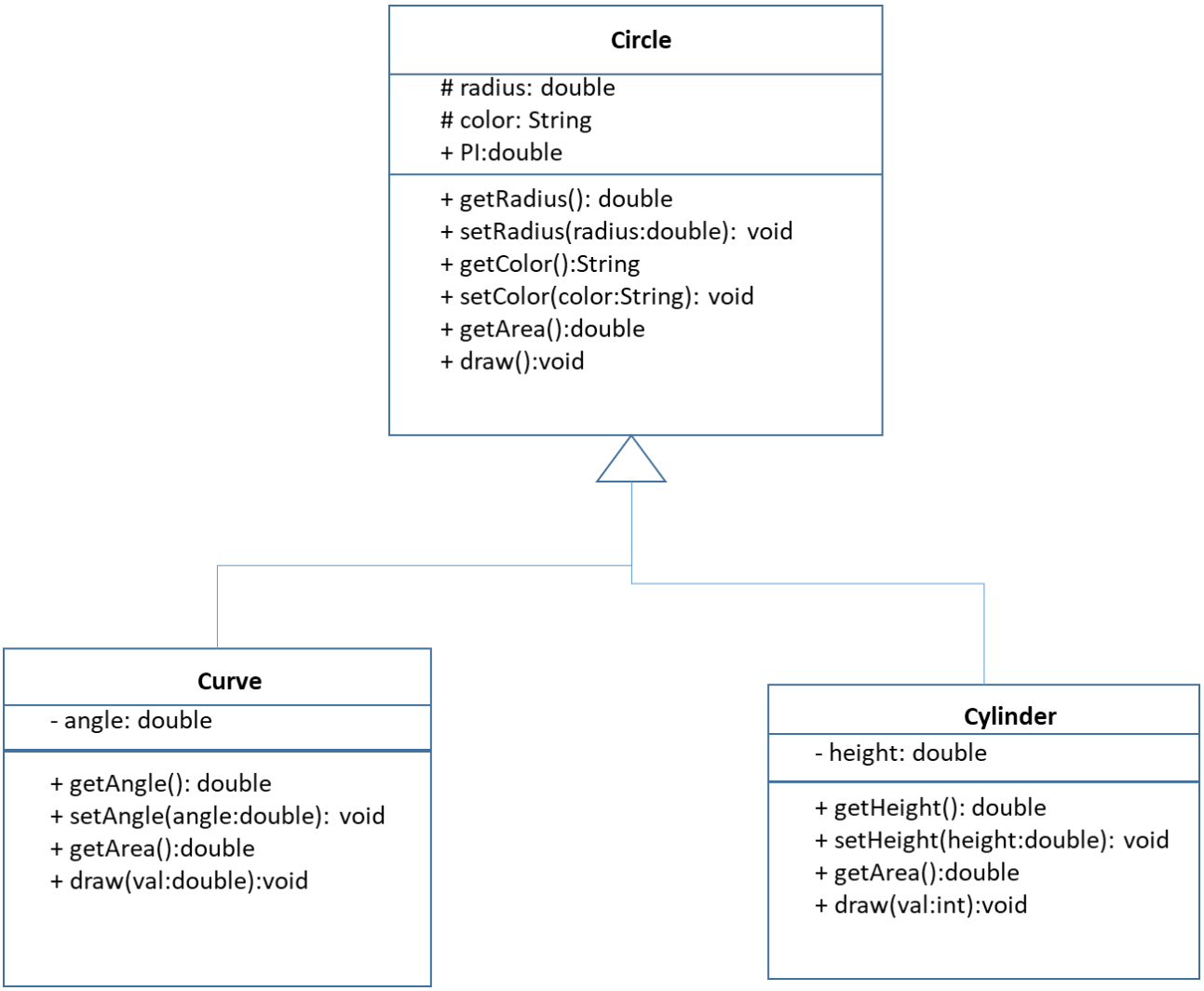
SENG102

Lab Assignment 8

Question 1

In this lab assignment, you are asked to write java code of given classes in the following class diagram.



Instructions:

- Create classes with defined attributes.
- Write the methods of classes according to the given signatures,
- *PI* as a constant final attribute. (PI=3.14)
- You can get class name using the following code in java:
  - this.getClass().getSimpleName();
- The methods **draw(), getArea()** give information when it is invoked. It prints out the class name and "…method is invoked ".
  - i.e. `draw()` method has the following line:

```
        System.out.println(this.getClass().getSimpleName() + " draw method is
invoked");
```

- The properties of the **super class** is as follows:
  - The access (visibility) modifiers are as given in the diagram.
  - getArea() methods calculates the area of the instance.
    Area formulation for circle: $A=\pi r^2$
  - draw() method prints out:
    "This method draws circle of class " + class name
- Part of the code for this class given below.

```
4  public class Circle {
5
6        ...
7
8
9      public double getRadius() {
10         return radius;
11     }
12     public void setRadius(double radius) {
13         this.radius = radius;
14     }
15     public String getColor() {
16         return color;
17     }
18     public void setColor(String color) {
19         this.color = color;
20     }
21     public void draw() {
22         System.out.println(this.getClass().getSimpleName() + " draw method is invoked");
23         System.out.println("This method draws circle of class " + this.getClass().getSimpleName());
24     }
25        ...
```

- In the **subclasses**:
- Override the getArea() method of super class,
  - The method calculates the area of the instance
  - Area formulation for cylinder: $A=2\pi r(h+r)$ (h stands for height)
  - Area formulation for curve: $A=(\alpha/360)\pi r^2$ (α stands for angle)
- Overload the draw() methods (with a parameter to call that method).
  - The method calls the draw method of the super class at the first line.
  - prints out the name of the class and the method:
- `System.out.println(this.getClass().getSimpleName() + " draw method is invoked");`
  - prints out the following line:
    - "This method is overloaded with an **int** parameter the value is: " + val. (for cylinder class)
    - "This method is overloaded with an **double** parameter the value is: " + val. (for curve class)

- The runnable class is as follows:
- The name of the class is **testInheritance.java**
- It creates one instance of each class.
  - Circle c1 = new Circle();
  - Cylinder cyl1=new Cylinder();
  - Curve cur1=new Curve();
- The radius of c1 is set to 5, the color of c1 is set to "Yellow",

- The radius of cyl1 is set to 4, the color of cyl1 is set to “Blue”, and the height of cyl1 is set to 10,
- The radius of cur1 is set to 3, the color of cur1 is set to “Red”, and the angle of cur1 is set to 30,
- Part of the code for this class given below.

```
public class testInheritance {

    public static void main(String[] args) {
        Circle c1 = new Circle();
        Cylinder cyl1=new Cylinder();
        Curve cur1=new Curve();

        c1.setRadius(5);
        cyl1.setRadius(4);
        cur1.setRadius(3);

        cyl1.setHeight(10);
        cur1.setAngle(30.0);

        c1.setColor("Yellow");
        cyl1.setColor("Blue");
        cur1.setColor("Red");

        c1.getArea();









        cur1.draw(10.0);

```

- To test your code, inside main method, invoke getArea() and draw() methods of related classes to obtain the given output.

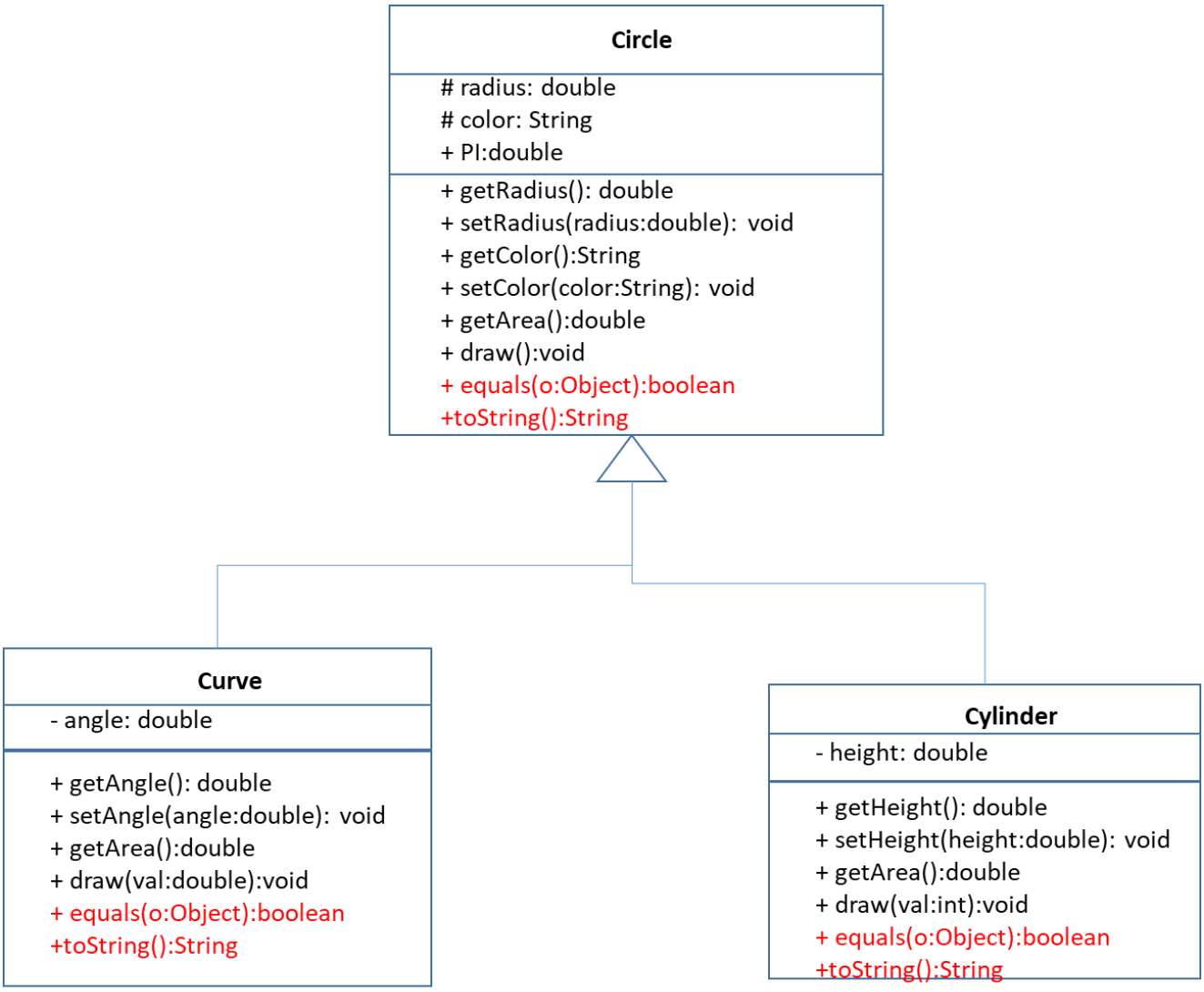
Expected Output:

```
Circle getArea method is invoked
Circle area value is: 78.5
Cylinder getArea method is invoked
Cylinder area value is: 351.68
Curve getArea method is invoked
Curve area value is: 2.3549999999999995
Circle draw method is invoked
This method draws circle of class Circle
Cylinder draw method is invoked
This method draws circle of class Cylinder
Cylinder draw method is invoked
This method draws circle of class Cylinder
Cylinder draw method is invoked
This method is overloaded with an int parameter the value is: 20
Curve draw method is invoked
```

```
This method draws circle of class Curve
Curve draw method is invoked
This method draws circle of class Curve
Curve draw method is invoked
This method is overloaded with a double parameter the value is: 10.0
```

Question 2

In this lab assignment, you are asked to write java code of overridden equals() and toString() methods of given classes in the following class diagram.



Instructions:

- Use the classes you created in the first assignment.
- **equals() method instructions:**
  - Override the equals() method of for each class,
  - for each implementation of the method, it has the following line to print out the name of the class

```
System.out.println(this.getClass().getSimpleName()+ " equals method is invoked");
```

  - each method accepts object as parameter
    - `public boolean equals(Object o)`
  - At first, check that if the object is null then return false
  - Compare the class type of the parameter object and your class type, if they are different then return false. You can get your class type using: `this.getClass()`
  - Create a new instance of your class and assign the parameter object to this variable. Do the type conversion of parameter object to your class type using casting.
  - Compare:
    - For circle object: radius and color
    - For cylinder object: radius, color, and height
    - For curve object: radius, color, and angle

    if they are same, then return true, otherwise false.
    Do not forget, the color the color attribute is String and requires string comparison.

- **toString() method instructions:**
  - Override the toString() method for each class,
  - The method returns the following values, having tab space between each value:
    - For circle object: radius and color
    - For cylinder object: radius, color, and height
    - For curve object: radius, color, and angle

- The runnable class instructions are as follows:
- The name of the class is **testInheritanceQ2.java**
- Create your own class to test the methods above.
- <u>You will not submit this class</u>.
- It creates various instances of classes (circle, cylinder, curve) with different attributes.
- The class we will use to test your submission uses equals() and toString() methods of your classes.

<u>Submission:</u>

Please create a zip file containing Circle.java, Cylinder.java, Curve.java