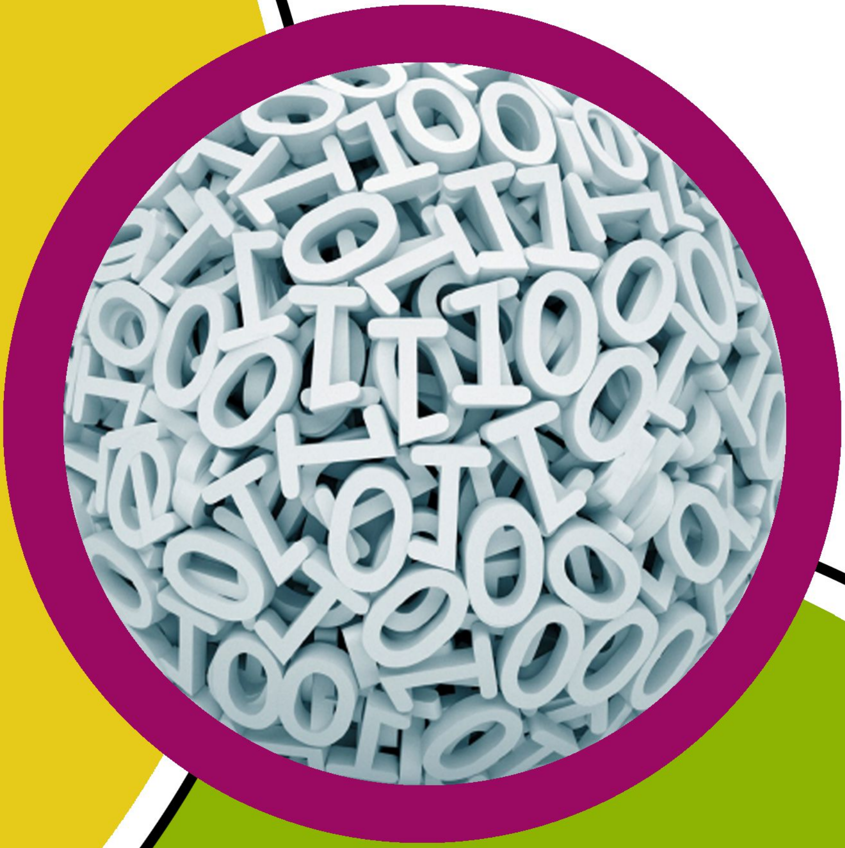
a. variable name:

b. loops:

c. conditionals:

d. user input:

e. turtle library:



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