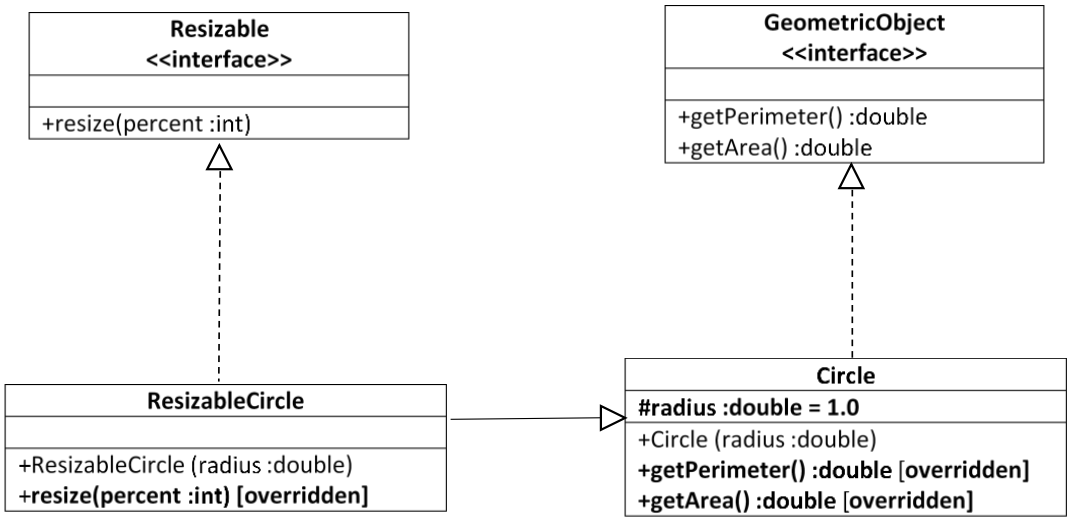
Q3: Writing a Java Program (Inheritance & Interfaces) (6 marks)

Given the following UML class diagrams:



1. Define the interface **GeometricObject** which declares two abstract methods: *getPerimeter()* and *getArea()*, as specified in the class diagram. (1 mark)

```
public interface GeometricObject {
   public abstract double getPerimeter();
   public abstract double getArea();
}
```

2. Define the subclass **Circle** that implements the interface **GeometricObject**, with a protected variable *radius*. The *getPerimeter()* method return the perimeter of the circle which is equal to $2 \times \pi \times radius$**.** The *getArea()* method return the area of the circle which is equal to $\pi \times radius \times radius$**o. Hint:** You should use the Math.PI. (2 marks)

```
public class Circle implements GeometricObject {
   protected double radius = 1.0;

   public Circle(double radius) {
      this.radius = radius;
   }
   @Override
   public double getPerimeter() {
      return 2 * radius * Math.PI;
   }
   @Override
   public double getArea() {
      return radius * radius * Math.PI;
   }
}
```

3. Define the interface **Resizable** which declares an abstract method *resize()* with an integer parameter *percent*. (1 mark)

```
public interface Resizable {
   public abstract void resize(int percent);
}
```

4. Define the subclass **ResizableCircle** which inherit the class **Circle** and implement the interface **Resizable**, as shown in the above UML class diagrams. The subclass **ResizableCircle** declares an *overridden* method *resize(percent :int)* to modify the radius of the circle as follows:
$radius = radius \times (\frac{percent}{100.0})$. (1 mark)

```
public class ResizableCircle extends Circle implements Resizable {

   public ResizableCircle(double radius) {
      super(radius);
   }

   @Override
   public void resize(int percent) {
      radius *= percent/100.0;
   }
}
```

5. Define a *main()* method in class **TestClass** to test the functionality of the code as follows: (1 mark)
   - Declare an object *resObj* of type **ResizableCircle** with radius value equals to 5.0
   - Display the Perimeter and the Area of the object.
   - Resize the circle to 40 percent (40%) and display again the Perimeter and the Area of the object.

```
public class TestCircle {
   public static void main(String[] args) {
      ResizableCircle resObj = new ResizableCircle(5.0);
      System.out.println("Perimeter = " + resObj.getPerimeter());
      System.out.println("Area = " + resObj.getArea());

      resObj.resize(40);
```

```
        System.out.println("Perimeter = " + resObj.getPerimeter());
        System.out.println("Area = " + resObj.getArea());
    }
}
```