OBJECT ORIENTED PROGRAMMING LAB

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22MCA030

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;
	String pname;
	double price;
	double lowest;
	void data(int c, String n, double p){
	    pcode=c;
	    pname=n;
	    price=p;
	}
	void display(){
	    System.out.println(pcode+"\t\t"+pname+"\t\t"+price);

	}
	static void findLowest(double price1,double price2, double price3){
	if(price1<=price2 && price1<=price3){
	    System.out.println("\nCAR isthe lowest price!");

	}
	else if(price2<=price1 && price2<=price3){
	    System.out.println("\nBIKE is the lowest price!");

	}
	else{
	    System.out.println("\n BUS is the lowest price!");

	}

      }
     public static void main(String[] args){
        System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:24/03/2023\n\n");
	    product obj1 = new product();
	    product obj2 = new product();
```

```
        product obj3 = new product();
        obj1.data(101,"CAR",700000.00);
        obj2.data(102,"BIKE",150000.00);
        obj3.data(103,"BUS",900000.00);
        System.out.println("Product
Information:\nProduct_Code\tProduct_Name\tProduct_Price");
        obj1.display();
        obj2.display();
        obj3.display();
        findLowest(obj1.price,obj2.price,obj3.price);

    }
  }
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac product.java
sjcet@Z238-UL:~/Gopika/java$ java product
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:24/03/2023


Product Information:
Product_Code    Product_Name    Product_Price
101             CAR             700000.0
102             BIKE            150000.0
103             BUS             900000.0
```

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

CODE:

```
import java.util.*;
public class Matrix
{
public static void main(String[] args)
{
System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:24/03/2023\n\n");
int r,c;
Scanner x = new Scanner (System.in);
System.out.println("Number of rows");
r=x.nextInt();
System.out.println("Number of coloumn");
c=x.nextInt();
  int m1[][]=new int[r][c];
  int m2[][]=new int[r][c];
  int m3[][] = new int[r][c];
           System.out.println("Enter all the elements of first matrix:");
          for (int i = 0; i < r; i++)
          {
              for (int j = 0; j < c; j++)
              {
                  m1[i][j] = x.nextInt();
              }
          }
          System.out.println("");
          System.out.println("Enter all the elements of second matrix:");
          for (int i = 0; i < r; i++)
          {
              for (int j = 0; j < c; j++)
              {
                  m2[i][j] = x.nextInt();
              }
          }
          System.out.println("");
          System.out.println("First Matrix:");
```

```
        for (int i = 0; i < r; i++)
        {
            for (int j = 0; j < c; j++)
            {
                System.out.print(m1[i][j]+" ");
            }
            System.out.println("");
        }
        System.out.println("Second Matrix:");
        for (int i = 0; i < r; i++)
        {
            for (int j = 0; j < c; j++)
            {
                System.out.print(m2[i][j]+" ");
            }
            System.out.println("");
        }
        for (int i = 0; i < r; i++)
        {
            for (int j = 0; j < c; j++)
            {
                for (int k = 0; k < c; k++)
                {
                    m3[i][j] = m1[i][j] + m2[i][j];
                }
            }
        }
        System.out.println("Matrix after addition:");
        for (int i = 0; i < r; i++)
        {
            for (int j = 0; j < c; j++)
            {
                System.out.print(m3[i][j]+" ");
            }
            System.out.println("");
        }
    }

}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Matrix.java
sjcet@Z238-UL:~/Gopika/java$ java Matrix
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:24/03/2023


Number of rows
2
Number of coloumn
3
Enter all the elements of first matrix:
1 2 3
4 5 6

Enter all the elements of second matrix:
7 8 9
4 5 6

First Matrix:
1 2 3
4 5 6
Second Matrix:
7 8 9
4 5 6
Matrix after addition:
8 10 12
8 10 12
```

3)Add complex numbers

CODE:

```
import java.util.Scanner;

class Complex
{
	int real;
	int img;
}
public class ComplexNumber
{
	public static void main(String[] args)
	{
		System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:28/03/2023\n\n");
		Scanner SC = new Scanner(System.in);
		Complex num1 = new Complex();
		Complex num2 = new Complex();
		Complex num3 = new Complex();
		System.out.printf("Enter a first complex number (real and imaginary): ");
		num1.real = SC.nextInt();
		num1.img = SC.nextInt();
		System.out.printf("Enter a second complex number (real and imaginary):
");
		num2.real = SC.nextInt();
		num2.img = SC.nextInt();
		num3.real = num1.real + num2.real;
		num3.img = num1.img + num2.img;
		if(num3.img >= 0)
		{
			System.out.printf("Result is = %d + %di\n", num3.real, num3.img);
		}
		else
		{
			System.out.printf("Result is = %d %di\n", num3.real, num3.img);
		}

	}
```

```
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac ComplexNumber.java
sjcet@Z238-UL:~/Gopika/java$ java ComplexNumber
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:28/03/2023


Enter a first complex number (real and imaginary): 25 12
Enter a second complex number (real and imaginary): 11 45
Result is = 36 + 57i
```

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

CODE:

```
import java.util.*;
public class Symmetric
{
	public static void main(String[] args)
	{
		System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:28/03/2023\n\n");
		Scanner s=new Scanner(System.in);
		int r,c;
		System.out.println("enter no of rows and columns");
		r=s.nextInt();
		c=s.nextInt();
		int[][]  a=new int[r][c];
		int[][]  b=new int[r][c];
		System.out.println("enter the matrix elements");
		for(int i=0;i<r;i++)
		{
			for(int j=0;j<c;j++)
			{
				a[i][j]=s.nextInt();
			}
		}
		if(r==c)
		{
			for(int i=0;i<r;i++)
			{
				for(int j=0;j<c;j++)
				{
					b[i][j]=a[j][i];
				}
			}
		}
	int x=0;
	for(int i=0;i<r;i++)
	{
		for(int j=0;j<c;j++)
```

```
                {
                        if(a[i][j]==b[i][j])
                x=1;
        }
    }
        if(x==1)
        {
                System.out.println("\nMatrix is a Symmetric Matrix");
        }
        else
        {
                System.out.println("\nMatrix is  not a Symmetric Matrix");

        }
        }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Symmetric.java
sjcet@Z238-UL:~/Gopika/java$ java Symmetric
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:28/03/2023


enter no of rows and columns
3
2
enter the matrix elements
1 2
4 5
7 8

Matrix is  not a Symmetric Matrix
sjcet@Z238-UL:~/Gopika/java$ javac Symmetric.java
sjcet@Z238-UL:~/Gopika/java$ java Symmetric
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:28/03/2023


enter no of rows and columns
3
3
enter the matrix elements
1 2 3
2 4 5
3 5 6

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:

```
class CPU
{
	double price;
	class Processor
	{
	double cores;
	String manufacturer;

	double getCache()
	{
			return 4.3;
	}
	}
	protected class RAM
	{
	double memory;
	String manufacturer;

	double getClockSpeed()
	{
			return 5.5;
	}
      }
}

class main
{
	public static void main(String[] args)
	{
		System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:04/0/2023\n\n");
	CPU cpu = new CPU();
	CPU.Processor processor = cpu.new Processor();
	CPU.RAM ram = cpu.new RAM();
```

```
        System.out.println("Processor Cache = " + processor.getCache());
        System.out.println("Ram Clock speed = " + ram.getClockSpeed());
        }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac CPU.java
sjcet@Z238-UL:~/Gopika/java$ java main
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:01/04/2023


Processor Cache = 4.3
Ram Clock speed = 5.5
```

CYCLE:2

1)Program to Sort strings.

CODE:

```
import java.util.*;
public class SortStrings
{
	public static void main(String[]args)
	{
		System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:04/0/2023\n\n");
		String names[]=
		{
			"Gopika","Jyothika","Devika","Bhoomika","Theertha"
		};
		System.out.println("\nThe names order before sorting:");
		for(int i=0;i<names.length;i++)
		System.out.println(names[i]);
		Arrays.sort(names);
		System.out.println("\n The names in alphabetical order:");
		for(int i=0;i<names.length;i++)
		System.out.println(names[i]);
	}
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac SortStrings.java
sjcet@Z238-UL:~/Gopika/java$ java SortStrings
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:01/04/2023


The names order before sorting:
Gopika
Jyothika
Devika
Bhoomika
Theertha

 The names in alphabetical order:
Bhoomika
Devika
Gopika
Jyothika
Theertha
```

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("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:04/0/2023\n\n");
        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

```
sjcet@Z238-UL:~/Gopika/java$ javac searchelement.java
sjcet@Z238-UL:~/Gopika/java$ java searchelement
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:04/04/2023


Enter the size of the array: 3
Enter the elements of the array:
15
30
68
Enter the element to search: 30
Element found at position 2
```

3)Perform string manipulations.

CODE:

```
import java.util.Scanner;
public class String_man{
   public static void main(String[] args) {
   System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:04/0/2023\n\n");
       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

```
sjcet@Z238-UL:~/Gopika/java$ javac String_man.java
sjcet@Z238-UL:~/Gopika/java$ java String_man
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:04/04/2023


Enter The String
Physics
Length of String = 7
Character at First position  = h
String Contains 'Col' sequence :false
String ends with e : false
Replace'col' with 'kol' : Physics
LOWERCASE : physics
UPPERCASE : PHYSICS
```

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;
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("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:04/0/2023\n\n");
      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();
         }
        }
     }
}
```

```
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:04/04/2023



Enter the No. of Employee's
2

Enter the Employee details
Employee number :
101
Name :
Aryan
Salary :
20000

Enter the Employee details
Employee number :
102
Name :
Bhoomika
Salary :
450000

Informations of all the employee's
Empolyee No :101
Name :Aryan
Salary Amount20000.0

Empolyee No :102
Name :Bhoomika
Salary Amount450000.0


Enter the Employee Number to get details of a employee
101

Employee details
Empolyee No :101
Name :Aryan
Salary Amount20000.0
```

CYCLE:3

1)Area of different shapes using overloaded functions.

CODE:

```
import java.util.Scanner;
public class shapes {
      void area(int r1){
       double Area_val = 3.14*r1*r1;
       System.out.println("\nArea of Circle is Radius "+r1+" = "+Area_val);
   }
   void area(int a1,int b1){
       int Area_val = a1*b1;
       System.out.println("\nArea of Rectangle is with dimensions "+a1+" X "+b1+" =
"+Area_val);
   }
   void area(int a1,int b1,int c1){
       int Area_val = a1*b1*c1;
       System.out.println("\nArea of Cuboid is with dimensions "+a1+" X "+b1+" X "+c1+"
= "+Area_val);
   }
   public static void main(String[] args) {
       Scanner sc = new Scanner(System.in);
       System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:02/06/2023\n\n");
       System.out.println("\nEnter the Length");
       int l = sc.nextInt();
       System.out.println("Enter the Breath");
       int b = sc.nextInt();
       System.out.println("Enter the Height");
       int h = sc.nextInt();
       System.out.println("Enter the Radius");
       int r = sc.nextInt();
       shapes obj1 = new shapes();
       obj1.area(r);
       obj1.area(l,b);
       obj1.area(l,b,h);
   }

}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac shapes.java
sjcet@Z238-UL:~/Gopika/java$ java shapes
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:02/06/2023



Enter the Length
12
Enter the Breath
15
Enter the Height
17
Enter the Radius
3

Area of Circle is Radius 3 = 28.259999999999998

Area of Rectangle is with dimensions 12 X 15 = 180

Area of Cuboid is with dimensions 12 X 15 X 17 = 3060
```

2)Create a class 'Employee' with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class 'Teacher' that inherit the properties of class employee and contain its own data members department, Subjects taught and constructors to initialize these data members and also include display function to display all the data members. Use array of objects to display details of N teachers.

CODE:

```
import java.util.Scanner;
 class Employee {
    int Empid;
    String Name;
    double Salary;
    String Address;
    Employee(int no, String na, double sal, String add) {
        this.Empid = no;
        this.Name = na;
        this.Salary = sal;
        this.Address = add;
    }
}
public class Teacher extends Employee{
 String dept;
 String subject;

 Teacher(int no, String na, double sal, String add, String dep, String sub){
     super(no,na,sal,add);
     this.dept= dep;
     this.subject=sub;
 }

 void display(){
    System.out.println("Employee id: "+Empid);
    System.out.println("Name: "+Name);
    System.out.println("Salary: "+Salary);
    System.out.println("Address: "+Address);
    System.out.println("Department: "+dept);
    System.out.println("Subject: "+subject);
 }
 public static void main(String[] args) {
```

```
        System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:09/06/2023\n\n");
    System.out.println("Enter the No. of Employee's");
    Scanner sc1 = new Scanner(System.in);
    int num = sc1.nextInt();
    Teacher arr[]=new Teacher[num];
    for(int i =0;i<num;i++)
    {
        Scanner sc =new Scanner(System.in);
        System.out.println("Enter Employee id: ");
        int Empid=sc.nextInt();
        System.out.println("Enter Employee Name: ");
        String Name=sc.next();
        System.out.println("Enter Salary: ");
        double Salary=sc.nextDouble();
        System.out.println("Enter Address: ");
        String Address=sc.next();
        System.out.println("Enter department: ");
        String dept=sc.next();
        System.out.println("Enter Subject: ");
        String subject=sc.next();
        arr[i]=new Teacher(Empid,Name,Salary,Address,dept,subject);


    }
    System.out.println("********Informations of all the employee's************");
    for(int i=0;i<num;i++){
        int j=i+1;
        System.out.println("\n"+j+").");
        arr[i].display();

 }
 sc1.close();
 }


}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Teacher.java
sjcet@Z238-UL:~/Gopika/java$ java Teacher
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:09/06/2023


Enter the No. of Employee's
2
Enter Employee id:
101
Enter Employee Name:
Aryan
Enter Salary:
50000
Enter Address:
Gangothri
Enter department:
Physics
Enter Subject:
Geophysics
Enter Employee id:
102
Enter Employee Name:
Bhoomika
Enter Salary:
250000
Enter Address:
Ujjaini
Enter department:
Physics
Enter Subject:
Astrology
```

```
********Informations of all the employee's************

1).
Employee id: 101
Name: Aryan
Salary: 50000.0
Address: Gangothri
Department: Physics
Subject: Geophysics

2).
Employee id: 102
Name: Bhoomika
Salary: 250000.0
Address: Ujjaini
Department: Physics
Subject: Astrology
```

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, Teacherid and also contain constructors and methods to display the data members. Use array of objects to display details of N teachers.

CODE:

```
import java.util.*;
class Person{
  String Name;
  String Gender;
  String Address;
  String Age;
  public Person(String Name,String Gender,String Address,String Age){
    this.Name=Name;
    this.Gender=Gender;
    this.Address=Address;
    this.Age=Age;
  }
}
class Employee extends Person {
   String Empid;
   String Company_Name;
   String Qualification;
   String Salary;
   public Employee(String Name,String Gender,String Address,String Age ,String
Empid,String Company_Name, String Qualification,String Salary){
      super(Name,Gender,Address,Age);
      this.Empid= Empid;
      this.Company_Name=Company_Name;
      this.Qualification=Qualification;
      this.Salary=Salary;
    }
}
class Teacher extends Employee{
     String Teacherid;
     String Department;
```

```
    String Subject;
    public Teacher(String Name,String Gender,String Address,String Age,String
Empid,String Company_Name,String Qualification,String Salary,String Teacherid,String
Department,String Subject){
    super(Name,Gender,Address,Age,Empid,Name,Qualification, Salary);
    this.Teacherid=Teacherid;
    this.Department=Department;
    this.Subject=Subject;
    }
    public void read(){
    Scanner in =new Scanner(System.in);
    System.out.println("enter the Name=");
    Name=in.nextLine();
    System.out.println("enter the Gender=");
    Gender=in.nextLine();
    System.out.println("enter the Address=");
    Address=in.nextLine();
    System.out.println("enter the Age=");
    Age=in.nextLine();
    System.out.println("enter the Employ id=");
    Empid=in.nextLine();
    System.out.println("enter the Company Name=");
    Company_Name=in.nextLine();
    System.out.println("enter the Qualification=");
    Qualification=in.nextLine();
    System.out.println("enter the Salary=");
    Salary=in.nextLine();
    System.out.println("enter the Teacher id=");
    Teacherid=in.nextLine();
    System.out.println("enter the Department=");
    Department=in.nextLine();
    System.out.println("Enter the Subject=");
    Subject=in.nextLine();
    }
    public void display(){
    System.out.println("_______Employee Details_________");
    System.out.println("Name="+ Name);
    System.out.println("Gender=" + Gender);
    System.out.println("Address=" + Address);
```

```
    System.out.println("Age=" + Age);
    System.out.println("Empid=" + Empid);
    System.out.println("Company Name=" + Company_Name);
    System.out.println("Qualification=" + Qualification);
    System.out.println("Salary=" + Salary);
     System.out.println("_______Teachers Details_________");
    System.out.println("Teacher id=" + Teacherid);
    System.out.println("Department=" + Department);
    System.out.println("Subject=" + Subject);
    System.out.println(".....");
    }
}
 class InheritancePerson{
   public static void main(String Args[]){
     System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:09/06/2023\n\n");
    int i,n;
    Scanner in =new Scanner(System.in);
    System.out.println("Enter the Number of employee=");
    n=in.nextInt();
    Teacher T[] = new Teacher[n];
    for(i=0;i<n;i++){
       T[i]=new

Teacher("Name","Gender","Address","Age","Empid","Name","Qualification","Salary","Te
acherid","Department","Subject");
        T[i].read();
    }
    for(i=0;i<n;i++){
      T[i].display();
    }
  }
}
```

OUTPUT

```
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:09/06/2023


Enter the Number of employee=
1
enter the Name=
Aryan
enter the Gender=
Male
enter the Address=
Ujjaini
enter the Age=
21
enter the Employ id=
101
enter the Company Name=
IBM
enter the Qualification=
MSc Computer Science
enter the Salary=
30000
enter the Teacher id=
105
enter the Department=
MCA
Enter the Subject=
Computer
_______Employee Details_________
Name=Aryan
Gender=Male
Address=Ujjaini
Age=21
Empid=101
Company Name=IBM
Qualification=MSc Computer Science
Salary=30000
_______Teachers Details_________
Teacher id=105
Department=MCA
Subject=Computer
.................................-............
```

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{
    String publisher;
    Publisher(String pub){
        this.publisher=pub;
    }
}
class Book extends Publisher{
    String book;
    Book(String pub,String boo){
        super(pub);
        book=boo;

    }
}
class Literature extends Book{
    String category;
    Literature(String pub, String boo){
        super(pub, boo);
    }
    void display(){
        System.out.println("Publisher :"+publisher);
        System.out.println("Book :"+book);
    }
}
class Fiction extends Book{
    Fiction(String pub, String boo){
        super(pub, boo);
    }
    void display(){
        System.out.println("Publisher :"+publisher);
        System.out.println("Book :"+book);
    }
}
public class bookDetails{
```

```
    public static void main(String[] args) {
    System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:14/06/2023\n");
        System.out.println("Enter the No. of Literature Books");
        Scanner sc1 = new Scanner(System.in);
        int num = sc1.nextInt();
        Literature arr[]=new Literature[num];
        System.out.println("Enter the Literature Book Details\n");
        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("Book : ");
            String boo =sc.nextLine();
            System.out.println("Publisher: ");
            String pub =sc.nextLine();

            arr[i]=new Literature(boo,pub);
        }
        System.out.println("Enter the No. of Fiction Books");
        int num1 = sc1.nextInt();
        Fiction arr1[]=new Fiction[num1];
        System.out.println("Enter the Fiction Book Details\n");
        int x1 = 0,j1=0;
        for(int i =0;i<num1;i++)
        {
            x1 = i +1;
            System.out.println("\n"+x1+")");
            System.out.println("Book : ");
            String boo =sc.nextLine();
            System.out.println("Publisher: ");
            String pub =sc.nextLine();

            arr1[i]=new Fiction(boo,pub);
        }
        sc.close();
```

```
    sc1.close();

    System.out.println(".....Informations of all the Literature Books.....");
    for(int i=0;i<num;i++){
        j=i+1;
        System.out.println("\n"+j+").");
        arr[i].display();

    }
    System.out.println(".....Informations of all the Fiction Books.....");
    for(int i=0;i<num1;i++){
        j1=i+1;
        System.out.println("\n"+j1+").");
        arr1[i].display();

    }
 sc1.close();
 }

}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac bookDetails.java
sjcet@Z238-UL:~/Gopika/java$ java bookDetails
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:14/06/2023

Enter the No. of Literature Books
2
Enter the Literature Book Details


1)
Book :
400 Days
Publisher:
DC Books

2)
Book :
Three Mistakes of my Life
Publisher:
DC Books
Enter the No. of Fiction Books
2
Enter the Fiction Book Details


1)
Book :
The Alchemist
Publisher:
Blues Books

2)
Book :
The Kite Runner
Publisher:
Whiles Ride
```

```
.....Informations of all the Literature Books.....

1).
Publisher :400 Days
Book :DC Books

2).
Publisher :Three Mistakes of my Life
Book :DC Books
.....Informations of all the Fiction Books.....

1).
Publisher :The Alchemist
Book :Blues Books

2).
Publisher :The Kite Runner
Book :Whiles Ride
```

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 Sports{
    String sport;
    int Rating;
    Sports(String spo, int ra){
        sport = spo;
        Rating = ra;
    }

}
class Student extends Sports{
    String Grade;
    double Overall_per;
    Student(String spo, int ra,String gd, double per ){
        super(spo, ra);
        Grade = gd;
        Overall_per = per;
    }
}
public class Result extends Student {
    Result(String spo, int ra,String gd, double per ){
        super(spo, ra, gd, per);
    }
    void display(){
        System.out.println("\nSports Details of Student");
        System.out.println("Sport :"+sport);
        System.out.println("Rating :"+Rating);
        System.out.println("\nAcademic Details of Student");
        System.out.println("Academic Grade :"+Grade);
        System.out.println("Overall percentage :"+Overall_per);
    }

    public static void main(String[] args) {
          System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:05/06/2023\n\n");
```

```
        Scanner sc =new Scanner(System.in);
        System.out.println("Enter the Sports Details of Student");
        System.out.println("Sport: ");
        String a =sc.next();
        System.out.println("Sport Rating  out of 10: ");
        int b =sc.nextInt();
        System.out.println("Enter the Sports Details of Student");
        System.out.println("Academic Grade: ");
        String c =sc.next();
        System.out.println("Overall percentage: ");
        double d =sc.nextDouble();
        sc.close();
        Result obj= new Result(a,b,c,d);
        obj.display();
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Result.java
sjcet@Z238-UL:~/Gopika/java$ java Result
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:05/06/2023


Enter the Sports Details of Student
Sport:
Cricket
Sport Rating  out of 10:
9
Enter the Sports Details of Student
Academic Grade:
A
Overall percentage:
96

Sports Details of Student
Sport :Cricket
Rating :9

Academic Details of Student
Academic Grade :A
Overall percentage :96.0
```

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

CODE:

```
import java.util.Scanner;

interface prop
{
   void getdata();
   void area();
   void perimeter();
}

class Circle implements prop
{
   double pi = 3.14;
   double r;
   Scanner sc = new Scanner(System.in);
   public void getdata()
   {
      System.out.println("Enter the radius of the circle:");
      r = sc.nextDouble();
   }
   public void perimeter()
   {
      System.out.println("Perimeter of the circle: "+(2*pi*r));
   }
   public void area()
   {
      System.out.println("Perimeter of the circle: "+(pi*r*r));
   }
}

class Rectangle implements prop
{
   double l,b;
   Scanner sc = new Scanner(System.in);
   public void getdata()
   {
```

```
        System.out.println("Enter the length of the rectangle:");
        l = sc.nextDouble();
        System.out.println("Enter the breadth of the rectangle:");
        b = sc.nextDouble();
    }
    public void area()
    {
        System.out.println("Perimeter of a rectangle: "+(l*b));
    }
    public void perimeter()
    {
        System.out.println("Perimeter of a rectangle: "+(2*(l+b)));
    }
}

public class Function
{
    public static void main(String[] args)
    {
        System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:09/06/2023\n\n");
        int ch;
        Scanner sc = new Scanner(System.in);
        Circle ob = new Circle();
        Rectangle obj = new Rectangle();
        do
        {
            System.out.println("\n1.Circle\n2.Rectangle\n3.exit");
            System.out.println("Enter your choice:");
            ch = sc.nextInt();
            switch(ch)
            {
                case 1 :ob.getdata();
                        ob.area();
                        ob.perimeter();
                        break;
                case 2 :obj.getdata();
                        obj.area();
```

```
                obj.perimeter();
                break;
            case 3 :System.out.println("Exited...");
                System.exit(0);
          }
       }while(true);
   }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Function.java
sjcet@Z238-UL:~/Gopika/java$ java Function
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:09/06/2023



1.Circle
2.Rectangle
3.exit
Enter your choice:
1
Enter the radius of the circle:
3
Perimeter of the circle: 28.259999999999998
Perimeter of the circle: 18.84

1.Circle
2.Rectangle
3.exit
Enter your choice:
2
Enter the length of the rectangle:
24
Enter the breadth of the rectangle:
23
Perimeter of a rectangle: 552.0
Perimeter of a rectangle: 94.0

1.Circle
2.Rectangle
3.exit
Enter your choice:
3
Exited...
```

7)repare bill with the given format using calculate method from 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.util.Scanner;

interface calc
{
   void calculate();
}

class bill implements calc
{
   String date,name,p_id;
   int quantity;
   double unit_price,total,namount=0;
   Scanner sc = new Scanner(System.in);
   public void getdata()
   {
      System.out.println("\nEnter product id:");
      p_id = sc.nextLine();
      System.out.println("Enter product name:");
      name = sc.nextLine();
      System.out.println("Enter the Quantity:");
      quantity = sc.nextInt();
      System.out.println("Enter the unit price:");
      unit_price = sc.nextDouble();
   }
   public void calculate()
   {
      total = quantity * unit_price;
   }
```

```
    public void display()
    {
        System.out.println(p_id+"\t\t"+name+"\t\t"+quantity+"\t\t"+unit_price+"\t"+total);
    }
}


public class Amount
{
    public static void main(String[] args)
    {
       System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:09/06/2023\n\n");
        int n,i;
        double namount=0,t;
        int ran;
        String date;
        t = Math.random() *1000000;
        ran = (int) t;
        Scanner sc = new Scanner(System.in);
        System.out.println("Order no. #"+ran);
        System.out.println("Enter the date:");
        date = sc.nextLine();
        System.out.println("Enter how many products are there:");
        n = sc.nextInt();
        bill ob[] = new bill[n];
        for(i=0;i<n;i++)
            ob[i] = new bill();
        for(i=0;i<n;i++){
            ob[i].getdata();
            ob[i].calculate();
        }
        System.out.println("Date:"+date);
        System.out.println("Product Id \tName\t   Quantity\t   unit price\t Total ");
        System.out.println("-----------------------------------------------------------");
        for(i=0;i<n;i++){
            ob[i].display();
            namount += ob[i].total;
```

```
        }
        System.out.println("-----------------------------------------------------------");
        System.out.println("\t\t\tNet.Amount\t"+ namount);

    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java$ javac Amount.java
sjcet@Z238-UL:~/Gopika/java$ java Amount
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:09/06/2023


Order no. #800478
Enter the date:
12/08/2023
Enter how many products are there:
2

Enter product id:
122
Enter product name:
Notebook
Enter the Quantity:
1
Enter the unit price:
45

Enter product id:
111
Enter product name:
Pen
Enter the Quantity:
1
Enter the unit price:
10
Date:12/08/2023
Product Id      Name       Quantity        unit price    Total
-------------------------------------------------------------
122             Notebook                1               45.0    45.0
111             Pen             1               10.0    10.0
-------------------------------------------------------------
                        Net.Amount      55.0
```

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:

```
import package_graphics.*;
import java.util.Scanner;
public class Q1
 {
public static void main(String []args)
{
   System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
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("Area of rectangle="+testObj.recArea(l,h));
System.out.println("Area of circle="+testObj.cirArea(r));
System.out.println("Area of square="+testObj.squArea(a));
System.out.println("Area of triangle="+testObj.triArea(c,d));
}
}
```

Package_graphics(folder):

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)
{
return l*h;
}
public float cirArea(int r)
{
return r*r*(float)3.14;
}
public float squArea(int a)
{
return a*a;
}
public float triArea(int l, int h)
{
return l*h*(float)(.5);
}
}
```

OUTPUT

```
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


Enter the length for rectangle
12
Enter the breadth for rectangle
14
Enter the radius of circle
5
Enter the side for Square
4
Enter the breadth for triangle
6
Enter the height for triangle
9
Area of rectangle=168.0
Area of circle=78.5
Area of square=16.0
Area of triangle=27.0
```

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:

```
import arithmetic.ArithmeticOperations;
import java.util.Scanner;

public class ArithmeticMain {
    public static void main(String[] args) {
  System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:23/06/2023\n\n");
        ArithmeticOperations operations = new ArithmeticOperations();

       Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first number: ");
        double num1 = scanner.nextDouble();

        System.out.print("Enter the second number: ");
        double num2 = scanner.nextDouble();

        System.out.println("Addition: " + operations.add(num1, num2));
        System.out.println("Subtraction: " + operations.subtract(num1, num2));
        System.out.println("Multiplication: " + operations.multiply(num1, num2));
        System.out.println("Division: " + operations.divide(num1, num2));

    }
}
```

arithmetic(folder):

ArithmeticOperations.java

Addition.java

```
package arithmetic;

public interface Addition {
    public double add(double num1, double num2);
}
```

Subtraction.java

```
package arithmetic;

public interface Subtraction {
    public double subtract(double num1, double num2);
}
```

Multiplication.java

```
package arithmetic;

public interface Multiplication {
    public double multiply(double num1, double num2);
}
```

Division.java

```
package arithmetic;

public interface Division {
    public double divide(double num1, double num2);
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac ArithmeticMain.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java ArithmeticMain
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:23/06/2023


Enter the first number: 29
Enter the second number: 25
Addition: 54.0
Subtraction: 4.0
Multiplication: 725.0
Division: 1.16
```

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)
	{
		String username = "SJCET";
		String passcode = "SJCET2024";
		String user_name,password;
		Scanner sc = new Scanner(System.in);
		try
		{
			System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:16/06/2023\n\n");
			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

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Userauthentication.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Userauthentication
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:16/06/2023


Enter the username:
SJCET
Enter the password:
SJCET123
Exception caught authException: Invalid user credentials
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Userauthentication
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:16/06/2023


Enter the username:
SJCET
Enter the password:
SJCET2024
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("Name:GOPIKA UNNIKRISHNAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:16/06/2023\n\n");
		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

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Average.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Average
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:16/06/2023


Enter n numbers:
5
Enter number1
4
Enter number2
6
Enter number3
8
Enter number4
3
Enter number5
6
Average is 5.4
```

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

CODE:

```
class MultiplicationTableThread extends Thread {
    public void run() {
    System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:23/06/2023\n\n");
        System.out.println("Multiplication Table of 5:");
        for (int i = 1; i <= 10; i++) {
            System.out.println("5 * " + i + " = " + (5 * i));
        }
    }
}

class PrimeNumbersThread extends Thread {
    public void run() {
        System.out.println("First 10 Prime Numbers:");
        int count = 0;
        for (int num = 2; count < 10; num++) {
            if (isPrime(num)) {
                System.out.print(num + " ");
                count++;
            }
        }
        System.out.println();
    }

    private boolean isPrime(int number) {
        if (number <= 1) {
            return false;
        }
        for (int i = 2; i <= Math.sqrt(number); i++) {
            if (number % i == 0) {
                return false;
            }
        }
        return true;
    }
```

```
}

public class ThreadExample1 {
    public static void main(String[] args) {
        MultiplicationTableThread tableThread = new MultiplicationTableThread();
        PrimeNumbersThread primeThread = new PrimeNumbersThread();

        tableThread.start();

        try {
            tableThread.join();
        } catch (InterruptedException e) {
            e.printStackTrace();
        }

        primeThread.start();
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac ThreadExample1.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java ThreadExample1
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:23/06/2023


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 number is"+i);
```

```
                        }
                }
        }
}
public class mulThread
{
        public static void main(String[]args)
        {
                int c,range;
                Scanner sc=new Scanner(System.in);
                System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:21/06/2023\n\n");
                System.out.println("Enter the count of Fibonooci:");
                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

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac mulThread.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java mulThread
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:21/06/2023


Enter the count of Fibonooci:
5
Enter the range of Even number:
5
fib is0
fib is1
fib is1
Even number is0
Even number is2
Even number is4
fib is2
fib is3
```

7)Producer/Consumer using ITC

CODE:

```
public class ProducerConsumer
{
    public static void main(String[] args)
    {
        Shop c = new Shop();
        Producer p1 = new Producer(c, 1);
        Consumer c1 = new Consumer(c, 1);
        p1.start();
        c1.start();
    }
}
class Shop
{
    private int materials;
    private boolean available = false;
    public synchronized int get()
    {
        while (available == false)
        {
            try
            {
                wait();
            }
            catch (InterruptedException ie)
            {
            }
        }
        available = false;
        notifyAll();
        return materials;
    }
    public synchronized void put(int value)
    {
        while (available == true)
        {
            try
            {
```

```
                wait();
            }
            catch (InterruptedException ie)
            {
                ie.printStackTrace();
            }
        }
        materials = value;
        available = true;
        notifyAll();
    }
}
class Consumer extends Thread
{
    private Shop Shop;
    private int number;
    public Consumer(Shop c, int number)
    {
        Shop = c;
        this.number = number;
    }
    public void run()
    {
        int value = 0;
        for (int i = 0; i < 10; i++)
        {
            value = Shop.get();
            System.out.println("Consumed value " + this.number+ " got: " + value);
        }
    }
}
class Producer extends Thread
{
    private Shop Shop;
    private int number;

    public Producer(Shop c, int number)
    {
        Shop = c;
```

```
            this.number = number;
        }
        public void run()
        {
            System.out.println("Name:GOPIKA UNNIKRISHAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:21/06/2023\n\n");
            for (int i = 0; i < 10; i++)
            {
                Shop.put(i);

                System.out.println("Produced value " + this.number+ " put: " + i);
                try
                {
                    sleep((int)(Math.random() * 100));
                }
                catch (InterruptedException ie)
                {
                    ie.printStackTrace();
                }
            }
        }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac ProducerConsumer.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java ProducerConsumer
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:21/06/2023


Produced value 1 put: 0
Consumed value 1 got: 0
Produced value 1 put: 1
Consumed value 1 got: 1
Produced value 1 put: 2
Consumed value 1 got: 2
Produced value 1 put: 3
Consumed value 1 got: 3
Produced value 1 put: 4
Consumed value 1 got: 4
Produced value 1 put: 5
Consumed value 1 got: 5
Produced value 1 put: 6
Consumed value 1 got: 6
Produced value 1 put: 7
Consumed value 1 got: 7
Produced value 1 put: 8
Consumed value 1 got: 8
Produced value 1 put: 9
Consumed value 1 got: 9
```

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

CODE:

```
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class Stack<T> {
    private List<T> stack;
    private int capacity;

    public Stack(int capacity) {
        this.stack = new ArrayList<>();
        this.capacity = capacity;
    }

    public void push(T element) {
        if (stack.size() >= capacity) {
            throw new IllegalStateException("Stack is full");
        }
        stack.add(element);
    }

    public T pop() {
        if (isEmpty()) {
            throw new IllegalStateException("Stack is empty");
        }
        return stack.remove(stack.size() - 1);
    }

    public boolean isEmpty() {
        return stack.isEmpty();
    }
}

public class GenericStackExample {
    public static void main(String[] args) {
    System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:23/06/2023\n\n");
```

```
Scanner scanner = new Scanner(System.in);
System.out.print("Enter the capacity of the stack: ");
int capacity = scanner.nextInt();

Stack<Integer> integerStack = new Stack<>(capacity);

System.out.println("Stack created with capacity " + capacity);

while (true) {
    System.out.println("\nChoose an operation:");
    System.out.println("1. Push");
    System.out.println("2. Pop");
    System.out.println("3. Exit");

    int choice = scanner.nextInt();

    switch (choice) {
        case 1:
            System.out.print("Enter the element to push: ");
            int element = scanner.nextInt();
            try {
                integerStack.push(element);
                System.out.println("Element pushed: " + element);
            } catch (IllegalStateException e) {
                System.out.println("Stack is full. Cannot push element.");
            }
            break;
        case 2:
            try {
                int poppedElement = integerStack.pop();
                System.out.println("Element popped: " + poppedElement);
            } catch (IllegalStateException e) {
                System.out.println("Stack is empty. Cannot pop element.");
            }
            break;
        case 3:
            System.out.println("Exiting the program.");
            scanner.close();
            System.exit(0);
```

```
                default:
                    System.out.println("Invalid choice. Please try again.");
                    break;
            }
        }
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac GenericStackExample.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java GenericStackExample
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:23/06/2023


Enter the capacity of the stack: 8
Stack created with capacity 8

Choose an operation:
1. Push
2. Pop
3. Exit
1
Enter the element to push: 14
Element pushed: 14

Choose an operation:
1. Push
2. Pop
3. Exit
2
Element popped: 14

Choose an operation:
1. Push
2. Pop
3. Exit
3
Exiting the program.
```

9)Using generic method perform Bubble sort.

CODE:

```
import java.util.*;

class Q9{
 void sort(int arr[])
   {
      int n = arr.length;
       for(int i =0;i < n-1;i++)
       {
           for(int j=0;j<n-i-1;j++)
           {
               if(arr[j] > arr[j+1])
               {
                   int temp = arr[j];
                   arr[j]=arr[j+1];
                   arr[j+1]= temp;
               }
           }
       }
   }
void display(int arr[])
   {
       System.out.println("Sorted Array :");
       int n = arr.length;
       for(int i=0;i<n;i++)
       {
           System.out.print(arr[i]+ " ");
       }
   }
public static void main(String[] args)
   {
       int n,e;
       System.out.println("Name:GOPIKA UNNIKRISHAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:26/06/2023\n\n");
       System.out.println("Enter size of Array :");
       Scanner inp =new Scanner(System.in);
       n = inp.nextInt();
```

```
        int[] arr = new int[n];
        for(int i=0;i<n;i++)
        {
            System.out.println("Enter element :");
            e = inp.nextInt();
            arr[i]=e;
        }
        Q9 ob = new Q9();
        ob.sort(arr);
        ob.display(arr);
        System.out.println("\n");

    }

}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q9.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q9
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:26/06/2023


Enter size of Array :
4
Enter element :
12
Enter element :
14
Enter element :
16
Enter element :
18
Sorted Array :
12 14 16 18
```

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

CODE:

```
import java.util.*;
public class Q10 {

    public static void main(String[] args) {
   System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
        ArrayList<String> obj = new ArrayList<String>();
        obj.add("JAVA");
        obj.add("C");
        obj.add("PYTHON");
        obj.add("CSS");
System.out.println("Original ArrayList:");
        for(String str:obj)
            System.out.println(str);
obj.add(1, "PHP");
System.out.println("ArrayList after add operation:");
        for(String str:obj)
            System.out.println(str);
obj.remove("PHP");
System.out.println("ArrayList after remove operation:");
        for(String str:obj)
            System.out.println(str);
obj.remove(3);
System.out.println("Final ArrayList:");
        for(String str:obj)
            System.out.println(str);
Collections.sort(obj);
System.out.println("ArrayList after sorting:");
        for (String str : obj)
            System.out.println(str);
System.out.println("Object at index 2:"+obj.get(2));
System.out.println("Six is in the ArrayList :"+obj.contains("degree"));
System.out.println("Two is in the ArrayList :"+obj.contains("dell"));
System.out.println("Size of the ArrayList:"+obj.size());
obj.clear();
```

```
 System.out.println("__ArrayList Removed__");
}
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q10.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q10
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


Original ArrayList:
JAVA
C
PYTHON
CSS
ArrayList after add operation:
JAVA
PHP
C
PYTHON
CSS
ArrayList after remove operation:
JAVA
C
PYTHON
CSS
Final ArrayList:
JAVA
C
PYTHON
ArrayList after sorting:
C
JAVA
PYTHON
Object at index 2:PYTHON
Six is in the ArrayList :false
Two is in the ArrayList :false
Size of the ArrayList:3
__ArrayList Removed__
```

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

CODE:

```
import java.util.*;

public class Q11 {
   public static  void main(String[] args){
     System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
       LinkedList<String> L=new LinkedList<>();
       L.add("JAVA");
       L.add("PYTHON");
       L.add("CSS");
       L.add(0,"PROGRAMING LANGUAGE");
       System.out.println(L);
       L.remove("CSS");
       System.out.println(L);
       L.remove(2);
       System.out.println(L);
       L.removeLast();
       System.out.println(L);
       L.removeFirst();
       System.out.println(L);


   }

}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q11.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q11
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


[PROGRAMING LANGUAGE, JAVA, PYTHON, CSS]
[PROGRAMING LANGUAGE, JAVA, PYTHON]
[PROGRAMING LANGUAGE, JAVA]
[PROGRAMING LANGUAGE]
[]
```

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

CODE:

```
import java.util.Stack;

public class Q12 {
    public static void removeElementAtPosition(Stack<String> stack, int position) {
        if (position >= 1 && position <= stack.size()) {
            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());
            }

            System.out.println("Element at position " + position + " removed successfully.");
        } else {
            System.out.println("Invalid position. Please provide a valid position within the
stack range.");
        }
    }

    public static void main(String[] args) {
        Stack<String> stack = new Stack<>();
        stack.push("Element 1");
        stack.push("Element 2");
        stack.push("Element 3");
        stack.push("Element 4");
        stack.push("Element 5");

        int positionToRemove = 3;
```

```
 System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
        System.out.println("Before removal: " + stack);
        removeElementAtPosition(stack, positionToRemove);
        System.out.println("After removal: " + stack);
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q12.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q12
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


Before removal: [Element 1, Element 2, Element 3, Element 4, Element 5]
Element at position 3 removed successfully.
After removal: [Element 1, Element 2, Element 4, Element 5]
```

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

CODE:

```
import java.util.PriorityQueue;

public class Q13 {
    public static void main(String[] args) {
        PriorityQueue <Integer> pq = new PriorityQueue<>();
        pq.add(10);
        pq.add(20);
        pq.add(15);
        System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:27/06/2023\n\n");
        System.out.println(pq);
        System.out.println(pq.peek());
        System.out.println(pq.poll());
        System.out.println(pq.peek());
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q13.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q13
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


[10, 20, 15]
10
10
15
```

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

CODE:

```
import java.util.*;
public class Q14 {
    public static void main(String[] args) {
     System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
        Deque<Integer> dq = new ArrayDeque<>();
        dq.add(1);
        dq.add(2);
        dq.add(3);
        System.out.println("Inserting three elements : ");
        for (Integer integer : dq) {
            System.out.println(integer);
        }
        dq.pop();
        System.out.println("After popping : ");
        for (Integer integer : dq) {
            System.out.println(integer);
        }
        dq.remove(3);
        System.out.println("Removing the element 3 :"+dq);
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q14.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q14
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


Inserting three elements :
1
2
3
After popping :
2
3
Removing the element 3 :[2]
```

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

CODE:

```
import java.util.LinkedHashSet;
import java.util.Set;

public class Q15 {
public static void main(String[] args) {
  System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
        Set<String> set = new LinkedHashSet<>();
        set.add("Apple");
        set.add("Banana");
        set.add("Orange");
        set.add("Apple"); // Adding a duplicate element

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

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q15.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q15
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


----------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.HashSet;
import java.util.Scanner;
import java.util.Set;

public class Q16 {
    public static void main(String[] args) {
        Set<Integer> set1 = new HashSet<>();
        Set<Integer> set2 = new HashSet<>();

        Scanner scanner = new Scanner(System.in);
         System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:27/06/2023\n\n");
        System.out.print("Enter the number of elements in Set 1: ");
        int numElements1 = scanner.nextInt();
        System.out.println("Enter the elements for Set 1:");
        for (int i = 0; i < numElements1; i++) {
            int element = scanner.nextInt();
            set1.add(element);
        }

        System.out.print("Enter the number of elements in Set 2: ");
        int numElements2 = scanner.nextInt();
        System.out.println("Enter the elements for Set 2:");
        for (int i = 0; i < numElements2; i++) {
            int element = scanner.nextInt();
            set2.add(element);
        }


        boolean isEqual = set1.equals(set2);


        System.out.println("Set 1: " + set1);
        System.out.println("Set 2: " + set2);
        if (isEqual) {
            System.out.println("Set 1 and Set 2 are equal.");
```

```
        } else {
            System.out.println("Set 1 and Set 2 are not equal.");
        }

        scanner.close();
    }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q16.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q16
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


Enter the number of elements in Set 1: 3
Enter the elements for Set 1:
12
13
14
Enter the number of elements in Set 2: 3
Enter the elements for Set 2:
23
24
25
Set 1: [12, 13, 14]
Set 2: [23, 24, 25]
Set 1 and Set 2 are not equal.
```

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

CODE:

```
import java.util.HashMap;
import java.util.Map;
import java.util.TreeMap;
public class Q17{
   public static void main(String[] args) {
   System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
       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("----------OUTPUT---------");
       System.out.println("HashMap: " + hashMap);
       System.out.println("TreeMap: " + treeMap);
   }
}
```

OUTPUT

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q17.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q17
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
Date:27/06/2023


----------OUTPUT---------
HashMap: {Bob=35, Alice=30, John=25}
TreeMap: {Alice=30, Bob=35, John=25} _
```

18)Program to Convert HashMap to TreeMap

CODE:

```
import java.util.HashMap;
import java.util.Map;

public class Q18{
    public static void main(String[] args) {
            Map<String, Integer> map = new HashMap<>();
        map.put("John", 25);
        map.put("Alice", 30);import package_graphics.*;
import java.util.Scanner;
public class Q1
 {
public static void main(String []args)
{
  System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg No:22MCA030\nCourse
Code:20MCA132\nCourse Name:OBJECT ORIENTED PROGRAMMING
LAB\nDate:27/06/2023\n\n");
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("Area of rectangle="+testObj.recArea(l,h));
System.out.println("Area of circle="+testObj.cirArea(r));
System.out.println("Area of square="+testObj.squArea(a));
System.out.println("Area of triangle="+testObj.triArea(c,d));
}
}
```

```
        map.put("Bob", 35);
        System.out.println("Name:GOPIKA UNNIKRISHNAN\nReg
No:22MCA030\nCourse Code:20MCA132\nCourse Name:OBJECT ORIENTED
PROGRAMMING LAB\nDate:27/06/2023\n\n");
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

```
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ javac Q18.java
sjcet@Z238-UL:~/Gopika/java/Cycle_4$ java Q18
Name:GOPIKA UNNIKRISHNAN
Reg No:22MCA030
Course Code:20MCA132
Course Name:OBJECT ORIENTED PROGRAMMING LAB
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}
```