LAB # 8

Mutability and Immutability

OBJECTIVE: Understanding and implementing the concept of mutability and immutability

Lab Task:

1. **Apply concept of mutability and immutability for the task promoted and failed students. The roll number, subject code, and subject name would have to be entered at time of object creation and with getter method these variables should be printed. (Hint: Those students who are failed in previous semester will be registered in immutable class, and promoted students are registered in mutable class)**

```
 2  public class Mutable {
 3  private int course_code;
 4  private String course_name;
 5  private int roll_no;
 6  Mutable (int course_code, String course_name, int roll_no)
 7  {
 8      this.course_code= course_code;
 9      this.course_name = course_name;
10      this.roll_no = roll_no;
11  }
12  public int getCourse_code()
13  {
14      return course_code;
15  }
16  public String getCourse_name()
17  {
18      return course_name;
19  }
20  public int getRoll_no()
21  {
22      return roll_no;
23  }
24
25  public void setCourse_code(int course_code)
26  {
27      this.course_code = course_code;
28  }
29  public void setCourse_name(String course_name)
30  {
31      this.course_name = course_name;
32  }
33  public void setRoll_no(int roll_no)
34  {
35      this.roll_no = roll_no;
36  }
37
38
39  }
```

```java
public final class Immutable {
    final int course_code;
    final String course_name;
    final int roll_no;
    Immutable (int course_code, String course_name, int roll_no)
    {
        this.course_code= course_code;
        this.course_name = course_name;
        this.roll_no = roll_no;
    }
    public int getCourse_code()
    {
        return course_code;
    }
    public String getCourse_name()
    {
        return course_name;
    }
    public int getRoll_no()
    {
        return roll_no;
    }
}


public class Main {

    public static void main(String[] args) {


        System.out.println("Mutable Class ");
        System.out.println("Before Set ");
        Mutable mutable = new Mutable (114,"Software Design Aechitecture",131);
        System.out.println(" "+ mutable.getCourse_code());
        System.out.println(" "+ mutable.getCourse_name());
        System.out.println(" "+ mutable.getRoll_no());

        System.out.println("\nAfter Set ");
        mutable.setCourse_code(411);
        mutable.setCourse_name("Software Cunstruction and Development");
        mutable.setRoll_no(131);
        System.out.println(" "+ mutable.getCourse_code());
        System.out.println(" "+ mutable.getCourse_name());
        System.out.println(" "+ mutable.getRoll_no());


        System.out.println("\nImmutable Class ");
        Immutable immutable = new Immutable (137,"Software Design and Architecture", 131);
        System.out.println(" "+ immutable.getCourse_code());
        System.out.println(" "+ immutable.getCourse_name());
        System.out.println(" "+ immutable.getRoll_no());

    }

}
```

Output:

```
Mutable Class
Before Set
 114
 Software Design Aechitecture
 131

After Set
 411
 Software Cunstruction and Development
 131

Immutable Class
 137
 Software Design and Architecture
 131
```

2. **Write a program that will calculate the below 4 formulas. Decide what to make mutable and what to make immutable and perform task operations. Formulas are:**
   Circumference of circle: $C = 2 \pi r$
   Area of circle: $A = \pi r^2$
   Volume of sphere: $V = 4/3 \pi r 3$
   Surface area of sphere: $A = 4 \pi r^2$ (Hint: Value of pie would be constant and value of radius should be variant)

```java
package lab8;

public final class circumference
{
    int radius;

    circumference (int radius)
    {
        this.radius = radius;

    }
    public int getRadius()
    {
        return radius;
    }
}
```

```java
package lab8;

public class Area {
    int radius;

Area(int radius)
 {
     this.radius = radius;
 }
 public int getRadius()
 {
     return radius;
 }
 public void setRadius(int radius)
 {
     this.radius = radius;
 }
}
```

```java
package lab8;

public class Volume {
 int radius;
  Volume(int radius)
 {
      this.radius = radius;
 }
public int getRadius()
{
     return radius;
}
public void setRadius(int radius)
{
     this.radius = radius;
}
}
```

```java
package lab8;

public final class Surface_area {
int radius;

   Surface_area(int radius)
  {
      this.radius = radius;
  }
 public int getRadius()
 {
     return radius;
 }

}
```

```java
package lab8;

public class calculateFormulas {
    static double Area;
    static double Volume;
    static double circumference;
    static double Surface_area;
    static double pi = 3.14;
    private static int radius;
    public static void main(String[] args) {

        Area mutable1 = new Area (6);
        System.out.println("radius of circle is : "+ mutable1.getRadius());
        mutable1.setRadius(8);
        System.out.println("new radius of circle is: "+ mutable1.getRadius());
        radius = mutable1.getRadius();
        Area = pi*radius*radius;
        System.out.println("Area of Circle is "+ Area);


        Volume mutable2 = new Volume (3);
        System.out.println("radius of sphere is : "+ mutable2.getRadius());
        mutable2.setRadius(2);
        System.out.println("new radius of sphere is: "+ mutable2.getRadius());
        radius = mutable2.getRadius();
        Volume = 4/3*pi*radius*radius*radius;
        System.out.println("Volume of Sphere is "+ Volume);


         circumference immutable1 = new circumference (3);
         System.out.println("radius of sphere is : "+ immutable1.getRadius());
         radius = mutable2.getRadius();
         circumference = 2*pi*radius;
         System.out.println("circumference of circle is "+circumference );

         Surface_area immutable2 = new Surface_area(3);
         System.out.println("radius of sphere is : "+ immutable2.getRadius());
         radius = mutable2.getRadius();
         Surface_area = 4*pi*radius*radius;
         System.out.println("Surface Area of Sphere is "+ Surface_area);

    }
}
```

OUTPUT:

```
radius of circle is : 6
new radius of circle is: 8
Area of Circle is 200.96
radius of sphere is : 3
new radius of sphere is: 2
Volume of Sphere is 25.12
radius of sphere is : 3
circumference of circle is 12.56
radius of sphere is : 3
Surface Area of Sphere is 50.24
```