LAB 7: INTERFACES IN JAVA

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Q.1 Write a program to define the interface called Matrix. Take the maximum number of rows and columns to be 3 and perform matrix addition and subtraction while implementing the given interfaces.

CODE:

```java
import java.util.Scanner;

interface Matrix
{
        int c[][]=new int[3][3];
        void calcmat();
}

class Addition implements Matrix
{       int a[][],b[][];
        Addition(int arr1[][],int arr2[][])
        {       a=arr1;
                b=arr2;
        }
        public void calcmat()
        {
                for(int i=0;i<3;i++)
                {       for(int j=0;j<3;j++)
                        {       c[i][j]=a[i][j]+b[i][j];
                                System.out.print(c[i][j]+ " ");
                        }System.out.println();
                }
        }
}
class Subtraction implements Matrix
{       int a[][],b[][];
        Subtraction(int arr1[][],int arr2[][])
        {       a=arr1;
```

```java
        {       a=arr1;
                b=arr2;
        }
        public void calcmat()
        {
                for(int i=0;i<3;i++)
                {       for(int j=0;j<3;j++)
                        {       c[i][j]=a[i][j]-b[i][j];
                                System.out.print(c[i][j]+ " ");
                        }System.out.println();
                }
        }
}



class MatInterface
{       public static void main(String args[])
        {       Scanner s=new Scanner(System.in);
                int a[][]=new int[3][3];
                int b[][]=new int[3][3];

                System.out.println("\nEnter the elements of matrix 'A' ");
                for(int i=0;i<3;i++)
                {       for(int j=0;j<3;j++)
                        {       a[i][j]=s.nextInt();}
                }
```

```
        System.out.println("\nMatrix A: ");
        for(int i=0;i<3;i++)
        {        for(int j=0;j<3;j++)
                {
                        System.out.print(a[i][j]+ " ");
                }System.out.println();
        }

        System.out.println("\nEnter the elements of matrix 'B' ");
        for(int i=0;i<3;i++)
        {        for(int j=0;j<3;j++)
                {        b[i][j]=s.nextInt();}
        }

        System.out.println("\nMatrix B: ");
        for(int i=0;i<3;i++)
        {        for(int j=0;j<3;j++)
                {
                        System.out.print(b[i][j]+ " ");
                }System.out.println();
        }
        Matrix ob1=new Addition(a,b);
        System.out.println("\nA + B: ");
        ob1.calcmat();
        Matrix ob2=new Subtraction(a,b);
        System.out.println("\nA - B: ");
        ob2.calcmat();
```

OUTPUT:


```
C:\Windows\System32\cmd.exe

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>javac MatInterface.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>java MatInterface

Enter the elements of matrix 'A'
54 85 96 12 74 3 85 4 6

Matrix A:
54 85 96
12 74 3
85 4 6

Enter the elements of matrix 'B'
12 45 96 10 74 31 85 14 65

Matrix B:
12 45 96
10 74 31
85 14 65

A + B:
66 130 192
22 148 34
170 18 71

A - B:
42 40 0
2 0 -28
0 -10 -59

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>java MatInterface
```
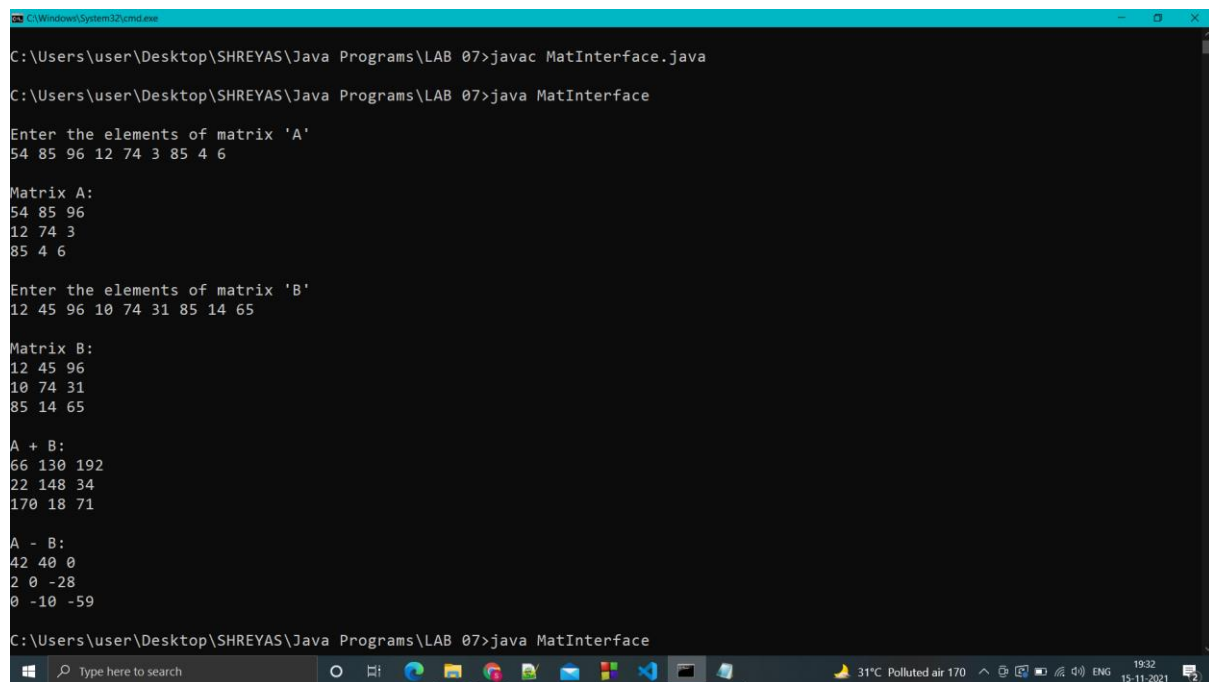
Q.2 Write a program to demonstrate how a class and an interface can be extended and implemented at the same time.

CODE:

```java
interface Place
{
        public void city();
        public void district();
        public void state();
}

class Country
{
        String count="India";
        String state="Maharashtra";
        String district="Thane";
        void count()
        {
                System.out.println("\nEntering superclass");
                System.out.println("Country: "+count);
                System.out.println("Exiting superclass\n");
        }
}

class Home extends Country implements Place
{
        String city;
        Home(String a)
        {
                city=a;
        }
        //Methods of interface Place
```

```java
        String city;
        Home(String a)
        {
                city=a;
        }
        //Methods of interface Place
        public void state()
        {       super.count();
                System.out.println("State: "+state);//Using variables from superclass
        }
        public void district()
        {       System.out.println("District: "+district);
        }
        public void city()
        {       System.out.println("City: "+city);
        }
}

class extendAndImplement
{       static public void main(String args[])
        {
                Home ob=new Home("Thane City");
                ob.state();
                ob.district();
                ob.city();
        }
}
```
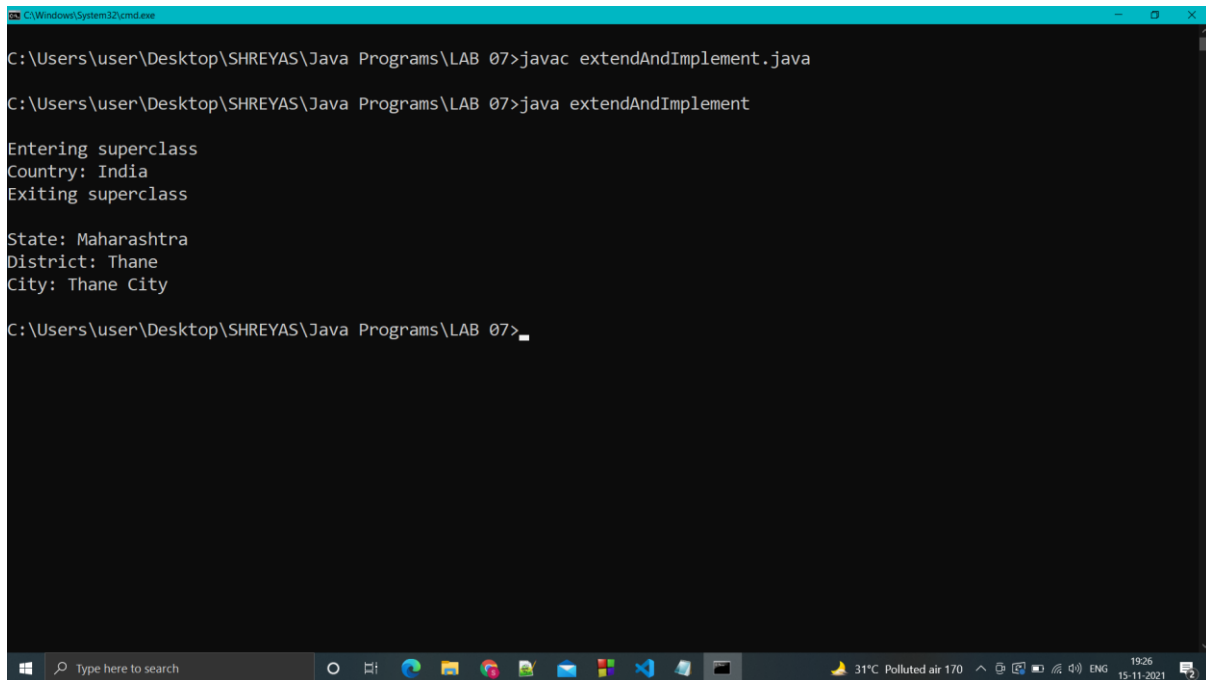
OUTPUT:

```
C:\Windows\System32\cmd.exe

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>javac extendAndImplement.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>java extendAndImplement

Entering superclass
Country: India
Exiting superclass

State: Maharashtra
District: Thane
City: Thane City

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>
```

Q.3 Write a program to demonstrate how interfaces can be extended.

CODE:

```java
interface Market
{
        void shop1();
        void shop2();
}

// Mall now includes shop1() and shop2(), and it adds shop3().
interface Mall extends Market
{
        void shop3();
}

// This class must implement all of Market and Mall
class Shops implements Mall {
        public void shop1()
        {
                System.out.println("Shop 1: Stationary");
        }
        public void shop2()
        {
                System.out.println("Shop 2: Electrical");
        }
        public void shop3()
        {
                System.out.println("Shop 3: Electronics in Mall");
        }
}
```

```java
}

// This class must implement all of Market and Mall
class Shops implements Mall {
        public void shop1()
        {
                System.out.println("Shop 1: Stationary");
        }
        public void shop2()
        {
                System.out.println("Shop 2: Electrical");
        }
        public void shop3()
        {
                System.out.println("Shop 3: Electronics in Mall");
        }
}

class extendInterface
{
        public static void main(String arg[])
        {
                Shops ob = new Shops();
                ob.shop1();
                ob.shop2();
                ob.shop3();
        }
}
```

OUTPUT:


```
C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>javac extendInterface.java

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>java extendInterface
Shop 1: Stationary
Shop 2: Electrical
Shop 3: Electronics in Mall

C:\Users\user\Desktop\SHREYAS\Java Programs\LAB 07>
```