SESSION - II

Part - II

Lab No. 6: Inheritance and Packages

Lab Exercises

1. Create a Person class with private instance variables for the person's name and birth date. Add appropriate accessor methods for these variables. Then create a subclass College Graduate with private instance variables for the student's GPA and year of graduation and appropriate accessors for these variables. Include appropriate constructors for your classes. Then create a class with main() method that demonstrates your classes.

Code:

```
import java.util.* ;
class Person{
	private String name ;
	private Date dob ;
	public Person(){
		name = "";
		dob = new Date() ;
	}
	public Person(String name, Date dob){
		this.dob = dob ;
		this.name = name ;

	}
	public void set_name(String name){
		this.name = name ;
	}
	public String get_name(){
		return this.name ;

	}
```

```
	public void set_dob(int year,int month,int day){

		this.dob = new Date(year-1900,month,day)  ;

	}
	public Date get_dob(){
		return this.dob ;
	}
}
class CollegeGraduate extends Person{
	private float gpa ;
	private int grad_year ;
	public CollegeGraduate(){
		super();
		gpa = 0 ;
		grad_year = 0;
	}
	public CollegeGraduate(String name, Date dob, float gpa , int grad_year){
		super(name,dob);
		this.gpa = gpa ;
		this.grad_year = grad_year ;
	}
	public void set_gpa(float gpa){
		this.gpa = gpa ;
	}
	public float get_gpa(){
		return this.gpa ;
	}
	public void set_grad(int grad_year){
		this.grad_year = grad_year ;
	}
	public int get_grad(){
		return this.grad_year ;
```

```
        }
}
public class person{
        public static void main(String[] args){
                Scanner sc = new Scanner(System.in);
                Date d = new Date(2000-1900,1,20) ;
                CollegeGraduate cg1 = new CollegeGraduate("Mohammad Danish Eqbal",d,8.5f,2023) ;
                System.out.println("Details of College graduate are:");
                System.out.println("Name :"+cg1.get_name()+"\tDate of Birth "+cg1.get_dob()+"\nGPA "+cg1.get_gpa()+"\tGraduation Year "+cg1.get_grad());
                Person p = new Person() ;
                System.out.println("Enter birth year, month and date");
                int year,month,date ;
                year = sc.nextInt();
                month = sc.nextInt()-1;
                date = sc.nextInt();
                System.out.println("Enter Name: ");
                sc.nextLine();
                String name = sc.nextLine();
                p.set_dob(year,month,date);
                p.set_name(name) ;
                System.out.println("Details of the person using accessor methods: ") ;
                System.out.println("Name: "+p.get_name()+"\t\tDOB: "+p.get_dob());
        }
}
```

Test Case:

```
student@lplab-Lenovo-Product:~/190905513$ java person
Details of College graduate are:
Name :Mohammad Danish Eqbal     Date of Birth Sun Feb 20 00:00:00 IST 2000
GPA 8.5 Graduation Year 2023
Enter birth year, month and date
2000 02 20
Enter Name:
Mohammad Danish
Details of the person using accessor methods:
Name: Mohammad Danish           DOB: Sun Feb 20 00:00:00 IST 2000
student@lplab-Lenovo-Product:~/190905513$
```

2. Define a class Maximum with the following overloaded methods

a. max (which finds maximum among three integers and returns the maximum integer)

b. max (which finds maximum among three floating point numbers and returns the maximum among them)

c. max (which finds the maximum in an array and returns it)

d. max (which finds the maximum in a matrix and returns the result)

Place this in a package called p1. Let this package be present in a folder called "myPackages", which is a folder in your present working directory (eg: c\student\3rdsem \mypackages\p1). Write a main method to use the methods of Max class in a package p1.

Code:

//maximum.java

//path: /home/student/190905513/mypackages/

```
package mypackages.p1.mypackages;
public class maximum{
	public int maax(int a,int b,int c){
		if(a>b){
			if (a>c)
				return a ;
			else
				return c ;
		}
		else {
			if(b>c)
				return b ;
			else
				return c ;
		}
	}

	public float maax(float a,float b,float c){
		if(a>b){
			if (a>c)
				return a ;
			else
				return c ;
```

```
		}
		else {
			if(b>c)
				return b ;
			else
				return c ;
		}
	}

	public int maax(int[] arr){
		int largest,n ;
		n= arr.length ;
		largest = arr[0];
		for(int i =0;i<n;i++){
			if (arr[i] > largest )
				largest = arr[i];
		}
		return largest ;

	}
	public int maax(int[][] matrix,int r,int c){
		int largest = matrix[0][0] ;
		for(int i=0 ;i<r;i++){
			for(int j=0;j<c ;j++){
				if (matrix[i][j]>largest)
					largest= matrix[i][j] ;
			}
		}
		return largest ;
	}

}
```

//maxtest.java

//path: /home/student/190905513/

```
package mypackages.p1.mypackages;
public class maximum{
	public int maax(int a,int b,int c){
		if(a>b){
			if (a>c)
				return a ;
			else
				return c ;
		}
		else {
			if(b>c)
				return b ;
			else
				return c ;
		}
	}

	public float maax(float a,float b,float c){
		if(a>b){
			if (a>c)
				return a ;
			else
				return c ;
		}
		else {
			if(b>c)
				return b ;
			else
				return c ;
		}
	}
```

```
    public int maax(int[] arr){
        int largest,n ;
        n= arr.length ;
        largest = arr[0];
        for(int i =0;i<n;i++){
            if (arr[i] > largest )
                largest = arr[i];
        }
        return largest ;

    }
    public int maax(int[][] matrix,int r,int c){
        int largest = matrix[0][0] ;
        for(int i=0 ;i<r;i++){
            for(int j=0;j<c ;j++){
                if (matrix[i][j]>largest)
                    largest= matrix[i][j] ;
            }
        }
        return largest ;
    }
}
```

Test Case:

```
student@lplab-Lenovo-Product:~/190905513/mypackages$ cd ..
student@lplab-Lenovo-Product:~/190905513$ ls
abstractd.class  CollegeGraduate.class  mypackages    Person.class     series.class  Square.class
abstractd.java   Figure.class           my_packages   person.java      Series.class  Student.class
ByTwos.class     maxtest.java           person.class  Rectangle.class  series.java   studentdemo.class
student@lplab-Lenovo-Product:~/190905513$ gedit maxtest.java
student@lplab-Lenovo-Product:~/190905513$ javac maxtest.java
student@lplab-Lenovo-Product:~/190905513$ java maxtest
Enter 3 integers tp find max
3 4 5
Largest is 5
Enter 3 float numbers to find max
3.5 4.5 6.7
Largest is 6.7
Enter length of array
2
Enter elements of array
2 4
Largest is 4
Enter elements of matric
1 2  34
32 234 43 342
12 3 3 44 67
Largest is 342
student@lplab-Lenovo-Product:~/190905513$
```

3. Create an abstract class Figure with abstract method area and two integer dimensions. Create three more classes Rectangle, Triangle and Square which extend Figure and implement the area method. Show how the area can be computed dynamically during run time for Rectangle, Square and Triangle to achieve dynamic polymorphism. (Use the reference of Figure class to call the three different area methods).

Code:

```
import java.util.* ;
abstract class Figure {
	int dim1 ;
	int dim2 ;
	public Figure(int a , int b){
		this.dim1 = a ;
		this.dim2 = b ;
	}
	abstract float area();

}
class Rectangle extends Figure{
	public Rectangle(int a , int b){
		super(a,b);
	}

	float area(){
		System.out.println("Area of rectangle= ");
		return (dim1*dim2) ;



	}

}

class Triangle extends Figure{
	public Triangle(int a, int b){
		super(a,b);
```

```
	}
	float area(){
		System.out.println("Area of triangle= ");
		return dim1*dim2 /2 ;
	}

}

class Square extends Figure{
	public Square(int a){
		super(a,a);
	}
	float area(){
		System.out.println("Area of Square= ");
		return (dim1*dim2) ;
	}
}

public class abstractd{
	public static void main(String[] args){
		Scanner sc = new Scanner(System.in);
		System.out.println("Enter length and breadth of the rectangle: ");
		int l,b = 0 ;
		l = sc.nextInt();
		b = sc.nextInt();
		Rectangle r1 = new Rectangle(l,b);
		System.out.println("Enter base and height of the triangle: ");
		l = sc.nextInt();
		b = sc.nextInt();
		Triangle t1 = new Triangle(l,b) ;
		System.out.println("Enter side of the square");
		l = sc.nextInt();
		Square s1 = new Square(l);
```

```
        Figure f1 ;
        f1 = r1 ;
        System.out.println();
        System.out.println(f1.area()) ;
        System.out.println();
        f1 = t1 ;
        System.out.println();
        System.out.println(f1.area());
        System.out.println();
        f1 = s1 ;
        System.out.println();
        System.out.println(f1.area());
        System.out.println();
    }
}
```

Test Case:

```
student@lplab-Lenovo-Product:~/190905513$ gedit abstractd.java
^C
student@lplab-Lenovo-Product:~/190905513$ javac abstractd.java
student@lplab-Lenovo-Product:~/190905513$ java abstractd
Enter length and breadth of the rectangle:
4 5
Enter base and height of the triangle:
3
7
Enter side of the square
10

Area of rectangle=
20.0


Area of triangle=
10.0


Area of Square=
100.0

student@lplab-Lenovo-Product:~/190905513$
```