BIS 420 PROGRAMMING FOR DATA SCIENCE

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CHAPTER 15 EXERCISE 15.4
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Swampy (see Chapter 4) provides a module named World, which defines a user-defined type also called World. You can import it like this:

from swampy.World import World

Or, depending on how you installed Swampy, like this:

from World import World

The following code creates a World object and calls the mainloop method, which waits for the user.

world = World()

world.mainloop()

A window should appear with a title bar and an empty square. We will use this window to draw

Points, Rectangles and other shapes. Add the following lines before calling mainloop and run the

program again.

canvas = world.ca(width=500, height=500, background='white')

bbox = [[-150,-100], [150, 100]]

canvas.rectangle(bbox, outline='black', width=2, fill='green4')

You should see a green rectangle with a black outline. The first line creates a Canvas, which appears in the window as a white square. The Canvas object provides methods like rectangle for drawing various shapes.

bbox is a list of lists that represents the “bounding box” of the rectangle. The first pair of coordinates is the lower-left corner of the rectangle; the second pair is the upper-right corner.

You can draw a circle like this:150 Chapter 15. Classes and objects canvas.circle([-25,0], 70, outline=None, fill='red')

The first parameter is the coordinate pair for the center of the circle; the second parameter is the

radius.

If you add this line to the program, the result should resemble the national flag of Bangladesh (see http: // en. wikipedia. org/ wiki/ Gallery_ of_ sovereign-state_ flags).

1. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

2. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

3. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

4. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

5. Write a program that draws the national flag of the Czech Republic. Hint: you can draw a polygon like this:

```
points = [[-150,-100], [150, 100], [150, -100]]
canvas.polygon(points, fill='blue')
```

I have written a small program that lists the available colors; you can download it from http:// thinkpython. com/ code/ color_ list. py .

```
def draw_rectangle(canvas, rect):
    x = rect.corner.x
    y = rect.corner.y
    bbox = [[x, y], [x + rect.width, y + rect.height]]
    canvas.rectangle(bbox, outline='black', fill=rect.color)


class Rectangle:
    def __init__(self, width, height, corner, color='green4'):
        self.width = width
        self.height = height
        self.corner = corner
        self.color = color
```

```
def draw_point(canvas, point, color='black'):
    radius = 3
    canvas.circle([point.x, point.y], radius, outline=None, fill=color)

class Circle:
    def __init__(self, center, radius, color='red'):
        self.center = center
        self.radius = radius
        self.color = color

def draw_circle(canvas, circle):
    canvas.circle([circle.center.x, circle.center.y], circle.radius, outline=None, fill=circle.color)

def draw_czech_flag(canvas):

    canvas.rectangle([[-150, 0], [150, 100]], fill='white', outline='black')

    canvas.rectangle([[-150, -100], [150, 0]], fill='red', outline='black')

    points = [[-150, 100], [-150, -100], [0, 0]]
    canvas.polygon(points, fill='blue')

from swampy.World import World

world = World()
canvas = world.ca(width=500, height=500, background='white')
```

```
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

corner = Point(-50, -25)
rect = Rectangle(100, 50, corner, color='green4')
draw_rectangle(canvas, rect)

pt = Point(0, 0)
draw_point(canvas, pt)

circle = Circle(Point(75, 75), 30, 'blue')
draw_circle(canvas, circle)

draw_czech_flag(canvas)

world.mainloop()
```

```
def draw_rectangle(canvas, rect):
    x = rect.corner.x
    y = rect.corner.y
    bbox = [[x, y], [x + rect.width, y + rect.height]]
    canvas.rectangle(bbox, outline='black', fill=rect.color)

class Rectangle:
    def __init__(self, width, height, corner, color='green4'):
        self.width = width
        self.height = height
        self.corner = corner
        self.color = color
```

```
def draw_point(canvas, point, color='black'):
    radius = 3
    canvas.circle([point.x, point.y], radius, outline=None, fill=color)

class Circle:
    def __init__(self, center, radius, color='red'):
        self.center = center
        self.radius = radius
        self.color = color

def draw_circle(canvas, circle):
    canvas.circle([circle.center.x, circle.center.y], circle.radius, outline=None,
fill=circle.color)

def draw_czech_flag(canvas):

    canvas.rectangle([[-150, 0], [150, 100]], fill='white', outline='black')

    canvas.rectangle([[-150, -100], [150, 0]], fill='red', outline='black')

    points = [[-150, 100], [-150, -100], [0, 0]]
    canvas.polygon(points, fill='blue')

from swampy.World import World

world = World()
canvas = world.ca(width=500, height=500, background='white')
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

corner = Point(-50, -25)
rect = Rectangle(100, 50, corner, color='green4')
draw_rectangle(canvas, rect)

pt = Point(0, 0)
draw_point(canvas, pt)

circle = Circle(Point(75, 75), 30, 'blue')
draw_circle(canvas, circle)

draw_czech_flag(canvas)

world.mainloop()
```