

LAB # 14

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 usages
1 final class ImmutableStudent {
    3 usages
2     private final String rollNumber;
    3 usages
3     private final String subjectCode;
    3 usages
4     private final String subjectName;
5
    1 usage
6     public ImmutableStudent(String rollNumber, String subjectCode, String subjectName) {
7         this.rollNumber = rollNumber;
8         this.subjectCode = subjectCode;
9         this.subjectName = subjectName;
10    }
11
    no usages
12    public String getRollNumber() {
13        return rollNumber;
14    }
15
    no usages
16    public String getSubjectCode() {
17        return subjectCode;
18    }
19
    no usages
20    public String getSubjectName() {
21        return subjectName;
22    }
23
24    @Override
25    public String toString() {
```

```

23
24
25 @Override
26 public String toString() {
27     return "ImmutableStudent{" +
28         "rollNumber='" + rollNumber + '\'' +
29         ", subjectCode='" + subjectCode + '\'' +
30         ", subjectName='" + subjectName + '\'' +
31         '}';
32 }
33
34
35 2 usages
class MutableStudent {
36     4 usages
37     private String rollNumber;
38     4 usages
39     private String subjectCode;
40     4 usages
41     private String subjectName;
42
43     1 usage
44     public MutableStudent(String rollNumber, String subjectCode, String subjectName) {
45         this.rollNumber = rollNumber;
46         this.subjectCode = subjectCode;
47         this.subjectName = subjectName;
48     }
49
50     no usages
51     public String getRollNumber() {
52         return rollNumber;
53     }
54
55     this.subjectName = subjectName;
56 }
57
58 no usages
59 public String getRollNumber() {
60     return rollNumber;
61 }
62
63 no usages
64 public void setRollNumber(String rollNumber) {
65     this.rollNumber = rollNumber;
66 }
67
68 no usages
69 public String getSubjectCode() {
70     return subjectCode;
71 }
72
73 no usages
74 public void setSubjectCode(String subjectCode) {
75     this.subjectCode = subjectCode;
76 }
77
78 no usages
79 public String getSubjectName() {
80     return subjectName;
81 }
82
83 1 usage
84 public void setSubjectName(String subjectName) {
85     this.subjectName = subjectName;
86 }
87
88
89

```

```

70     @Override
71     public String toString() {
72         return "MutableStudent{" +
73             "rollNumber='" + rollNumber + '\'' +
74             ", subjectCode='" + subjectCode + '\'' +
75             ", subjectName='" + subjectName + '\'' +
76             '}';
77     }
78 }
79
80 public class Main {
81     public static void main(String[] args) {
82         ImmutableStudent failedStudent = new ImmutableStudent(rollNumber: "001", subjectCode: "CS101", subjectName: "Computer Science");
83         System.out.println("Failed Student: " + failedStudent);
84
85         MutableStudent promotedStudent = new MutableStudent(rollNumber: "002", subjectCode: "CS102", subjectName: "Mathematics");
86         System.out.println("Promoted Student: " + promotedStudent);
87
88         promotedStudent.setSubjectName("Physics");
89         System.out.println("Updated Promoted Student: " + promotedStudent);
90     }
91 }

```

Ctrl+L to Chat, Ctrl+I to Command

Run Main (1) x

```

C:\Users\Admin\jdk\corretto-1.8.0_392\bin\java.exe ...
Failed Student: ImmutableStudent{rollNumber='001', subjectCode='CS101', subjectName='Computer Science'}
Promoted Student: MutableStudent{rollNumber='002', subjectCode='CS102', subjectName='Mathematics'}
Updated Promoted Student: MutableStudent{rollNumber='002', subjectCode='CS102', subjectName='Physics'}

```

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: $V = \frac{4}{3} \pi r^3$

Surface area of sphere: $A = 4 \pi r^2$

(Hint: Value of pie would be constant and value of radius should be variant)

```

public class CircleSphereCalculations {
    4 usages
    private static final double PI = 3.14159;
    9 usages
    double radius;
    1 usage
    public CircleSphereCalculations(double radius) {
        this.radius = radius;
    }
    1 usage
    public void setRadius(double radius) {
        this.radius = radius;
    }
    no usages
    public double getRadius() {
        return radius;
    }
    2 usages
    public double calculateCircumference() {
        return 2 * PI * radius;
    }
    2 usages
    public double calculateAreaOfCircle() {
        return PI * radius * radius;
    }
    2 usages
    public double calculateVolumeOfSphere() {
        return (4.0 / 3.0) * PI * Math.pow(radius, 3);
    }
    2 usages
    public double calculateSurfaceAreaOfSphere() {
        return 4 * PI * radius * radius;
    }
}

```

```
        return PI * radius * radius;
    }

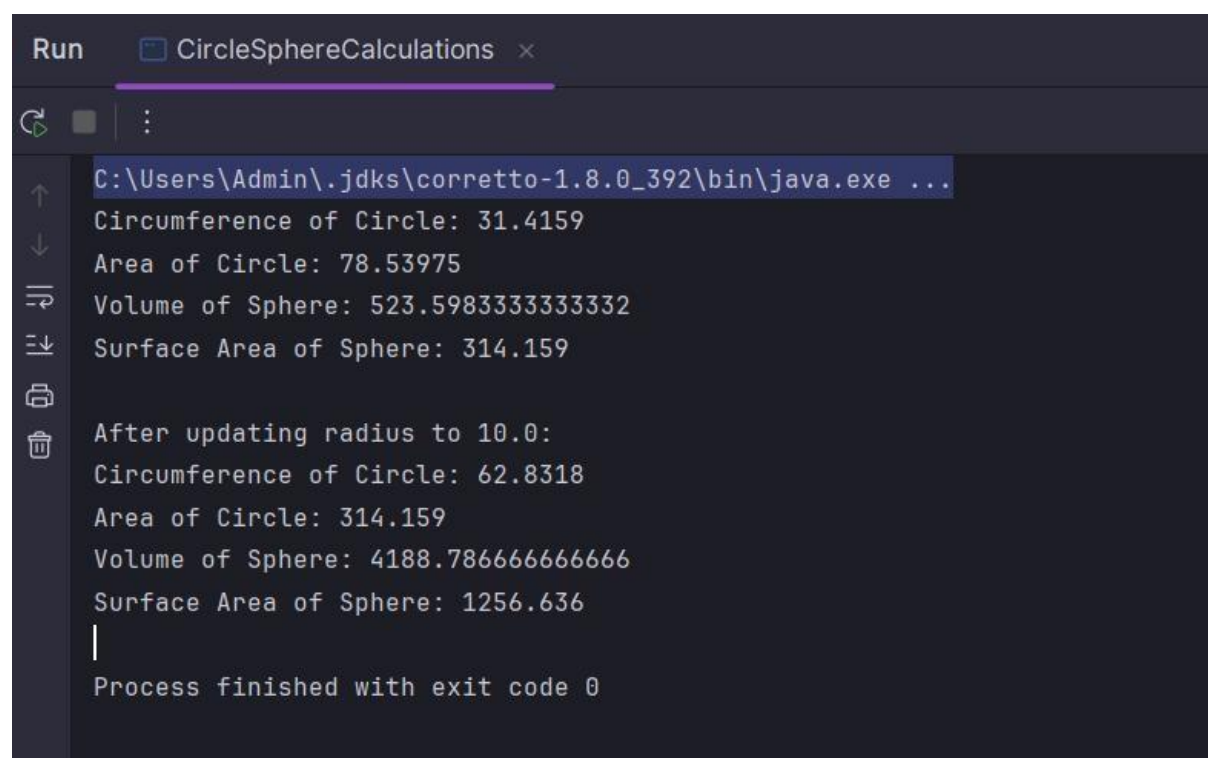
    2 usages
    public double calculateVolumeOfSphere() {
        return (4.0 / 3.0) * PI * Math.pow(radius, 3);
    }

    2 usages
    public double calculateSurfaceAreaOfSphere() {
        return 4 * PI * radius * radius;
    }

    public static void main(String[] args) {
        CircleSphereCalculations calculator = new CircleSphereCalculations( radius: 5.0);

        System.out.println("Circumference of Circle: " + calculator.calculateCircumference());
        System.out.println("Area of Circle: " + calculator.calculateAreaOfCircle());
        System.out.println("Volume of Sphere: " + calculator.calculateVolumeOfSphere());
        System.out.println("Surface Area of Sphere: " + calculator.calculateSurfaceAreaOfSphere());

        calculator.setRadius(10.0);
        System.out.println("\nAfter updating radius to 10.0:");
        System.out.println("Circumference of Circle: " + calculator.calculateCircumference());
        System.out.println("Area of Circle: " + calculator.calculateAreaOfCircle());
        System.out.println("Volume of Sphere: " + calculator.calculateVolumeOfSphere());
        System.out.println("Surface Area of Sphere: " + calculator.calculateSurfaceAreaOfSphere());
    }
}
```



```
Run CircleSphereCalculations x
C:\Users\Admin\jdk\corretto-1.8.0_392\bin\java.exe ...
Circumference of Circle: 31.4159
Area of Circle: 78.53975
Volume of Sphere: 523.5983333333332
Surface Area of Sphere: 314.159

After updating radius to 10.0:
Circumference of Circle: 62.8318
Area of Circle: 314.159
Volume of Sphere: 4188.7866666666666
Surface Area of Sphere: 1256.636

Process finished with exit code 0
```