

LAB # 8

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.

```
public final class FailedStudent {
    private final String rollNumber;
    private final String subjectCode;
    private final String subjectName;
    public FailedStudent(String rollNumber, String subjectCode, String subjectName) {
        this.rollNumber = rollNumber;
        this.subjectCode = subjectCode;
        this.subjectName = subjectName;}
    public String getRollNumber() {
        return rollNumber;}
    public String getSubjectCode() {
        return subjectCode;[1]}
    public String getSubjectName() {
        return subjectName;}
    public static void main(String[] args) {
        FailedStudent failedStudent = new FailedStudent("123", "CS101", "Data Structures");
        System.out.println("Failed Student Roll Number: " + failedStudent.getRollNumber());
        System.out.println("Subject Code: " + failedStudent.getSubjectCode());
        System.out.println("Subject Name: " + failedStudent.getSubjectName());}
}
```

Failed Student Roll Number: 123
Subject Code: CS101
Subject Name: Data Structures

```
public class PromotedStudent {
    private String rollNumber;
    private String subjectCode;
    private String subjectName;
    public PromotedStudent(String rollNumber, String subjectCode, String subjectName) {
        this.rollNumber = rollNumber;
        this.subjectCode = subjectCode;
        this.subjectName = subjectName;}
    public String getRollNumber() {
        return rollNumber;}
    public void setRollNumber(String rollNumber) {
        this.rollNumber = rollNumber;}
    public String getSubjectCode() {
        return subjectCode;}
    public void setSubjectCode(String subjectCode) {
        this.subjectCode = subjectCode;}
    public String getSubjectName() {
        return subjectName;}
    public void setSubjectName(String subjectName) {
        this.subjectName = subjectName;}
    public static void main(String[] args) {
        PromotedStudent promotedStudent = new PromotedStudent("456", "CS102", "Algorithms");
        System.out.println("Promoted Student Roll Number: " + promotedStudent.getRollNumber());
        System.out.println("Subject Code: " + promotedStudent.getSubjectCode());
        System.out.println("Subject Name: " + promotedStudent.getSubjectName());
        promotedStudent.setSubjectCode("CS103");
        promotedStudent.setSubjectName("Operating Systems");
        System.out.println("\nUpdated details for Promoted Student:");
        System.out.println("Subject Code: " + promotedStudent.getSubjectCode());
        System.out.println("Subject Name: " + promotedStudent.getSubjectName());}
}
```

Promoted Student Roll Number: 456
Subject Code: CS102
Subject Name: Algorithms

Updated details for Promoted Student:
Subject Code: CS103
Subject Name: Operating Systems

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: $A = 4 \pi r^2$

```
public class CircleSphere {
    private double radius;
    public CircleSphere(double radius) {
        this.radius = radius;
    }
    public double getRadius() {
        return radius;
    }
    public void setRadius(double radius) {
        this.radius = radius;
    }
    public double circumferenceOfCircle() {
        return 2 * Math.PI * radius;
    }
    public double areaOfCircle() {
        return Math.PI * radius * radius;
    }
    public double volumeOfSphere() {
        return (4.0 / 3) * Math.PI * radius * radius * radius;
    }
    public double surfaceAreaOfSphere() {
        return 4 * Math.PI * radius * radius;
    }
    public static void main(String[] args) {
        CircleSphere obj = new CircleSphere(5);
        System.out.println("Radius: " + obj.getRadius());
        System.out.println("Circumference of Circle: " + obj.circumferenceOfCircle());
        System.out.println("Area of Circle: " + obj.areaOfCircle());
        System.out.println("Volume of Sphere: " + obj.volumeOfSphere());
        System.out.println("Surface Area of Sphere: " + obj.surfaceAreaOfSphere());
        obj.setRadius(7);
        System.out.println("\nUpdated Radius: " + obj.getRadius());
        System.out.println("Circumference of Circle: " + obj.circumferenceOfCircle());
        System.out.println("Area of Circle: " + obj.areaOfCircle());
        System.out.println("Volume of Sphere: " + obj.volumeOfSphere());
        System.out.println("Surface Area of Sphere: " + obj.surfaceAreaOfSphere());
    }
}
Radius: 5.0
Circumference of Circle: 31.41592653589793
Area of Circle: 78.53981633974483
Volume of Sphere: 523.5987755982989
Surface Area of Sphere: 314.1592653589793

Updated Radius: 7.0
Circumference of Circle: 43.982297150257104
Area of Circle: 153.93804002589985
Volume of Sphere: 1436.755040241732
Surface Area of Sphere: 615.7521601035994
```

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