Department of Computer Science
The City College of CUNY

CSc 22100 (27461): Software Design Laboratory [Fall 2018]

Exercise 1

A printout showing the problem, solution method, codes developed, and outputs produced for the tests indicated is due during and before the end of the class on Monday, 1 October 2018. *The deadline is strictly observed.*

1- Create a hierarchy of Java classes as follows:

MyLine *is_a* MyShape;
MyPolygon *is_a* MyShape;
MyCircle *is_a* MyShape.

Class MyShape:

Class MyShape is the hierarchy's superclass and inherits Java class Object. An implementation of the class defines a point (x, y) and the color of the shape. The class includes appropriate class constructors and methods that perform the following operations:

a. *getX, getY, getColor* – returns the point (x, y) and color of the MyShape object;
b. *setX, setY, setColor* – sets the point (x, y) and color for the MyShape object;
c. *shiftXY* – moves point (x, y) by $(\Delta x, \Delta y)$;
d. *toString* –returns the object's description as a String. This method must be overridden in each subclass in the hierarchy.
e. *draw* – This method must be overridden in each subclass in the hierarchy. For the MyShape object, it paints the drawing canvas in color.

Class MyLine:

Class MyLine inherits class Shape. The MyLine object is a straight line defined by its two endpoints (x_1, y_1) and (x_2, y_2). The MyLine object may be of any color. The class includes appropriate class constructors and methods that perform the following operations:

a. *getLength* — returns the length of the MyLine object;
b. *get_xAngle* — return the angle (in degrees) of the MyLine object with the x-axis;
c. *toString* — returns a string representation of the MyLine object: length and angle with the x-axis;
d. *draw* — draws a MyLine object whose end points are (x, y) (x_1, y_1) and (x_2, y_2).

Class MyPolygon:

Class MyPolygon inherits class MyShape. The MyPolygon object is a *regular* polygon defined by the integer parameter N — the number of the polygon's equal side lengths and equal interior angles. The MyPolygon object may be filled with a color. The class includes appropriate class constructors and methods that perform the following operations:

e. *getArea* — returns the area of the MyPolygon object;
f. *getPerimeter* — returns the perimeter of the MyPolygon object;
g. *getAngle* — return the interior angle (in degrees) of the MyPolygon object;
h. *getSide* — returns the side length of the MyPolygon object;
i. *toString* — returns a string representation of the MyPolygon object: side length, interior angle, perimeter, and area;
j. *draw* — draws a MyPolygon object whose center point (x, y) is defined in class MyShape and inscribed in a circle of radius *radius*.

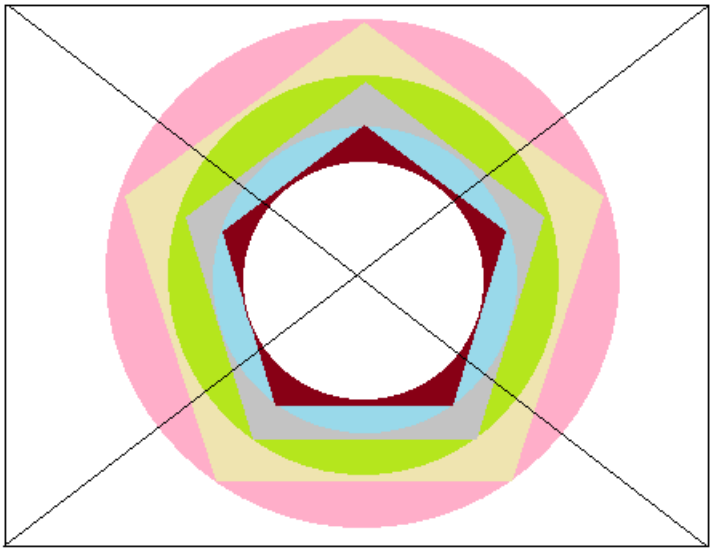
Class MyCircle:

Class MyCircle inherits class Shape. The MyCircle object is defined by its radius, *radius*, and center (x, y), and may be filled with a color. The MyCircle class includes appropriate class constructors and methods that perform the following operations:

a. *getArea* — returns the area of the MyCircle object;
b. *getPerimeter* — returns the perimeter of the MyCircle object;
c. *getRadius* — returns the radius of the MyCircle object;
d. *toString* — returns a string representation of the MyCircle object: radius, perimeter, and area;
e. *draw* — draws a MyCircle object of radius *radius*. The center point (x, y) of the circle is defined in class MyCircle Shape.

2- Use JavaFX graphics and the class hierarchy to draw a geometric configuration comprised of a sequence of alternating concentric pentagons and circles as illustrated below, subject to the following additional requirements:

a. The code is applicable to canvases of variable height and width;
b. The dimensions of the shapes are proportional to the smallest dimension of the canvas;
c. The pentagons and circles are filled with different colors of your choice.



Hesham A Auda
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