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## Graphics Programming

**Here begins the fun part of Python:**

- Graphics make programming more fun. It can be done by multiple ways such as including graphics.py library, by using pip, can be done using turtle.
- One of the easiest ways is to use graphics.py, this file can be downloaded from the link “[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUK EwiCkZXL2cL1AhX\\_SGwGHSVyCVQQFnoECAsQAQ&url=https%3A%2F%2Fmcsp.wartburg.edu%2Fzelle%2Fpython%2Fgraphics.py&usg=AOvVaw0BK1u3K7Zl1wKnnajKPS](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUK EwiCkZXL2cL1AhX_SGwGHSVyCVQQFnoECAsQAQ&url=https%3A%2F%2Fmcsp.wartburg.edu%2Fzelle%2Fpython%2Fgraphics.py&usg=AOvVaw0BK1u3K7Zl1wKnnajKPS)”, and can be stored in the same folder where all of the python programs are saved.
- This task can be performed in IDLE or any IDE of your choice.

Any Python Graphics program will require these four tasks

- Import graphics.py
- Create a GraphWin Object
- Paint the output of graphics functions on the declared window object
- Close the opened GraphWin Object

### 1. Import graphics.py

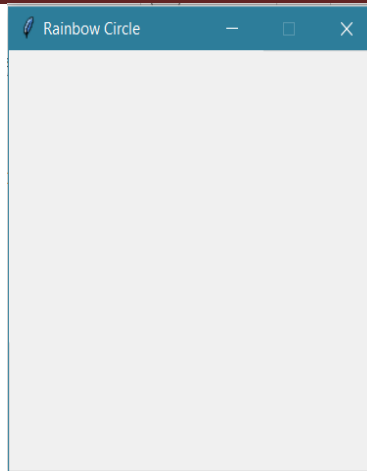
```
from graphics import *
```

### 2. Create a GraphWin Object

The next thing is to create a window area where the output of Python Graphics program will be displayed. It is created like this

```
Window_object= GraphWin(text-title, width, height)
```

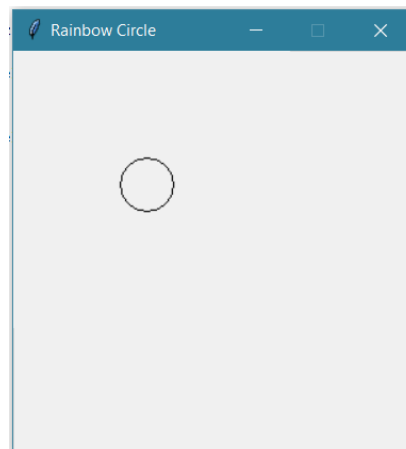
```
displayArea=GraphWin('Rainbow Circle', 300, 300)
```



In the second code line the window object is identified by `WorkArea`. It is an instance of `GraphWin` class defined in `graphics.py`. It draws a toplevel window to display the output. This opens a window with title “Rainbow Circle” and the size is 300 X300 pixel.

### 3. Paint the output of graphics functions on the declared window object:

After creating the `GraphWin` Object you can use the graphics functions from `graphics.py` to create your basic graphics images. Output of the graphics functions are displayed with ***draw*** method. It is called with the shape object to be displayed and passing `GraphWin` object as parameter.



```
cir= Circle(Point(100,100), 20)  
cir.draw(displayArea)
```

This code will draw a circle of radius 20 pixels at center 100,100.

### 4. Close the opened GraphWin Object

This is the last part of any Python Graphics program. *Close* method is called to close the declared `GraphWin` object and free the resources.

```
displayArea.close()
```

## Problems:

1. Understand the working of the following program and predict the output:

```
from graphics import *
win = GraphWin('Face', 200, 150) # give title and dimensions
#win.yUp() # make right side up coordinates!

head = Circle(Point(40,100), 25) # set center and radius
head.setFill("yellow")
head.draw(win)

eye1 = Circle(Point(30, 105), 5)
eye1.setFill('blue')
eye1.draw(win)

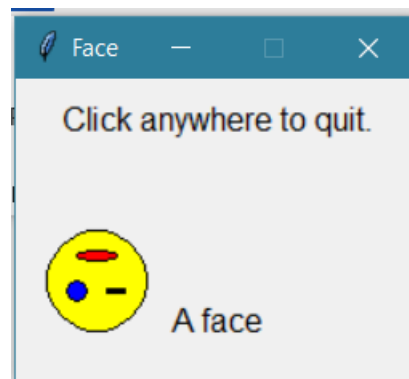
eye2 = Line(Point(45, 105), Point(55, 105)) # set endpoints
eye2.setWidth(3)
eye2.draw(win)

mouth = Oval(Point(30, 90), Point(50, 85)) # set corners of bounding box
mouth.setFill("red")
mouth.draw(win)

label = Text(Point(100, 120), 'A face')
label.draw(win)

message = Text(Point(win.getWidth()/2, 20), 'Click anywhere to quit.')
message.draw(win)
win.getMouse()
win.close()
```

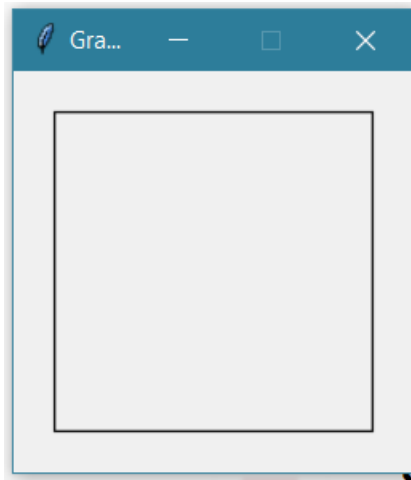
**Ans:**



2. Understand the code and predict the output:

```
from graphics import *
win = GraphWin(width = 200, height = 200) # create a window
win.setCoords(0, 0, 10, 10) # set the coordinates of the window; bottom left
is (0, 0) and top right is (10, 10)
mySquare = Rectangle(Point(1, 1), Point(9, 9)) # create a rectangle from (1,
1) to (9, 9)
mySquare.draw(win) # draw it to the window
win.getMouse()
```

Ans:



3. Understand the code and predict the output:

```
from graphics import *
import random, time
def main():
    win = GraphWin("Random Circles", 300, 300)
    for i in range(75):
        r = random.randrange(256)
        b = random.randrange(256)
        g = random.randrange(256)
        color = color_rgb(r, g, b)

        radius = random.randrange(3, 40)
        x = random.randrange(5, 295)
        y = random.randrange(5, 295)

        circle = Circle(Point(x,y), radius)
        circle.setFill(color)
        circle.draw(win)
        time.sleep(.05)

    win.promptClose(win.getWidth()/2, 20)
```

main()

Ans:

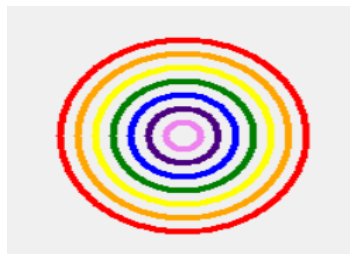


4. Identify the output of the following program:

```
from graphics import *
win = GraphWin("Eyes",200,200)
leftEye = Circle(Point(80,50), 5)
leftEye.setFill('yellow')
leftEye.setOutline('red')
rightEye = leftEye
leftEye.draw(win)
rightEye.draw(win)
input("Press <Enter> to quit")
win.close()
```

**Ans:** GraphicsError(OBJ\_ALREADY\_DRAWN) in the line “rightEye.draw(win)” as left and right both are same. Comment out this line and code will start running.

5. Write a program to print rainbow using graphics module in python.



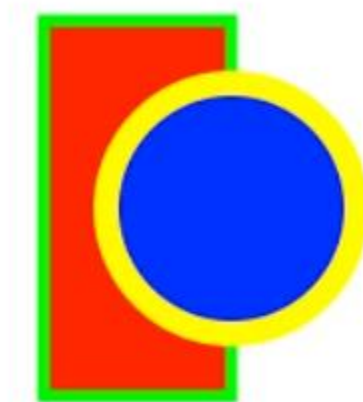
```
from graphics import *
def main():
```

```
col_arr=["violet","indigo","blue","green","yellow","orange","red"]
workArea = GraphWin('Rainbow Circle', 300, 300)
x=workArea.getWidth()/2
y=workArea.getHeight()/2
i=0
while i<len(col_arr):
    cir=Circle(Point(x, y), 10+10*i)
    cir.setOutline(col_arr[i])
    cir.setWidth(4)
    cir.draw(workArea)
    i+=1

message = Text(Point(workArea.getWidth()/2, 250), 'Click to Exit')
message.draw(workArea)
workArea.getMouse()
workArea.close()

main()
```

6. Write a python program to draw the following:



```
from graphics import *

def main():
    win = GraphWin()
```

```
a = Point(25,25)
b = Point(100,175)
c = Point(100,100)

rect = Rectangle(a, b)
circ = Circle(c, 50)

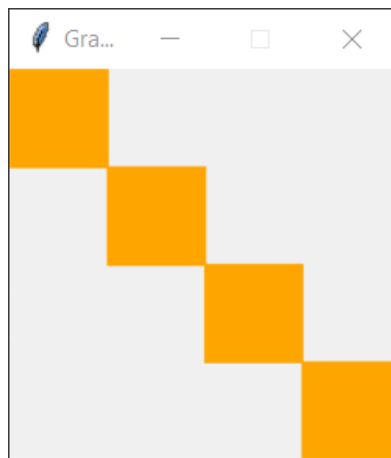
rect.setFill("red")
circ.setFill("blue")
rect.setOutline("green")
circ.setOutline("yellow")
rect.setWidth(5)
circ.setWidth(10)

rect.draw(win)
circ.draw(win)

input("Press <Enter> to quit")
win.close()

main()
```

7. Draw the following graphics on screen:



```
from graphics import *

def main():
```

```
win = GraphWin()

for i in range(4):
    rect = Rectangle(Point(i*50,i*50),Point((i+1)*50,(i+1)*50))
    rect.setFill("orange")
    rect.setOutline("orange")
    rect.draw(win)

input("Press <Enter> to quit")
win.close()

main()
```

8. Draw the Target symbol (a set of concentric circles, alternating red and white) in a graphics window that is 200 pixels wide by 200 pixels high.



```
from graphics import *

def main():
    win = GraphWin("Dart Board",200,200)
    a=Point(100,100)
    circle1=Circle(a,60)
    circle1.setFill("red")
    circle2=Circle(a,40)
    circle2.setFill("white")
    circle3=Circle(a,20)
    circle3.setFill("red")
```

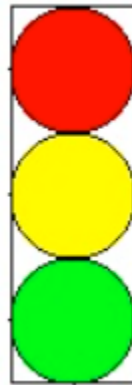


```
circle1.draw(win)
circle2.draw(win)
circle3.draw(win)

input("Press <Enter> to quit")
win.close()

main()
```

9. Draw a simple traffic light in a graphics window that is 200 pixels wide by 200 pixels high. The three lights should have a diameter of 50 pixels each, and the traffic light should be centered in the graphics window.



```
from graphics import *

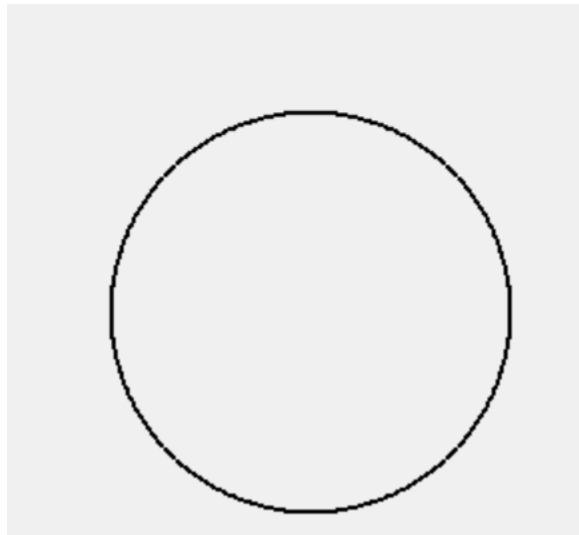
def main():
    win = GraphWin("Traffic Lights",200,200)
    center=Point(100,100)
    rect=Rectangle(Point(center.x-25,center.y-75),Point(center.x+25,center.y+75))
    yellowCircle=Circle(center,25)
    yellowCircle.setFill("yellow")
    redCircle=Circle(Point(center.x,center.y-50),25)
    redCircle.setFill("red")
    greenCircle=Circle(Point(center.x,center.y+50),25)
    greenCircle.setFill("green")
    rect.draw(win)
    redCircle.draw(win)
```

```
yellowCircle.draw(win)
greenCircle.draw(win)

input("Press <Enter> to quit")
win.close()

main()
```

10. Write a Program to Draw following using Graphics:



```
from graphics import *
import math

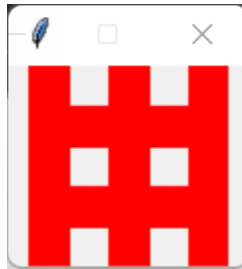
height = 500
width = 500
radius = 100

win = GraphWin(sys.argv[0], width, height, autoflush=False)
win.setCoords(-width/2, -height/2, width/2, height/2)

for a in range(0,360):
    ar = math.radians(a)
    pt = Point(radius*math.sin(ar), radius*math.cos(ar)) # Circle
    #pt = Point(2*radius*math.sin(ar), radius*math.cos(ar)) # Ellipse
```

```
#pt = Point(radius*math.sin(2*ar), radius*math.cos(3*ar)) # Lissajous
pt.draw(win)
win.update()
print ("Done")
win.getMouse() # Pause to view result
win.close()
```

11. Write a Program to Draw following using Graphics:



```
from graphics import *

def pattern():
    win = GraphWin("Rec", 100, 100)

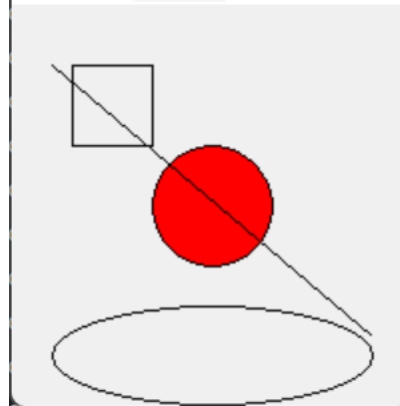
    # vertical lines
    for x in range(0, 100, 40):
        r = Rectangle(Point(x, 0), Point(x+20, 100))
        r.setFill("Red")
        r.setOutline("Red")
        r.draw(win)

    # horizontal lines
    for y in range(20, 100, 40):
        r = Rectangle(Point(0, y), Point(100, y+20))
        r.setFill("Red") # "Green"
        r.setOutline("Red") # "Green"
        r.draw(win)

    win.getMouse()
    win.close()
```

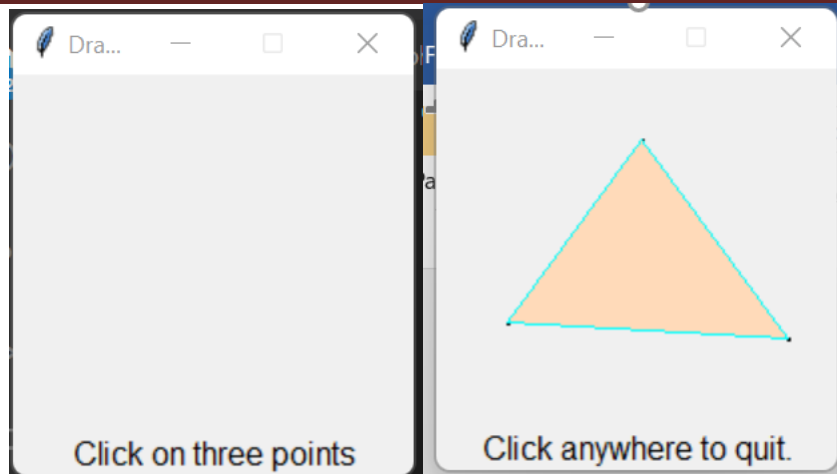
```
win.close()  
pattern()
```

12. Write a Program to Draw following using Graphics:



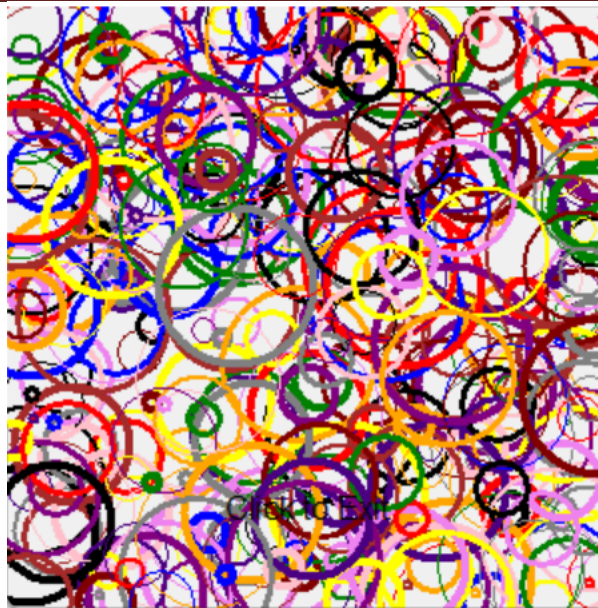
```
from graphics import *  
  
#### Open a graphics window  
win = GraphWin('Shapes')  
#### Draw a red circle centered at point (100,100) with radius 30  
center = Point(100,100)  
circ = Circle(center, 30)  
circ.setFill('red')  
circ.draw(win)  
#### Draw a square using a Rectangle object  
rect = Rectangle(Point(30,30), Point(70,70))  
rect.draw(win)  
#### Draw a line segment using a Line object  
line = Line(Point(20,30), Point(180, 165))  
line.draw(win)  
#### Draw an oval using the Oval object  
oval = Oval(Point(20,150), Point(180,199))  
oval.draw(win)  
  
win.getMouse()  
win.close()
```

13. Write a Program to Draw following using Graphics:



```
from graphics import *
def main():
    win = GraphWin("Draw a Triangle")
    win.setCoords(0.0, 0.0, 10.0, 10.0)
    message = Text(Point(5, 0.5), "Click on three points")
    message.draw(win)
    # Get and draw three vertices of triangle
    p1 = win.getMouse()
    p1.draw(win)
    p2 = win.getMouse()
    p2.draw(win)
    p3 = win.getMouse()
    p3.draw(win)
    # Use Polygon object to draw the triangle
    triangle = Polygon(p1,p2,p3)
    triangle.setFill("peachpuff")
    triangle.setOutline("cyan")
    triangle.draw(win)
    # Wait for another click to exit
    message.setText("Click anywhere to quit.")
    win.getMouse()
main()
```

14. Write a Program to Draw following using Graphics:



```
import random
import time
from graphics import *
def main():
    # generate list of colors
    col_arr=["violet","indigo","blue","green",
            "yellow","orange","red","pink",
            "brown","purple","gray","maroon",
            "black"]

    workArea = GraphWin('Multiple Circle Pattern', 300, 300) # give title
    and dimensions

    i=0
    while i<500:
        x1=random.randrange(300)#Generate random center points
        y1=random.randrange(300)
        rcir=Circle(Point(x1, y1), i%40)# create circle object with radius
        depending on current counter
        rcir.setOutline(col_arr[i%13]) #change color
        rcir.setWidth(i%5)#change width of outline
        rcir.draw(workArea)#draw circles at generated center
        time.sleep(0.01)
```

```
i+=1

message = Text(Point(workArea.getWidth()/2, 250), 'Click to Exit')
message.draw(workArea)
workArea.getMouse()# get mouse to click on screen to exit
workArea.close() # close the workArea window

main()
```