In-class Exercises – Abstract classes and Interfaces

Design appropriate class diagram and implement the below using NetBeans IDE.

1. Create a class named Triangle that extends GeometricObject. The class contains: Three double data fields named side1, side2, and side3 with default values 1.0 to denote three sides of the triangle. A no-arg constructor that creates a default triangle. A constructor that creates a triangle with the specified side1, side2, and side3. The accessor methods for all three data fields. A method named getArea() that returns the area of this triangle. A method named getPerimeter() that returns the perimeter of this triangle. A method named toString() that returns a string description for the triangle.

2. Create a class named Circle, which is another GeometricObject. Circle has one data field radius, and has methods to calculate the area and the perimeter, along with other necessary constructor, accessor and mutator methods.

3. Create a class Rectangle which is also a GeometricObject. The class has attributes length and width, each of which defaults to 1. It has methods that calculate the perimeter and the area of the rectangle. It has set and get methods for both length and width. The set methods should verify that length and width are each floating-point number larger than 0.0 and less than 20.0.

4. Create a more sophisticated Rectangle class than the one you created in question 2. This class stores only the Cartesian coordinates of the four corners of the rectangle. The constructor calls a set method that accepts four sets of coordinates and verifies that each of these is in the first quadrant with no single x- or y-coordinate larger than 20.0. The set method also verifies that the supplied coordinates specify a rectangle. Provide methods to calculate the length, width, perimeter and area. The length is the larger of the two dimensions. Include a predicate method isSquare which determines whether the rectangle is a square.

5. Modify the GeometricObject class to implement the Comparable interface, and defines a largerObject method for finding the larger of two GeometricObject objects.

6. Write a test program that uses the largerObject method to find the larger of two circles and the larger of two rectangles.