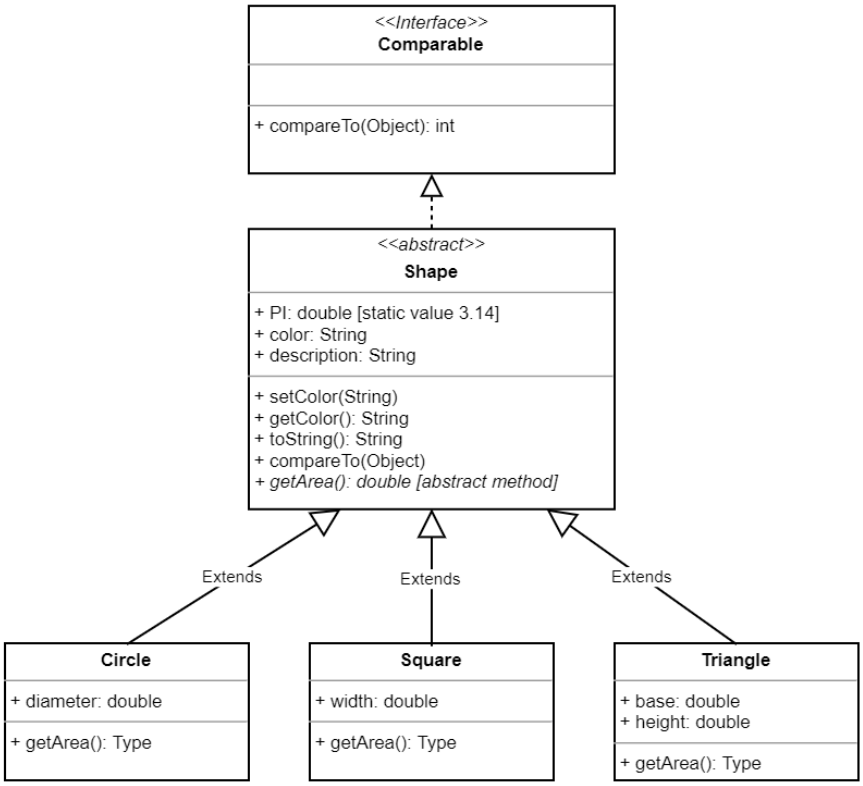
ITCS 209 Object Oriented Programming	Name:	Lab	Challenge Bonus	Peer Bonus
	ID:			
	Sec:			

Lab09: Interface, HashMap, and Regular Expression



In this lab, the total of 5 java files are provided

- **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 THIS 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

description (color=____, area=___) -- see the 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)

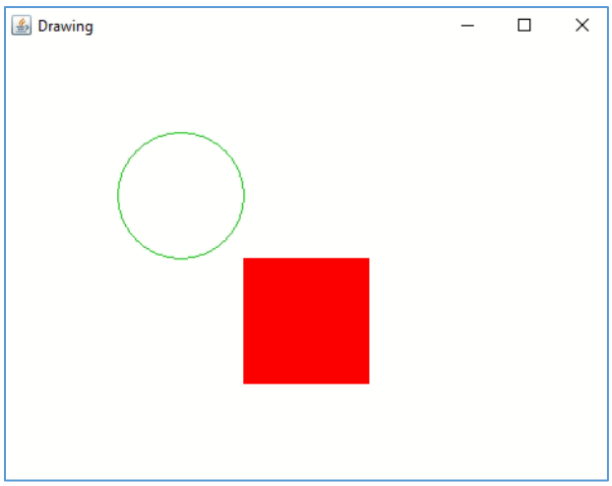
In the main method, put two more object into the shapeMap. One object must have a valid name, another one must have invalid name

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.



Peer Bonus (Optional):