

Lab-8

202203028

Dhaval Malsattar

Question-1:

Code:

```
package Lab_8;

abstract class Student{
    String name;
    int id;
    abstract void displayDetails();
    Student(String name,int id){
        this.name = name;
        this.id = id;
    }
}

class UnderGraduateStudent extends Student{
    int year;
    void displayDetails(){
        System.out.println("Student name = "+name);
        System.out.println("Student id = "+id);
        System.out.println("year of Graduation = "+year);
    }
    UnderGraduateStudent(String name,int id,int year){
        super(name,id);
        this.year = year;
    }
}

class PostGraduateStudent extends Student{
    int year;
    String researchTopic;
    void displayDetails(){
        System.out.println("Student name = "+name);
        System.out.println("Student id = "+id);
        System.out.println("year of Graduation = "+year);
        System.out.println("Research topic = "+researchTopic);
    }
}
```

```

        PostGraduateStudent(String name,int id,int year,String researchTopic){
            super(name,id);
            this.year = year;
            this.researchTopic = researchTopic;
        }
    }
}
public class Lab_8_1
{
    public static void main(String[] args) {
        UnderGraduateStudent u1 = new UnderGraduateStudent("Dhaval
Malsattar",202203028,2026);
        u1.displayDetails();
        System.out.println();
        PostGraduateStudent p1 = new PostGraduateStudent("Dhaval
Malsattar",202203028,2026,"Tic Tac Toe");
        p1.displayDetails();

    }
}

```

Output :

```

PS C:\Users\Admin\Desktop\OOPs-LAB>
PS C:\Users\Admin\Desktop\OOPs-LAB> java Lab_8/Lab_8_1
Student name = Dhaval Malsattar
Student id = 202203028
year of Graduation = 2026

Student name = Dhaval Malsattar
Student id = 202203028
year of Graduation = 2026
Research topic = Tic Tac Toe
PS C:\Users\Admin\Desktop\OOPs-LAB> 

```

Question-2:

Code:

```

package Lab_8;
abstract class Student{
    String name;
    int age;
    double grade;
    abstract double calculateAverageGrade();
}

```

```

Student(String name,int age,double grade){
    this.name = name;
    this.age = age;
    this.grade = grade;
}
}
class ScienceStudent extends Student{
    static int count=0;
    static double TotalPhysicsGrade=0;
    double physicsGrade;
    double calculateAverageGrade(){
        return (grade+physicsGrade)/2;
    }
    static void calculateAveragePhysicsGrade(){
        System.out.println("*****");
        System.out.println(TotalPhysicsGrade/count);
    }

    ScienceStudent(String name,int age,double grade,double physicsGrade){
        super(name,age,grade);
        this.physicsGrade = physicsGrade;
        count++;
        this.TotalPhysicsGrade += physicsGrade;
    }
    void displayDetails(){
        System.out.println("Student name = "+name);
        System.out.println("Student age = "+age);
        System.out.println("Physics Grade = "+physicsGrade);
        System.out.println("Average Grade = 
"+this.calculateAverageGrade());
        System.out.println();
    }
}
public class Lab_8_2
{
    public static void main(String[] args) {

        ScienceStudent s1 = new ScienceStudent("Dhaval", 18, 9.9, 10);
        s1.displayDetails();
        ScienceStudent s2 = new ScienceStudent("Deven", 18, 8.9, 9);
        s2.displayDetails();
        ScienceStudent s3 = new ScienceStudent("Dhruv", 18, 7.9, 7);
        s3.displayDetails();
        ScienceStudent s4 = new ScienceStudent("Dhaval2", 18, 10, 10);
        s4.displayDetails();

        ScienceStudent.calculateAveragePhysicsGrade();
    }
}

```

```
}  
}
```

Output:

```
PS C:\Users\Admin\Desktop\OOPs-LAB> javac Lab_8/Lab_8_2.java  
PS C:\Users\Admin\Desktop\OOPs-LAB> java Lab_8/Lab_8_2  
Student name = Dhaval  
Student age = 18  
Physics Grade = 10.0  
Average Grade = 9.95  
  
Student name = Deven  
Student age = 18  
Physics Grade = 9.0  
Average Grade = 8.95  
  
Student name = Dhruv  
Student age = 18  
Physics Grade = 7.0  
Average Grade = 7.45  
  
Student name = Dhaval2  
Student age = 18  
Physics Grade = 10.0  
Average Grade = 10.0  
  
*****  
9.0  
PS C:\Users\Admin\Desktop\OOPs-LAB> |
```

Question-3:

Code:

```
package Lab_8;  
interface Shape{  
    double getArea();  
    double getPerimeter();  
    void displayDetails();  
}  
class Ractangle implements Shape{  
    double height;  
    double width;  
    Ractangle(double l,double m){  
        height = l;  
        width = m;  
    }  
}
```

```

    }
    public double getArea(){
        return height*width;
    }
    public double getPerimeter(){
        return height+width;
    }
    public void displayDetails(){
        System.out.println("Area Ractangle = "+getArea());
        System.out.println("perimeter Ractangle = "+getPerimeter());
    }
}
class Circle implements Shape{
    double radius;
    Circle(double r){
        radius = r;
    }
    public double getArea(){
        return Math.PI*radius*radius;
    }
    public double getPerimeter(){
        return Math.PI*2*radius;
    }
    public void displayDetails(){
        System.out.println("Area Circle = "+getArea());
        System.out.println("perimeter Circle = "+getPerimeter());
    }
}
public class Lab_8_3{
    public static void main(String[] args) {
        Ractangle r1 = new Ractangle(10,30);
        Circle c1 = new Circle(10);
        r1.displayDetails();
        c1.displayDetails();
    }
}

```

Output:

```

PS C:\Users\Admin\Desktop\OOPs-LAB> javac Lab_8/Lab_8_3.java
PS C:\Users\Admin\Desktop\OOPs-LAB> java Lab_8/Lab_8_3
Area Ractangle = 300.0
perimeter Ractangle = 40.0
Area Circle = 314.1592653589793
perimeter Circle = 62.83185307179586
PS C:\Users\Admin\Desktop\OOPs-LAB> 

```

Question-4:

Code:

```
package Lab_8;
import java.util.*;
interface Calculator{
    int add(int a,int b);
    int subtract(int a,int b);
    int multiply(int a,int b);
    double divide(int a,int b);
}
class BasicCalculator implements Calculator{
    public int add(int a,int b){
        return a+b;
    }
    public int subtract(int a,int b){
        return a-b;
    }
    public int multiply(int a,int b){
        return a*b;
    }
    public double divide(int a,int b){
        return a/b;
    }
}
public class Lab_8_4 {
    public static void main(String[] args) {
        BasicCalculator b1 = new BasicCalculator();
        int a=90,b=5;
        System.out.println(b1.add(a,b));
        System.out.println(b1.subtract(a,b));
        System.out.println(b1.multiply(a,b));
        System.out.println(b1.divide(a,b));
    }
}
```

Output:

```
PS C:\Users\Admin\Desktop\OOPs-LAB> javac Lab_8/Lab_8_4.java
PS C:\Users\Admin\Desktop\OOPs-LAB> java Lab_8/Lab_8_4
95
85
450
18.0
PS C:\Users\Admin\Desktop\OOPs-LAB> █
```

Question-5:

Code:

```
package Lab_8;
import java.util.*;
interface Sortable{
    void sort(int arr[]);
}
class BubbleShort implements Sortable{
    public void sort(int a[]){
        int n=a.length;
        int t;
        for(int i=0;i<n-1;i++){
            for(int j=0;j<n-1-i;j++){
                if(a[j]>a[j+1]){
                    t=a[j];
                    a[j]=a[j+1];
                    a[j+1]=t;
                }
            }
        }
    }
}
class InsertionShort implements Sortable{
    public void sort(int a[]){
        int n=a.length;
        for(int i=1;i<n;i++){
            int j=i;
            int t=a[i];
            while(j>0 && a[j-1]>t ){
                a[j]=a[j-1];
                j--;
            }
            a[j]=t;
        }
    }
}
public class Lab_8_5 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter number of element");
        int n = sc.nextInt();
        int a[] = new int[n];
        int b[] = new int[n];
    }
}
```

```

        System.out.println("Enter elements");
        for(int i=0;i<n;i++){
            a[i]=sc.nextInt();
            b[i]=a[i];
        }

        System.out.println("With Bubble Short");
        BubbleShort b1 = new BubbleShort();
        b1.sort(a);
        for(int i=0;i<n;i++){
            System.out.print(a[i]+" ");
        }
        System.out.println();
        System.out.println("With Insertion Short");
        InsertionShort i1 = new InsertionShort();
        i1.sort(b);
        for(int i=0;i<n;i++){
            System.out.print(a[i]+" ");
        }
    }
}

```

Output:

```

PS C:\Users\Admin\Desktop\OOPs-LAB> javac Lab_8/Lab_8_5.java
PS C:\Users\Admin\Desktop\OOPs-LAB> java Lab_8/Lab_8_5
Enter number of element
7
Enter elements
2 54 12 44 21 43 7
With Bubble Short
2 7 12 21 43 44 54
With Insertion Short
2 7 12 21 43 44 54
PS C:\Users\Admin\Desktop\OOPs-LAB>

```