**Programming Project 3**

The third programming project involves writing a program that draws two types of shapes, ovals and rectangles. This program consists of five classes and the Program Core.

The first class is the **Shape** class, which is an abstract class that extends the predefined Java class Rectangle. It should contain two instance variables, the color of the shape and whether the shape is solid or hollow. It should also contain a class (static) variable that keeps track of how many shapes have been created. It should have three instance methods, one class method, and one abstract method:

1. A ***constructor*** that accepts three parameters for the purpose of initializing the characteristics of the shape:
   1. Rectangle object that defines the dimensions and position of the shape
   2. Color of the shape
   3. Shape is solid or hollow

It should also update the number of shapes created from the beginning of the program.

1. An instance method named ***setColor*** that accepts the Graphics object as a parameter and sets the color for the next draw operation to the color of the current shape.
2. An instance method named ***getSolid*** that returns whether the shape is solid or hollow.
3. A class method named ***getNoOfShapes*** that returns the number of shapes created so far.
4. An abstract method named ***draw*** that accepts a Graphics object as a parameter.

The **Shape** class has two subclasses: **Oval** and **Rectangular**.

The first subclass is **Oval**. It should have the following two methods:

1. A ***constructor*** that accepts three parameters for the purpose of initializing the characteristics of the shape, a Rectangle object that defines
   1. Dimensions and position of the shape
   2. Color of the shape
   3. Shape is solid or hollow.
2. An overridden method ***draw*** that draws the Oval object on the Graphics object passed as a parameter.

The second subclass is **Rectangular**. It should have the following two methods:

1. A ***constructor*** that accepts three parameters for the purpose of initializing the characteristics of the shape, a Rectangle object that defines
   1. Dimensions and position of the shape
   2. Color of the shape
   3. Shape is solid or hollow.
2. An overridden method ***draw*** that draws the Rectangular object on the Graphics object passed as a parameter.

The fourth class is named ***Drawing***, which should extend the predefined Java class JPanel. It has one instance variable that contains the shape that is currently drawn. It should have three methods:

1. An overridden ***paintComponent*** method that draws the current shape on the Graphics object that is passed to it as a parameter. It should also draw the number of shapes that have been created thus far in the upper left corner.
2. An overridden ***getPreferredSize*** method that specifies the dimensions of the drawing panel as 200 pixels wide and 200 pixels high.
3. An instance method named ***drawShape*** that is passed the current shape to be drawn. It first checks whether the shape provided will completely fit within the panel. Assume for this assignment – no matter what dimensions are coded for the panel – the dimensions for the Panel are 200 pixels x 200 pixels. If not, it throws an ***OutsideBounds*** exception. Otherwise, it saves the shape in the corresponding instance variable. It then calls repaint to cause that shape to be drawn.

No additional public methods should be included in any of the above classes.

The fifth class named ***OutsideBounds*** should define a checked exception.

The **Program Core** should contain the main method. It should generate the GUI shown below:

A screenshot of a cell phone

Description automatically generated

The combo-box for the *Shape* Type should allow two choices, either *Rectangle* or *Oval*. The combo-box for the *Fill* Type should also allow two choices, either *Hollow* or *Solid*. The combo-box for the *Color* should allow seven choices, *Black*, *Red*, *Orange*, *Yellow*, *Green*, *Blue* or *Magenta*.

Clicking the *Draw* button should first check whether any non-integer values have been entered in any of the fields that require integers. If so, an error message should be displayed in a JOptionPane window. Otherwise an appropriate Shape object should be created and passed to the ***drawShape*** method of the Drawing class. If that call results in an ***OutsideBounds*** exception being thrown, an appropriate error message should be displayed in a JOptionPane window. Note: only successful shapes that are displayed add to the count for Shapes.

It might be more user-friendly to add two additional buttons to the Geometric Drawing Window: (1) a Clear Field button for the width, height, and two coordinates test fields and (2) an Exit button to end the program.

Be sure to follow good programming style, which means making all instance variables private, naming all constants and avoiding the duplication of code. Furthermore, you must select enough different kinds of shapes for a comprehensive Test Plan for the program.