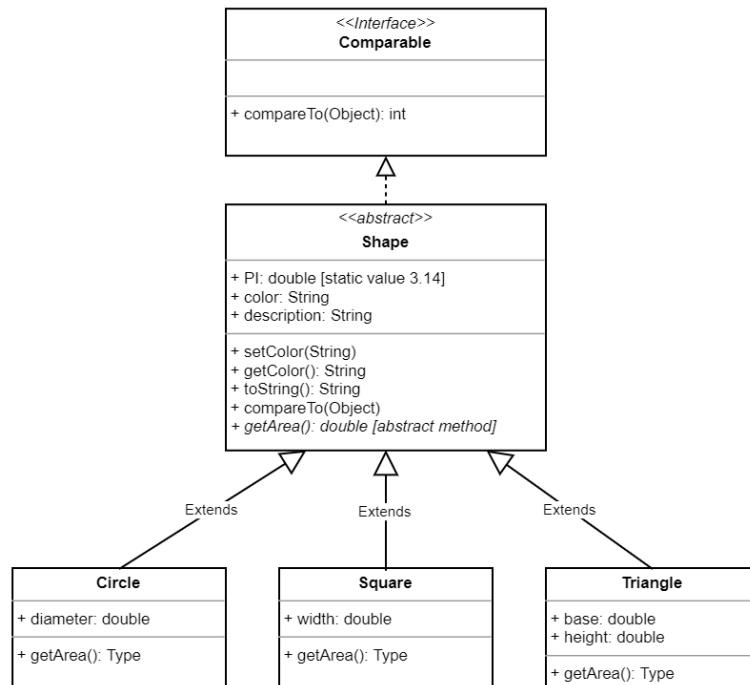


ITCS 209 Object Oriented Programming	Name:	Lab	Challenge Bonus	Peer Bonus
	ID:			
	Sec:			

Lab09: Interface, HashMap, and Regular Expression



In this lab, you are provided with the 5 java files as follows:

- **Comparable.java**: This is an *interface* class. **DO NOT MODIFY THIS CLASS !**
- **Circle.java**, **Square.java**, and **Triangle.java**: extend the **Shape** class. Each class contains its own unique attributes, and overridden `getArea()` method. **DO NOT MODIFY THESE CLASS**
- **ShapeTester.java**: This is a main program for testing. You have to complete this class.

Task 1: Implement “Shape” Abstract Class (As shown in the class diagram above)

You have to create **Shape.java** file

This class is an *abstract class* that implements **Comparable** interface

- **Instance Fields (Attributes)**: static variable `PI` with value 3.14, `color`, and `description`
- **Constructor Method**: `Shape (String color, String description)`
- **Methods**:
 - `setColor(String color)`: to set a new color to this **Shape**
 - `getColor()`: return color of this **Shape**
 - `toString()`: return information of this **Shape** in the following pattern:

$$\text{“description (color=____, area=____)”}$$
 (see expected output for more examples)
 - `compareTo(Object shape)`: This method is used for comparing two shapes between this shape and the given shape in the parameter. If this shape has larger area than the given shape, return 1. If this shape has the same size as the given shape, return 0. Otherwise, return -1.
 - `getArea():` is an abstract method. You just have to define the method but do not have to implement the body of this method. This `getArea()` method will be implemented within each subclass (**Circle**, **Square**, and **Triangle**)

Task 2: Complete the “ShapeTester” class

Complete two static methods. Please see the comment for more details

- static void printAllShapes(HashMap<String, Shape> shapes)
- static int countInvalidName(HashMap<String, Shape> shapes)

In the main method, put two more object into the shapeMap. One object must have a valid name, another one must have invalid name

Expected output (updated on 3/17/19 3:00PM: add the first three lines)

```
my.circle is smaller than triangle x
Square* is the same size as triangle x
triangle2 is larger than triangle x
-----
triangle2->Triangle with base 20.0, height 40.0 (color=red, area=400.0)
circle_2->Circle with diameter 10.0 (color=yellow, area=314.0)
Square*>Square with width 10.0 (color=green, area=100.0)
2square->Square with width 5.0 (color=green, area=25.0)
my.circle->Circle with diameter 2.0 (color=yellow, area=12.56)
-----
Number of invalid shape's name is 3
```

Challenge Bonus (Optional): Working with JFrame, Graphics, JPanel, ect.

Can you rally draw Circle, Square, or Triangle shape on the screen? Here is the sample UI. However, feel free to make it more beautiful! You can use any libraries that you want to complete this task.

