LAB CYCLE - 1

1. Define a class ‘product’ with data members pcode, pname and price. Create 3 objects of the class and find the product having the lowest price.

CODE:

```
public class product{
        int pcode;
        int price;
        String pname;

        void getdata(int p1,String p2,int p3){
                pcode=p1;
                pname=p2;
                price=p3;
        }

        public static void main(String[] args){
                System.out.println("Name : Anjala Michael");
                System.out.println("Reg No : SJC22MCA-2007 ");
                System.out.println("Course : OOPS Lab ");
                System.out.println("Course code : 20MCA132 ");
                System.out.println("Date : 24/03/2023");

                int smallest;
                product ob1 = new product();
                product ob2 = new product();
                product ob3 = new product();

                ob1.getdata(1234,"Smart TV",55000);
                ob2.getdata(1235,"Smart Watch",15000);
                ob3.getdata(1236,"Smart Phone",25000);

                if(ob1.price<ob2.price){
                        if(ob3.price<ob1.price){
                                smallest = ob3.price;
                        }
                        else{
                                smallest = ob1.price;
```

```
                }
            }
            else{
                if(ob2.price<ob3.price){
                    smallest = ob2.price;
                }
                else{
                    smallest = ob3.price;
                }
            }

            System.out.println("The lowest price is "+smallest);
        }
}
```

OUTPUT

```
j(base) sjcet@Z238-UL:~/anjala007/java$ javac product.java
(base) sjcet@Z238-UL:~/anjala007/java$ java product
Name : Anjala Michael
Reg No : SJC22MCA-2007
Course : OOPS Lab
Course code : 20MCA132
Date : 24/03/2023
The lowest price is 15000
```

2. Read 2 matrices from the console and perform matrix addition.

CODE

```
import java.util.Scanner;
public class matrixAddition{
        public static void main(String[] args){
        System.out.println("Name : Anjala Michael");
        System.out.println("Reg No : SJC22MCA-2007 ");
        System.out.println("Course : OOPS Lab ");
        System.out.println("Course code : 20MCA132 ");
        System.out.println("Date : 28/03/2023");
            int p, q, m, n,choice,d;
            Scanner s = new Scanner(System.in);
            System.out.print("Enter number of rows and columns in first matrix : ");
            p = s.nextInt();
```

```
q = s.nextInt();
System.out.print("Enter number of rows and columns in second matrix : ");
m = s.nextInt();
n = s.nextInt();
int a[][] = new int[p][q];
int b[][] = new int[m][n];
int c[][] = new int[m][n];
System.out.println("Enter all the elements of first matrix : ");

for (int i = 0; i < p; i++){
        for (int j = 0; j < q; j++){
                a[i][j] = s.nextInt();
        }
}
System.out.println("Enter all the elements of second matrix : ");
for (int i = 0; i < m; i++){
        for (int j = 0; j < n; j++){
                b[i][j] = s.nextInt();
        }
}
System.out.println("First Matrix : ");
for (int i = 0; i < p; i++){
        for (int j = 0; j < q; j++){
                System.out.print(a[i][j]+" ");
        }
        System.out.println("");
}
System.out.println("Second Matrix : ");
for (int i = 0; i < m; i++){
        for (int j = 0; j < n; j++){
                System.out.print(b[i][j]+" ");
        }
        System.out.println("");
}
        if( p == m && q == n){
                for (int k = 0; k < p; k++){
                        for (int l = 0; l < q; l++){
                                c[k][l] = a[k][l] + b[k][l];
                        }
                }
```

```
                        System.out.println("Matrix after addition : ");
                        for (int k = 0; k < p; k++){
                                for (int l = 0; l < q; l++){
                                        System.out.print(c[k][l]+" ");
                                }
                                System.out.println("");
                        }
                }
                else{
                        System.out.println("Addition would not be possible");
                }
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/java$ javac matrixAddition.java
(base) sjcet@Z238-UL:~/anjala007/java$ java matrixAddition
Name : Anjala Michael
Reg No : SJC22MCA-2007
Course : OOPS Lab
Course code : 20MCA132
Date : 28/03/2023
Enter number of rows and columns in first matrix : 3
2
Enter number of rows and columns in second matrix : 3
2
Enter all the elements of first matrix :
1 2 3 4 5 6
Enter all the elements of second matrix :
1 2 3 4 5 6
First Matrix :
1 2
3 4
5 6
Second Matrix :
1 2
3 4
5 6
Matrix after addition :
2 4
6 8
10 12
```

3. Add complex numbers

CODE

```
import java.util.Scanner;

public class ComplexAddition {
   public static void main(String[] args) {
      Scanner input = new Scanner(System.in);
      System.out.print("Enter the real part of the first complex number: ");
      double real1 = input.nextDouble();
      System.out.print("Enter the imaginary part of the first complex number: ");
      double imaginary1 = input.nextDouble();
      System.out.print("Enter the real part of the second complex number: ");
      double real2 = input.nextDouble();
      System.out.print("Enter the imaginary part of the second complex number: ");
      double imaginary2 = input.nextDouble();

      double realResult = real1 + real2;
      double imaginaryResult = imaginary1 + imaginary2;
         System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-
03-2023");
      System.out.println("The sum of the two complex numbers is: " + realResult + " + " +
imaginaryResult + "i");
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 1$ javac ComplexAddition.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 1$ java ComplexAddition
Enter the real part of the first complex number: 4
Enter the imaginary part of the first complex number: 5
Enter the real part of the second complex number: 3
Enter the imaginary part of the second complex number: 6
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-03-2023
The sum of the two complex numbers is: 7.0 + 11.0i
```

4. Read a matrix from the console and check whether it is symmetric or not.

CODE

```
import java.util.Scanner;
public class SymmetricMatrix{
	public static void main(String[] args){
		System.out.println("Name : Anjala Michael");
		System.out.println("Reg No : SJC22MCA-2007 ");
		System.out.println("Course : OOPS Lab ");
		System.out.println("Course code : 20MCA132 ");
		System.out.println("Date : 28/03/2023");
		int p,q,m,n,flag=0;
		Scanner s = new Scanner(System.in);
		System.out.print("Enter number of rows and columns in the matrix : ");
		p = s.nextInt();
		q = s.nextInt();

		int a[][] = new int[p][q];
		//int b[][] = new int[m][n];

		System.out.println("Enter all the elements of the matrix : ");

		for (int i = 0; i < p; i++){
			for (int j = 0; j < q; j++){
				a[i][j] = s.nextInt();
			}
		}

		System.out.println("The given  Matrix is : ");
		for (int i = 0; i < p; i++){
			for (int j = 0; j < q; j++){
				System.out.print(a[i][j]+" ");
			}
			System.out.println("");
		}

		if(p!=q){
			System.out.println("The given matrix is not square matrix...so we can't
check the symmetry of the matrix!!!");
		}
```

```
            else{
                for(int i=0;i<p;i++){
                    for(int j=0;j<q;j++){
                        if(a[i][j]==a[j][i]){
                            flag=1;
                        }
                    }
                }

                if(flag==1){
                    System.out.println("The given matrix is a symmetric matrix");
                }
                else{
                    System.out.println("The given matrix is not a symmetric matrix ");
                }

            }
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/java$ javac SymmetricMatrix.java
(base) sjcet@Z238-UL:~/anjala007/java$ java SymmetricMatrix
Name : Anjala Michael
Reg No : SJC22MCA-2007
Course : OOPS Lab
Course code : 20MCA132
Date : 28/03/2023
Enter number of rows and columns in the matrix : 3
3
Enter all the elements of the matrix :
1 2 3
2 3 4
3 4 5
The given  Matrix is :
1 2 3
2 3 4
3 4 5
The given matrix is a symmetric matrix
```

5. Create CPU with attribute price. Create inner class Processor (no. of cores, manufacturer) and static nested class RAM (memory, manufacturer). Create an object of CPU and print information of Processor and RAM.

CODE

```
public class cpu{
   int price;
    class processor{
      int cores;
      String producer;
      processor(int noC, String manu){
         cores=noC;
         producer=manu;
      }
      void display(){
      System.out.println("\nProcessor info");
      System.out.println("No. of Cores = "+cores);
      System.out.println("Manufacturer = "+producer+"\n");
   }
   }
   static class ram{
      int mem;
      String manuf;
      ram(int memory,String producer ){
         mem=memory;
         manuf=producer;
      }
      void display(){

      System.out.println("\nRAM info");
      System.out.println("Memory = "+mem+" GB");
      System.out.println("Manufacturer = "+manuf+"\n");
         }
   }
   public static void main(String[] args) {
       System.out.println("Name : Anjala Michael");
                  System.out.println("Reg No : SJC22MCA-2007 ");
                  System.out.println("Course : OOPS Lab ");
                  System.out.println("Course code : 20MCA132 ");
                  System.out.println("Date : 28/03/2023");
```

```
        cpu.ram obj1= new cpu.ram(8,"Intel");
        cpu obj2 = new cpu();
        cpu.processor obj3 = obj2.new processor(8,"Samsung");
        obj1.display();
        obj3.display();

    }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 1$ javac cpu.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 1$ java cpu
Name : Anjala Michael
Reg No : SJC22MCA-2007
Course : OOPS Lab
Course code : 20MCA132
Date : 28/03/2023

RAM info
Memory = 8 GB
Manufacturer = Intel


Processor info
No. of Cores = 8
Manufacturer = Samsung
```

LAB CYCLE - 2

1. Program to Sort strings.

CODE

```
import java.util.Arrays;
import java.util.Scanner;
public class sortuserstrings {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);
    System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-04-
2023");
    System.out.print("Enter the number of strings you want to sort: ");
    int n = input.nextInt();
    String[] names = new String[n];

    System.out.println("Enter the strings to be sorted:");
    for (int i = 0; i < n; i++) {
      names[i] = input.next();
    }
        Arrays.sort(names);
    System.out.println("Sorted Names: ");
    for (String name : names) {
      System.out.println(name);
    }
  }
}
```

OUTPUT

```
E:\MCA\java>javac sortuserstrings.java

E:\MCA\java>java sortuserstrings
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-04-2023
Enter the number of strings you want to sort: 3
Enter the strings to be sorted:
crispin
annu
edwin
Sorted Names:
annu
crispin
edwin
```

2. Search an element in an array.

CODE

```
import java.util.Scanner;
public class searchelement {
  public static void main(String[] args) {
      Scanner input = new Scanner(System.in);
      System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-04-
2023");
      System.out.print("Enter the size of the array: ");
      int n = input.nextInt();
      int[] arr = new int[n];
     System.out.println("Enter the elements of the array:");
      for (int i = 0; i < n; i++) {
        arr[i] = input.nextInt();
    }
    System.out.print("Enter the element to search: ");
    int key = input.nextInt();
    boolean found = false;
    for (int i = 0; i < n; i++) {
      if (arr[i] == key) {
        found = true;
        System.out.println("Element found at position " + (i+1));
        break;
      }
    }
    if (!found) {
      System.out.println("Element not found in the array.");
    }
  }
}
```

OUTPUT

```
E:\MCA\java>javac searchelement.java

E:\MCA\java>java searchelement
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-04-2023
Enter the size of the array: 4
Enter the elements of the array:
34 23 45 99
Enter the element to search: 45
Element found at position 3

E:\MCA\java>
```

3. Perform string manipulations

CODE

```
import java.util.Scanner;
public class String_man{
   public static void main(String[] args) {
   System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-04-
2023");
       System.out.println("Enter The String");
       Scanner sc = new Scanner(System.in);
       String str1 = sc.nextLine();
       System.out.println("Length of String = "+str1.length());
       System.out.println("Character at First position  = "+str1.charAt(1));
       System.out.println("String Contains 'Col' sequence :"+str1.contains("Col"));
       System.out.println("String ends with e : "+str1.endsWith("e"));
       System.out.println("Replace 'col' with 'kol' : "+str1.replaceAll("Col","kol"));
       System.out.println("LOWERCASE : "+str1.toLowerCase());
       System.out.println("UPPERCASE : "+str1.toUpperCase());
}
}
```

OUTPUT

```
E:\MCA\java>javac String_man.java

E:\MCA\java>java String_man
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-04-2023
Enter The String
hello word
Length of String = 10
Character at First position  = e
String Contains 'Col' sequence :false
String ends with e : false
Replace'col' with 'kol' : hello word
LOWERCASE : hello word
UPPERCASE : HELLO WORD

E:\MCA\java>
```

4. Program to create a class for Employee having attributes eNo, eName eSalary. Read n employ information and Search for an employee given eNo, using the concept of Array of Objects.

CODE

```
import java.util.Scanner;
public class employee {
   int eNo;
   String eName;
   double eSalary;
   public void getdetails(){
      System.out.println("\nEnter the Employee details");
      Scanner sc = new Scanner(System.in);
      System.out.println("Employee number : ");
      eNo=sc.nextInt();
      System.out.println("Name : ");
      sc.nextLine();
      eName=sc.nextLine();
      System.out.println("Salary : ");
      eSalary=sc.nextDouble();
   }
   void display(){
      System.out.println("Empolyee No :"+eNo);
      System.out.println("Name :"+eName);
      System.out.println("Salary Amount"+eSalary+"\n");
   }
   public static void main(String[] args) {
   System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-04-
2023");
      System.out.println("\nEnter the No. of Employee's");
      Scanner sc1 = new Scanner(System.in);
      int num = sc1.nextInt();
      employee arr[]=new employee[num];
      for(int i =0;i<num;i++){
            arr[i]=new employee();
            arr[i].getdetails();

      }
      System.out.println("\nInformations of all the employee's");
      for(int i=0;i<num;i++){
         arr[i].display();
    }
    boolean state = false;
    System.out.println("\nEnter the Employee Number to get details of a employee");
```

```
    int num2= sc1.nextInt();
    for(int i=0;i<num;i++){
        if(arr[i].eNo==num2){
       System.out.println("\nEmployee details");
        arr[i].display();
        }
       }
   }
}
```

OUTPUT

```
E:\MCA\java>java employee
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-04-2023

Enter the No. of Employee's
2

Enter the Employee details
Employee number :
111
Name :
anu
Salary :
30000

Enter the Employee details
Employee number :
112
Name :
binu
Salary :
35000

Informations of all the employee's
Empolyee No :111
Name :anu
Salary Amount30000.0

Empolyee No :112
Name :binu
Salary Amount35000.0


Enter the Employee Number to get details of a employee
111
```

```
Enter the Employee Number to get details of a employee
111

Employee details
Empolyee No :111
Name :anu
Salary Amount30000.0
```

LAB CYCLE - 3

1. Area of different shapes using overloaded functions

CODE

```
class Area{
        int shape(int l,int b){
                return l*b;
        }
        double shape(double l,double b){
                return(0.5*l*b);
        }
        double shape(double l){
                return(3.14*l*l);
        }
}

public class MainArea{
        public static void main(String args[]){
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:08-06-2023");
                Area A=new Area();
                System.out.println("Area of Rectangle = "+A.shape(4,5));
                System.out.println("Area of Triangle = "+A.shape(6,5));
                System.out.println("Area of Circle = "+A.shape(5));
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac MainArea.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java MainArea
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:08-06-2023
Area of Rectangle = 20
Area of Triangle = 30
Area of Circle = 78.5
```

2. Create a class ‘Employee’ with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class ‘Teacher’ that inherits the properties of class employees and contains its own data members department, Subjects taught and constructors to initialize these data members and also include a display function to display all the data members. Use an array of objects to display details of N teachers.

CODE

```
public class Employee{
	public static void main(String[] args){
		System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:14-06-2023");
		System.out.println(" .....");
		Teacher teacObj[] = new Teacher[2];
		teacObj[0]=new
Teacher("1","Rosmin","Machiyaniyil",65000,"Physics","Thermodynamics");
		teacObj[1] = new Teacher("2","Sheenu","Kadaplackal",45000,"Computer
Science","Java Programming");
		teacObj[0].display();
		teacObj[1].display();
	}
}
class Employees{
	String Empid;
	String Name;
	String Address;
	int Salary;
	Employees(String id,String name,String addr,int salary){
		this.Empid = id;
		this.Name = name;
		this.Address = addr;
		this.Salary = salary;
	}
	void display(){
		System.out.println("EmpID : " + this.Empid);
		System.out.println("Name : " + this.Name);
		System.out.println("Address : " + this.Address);
		System.out.println("Salary : " + this.Salary);
	}
}
```

```
class Teacher extends Employees{
        String Department;
        String Subject;
        Teacher(String id,String name,String addr,int salary,String dept,String subj){
                super(id,name,addr,salary);
                this.Department=dept;
                this.Subject=subj;
        }
        void display(){
                super.display();
                System.out.println("Dept Name : " + this.Department);
                System.out.println("Subject Name : " + this.Subject);
                System.out.println(" .....");
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac Employee.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java Employee
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:14-06-2023
 .....
EmpID : 1
Name : Rosmin
Address : Machiyaniyil
Salary : 65000
Dept Name : Physics
Subject Name : Thermodynamics
 .....
EmpID : 2
Name : Sheenu
Address : Kadaplackal
Salary : 45000
Dept Name : Computer Science
Subject Name : Java Programming
 .....
```

3. Create a class ‘Person’ with data members Name, Gender, Address, Age and a constructor to initialize the data members and another class ‘Employee’ that inherits the properties of class Person and also contains its own data members like Empid, Company_name, Qualification, Salary and its own constructor. Create another class ‘Teacher’ that inherits the properties of class Employee and contains its own data members like Subject, Department, Teacher_id and also contains constructors and methods to display the data members. Use an array of objects to display details of N teachers.

CODE

```
import java.util.Scanner;
class person {
        String Name;
   String Gender;
   String Address;
   int Age;
   person(String name,String gender,String address, int age){
            this.Name = name;
      this.Gender = gender;
      this.Address = address;
      this.Age = age;
   }
}

class Employee extends person{
        int Empid;
        String Company_name;
        String Qualification;
        long Salary;
        Employee(String name,String gender,String address, int age,int empid, String
company_name, String qualification,long salary){
                super(name,gender,address,age);
           this.Empid= empid;
           this.Company_name=company_name;
           this.Qualification=qualification;
           this.Salary=salary;
        }
}

public class Teacher extends Employee{
    String Subject;
```

```
    String Department;
    String Teacherid;
    Teacher(String name,String gender,String address, int age,int empid, String company_name,
String qualification,long salary, String subject, String department, String teacherid){
        super(name,gender,address,age,empid,company_name,qualification,salary);
        this.Subject=subject;
        this.Department=department;
        this.Teacherid=teacherid;
            }

   void display(){
        System.out.println("Name: "+Name);
        System.out.println("Gender: "+Gender);
        System.out.println("Address: "+Address);
        System.out.println("Age: "+Age);
        System.out.println("Employee id: "+Empid);
        System.out.println("Company Name: "+Company_name);
        System.out.println("Qualification: "+Qualification);
        System.out.println("Salary: "+Salary);
        System.out.println("Subject: "+Subject);
        System.out.println("Department: "+Department);
        System.out.println("Teacher id: "+Teacherid);

    }
    public static void main(String[] args) {
        System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:14-06-
2023");
        System.out.println("\nEnter the No. of Teacher's");
        Scanner sc1 = new Scanner(System.in);
        int num = sc1.nextInt();
        Teacher arr[]=new Teacher[num];
        System.out.println("\n Enter the Teacher Details");
        int x = 0,j=0;
        Scanner sc =new Scanner(System.in);
        for(int i =0;i<num;i++)
        {
            x = i +1;
            System.out.println("\n"+x+")");
            System.out.println("Name: ");
            String a =sc.next();
```

```
        System.out.println("Gender: ");
        String b =sc.next();
        System.out.println("Address: ");
        String c =sc.next();
        System.out.println("Age: ");
        int d =sc.nextInt();
        System.out.println("Employee id: ");
        int e =sc.nextInt();
        System.out.println("Company name: ");
        String f =sc.next();
        System.out.println("Qualification: ");
        String g =sc.next();
        System.out.println("Salary: ");
        long h =sc.nextLong();
        System.out.println("Subject: ");
        String k =sc.next();
        System.out.println("Department: ");
        String l =sc.next();
        System.out.println("Teacher Id: ");
        String n =sc.next();
        arr[i]=new Teacher(a,b,c,d,e,f,g,h,k,l,n);
    }
    sc.close();
    System.out.println("\n***Informations of all the Teacher's***");
    for(int i=0;i<num;i++){
        j=i+1;
        System.out.println("\n"+j+")");
        arr[i].display();

  }
  sc1.close();
  }

}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac Teacher.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java Teacher
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:14-06-2023

Enter the No. of Teacher's
1

 Enter the Teacher Details

1)
Name:
Sheenu
Gender:
Female
Address:
Pathiyil,Elanji
Age:
35
Employee id:
111
Company name:
sgc
Qualification:
MTech
Salary:
45000
Subject:
CFDP
Department:
Computer applications
Teacher Id:

***Informations of all the Teacher's***

1)
Name: Sheenu
Gender: Female
Address: Pathiyil,Elanji
Age: 35
Employee id: 111
Company Name: sgc
Qualification: MTech
Salary: 45000
Subject: CFDP
Department: Computer
Teacher id: applications
```

4. Write a program has class Publisher, Book, Literature and Fiction. Read the information and print the details of books from either the category, using inheritance.

CODE

```
import java.util.Scanner;
class Publisher{
	int publisher_id;
	String publisher_name;
	Publisher(int publisher_id, String publisher_name){
		this.publisher_id= publisher_id;
		this.publisher_name= publisher_name;
	}
}

class Book extends Publisher{
	int book_id;
	String book_name;
	Book(int publisher_id, String publisher_name, int book_id, String book_name){
		super(publisher_id, publisher_name);
		this.book_id= book_id;
		this.book_name= book_name;
	}
}

class Literature extends Book{
	int literature_id;
	String literature_theme;
	Literature(int publisher_id, String publisher_name, int book_id, String
book_name, int literature_id, String literature_theme){
		super(publisher_id, publisher_name, book_id, book_name);
		this.literature_id= literature_id;
		this.literature_theme= literature_theme;
	}
	void displayDetails(){
		System.out.println("The publisher ID of the book is: " + this.publisher_id);
		System.out.println("The publisher name of the book is: " +
this.publisher_name);
		System.out.println("The Book ID of the book is: " + this.book_id);
		System.out.println("The Book name of the book is: " + this.book_name);
```

```
                System.out.println("The Literature ID of the book is: " +
this.literature_id);
                System.out.println("The Literature theme of the book is: " +
this.literature_theme);
        }
}

class Fiction extends Book{
        int fiction_id;
        String fiction_theme;
        Fiction(int publisher_id, String publisher_name, int book_id, String book_name,
int fiction_id, String fiction_theme){
                super(publisher_id, publisher_name, book_id, book_name);
                this.fiction_id= fiction_id;
                this.fiction_theme= fiction_theme;
        }
        void displayDetails(){
                System.out.println("The publisher ID of the book is: " + this.publisher_id);
                System.out.println("The publisher name of the book is: " +
this.publisher_name);
                System.out.println("The Book ID of the book is: " + this.book_id);
                System.out.println("The Book name of the book is: " + this.book_name);
                System.out.println("The Fiction ID of the book is: " + this.fiction_id);
                System.out.println("The Fiction theme of the book is: " +
this.fiction_theme);
        }
}
public class BookShelf {
        public static void main(String[] args) {
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:08-06-2023");
                Literature literature= new Literature(10,"Robert Kiyozaki",200,"Rich Dad
Poor Dad",2001,"Drama");
                Fiction fiction= new Fiction(101, "F. Scott Fitzgerald", 301, "The Great
Gatsby",301, "Fantasy-Fiction");
                literature.displayDetails();
                System.out.println("\n");
                fiction.displayDetails();
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac BookShelf.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java BookShelf
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:08-06-2023
The publisher ID of the book is: 10
The publisher name of the book is: Robert Kiyozaki
The Book ID of the book is: 200
The Book name of the book is: Rich Dad Poor Dad
The Literature ID of the book is: 2001
The Literature theme of the book is: Drama


The publisher ID of the book is: 101
The publisher name of the book is: F. Scott Fitzgerald
The Book ID of the book is: 301
The Book name of the book is: The Great Gatsby
The Fiction ID of the book is: 301
The Fiction theme of the book is: Fantasy-Fiction
```

5. Create classes Student and Sports. Create another class Result inherited from Student and Sports. Display the academic and sports score of a student.

CODE

```
import java.util.Scanner;
class student{
        int roll;
        String name;
        int phy,eng,maths;
        student(){
                Scanner sc1= new Scanner(System.in);
                System.out.println("Enter the roll number:");
                roll =sc1.nextInt();
                System.out.println("Enter name:");
                name=sc1.next();
                System.out.println("Enter physics mark:");
                phy =sc1.nextInt();
                System.out.println("Enter english mark:");
                eng =sc1.nextInt();
                System.out.println("Enter maths mark:");
                maths =sc1.nextInt();
        }
}
class sports extends student{
        int fscore,cscore;
        sports(){
                Scanner sc2= new Scanner(System.in);
                System.out.println("Enter football score:");
                fscore=sc2.nextInt();
                System.out.println("Enter Cricket score:");
                cscore=sc2.nextInt();
        }
}
class Result extends sports{
        void display(){
                System.out.println("Academic Details"+"\n"+" ");
                System.out.println("Name : " + name);
                System.out.println("Roll No : " + roll);
                System.out.println("");
                System.out.println("MARKS" +"\n" + " ");
                System.out.println("Physics :" + phy);
```

```
                System.out.println("English :" + eng);
                System.out.println("Maths :" + maths);
                System.out.println("Total subject mark:"+(phy+eng+maths));
                System.out.println("");
                System.out.println("SPORTS SCORE" +"\n"+" ");
                System.out.println("Football : " + fscore);
                System.out.println("Cricket : " + cscore);
                System.out.println("Total Sports mark:"+(fscore+cscore));
        }
    }
    public class FResult{
        public static void main(String[] args){
                System.out.println("Anjala Michael\n22mca007\nOOPS
    LAB\n20MCA132\nDate:15-06-2023");
                Result rs =new Result();
                rs.display();
        }
    }
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac FResult.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java FResult
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:15-06-2023
Enter the roll number:
10
Enter name:
antony
Enter physics mark:
55
Enter english mark:
67
Enter maths mark:
40
Enter football score:
75
Enter Cricket score:
69
Academic Details

Name : antony
Roll No : 10

MARKS

Physics :55
English :67
Maths :40
Total subject mark:162

SPORTS SCORE

Football : 75
Cricket : 69
Total Sports mark:144
```

6. Create an interface having prototypes of functions area() and perimeter(). Create two classes Circle and Rectangle which implement the above interface. Create a menu driven program to find the area and perimeter of objects.

CODE

```
import java.util.*;
import java.lang.*;
interface Shape {
        float pi = 3.14F;
        float area();
        float perimeter();
}
class Circle implements Shape{
        Scanner sc = new Scanner(System.in);
        int r;
        public float area(){
                System.out.print("Enter the radius : ");
                r = Integer.parseInt(sc.nextLine());
                return (pi * r * r);
        }
        public float perimeter() {
                System.out.print("Enter the radius : ");
                r = Integer.parseInt(sc.nextLine());
                return (2 * pi * r);
        }
}
class Rectangle implements Shape{
        Scanner sc = new Scanner(System.in);
        int l, b;
        public float area(){
                System.out.print("Enter the Length : ");
                l = Integer.parseInt(sc.nextLine());
                System.out.print("Enter the breadth : ");
                b = Integer.parseInt(sc.nextLine());
                return (l * b);
        }
        public float perimeter(){
                System.out.print("Enter the Length : ");
                l = Integer.parseInt(sc.nextLine());
                System.out.print("Enter the breadth : ");
                b = Integer.parseInt(sc.nextLine());
```

```
                return (2 * (l + b));
        }
}
class ShapeInterface{
        public static void main(String args[]) {
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:16-06-2023");
                Scanner sc = new Scanner(System.in);
                Circle c = new Circle();
                Rectangle r = new Rectangle();
                int ch;
                while (true) {
                        System.out.println("1:Area of Circle");
                        System.out.println("2:Perimeter of Circle");
                        System.out.println("3:Area of Rectangle");
                        System.out.println("4:Perimter of Rectangle");
                        System.out.println("5:EXIT");
                        System.out.print("Enter choice : ");
                        ch = Integer.parseInt(sc.nextLine());
                        switch (ch) {
                                case 1:
                                        float ar = c.area();
                                        System.out.println("Area :" + ar);
                                        System.out.println("**----------**--------- **");
                                        break;
                                case 2:
                                        float pr = c.perimeter();
                                        System.out.println("Perimeter of Circle = "+pr);
                                        System.out.println("**----------**--------- **");
                                        break;
                                case 3:
                                        float a = r.area();
                                        System.out.println("Area :" + a);
                                        System.out.println("**----------**--------- **");
                                        break;
                                case 4:
                                        float pr1 = r.perimeter();
                                System.out.println("Perimeter of Rectangle = "+pr1);
                                        System.out.println("**----------**--------- **");
                                        break;
```

```
                                case 5:
                                        System.out.println("Exiting the Program!!!!!");
                                        System.exit(0);
                                        default:
                                        System.out.println("invalid!");
                        }
        }
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac ShapeInterface.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java ShapeInterface
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:16-06-2023
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 1
Enter the radius : 5
Area :78.5
**-----------**--------- **
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 2
Enter the radius : 5
Perimeter of Circle = 31.400002
**-----------**--------- **
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 3
Enter the Length : 4
Enter the breadth : 5
Area :20.0
**-----------**--------- **
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 4
Enter the Length : 4
Enter the breadth : 5
Perimeter of Rectangle = 18.0
**-----------**--------- **
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 5
Exiting the Program!!!!!
```

7. Prepare a bill with the given format using the calculate method from the interface.

Order No.

Date:

Product Id	Name	Quantity	unit price	Total
101	A	2	25	50
102	B	1	100	100
			Net. Amount	150

CODE

```
import java.text.SimpleDateFormat;
import java.util.Date;
interface bill{
        void cal();
}
class details1 implements bill{
        int pid=101,q=2,uprice=25,t1;
        String name1="A";
        public void cal(){
                t1=q*uprice;
        }
}
class details2 extends details1 {
        int pid2=102,q2=1,uprice2=100,t2;
        String name2="B";
        SimpleDateFormat f=new SimpleDateFormat("dd/MM/yy");
        Date d= new Date();
        public void cal(){
                super.cal();
                t2=q2*uprice2;
```

```
        }
        public void display(){
                System.out.println("Order No.384\n");
                System.out.println("Date: "+f.format(d));
                System.out.println("\nProduct Id\tName\t\tQuantity\tunit price\tTotal");
                System.out.println(" ");
                System.out.println(pid+"\t\t"+name1+"\t\t"+q+"\t\t"+uprice+"\t\t"+t1);
                System.out.println(pid2+"\t\t"+name2+"\t\t"+q2+"\t\t"+uprice2+"\t\t"+t2);
                System.out.println(" ");
                System.out.println("\t\t\t\t\tNet.Amount"+"\t\t"+(t1+t2));
        }
}
public class Electricitybill{
        public static void main(String[] args){
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:16-06-2023");
                details2 obj2=new details2();
                obj2.cal();
                obj2.display();
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ javac Electricitybill.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 3$ java Electricitybill
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:16-06-2023
Order No.384

Date: 16/06/23

Product Id      Name            Quantity        unit price      Total

101             A               2               25              50
102             B               1               100             100

                                        Net.Amount              150
```

LAB CYCLE - 4

1. Create a Graphics package that has classes and interfaces for figures Rectangle, Triangle, Square and Circle. Test the package by finding the area of these figures.

CODE

main_graphics.java

```
import package_graphics.*;
import java.util.*;
public class main_graphics {
    public static void main(String []args){
   System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:21-
06-2023");
        package_graphics testObj = new package_graphics();
        int l,h,r,a,c,d;
        Scanner s=new Scanner(System.in);
        System.out.println("Enter the length for rectangle");
        l=s.nextInt();
        System.out.println("Enter the breadth for rectangle");
        h=s.nextInt();
        System.out.println("Enter the radius of circle");
        r=s.nextInt();
        System.out.println("Enter the side for Square");
        a=s.nextInt();
        System.out.println("Enter the breadth for triangle");
        c=s.nextInt();
        System.out.println("Enter the height for triangle");
        d=s.nextInt();
        System.out.println(testObj.recArea(l,h));
        System.out.println(testObj.cirArea(r));
        System.out.println(testObj.squArea(a));
        System.out.println(testObj.triArea(c,d));
    }
}
```

package_graphics.java

```
package package_graphics;
interface interface_graphics{
   public float recArea(int l, int h);
   public float cirArea(int r);
```

```
   public float squArea(int a);
   public float triArea(int l, int h);
}
public class package_graphics implements interface_graphics {
    public float recArea(int l, int h){
          System.out.println("Area of the Rectangle : ");
           return l*h;
    }
    public float cirArea(int r){
             System.out.println("Area of the Circle : ");
              return r*r*(float)3.14;
    }
    public float squArea(int a){
                      System.out.println("Area of the square : ");
       return a*a;
    }
    public float triArea(int l, int h){
       System.out.println("Area of the triangle : ");
       return l*h*(float)(.5);
    }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 4$ javac main_graphics.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 4$ java main_graphics
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:21-06-2023
Enter the length for rectangle
4
Enter the breadth for rectangle
6
Enter the radius of circle
5
Enter the side for Square
6
Enter the breadth for triangle
2
Enter the height for triangle
7
Area of the Rectangle :
24.0
Area of the Circle :
78.5
Area of the square :
36.0
Area of the triangle :
7.0
```

2. Create an Arithmetic package that has classes and interfaces for the 4 basic arithmetic operations. Test the package by implementing all operations on two given numbers.

CODE

Arithmetic_opt.java

```
import Arithmetic.*;
public class Arithmetic_opt{
   public static void main(String[] args) {
     System.out.println("\nAnjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:21-06-2023");
System.out.println("-----------OUTPUT---------");
       double num1 = 10;
       double num2 = 5;
       Arithmetic addition = new Addition();
       double sum = addition.calculate(num1, num2);
       System.out.println("Sum: " + sum);
       Arithmetic subtraction = new Subtraction();
       double difference = subtraction.calculate(num1, num2);
       System.out.println("Difference: " + difference);
       Arithmetic multiplication = new Multiplication();
       double product = multiplication.calculate(num1, num2);
       System.out.println("Product: " + product);
       Arithmetic division = new Division();
       double quotient = division.calculate(num1, num2);
       System.out.println("Quotient: " + quotient);
   }
}
```

Arithmetic.java

```
package Arithmetic;
public interface Arithmetic {
   double calculate(double a, double b);
}
```

Subtraction.java

```
package Arithmetic;
public class Subtraction implements Arithmetic {
   public double calculate(double a, double b) {
      return a - b;
   }
}
```

Multiplication.java

```
package Arithmetic;
public class Multiplication implements Arithmetic {
    public double calculate(double a, double b) {
        return a * b;
    }
}
```

Division.java

```
package Arithmetic;
public class Division implements Arithmetic {
    public double calculate(double a, double b) {
        if (b != 0) {
            return a / b;
        } else {
            throw new ArithmeticException("Cannot divide by zero");
            }
    }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac Arithmetic_opt.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java Arithmetic_opt

Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:21-06-2023
----------OUTPUT---------
Sum: 15.0
Difference: 5.0
Product: 50.0
Quotient: 2.0
```

3. Write a user defined exception class to authenticate the user name and password.

CODE

```
import java.util.Scanner;
class authException extends Exception{
   public authException(String s) {
   super(s);
  }
}
public class UserAuthentication{
   public static void main(String[] args) {
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:21-06-2023");
                String username = "student";
                String passcode = "student123";
                String user_name,password;
                Scanner sc = new Scanner(System.in);
                try{
        System.out.println("Enter the username:");
        user_name = sc.nextLine();
        System.out.println("Enter the password:");
        password = sc.nextLine();
        if(username.equals(user_name) && passcode.equals(password)){
            System.out.println("Authentication successful...");
         }
        else
            throw new authException("Invalid user credentials");
        }
         catch(authException e){
            System.out.println("Exception caught "+e);
         }
    }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 4$ javac UserAuthentication.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/cycle 4$ java UserAuthentication
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:21-06-2023
Enter the username:
student
Enter the password:
student123
Authentication successful...
```

4. Find the average of N positive integers, raising a user defined exception for each negative input.

CODE

```
import java.util.Scanner;
	class NegException extends Exception{
		public NegException(String s){
			super(s);
		}
	}
	public class Average {
		public static void main(String[] args){
			int i;
			double sum=0,avg=0;
			Scanner sc=new Scanner(System.in);
			System.out.println("\nAnjala Michael\n22mca007\nOOPS
		LAB\n20MCA132\nDate:22-06-2023");
			System.out.println("-----------OUTPUT---------");
			System.out.println("Enter n numbers:");
			int n=sc.nextInt();
			for(i=1;i<=n;i++){
				try{
					System.out.println("Enter number"+i);
					int a=sc.nextInt();
					if(a<0){
						i--;
			throw new NegException("Negative numbers not allowed,Try again");
					}
					else{
						sum=sum+a;
					}
				}
```

```
                    catch(NegException e){
                    System.out.println("NEGETIVE EXCEPTION OCCURED:"+e);
                    }
                }
                avg=sum/n;
                System.out.println("Average is "+avg);
                sc.close();
            }
        }
```

OUTPUT

```
java(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac Average.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java Average

Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:22-06-2023
----------OUTPUT---------
Enter n numbers:
5
Enter number1
34
Enter number2
23
Enter number3
31
Enter number4
55
Enter number5
67
Average is 42.0
```

5. Define 2 classes; one for generating a multiplication table of 5 and other for displaying first N prime numbers. Implement using threads. (Thread class)

CODE

```
class MultiplicationTableThread extends Thread {
    @Override
    public void run(){
System.out.println("\nAnjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:22-06-2023");
 System.out.println("-----------OUTPUT---------");
        System.out.println("Multiplication Table of 5:");
        for (int i = 1; i <= 10; i++) {
            System.out.println("5 * " + i + " = " + (5 * i));
        }
        new PrimeNumbersThread(10).start();
}  }
class PrimeNumbersThread extends Thread {
    private int count;
    public PrimeNumbersThread(int count) {
        this.count = count;
    }
    @Override
    public void run() {
        System.out.println("First " + count + " Prime Numbers:");
        int num = 2;
  int primeCount = 0;
        while (primeCount < count) {
            if (isPrime(num)) {
                System.out.println(num);
                primeCount++;
            }
            num++;
   } }
```

```
    private boolean isPrime(int number) {
        if (number < 2) {
            return false;
        }
        for (int i = 2; i <= Math.sqrt(number); i++) {
            if (number % i == 0) {
                return false;
        }   }
        return true;
    } }
public class Main {
    public static void main(String[] args) {
        new MultiplicationTableThread().start();
} }
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac Main.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java Main

Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:22-06-2023
-----------OUTPUT---------
Multiplication Table of 5:
5 * 1 = 5
5 * 2 = 10
5 * 3 = 15
5 * 4 = 20
5 * 5 = 25
5 * 6 = 30
5 * 7 = 35
5 * 8 = 40
5 * 9 = 45
5 * 10 = 50
First 10 Prime Numbers:
2
3
5
7
11
13
17
19
23
29
```

6. Define 2 classes; one for generating Fibonacci numbers and other for displaying even numbers in a given range. Implement using threads. (Runnable Interface)

CODE

```
import java.util.Scanner;
	class Fib extends Thread{
		int f,n1=0,n2=1,n3;
		Fib(int c){
			this.f=c;
		}
		public void run(){
			System.out.println("fib is "+n1);
			System.out.println("fib is "+n2);
			for(int i=2;i<this.f;++i) {
				n3=n1+n2;
				System.out.println("fib is "+n3);
				n1=n2;
				n2=n3;
			}
		}
	}
	class even extends Thread{
		int range;
		even(int range){
			this.range=range;
		}
		public void run(){
			for(int i=0;i<this.range;i++){
				if(i%2==0){
					System.out.println("even num is "+i);
				}
```

```
        }       }       }
        public class mulThread{
                public static void main(String [] args){
                        int c,range;
                        Scanner sc=new Scanner(System.in);
                        System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:23-06-2023");
                        System.out.println("-----------OUTPUT---------");
                        System.out.println("enter the count of Fibinooci");
                        c=sc.nextInt();
                        Fib fi=new Fib(c);
                        System.out.println("enter the range of even number");
                        range=sc.nextInt();
                        even ev = new even(range);
                        fi.start();
                        ev.start();
                }
        }
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac mulThread.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java mulThread
Anjala Michael
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OOPS LAB
20MCA132
Date:23-06-2023
-----------OUTPUT---------
enter the count of Fibinooci
5
enter the range of even number
10
fib is 0
fib is 1
fib is 1
fib is 2
fib is 3
even num is 0
even num is 2
even num is 4
even num is 6
even num is 8
```

7. Producer/Consumer using ITC

CODE

```
import java.util.LinkedList;
class Buffer {
   private LinkedList<Integer> buffer;
   private int capacity;
   public Buffer(int capacity) {
      this.buffer = new LinkedList<>();
      this.capacity = capacity;
   }
   public void produce(int value) throws InterruptedException {
      synchronized (this) {
         while (buffer.size() == capacity) {
            wait();
         }
         buffer.add(value);
         System.out.println("Produced: " + value);
         notifyAll();
  }  }
   public void consume() throws InterruptedException {
      synchronized (this) {
         while (buffer.isEmpty()) {
            wait();
         }
         int value = buffer.removeFirst();
         System.out.println("Consumed: " + value);
         notifyAll();
} } }
class Producer implements Runnable {
   private Buffer buffer;
   private int numProductions;
```

```
    public Producer(Buffer buffer, int numProductions) {
        this.buffer = buffer;
        this.numProductions = numProductions;
    }
    @Override
    public void run() {
        for (int i = 0; i < numProductions; i++) {
            try {
                buffer.produce(i);
                Thread.sleep(1000); // Simulate production time
            } catch (InterruptedException e) {
                e.printStackTrace();
} } } }
class Consumer implements Runnable {
    private Buffer buffer;
    private int numConsumptions;

    public Consumer(Buffer buffer, int numConsumptions) {
        this.buffer = buffer;
        this.numConsumptions = numConsumptions;
    }
    @Override
    public void run() {
 for (int i = 0; i < numConsumptions; i++) {
            try {
                buffer.consume();
                Thread.sleep(2000); // Simulate consumption time
            } catch (InterruptedException e) {
                e.printStackTrace();
}  }  } }
```

```
public class ProducerConsumerExample {
   public static void main(String[] args) {
   System.out.println("\nAnjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:23-06-
2023");
System.out.println("-----------OUTPUT---------");
        Buffer buffer = new Buffer(5);
        int numProductions = 10;
        int numConsumptions = 10;
        Producer producer = new Producer(buffer, numProductions);
        Consumer consumer = new Consumer(buffer, numConsumptions);
        Thread producerThread = new Thread(producer);
        Thread consumerThread = new Thread(consumer);
        producerThread.start();
        consumerThread.start();
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac ProducerConsumerExample.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java ProducerConsumerExample

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Date:23-06-2023
-----------OUTPUT---------
Produced: 0
Consumed: 0
Produced: 1
Consumed: 1
Produced: 2
Produced: 3
Consumed: 2
Produced: 4
Produced: 5
Consumed: 3
Produced: 6
Produced: 7
Consumed: 4
Produced: 8
Produced: 9
Consumed: 5
Consumed: 6
Consumed: 7
Consumed: 8
Consumed: 9
```

8. Program to create a generic stack and do the Push and Pop operations.

CODE

```
class Stack {
        private int arr[];
        private int top;
        private int capacity;
        Stack(int size){
                arr = new int[size];
                capacity = size;
                top = -1;
        }
        public void push(int x){
                if (isFull()){
                        System.out.println("Stack OverFlow");
                        System.exit(1);
                }
                System.out.println("Inserting " + x);
                arr[++top] = x;
        }
        public int pop(){
                if (isEmpty()){
                        System.out.println("STACK EMPTY");
                        System.exit(1);
                }
                return arr[top--];
        }
        public int getSize(){
                return top + 1;
        }
        public Boolean isEmpty(){
                return top == -1;
        }
        public Boolean isFull(){
                return top == capacity - 1;
        }
        public void printStack(){
                for (int i = 0; i <= top; i++){
                        System.out.print(arr[i] + "\n");
        }       }
        public static void main(String[] args){
```

```
                System.out.println("\nAnjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:23-06-2023");
                System.out.println("-----------OUTPUT---------");
                Stack stack = new Stack(5);
                stack.push(1);
                stack.push(2);
                stack.push(3);
                System.out.print("Stack: ");
                stack.printStack();
                stack.pop();
                System.out.println("\nAfter popping out");
                stack.printStack();
}       }
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac Stack.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java Stack

Anjala Michael
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OOPS LAB
20MCA132
Date:23-06-2023
-----------OUTPUT---------
Inserting 1
Inserting 2
Inserting 3
Stack: 1
2
3

After popping out
1
2
```

9. Using a generic method, perform Bubble sort.

CODE

```
import java.util.Arrays;
public class BubbleSortExample {
   public static <T extends Comparable<T>> void bubbleSort(T[] array) {
      int n = array.length;
      for (int i = 0; i < n - 1; i++) {
         for (int j = 0; j < n - i - 1; j++) {
            if (array[j].compareTo(array[j + 1]) > 0) {
               T temp = array[j];
               array[j] = array[j + 1];
               array[j + 1] = temp;
            }
         }
      }
   }
public static void main(String[] args) {
System.out.println("\nAnjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:23-06-
2023");
System.out.println("-----------OUTPUT---------");
      Integer[] numbers = {4, 2, 6, 1, 9, 3, 8, 5, 7};
      bubbleSort(numbers);
      System.out.println("Sorted numbers: " + Arrays.toString(numbers));
      String[] names = {"Alice", "Bob", "Charlie", "David", "Eve"};
      bubbleSort(names);
      System.out.println("Sorted names: " + Arrays.toString(names));
  }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac BubbleSortExample.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java BubbleSortExample

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OOPS LAB
20MCA132
Date:23-06-2023
-----------OUTPUT---------
Sorted numbers: [1, 2, 3, 4, 5, 6, 7, 8, 9]
Sorted names: [Alice, Bob, Charlie, David, Eve]
```

10. Maintain a list of Strings using ArrayList from the collection framework, perform built-in operations.

CODE

```
import java.util.*;
	public class arraylist{
		public static void main(String[] args) {
			ArrayList<String> arrayList= new ArrayList<>();
			arrayList.add("Bibin");
			arrayList.add("Rony");
			arrayList.add("Tarun");
			arrayList.add("Jack");
			System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:27-06-2023");
			System.out.println("-----------OUTPUT---------");
			System.out.println("The elements ofthe arraylist is - "+arrayList);
			Collections.sort(arrayList);
			System.out.println("\nThe ArrayList Sort : "+arrayList);
			Collections.addAll(arrayList,"Karun","Vimal","Shan","Ram","Gibin");
			System.out.println("\nAdding new items in the arraylist is : "+arrayList);
			Collections.sort(arrayList, Collections.reverseOrder());
			System.out.println("\nThe reverse order of the arraylist : "+arrayList);
			System.out.println("\nThe maximum element ofthe arraylist :
"+Collections.max(arrayList));
		}
	}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac arraylist.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java arraylist
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:27-06-2023
-----------OUTPUT---------
The elements ofthe arraylist is - [Bibin, Rony, Tarun, Jack]

The ArrayList Sort : [Bibin, Jack, Rony, Tarun]

Adding new items in the arraylist is : [Bibin, Jack, Rony, Tarun, Karun, Vimal, Shan, Ram, Gibin]

The reverse order of the arraylist : [Vimal, Tarun, Shan, Rony, Ram, Karun, Jack, Gibin, Bibin]

The maximum element ofthe arraylist : Vimal
```

11. Program to remove all the elements from a linked list

CODE

```
import java.util.LinkedList;
public class LinkedListRemoveAll{
   public static void main(String[] args) {
      LinkedList<String> linkedList = new LinkedList<>();
      linkedList.add("Apple");
      linkedList.add("Banana");
      linkedList.add("Orange");
      linkedList.add("Mango");
         System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-
06-2023");
         System.out.println("----------OUTPUT---------");
      System.out.println("Original linked list: " + linkedList);
           linkedList.clear();
      System.out.println("Linked list after removing all elements: " + linkedList);
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac LinkedListRemoveAll.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java LinkedListRemoveAll
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:26-06-2023
----------OUTPUT---------
Original linked list: [Apple, Banana, Orange, Mango]
Linked list after removing all elements: []
```

12. Program to remove an object from the Stack when the position is passed as parameter.

CODE

```
import java.util.Stack;
public class StackRemoveElement{
   public static void main(String[] args) {
    Stack<String> stack = new Stack<>();
      stack.push("Apple");
      stack.push("Banana");
      stack.push("Orange");
      stack.push("Mango");
      System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:26-06-2023");
System.out.println("-----------OUTPUT---------");
      System.out.println("Stack elements: " + stack);
      int positionToRemove = 2; // Position starts from 1
      removeElement(stack, positionToRemove);
      System.out.println("Stack after removal: " + stack);
   }
   public static void removeElement(Stack<String> stack, int position) {
      if (stack.isEmpty() || position <= 0 || position > stack.size()) {
System.out.println("Invalid position or stack is empty.");
         return;
      }
      Stack<String> tempStack = new Stack<>();
      for (int i = 1; i < position; i++) {
         tempStack.push(stack.pop());
      }
      stack.pop();
      while (!tempStack.isEmpty()) {
         stack.push(tempStack.pop());
      }
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac StackRemoveElement.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java StackRemoveElement
Anjala Michael
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Date:26-06-2023
-----------OUTPUT---------
Stack elements: [Apple, Banana, Orange, Mango]
Stack after removal: [Apple, Banana, Mango]
```

13. Program to demonstrate the creation of queue object using the PriorityQueue class

CODE

```
import java.util.PriorityQueue;
import java.util.Queue;


public class PriorityQueueExample {
   public static void main(String[] args) {
      Queue<Integer> queue = new PriorityQueue<>();
      queue.offer(5);
      queue.offer(2);
      queue.offer(8);
      queue.offer(1);
 System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-06-2023");
System.out.println("-----------OUTPUT---------");
      System.out.println("Queue elements: " + queue);
      while (!queue.isEmpty()) {
         int element = queue.poll();
         System.out.println("Removed element: " + element);
      }
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac PriorityQueueExample.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java PriorityQueueExample
Anjala Michael
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OOPS LAB
20MCA132
Date:26-06-2023
-----------OUTPUT---------
Queue elements: [1, 2, 8, 5]
Removed element: 1
Removed element: 2
Removed element: 5
Removed element: 8
```

14. Program to demonstrate the addition and deletion of elements in deque

CODE

```
import java.util.*;
class deque{
	public static void main(String[] args){
		Deque<String> deque = new LinkedList<String>();
		deque.add("Java");
		deque.addFirst("Python");
		deque.addLast("Datastructure");
		deque.push("Web-programming");
		deque.offer("Networking");
		deque.offerFirst("DBMS");
		System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:26-06-2023");
		System.out.println("----------OUTPUT---------");
		System.out.println(deque + "\n");
		deque.removeFirst();
		deque.removeLast();
		System.out.println("Deque after removing " + "first and last: " + deque);
	}
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac deque.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java deque
Anjala Michael
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OOPS LAB
20MCA132
Date:26-06-2023
----------OUTPUT---------
[DBMS, Web-programming, Python, Java, Datastructure, Networking]

Deque after removing first and last: [Web-programming, Python, Java, Datastructure]
```

15. Program to demonstrate the creation of Set object using the LinkedHashset class.

CODE

```
import java.util.LinkedHashSet;
import java.util.Set;
public class LinkedHashSetExample {
public static void main(String[] args) {
      Set<String> set = new LinkedHashSet<>();
      set.add("Apple");
      set.add("Banana");
      set.add("Orange");
      set.add("Apple"); // Adding a duplicate element
      System.out.println("Anjala Michael\n22mca007\nOOPS LAB\n20MCA132\nDate:26-06-
2023");
         System.out.println("-----------OUTPUT---------");
      System.out.println("Set elements: " + set);
      boolean containsBanana = set.contains("Banana");
      System.out.println("Contains 'Banana'? " + containsBanana);
      boolean removedOrange = set.remove("Orange");
      System.out.println("Removed 'Orange'? " + removedOrange);
      System.out.println("Set after removal: " + set);
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac LinkedHashSetExample.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java LinkedHashSetExample
Anjala Michael
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OOPS LAB
20MCA132
Date:26-06-2023
----------OUTPUT---------
Set elements: [Apple, Banana, Orange]
Contains 'Banana'? true
Removed 'Orange'? true
Set after removal: [Apple, Banana]
```

16. Write a Java program to compare two hash set

CODE

```
import java.util.*;
        public class CompareHash {
        public static void main(String[] args) {
                System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:27-06-2023");
                System.out.println("-----------OUTPUT---------");
                HashSet<String> h_set = new HashSet<String>();
                h_set.add("Red");
                h_set.add("Green");
                h_set.add("Black");
                h_set.add("White");
                HashSet<String>h_set2 = new HashSet<String>();
                h_set2.add("Red");
                h_set2.add("Pink");
                h_set2.add("Black");
                h_set2.add("Orange");
                HashSet<String>result_set = new HashSet<String>();
                for (String element : h_set){
                        System.out.println(h_set2.contains(element) ? "Yes" : "No");
                }
        }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac CompareHash.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java CompareHash
Anjala Michael
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OOPS LAB
20MCA132
Date:27-06-2023
-----------OUTPUT---------
Yes
No
Yes
No
```

17. Program to demonstrate the working of Map interface by adding, changing and removing elements.

CODE

```
import java.util.HashMap;
import java.util.Map;
public class MapExample {
   public static void main(String[] args) {
            Map<String, Integer> map = new HashMap<>();
      map.put("John", 25);
      map.put("Alice", 30);
      map.put("Bob", 35);
System.out.println("AnjalaMichael\n22mca007\nOOPS LAB\n20MCA132\nDate:27-06-2023");
         System.out.println("-----------OUTPUT---------");
      System.out.println("Initial Map: " + map);
      map.put("Alice", 32);
      System.out.println("Map after changing an element: " + map);
      map.remove("Bob");
      System.out.println("Map after removing an element: " + map);
   }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac MapExample.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java MapExample
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:27-06-2023
-----------OUTPUT---------
Initial Map: {Bob=35, Alice=30, John=25}
Map after changing an element: {Bob=35, Alice=32, John=25}
Map after removing an element: {Alice=32, John=25}
```

18. Program to Convert HashMap to TreeMap

CODE

```
import java.util.HashMap;
import java.util.Map;
import java.util.TreeMap;
public class HashMapToTreeMap{
    public static void main(String[] args) {
        Map<String, Integer> hashMap = new HashMap<>();
        hashMap.put("John", 25);
        hashMap.put("Alice", 30);
        hashMap.put("Bob", 35);
        Map<String, Integer> treeMap = new TreeMap<>(hashMap);
            System.out.println("Anjala Michael\n22mca007\nOOPS
LAB\n20MCA132\nDate:27-06-2023");
            System.out.println("-----------OUTPUT---------");
        System.out.println("HashMap: " + hashMap);
        System.out.println("TreeMap: " + treeMap);
    }
}
```

OUTPUT

```
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ javac HashMapToTreeMap.java
(base) sjcet@Z238-UL:~/anjala007/sem 2/java/Cycle4$ java HashMapToTreeMap
Anjala Michael
22mca007
OOPS LAB
20MCA132
Date:27-06-2023
-----------OUTPUT---------
HashMap: {Bob=35, Alice=30, John=25}
TreeMap: {Alice=30, Bob=35, John=25}
```

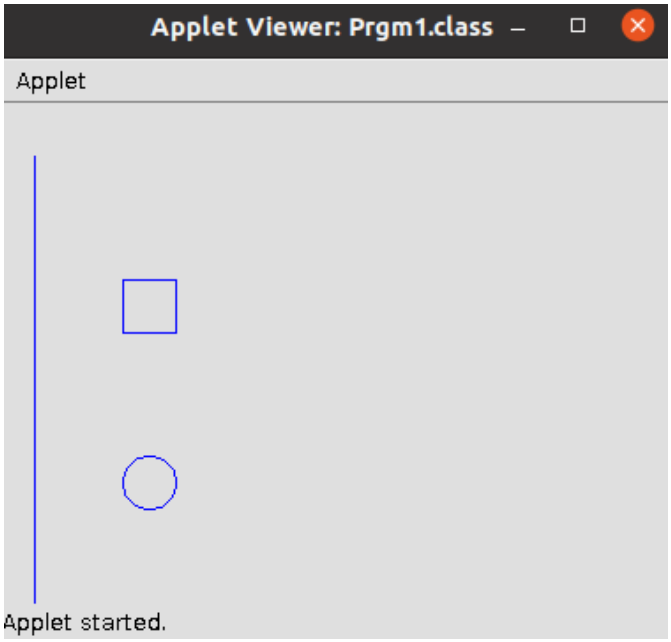
LAB CYCLE - 5

1. Program to draw Circle, Rectangle, Line in Applet.

CODE

```
package cycle5;
import java.applet.Applet;
import java.awt.Graphics;
import java.awt.Color;
public class shapes extends Applet{
    @Override
    public void paint(Graphics g){
        g.setColor(Color.black);
        g.drawLine(20,30,20,300);
        g.drawRect(70,100,30,30);
        g.fillRect(170,100,30,30);
        g.drawOval(70,200,30,30);
    }
}
```

OUTPUT



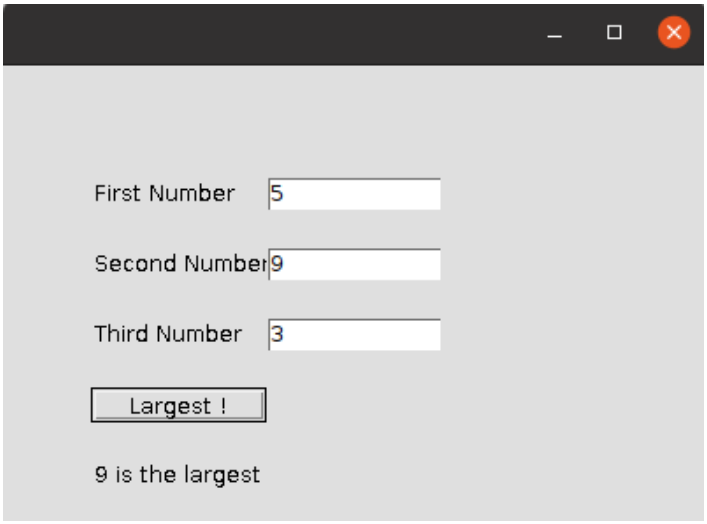
2. Program to find a maximum of three numbers using AWT.

CODE

```
package cycle5;
import java.awt.*;
import java.awt.event.*;
public class maximum  implements ActionListener{
   Frame f=new Frame();
   Label l1=new Label("First Number");
   Label l2=new Label("Second Number");
   Label l3=new Label("Third Number");
   Label res=new Label("Result");
   TextField t1=new TextField();
   TextField t2=new TextField();
   TextField t3=new TextField();
   Button b1=new Button("Largest !");
   maximum(){
   l1.setBounds(50,100,100,20);
   l2.setBounds(50,140,100,20);
   l3.setBounds(50,180,100,20);
   t1.setBounds(150,100,100,20);
   t2.setBounds(150,140,100,20);
   t3.setBounds(150,180,100,20);
   b1.setBounds(50,220,100,20);
   res.setBounds(50,260,100,20);
   f.add(l1);
   f.add(l2);
   f.add(l3);
   f.add(t1);
   f.add(t2);
   f.add(t3);
   f.add(res);
   f.add(b1);
   b1.addActionListener(this);
   f.setLayout(null);
   f.setVisible(true);
   f.setSize(400,400);
}
public static void main(String[] args){
     new maximum();
}
public void actionPerformed(ActionEvent e){
if(e.getSource()==b1){
int n1=Integer.parseInt(t1.getText());
int n2=Integer.parseInt(t2.getText());
int n3=Integer.parseInt(t3.getText());
int largeres= (n1 > n2) ? (n1 > n3 ? n1 : n3) : (n2 > n3 ? n2 : n3);
```

```
res.setText(String.valueOf(largeres)+" is the largest");
}
}
}
```

OUTPUT

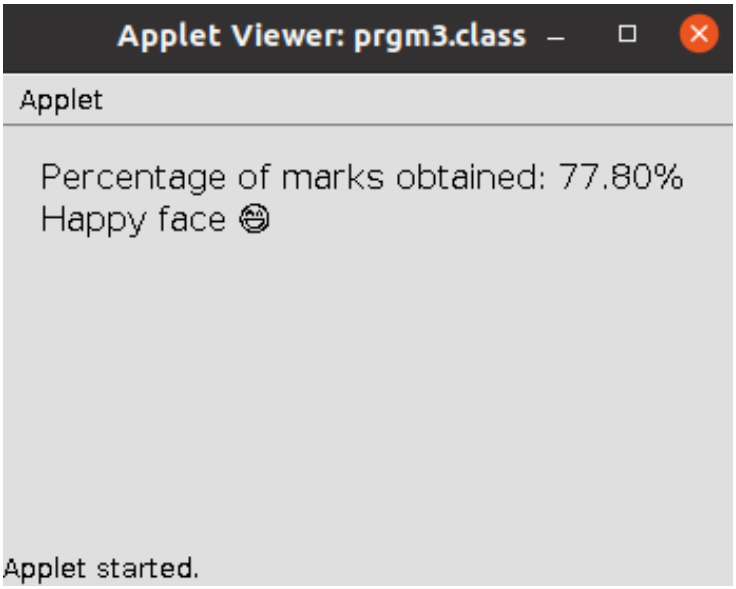


3. Find the percentage of marks obtained by a student in 5 subjects. Display a happy face if he secures above 50% or a sad face if otherwise.

CODE

```
 import java.applet.Applet;
import java.awt.Graphics;
import java.awt.Font;
public class prgm3  extends Applet {
    private int[] marks = {85, 78, 92, 64, 70};
    private int maxMarksPerSubject = 100;
    public void paint(Graphics g) {
        int totalMarks = 0;
        for (int mark : marks) {
            totalMarks += mark;
        }
        int totalMaxMarks = marks.length * maxMarksPerSubject;
        double percentage = ((double) totalMarks / totalMaxMarks) * 100;
        String result = "Percentage of marks obtained: " + String.format("%.2f", percentage) + "%";
        String face = (percentage > 50) ? "Happy face 😊" : "Sad face ☹";
        g.setFont(new Font("Arial", Font.PLAIN, 16));
        g.drawString(result, 20, 30);
        g.drawString(face, 20, 50);
    }
}
```

OUTPUT



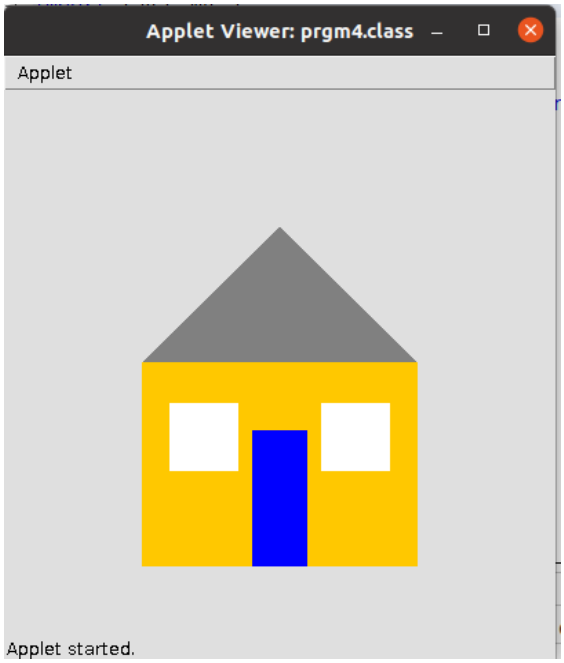
4. Using 2D graphics commands in an Applet, construct a house. On mouse click event, change the color of the door from blue to red.

CODE

```
import java.awt.*;
import java.applet.*;
import java.awt.event.*;
public class prgm4  extends Applet implements MouseListener {
   private Color doorColor = Color.BLUE;
   public void init() {
      setSize(400, 400);
      addMouseListener(this);
   }
   public void paint(Graphics g) {
      drawHouse(g);
   }
   public void drawHouse(Graphics g) {
     g.setColor(Color.orange);
      g.fillRect(100, 200, 200, 150);
     int[] xPoints = {100, 200, 300};
      int[] yPoints = {200, 100, 200};
      g.setColor(Color.GRAY);
      g.fillPolygon(xPoints, yPoints, 3);
     g.setColor(doorColor);
      g.fillRect(180, 250, 40, 100);
      g.setColor(Color.WHITE);
      g.fillRect(120, 230, 50, 50);
      g.fillRect(230, 230, 50, 50);
   }
  @Override
   public void mouseClicked(MouseEvent e) {
      // Check if the mouse click is within the door region
      int mouseX = e.getX();
      int mouseY = e.getY();
      if (mouseX >= 180 && mouseX <= 220 && mouseY >= 250 && mouseY <= 350) {
         // Toggle door color between blue and red
         doorColor = (doorColor == Color.BLUE) ? Color.RED : Color.BLUE;
         repaint(); // Trigger a repaint to update the door color
      }
   }
   // Other MouseListener methods (not used in this example)
   @Override
   public void mousePressed(MouseEvent e) {}
   @Override
   public void mouseReleased(MouseEvent e) {}
   @Override
   public void mouseEntered(MouseEvent e) {}
```

```
    @Override
    public void mouseExited(MouseEvent e) {}
}
```

OUTPUT



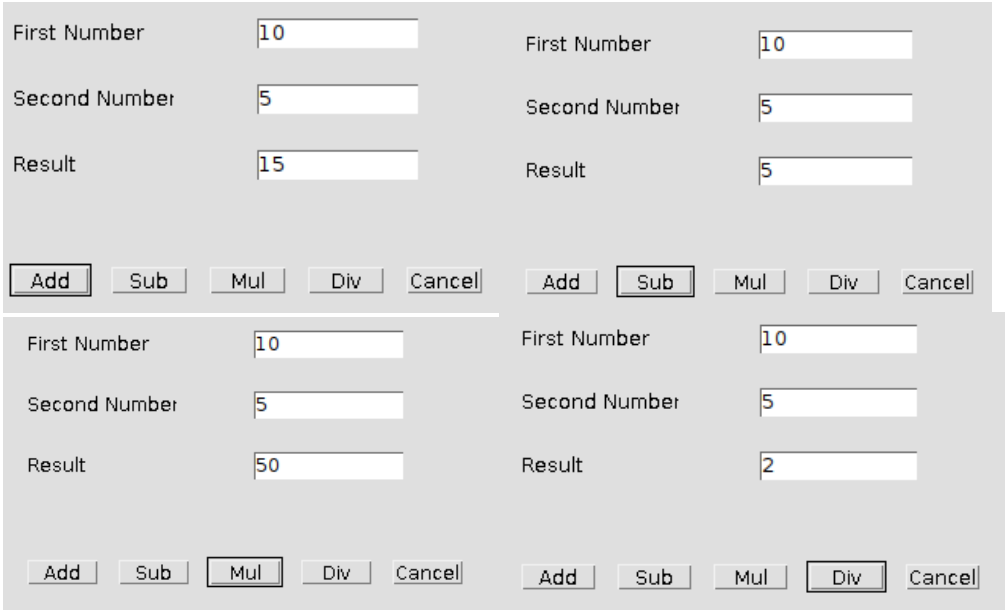
5. Implement a simple calculator using AWT components.

CODE

```
import java.awt.*;
import java.awt.event.*;
public class prgm5 implements ActionListener
{
       Frame f=new Frame();
       Label l1=new Label("First Number");
       Label l2=new Label("Second Number");
       Label l3=new Label("Result");
       TextField t1=new TextField();
       TextField t2=new TextField();
       TextField t3=new TextField();
       Button b1=new Button("Add");
       Button b2=new Button("Sub");
Button b3=new Button("Mul");
Button b4=new Button("Div");
Button b5=new Button("Cancel");
prgm5()
{
l1.setBounds(50,100,100,20);
l2.setBounds(50,140,100,20);
l3.setBounds(50,180,100,20);
t1.setBounds(200,100,100,20);
t2.setBounds(200,140,100,20);
t3.setBounds(200,180,100,20);
b1.setBounds(50,250,50,20);
b2.setBounds(110,250,50,20);
b3.setBounds(170,250,50,20);
b4.setBounds(230,250,50,20);
b5.setBounds(290,250,50,20);
f.add(l1);
f.add(l2);
f.add(l3);
f.add(t1);
f.add(t2);
f.add(t3);
f.add(b1);
f.add(b2);
f.add(b3);
f.add(b4);
f.add(b5);
b1.addActionListener(this);
b2.addActionListener(this);
b3.addActionListener(this);
b4.addActionListener(this);
b5.addActionListener(this);
f.setLayout(null);
f.setVisible(true);
f.setSize(400,350);
}
public void actionPerformed(ActionEvent e)
{
```

```
int n1=Integer.parseInt(t1.getText());
int n2=Integer.parseInt(t2.getText());
if(e.getSource()==b1)
{
t3.setText(String.valueOf(n1+n2));
}
if(e.getSource()==b2)
{
t3.setText(String.valueOf(n1-n2));
}
if(e.getSource()==b3)
{
t3.setText(String.valueOf(n1*n2));
}
if(e.getSource()==b4)
{
t3.setText(String.valueOf(n1/n2));
}
if(e.getSource()==b5)
{
System.exit(0);
}
}
public static void main(String...s)
{
new prgm5();
}
}
```

OUTPUT



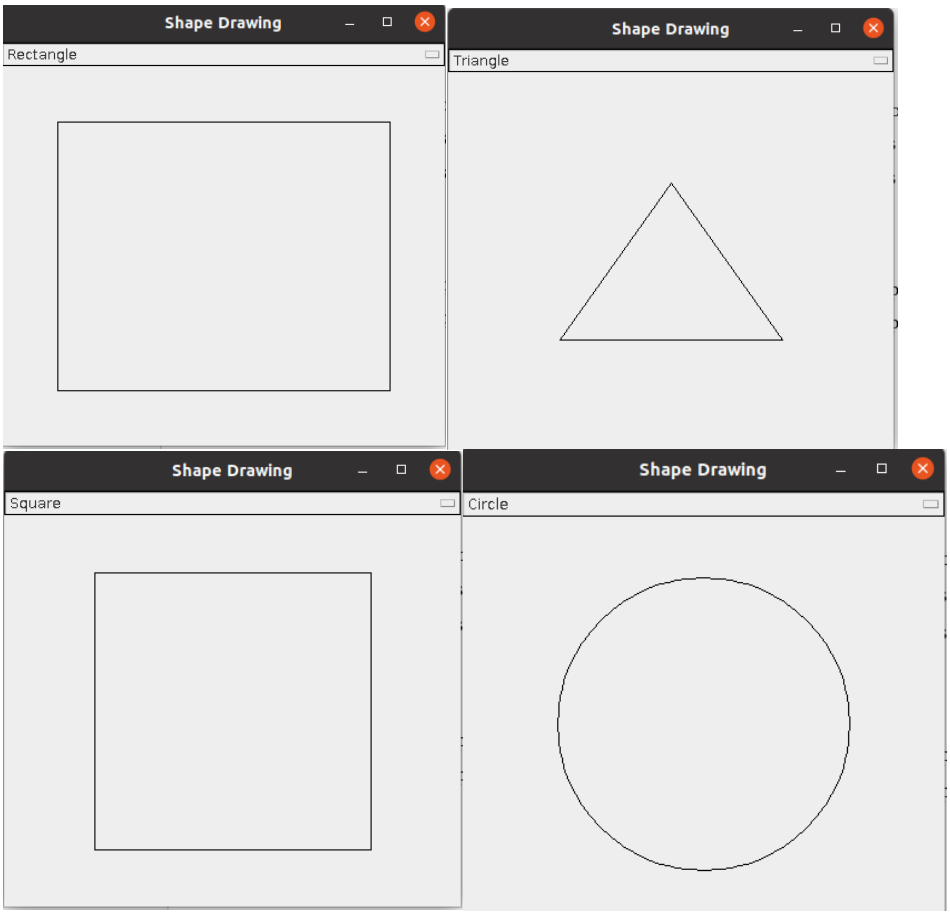
6. Develop a program that has a Choice component which contains the names of shapes such as rectangle, triangle, square and circle. Draw the corresponding shapes for given parameters as per user's choice.

CODE

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
public class prgm6  extends JFrame implements ItemListener {
   private String selectedShape = "Rectangle";
   public prgm6() {
      setTitle("Shape Drawing");
      setSize(400, 400);
      setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      // Create a Choice component to select shapes
      Choice shapeChoice = new Choice();
      shapeChoice.add("Rectangle");
      shapeChoice.add("Triangle");
      shapeChoice.add("Square");
      shapeChoice.add("Circle");
      shapeChoice.addItemListener(this);
      // Add the Choice component to the frame
      add(shapeChoice, BorderLayout.NORTH);
      // Add a custom drawing panel
      DrawingPanel drawingPanel = new DrawingPanel();
      add(drawingPanel, BorderLayout.CENTER);
   }
   @Override
   public void itemStateChanged(ItemEvent e) {
      if (e.getSource() instanceof Choice) {
         // Get the selected shape from the Choice component
         selectedShape = (String) e.getItem();
         // Repaint the drawing panel to update the shape
         repaint();
      }
   }
   class DrawingPanel extends JPanel {
      @Override
      protected void paintComponent(Graphics g) {
         super.paintComponent(g);
         drawShape(g);
      }
      private void drawShape(Graphics g) {
         int width = getWidth();
         int height = getHeight();
         g.setColor(Color.BLACK);
         // Draw the selected shape based on user's choice
```

```
        if (selectedShape.equals("Rectangle")) {
            g.drawRect(50, 50, width - 100, height - 100);
        } else if (selectedShape.equals("Triangle")) {
            int[] xPoints = {width / 2, 100, width - 100};
            int[] yPoints = {100, height - 100, height - 100};
            g.drawPolygon(xPoints, yPoints, 3);
        } else if (selectedShape.equals("Square")) {
            int side = Math.min(width, height) - 100;
            g.drawRect((width - side) / 2, (height - side) / 2, side, side);
        } else if (selectedShape.equals("Circle")) {
            int diameter = Math.min(width, height) - 100;
            g.drawOval((width - diameter) / 2, (height - diameter) / 2, diameter, diameter);
        }
    }
  }
  public static void main(String[] args) {
    SwingUtilities.invokeLater(() -> new prgm6().setVisible(true));
  }
}
```

OUTPUT

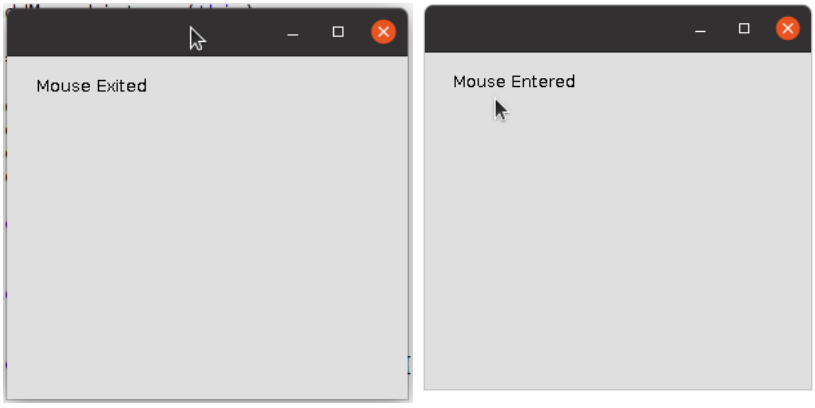


7. Develop a program to handle all mouse events and window events

CODE

```
import java.awt.*;
import java.awt.event.*;
public class prgm7 extends Frame implements MouseListener{
   Label l;
   prgm7(){
      addMouseListener(this);
      l=new Label();
      l.setBounds(20,50,100,20);
      add(l);
      setSize(300,300);
      setLayout(null);
      setVisible(true);
   }
   public void mouseClicked(MouseEvent e) {
      l.setText("Mouse Clicked");
   }
   public void mouseEntered(MouseEvent e) {
      l.setText("Mouse Entered");
   }
   public void mouseExited(MouseEvent e) {
      l.setText("Mouse Exited");
   }
   public void mousePressed(MouseEvent e) {
      l.setText("Mouse Pressed");
   }
   public void mouseReleased(MouseEvent e) {
      l.setText("Mouse Released");
   }
public static void main(String[] args) {
   new prgm7();
}
}
```

OUTPUT



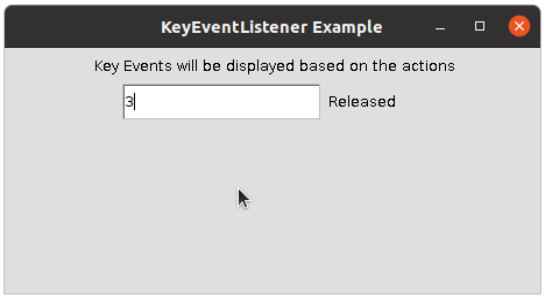
8. Develop a program to handle Key events.

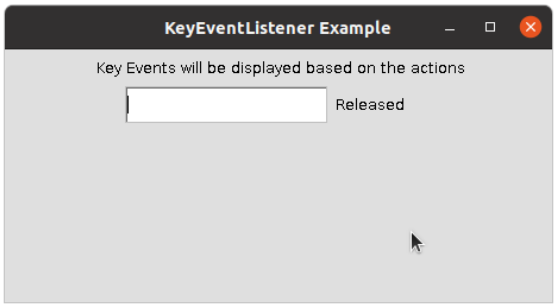
CODE

```
import java.awt.FlowLayout;
import java.awt.Frame;
import java.awt.Label;
import java.awt.TextField;
import java.awt.event.KeyEvent;
import java.awt.event.KeyListener;
public class prgm8 implements KeyListener
{
Label lb1, lbl2, lb;
TextField tf1;
Frame fr;
String s;
prgm8()
{
fr = new Frame("KeyEventListener Example");
lb1= new Label(" Key Events will be displayed based on the actions",
Label.CENTER);
lbl2= new Label();
lb= new Label();
tf1 = new TextField(20);
fr.setLayout(new FlowLayout());
fr.add(lb1);
fr.add(tf1);
fr.add(lbl2);
tf1.addKeyListener(this);
fr.setSize(460,250);
fr.setVisible(true);
}
public void keyPressed(KeyEvent ev)
{
lbl2.setText(" Key pressed");
}
public void keyReleased(KeyEvent ev)
{
lbl2.setText("Released");
}
public void keyTyped(KeyEvent ev)
{
lbl2.setText("Key is typed");
fr.setVisible(true);
}
public static void main(String[] args)
{
new prgm8();
```

```
}
}
```

OUTPUT


KeyEventListener Example
Key Events will be displayed based on the actions
3
Released


KeyEventListener Example
Key Events will be displayed based on the actions
Released