CS203 Java Programming and Application
Fall, 2016

Assignment 3
Assigned Date: Sunday, October 30, 2016
Due Date: Midnight Sunday, November 13, 2016

QUESTION 1 (30 MARKS)

Part I

Design and implement 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.
The **toString()** method is implemented as follows:
return "Triangle: side1 = " + side1 + **" side2 = "** + side2 +
" side3 = " + side3;

Write a test program that prompts the user to enter three sides of the triangle, a color, and a Boolean value to indicate whether the triangle is filled. The program should create a **Triangle** object with these sides and set the **color** and **filled** properties using the input. The program should display the area, perimeter, color, and true or false to indicate whether it is filled or not. The program should also display the three sides of the triangle by printing the triangle object. The formula for calculating the triangle area given three sides is as follow:

Let a,b,c be the lengths of the sides of a triangle. The area is given by:

$$Area = \sqrt{p(p-a)(p-b)(p-c)}$$

where p is half the perimeter, or $\frac{a+b+c}{2}$

Note: The total length of any two sides of a triangle is larger than the third side.

A sample run of your program should produce the output as follow:

```
Enter three sides: 1 2 2.3
Enter the color: Red
Enter a boolean value for filled: true
The area is 0.9973684123732814
The perimeter is 5.3
Triangle: side1 = 1.0 side2 = 2.0 side3 = 2.3
The triangle is Filled: true
```

Part II

The GeometricObject, Circle and Rectangle classes are given for this exercise. You may need to make necessary changes to the classes other than what is mentioned below. This exercise is about polymorphism.

Declare the getPerimeter() and getArea() methods in the GeometricObject class. These two methods should be declared as abstract because they cannot be implemented in the Geometric Object class. However, they are implemented in the subclasses. Change the toString() method of Triangle in Part (i) to return a string of "Triangle Object". Implement toString() method in Circle and Rectangle class to return a string of "Circle Object" and "Rectangle Object" respectively.
Implement a static method called *larger* in your test program. This method takes two geometric objects of the same type as arguments and returns the object with larger area. If two objects have the same area, the method returns **null**. If two geometric objects are not of the same type are used as arguments, the function throws **DifferentTypeException**. DifferentTypeException is a user defined exception. Define it for your *larger* method. The function signature of *larger* is as follow:

```
static GeometricObject larger(GeometricObject g1, GeometricObject g2) throws DifferentTypeException
```

Write a test program called TestLarger to test if your *larger* method works properly. Create different types of geometric objects to call the *larger* method. You should test your method with 2 Circles, 2 Rectangles, 2 Triangles, and 2 different object types should throw DifferentTypeException. Print appropriate details about the object returned by *larger* method such as description, radius, width, height, sides, perimeter and area. Format your output to two decimal places.

A sample output is as follow:

```
Testing 2 circles of same radius:
Two objects have equal area

Testing 2 circles of different radius:
The returned larger object is Circle Object
The area is 28.27
The radius is 3.00
The perimeter is 18.85
```

Testing 2 rectangles of different sizes:
The returned larger object is Rectangle Object
The area is 9.00
The width is 3.00
The height is 3.00
The perimeter is 12.00

Testing 2 triangles of different sizes:
The returned larger object is Triangle object
The area is 2.30
The side1 is 2.00
The side2 is 3.00
The side3 is 2.30
The perimeter is 7.30

Testing 2 different object types:
Two objects are of different type

QUESTION 2 (20 Marks)

This exercise is about how to read data from the web. Write a program that counts the number of words in President Abraham Lincoln's Gettysburg address from:

http://cs.armstrong.edu/liang/data/Lincoln.txt.

Create a **URL** object by using the url above. Use the **openStream()** method defined in the **URL** class to open an input stream and use this stream to create a **Scanner** object to input the file.

QUESTION 3 (15 Marks)

Create an exception hierarchy of ExceptionA, ExceptionB and ExceptionC such that ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a test program to show that the catch block for exception super type can catch all the subtype exceptions.

QUESTION 4 (15 Marks)

Use the exception hierarchy from Question 3 to demonstrate that the order of catch block is important if you want to specifically catch every exception in the same hierarchy. You should define a method called someMethod( ) that can throw all three exceptions **randomly**. Call someMethod( ) in your test program and catch all three exceptions separately. Run your program a few times to make sure that someMethod( ) may throw different exception for different run.

QUESTION 5 (20 Marks)

Write a program that prompts the user to enter a file name. The program checks whether the file exists. If so, change the file name by appending the date and time to the file. Pass the filename from the command line. Here is a sample run of the program:

```
java RenameFile c:\temp\Test.txt
Success. New file is c:\temp\Test.txtThu Aug 29 13_54_11 EDT 2013

java RenameFile c:\temp\Test.txt
The file does not exist
```