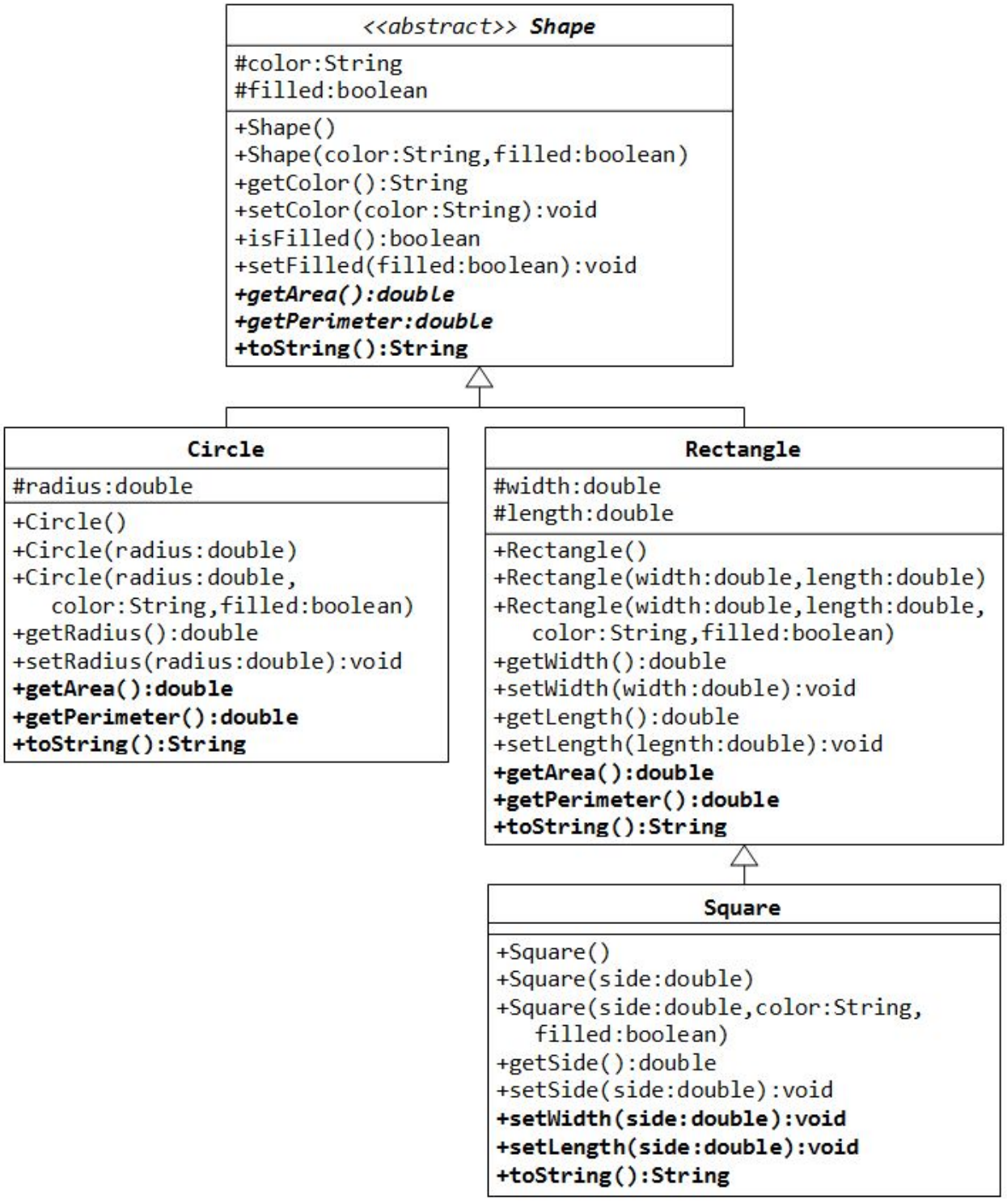
Homework 5 : Inheritance

In this homework, you are to implement the class hierarchy shown in the below diagram where Circle and Rectangle are subclasses of Shape class and Square is a subclass of Rectangle class.



- Write an abstract superclass called Shape (as shown in the class diagram), which contains:
  - Two instance variables color (String) and filled (boolean).
  - Two constructors: a no-arg (no-argument) constructor that initializes the color to "red" and filled to true, and a constructor that initializes the color and filled to the given values.
  - Getter and setter for all the instance variables. By convention, the getter for a boolean variable xxx is called isXxx() (instead of getXxx() for all the other types).
  - A toString() method that returns "A Shape with color of xxx and filled/Not filled".
  - Two abstract methods getArea() and getPerimeter().
- Write two subclasses of Shape called Circle and Rectangle, as shown in the class diagram.
- The Circle class contains:
  - An instance variable radius (double).
  - Three constructors as shown in the diagram where the no-arg constructor initializes the radius to 1.0
  - Getter and setter for the instance variable radius.
  - Methods getArea() and getPerimeter().
  - Override the toString() method inherited, to return "A Circle with radius=xxx, which is a subclass of yyy", where yyy is the output of the toString() method from the superclass.
- The Rectangle class contains:
  - Two instance variables width (double) and length (double).
  - Three constructors as shown in the diagram where the no-arg constructor initializes the width and length to 1.0.
  - Getter and setter for all the instance variables.
  - Methods getArea() and getPerimeter().
  - Override the toString() method inherited, to return "A Rectangle with width=xxx and length=zzz, which is a subclass of yyy", where yyy is the output of the toString() method from the superclass.
- Write a class called Square, as a subclass of Rectangle. Convince yourself that Square can be modeled as a subclass of Rectangle. Square has no instance variable, but inherits the instance variables width and length from its superclass Rectangle.
  - Provide the appropriate constructors (as shown in the class diagram). Hint:

    ```
    public Square(double side) {
            super(side, side);    // Call superclass Rectangle(double, double)
    }
    ```
  - Override the toString() method to return "A Square with side=xxx, which is a subclass of yyy", where yyy is the output of the toString() method from the superclass.
  - Override the setLength() and setWidth() to change both the width and length, so as to maintain the square geometry.

- Write ShapeDemo class which contains a main method (the only static method in your project) to test your classes. In the main method

- Create an instance of Circle class and assign it to a Shape typed variable such as “Shape circle = new Circle...”
  - Print the string representation of the instance
  - Print the area and perimeter of the circle instance
- Create an instance of Rectangle class and assign it to a Shape typed variable such as “Shape rect = new Rectangle...”
  - Print the string representation of the instance
  - Print the area and perimeter of the rectangle instance
- Create an instance of Square class and assign it to a Shape typed variable such as “Shape sq= new Square...”
  - Print the string representation of the instance
  - Print the area and perimeter of the square instance

Due date: **07.03.2016 13:30**

Submission:

- You will submit your homework to **onurkilincceker@gmail.com**
- Write CENG 1004 HW5 in the subject line of your email.
- To this email, you should attach your compressed deliverable file (zip file) which contains the source files of your application.
- The name of your zip file should be in the following format: StudentID_HW5.zip and you should replace StudentID with your own ID number. Assuming 1007090002 is your ID number, then the name of your zip file should be 1007090002_HW5.zip