CS 5000 – Summer 2025
Assignment #10, 50 Points

Inheritance and Polymorphism – Chapter 11

Remember to read and apply coding practices outlined in assignment 8.

Develop a complete Java program for each of the following problems. Please name the programs as indicated and add proper program headers and output labels as shown below. ***Please use only concepts and programming constructs/syntax we discuss to date.*** Make sure you **include a header for each program you submit for the assignment (see previous assignments).**

Program #1 (50 points): Design and implement class ***Triangle*** that inherits from class ***GeometricObject*** (provided with this assignment and required for submission).

Class ***Triangle*** has the following characteristics:

1. Defines three private variables of type double: side1, side2, and side3. Each is initialized with the value of 1.0.
2. Defines a default (non-argument) constructor method to create default triangle objects (with default sides).
3. Defines a second constructor to allow the user to create triangle objects with user-specific input values for all sides. The constructor rejects negative values (invalid) for a side.
4. Defines three access (get) methods, one for each variable, named as **`getSide1()`**, **`getSide2()`**, and **`getSide3()`**. Get methods reject negative values (invalid) for a side.
5. Defines three access (set) methods, one for each variable, named as **`setSide1()`**, **`setSide2()`**, and **`setSide3()`**. Set methods reject negative values (invalid) for a side.
6. Defines method **`getArea()`** that computes and returns the area of a triangle object. Here is the math (Heron's formula) for the area computation:

```
double s = (side1 + side2 + side3)/2.0
double Area = Sqrt(s(s-side1)(s-side2)(s-side3))
```

7. Defines method **`getPerimeter()`** that computes and returns the perimeter of a triangle object. Here is the math for perimeter computation:

```
Perimeter = (side1 + side2 + side3)
```

8. Defines method **`toString()`** that returns a meaningful description of a triangle object including its name, sides, area, and perimeter in the following format (the values below are just an example for illustration purposes). Make sure your code displays the outputs following the test data format. Please add blank line before and after this output.

```
                              ←------- blank line
Triangle:     myTriangle
Side 1:       4.0
Side 2:       5.0
Side 3:       6.0
Area:         9.921567416492215
Perimeter:    15.0
Color:        White
Is Filled:    true
                              ←------- blank line
```

Write a test program in a separate file, named ***testTriangle***, to create couple triangle objects (one default and one non-default) and test all of the class methods, including inherited methods **`setColor()`** and **`setFilled()`**, on those 2 objects. Add proper and meaningful labels to your outputs. Use blank lines to space outputs form prompts.

Document your code, use good coding practices, use proper prompts for input, format outputs as shown, do not hard-code inputs for non-default objects, allow user to re-enter invalid input values, allow program re-runs using sentinel loop, test your code thoroughly with valid and invalid inputs, and add author header in each submitted file.

Submission:

1. Before submitting your programs, make sure you review the assignment submission requirements and grading guidelines posted in D2L. The grading guidelines explain some of the common errors found in programming assignments.
2. The assignment due date is posted in D2L.
3. Please compile, run, and test your code right before you upload your java files to the assignment submission folder in D2L.
4. Please upload all java files (total 3 files).