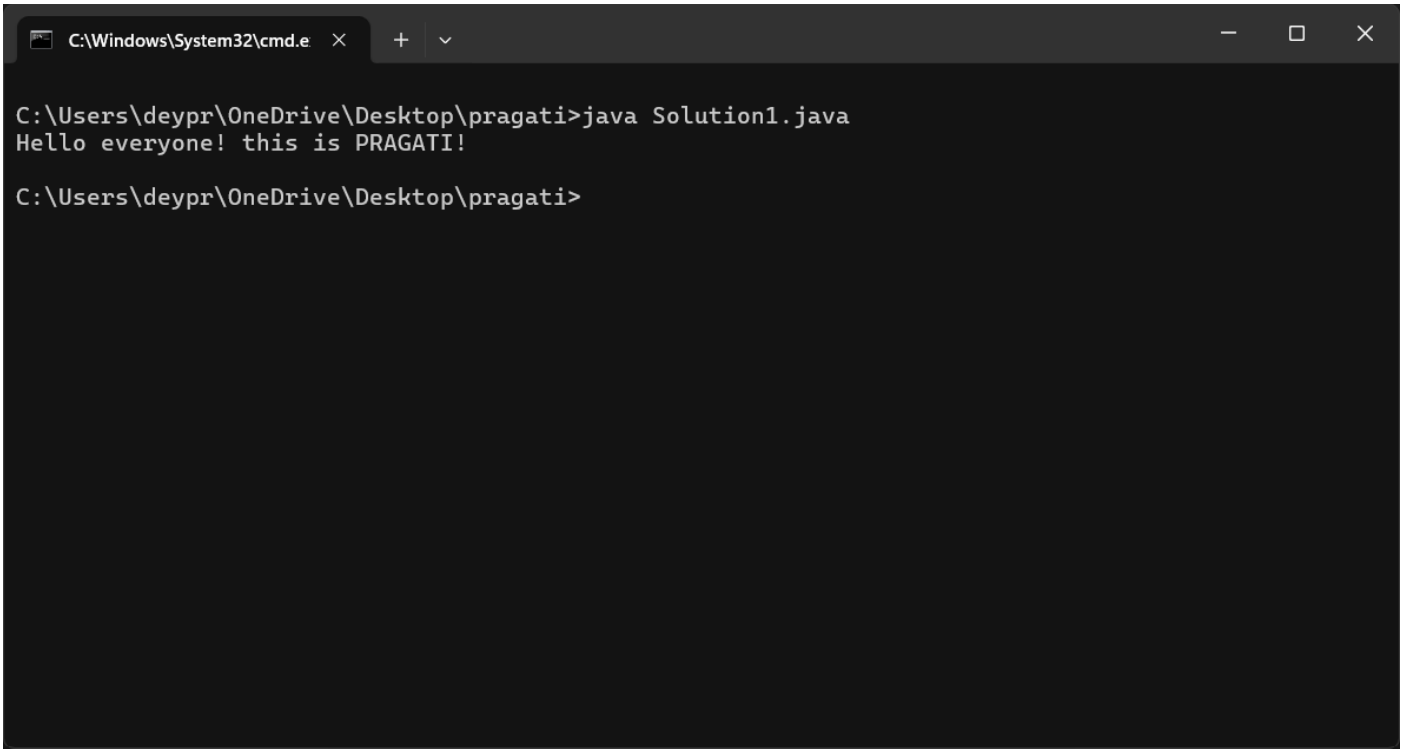
1. Write a program to print a message.

```java
class Solution1 {
    public static void main(String []args) {
        System.out.println("Hello everyone! this is PRAGATI!");
    }
}
```

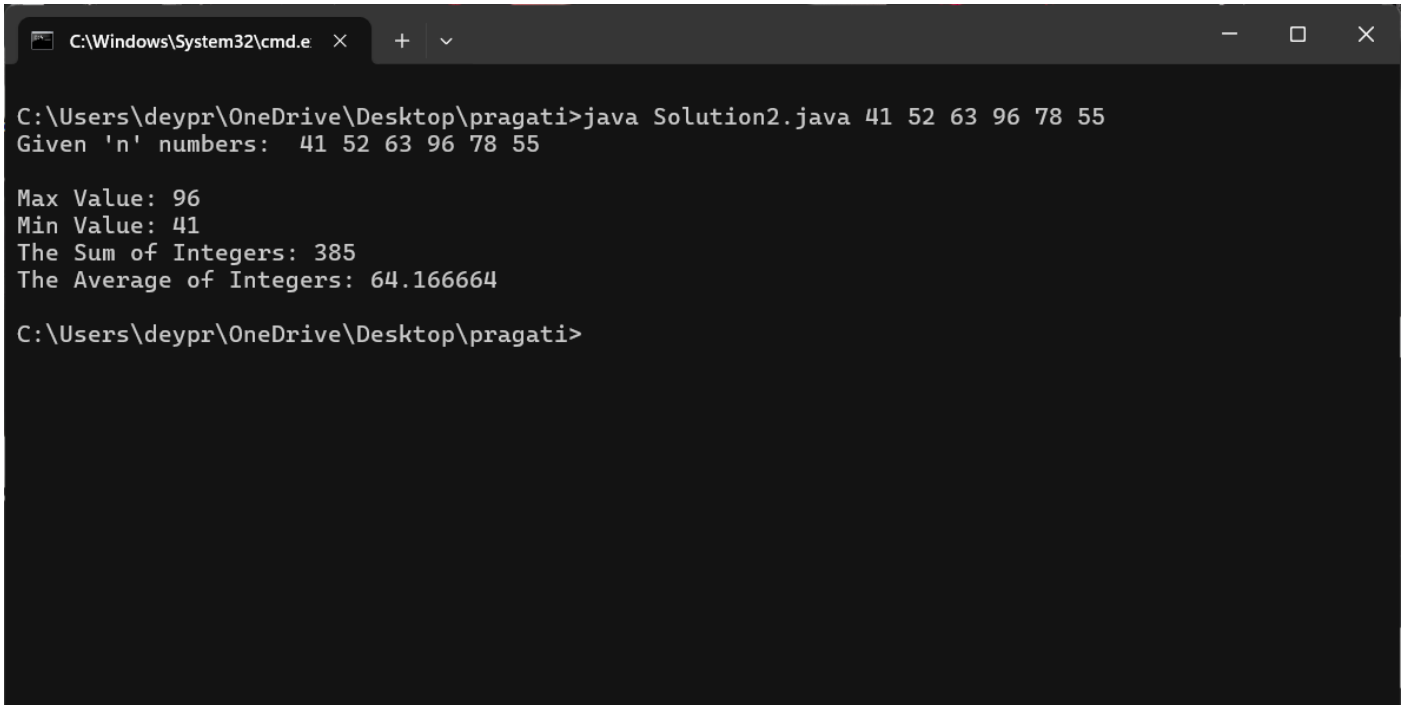
Output:



2. Write a program to find the sum, average, min and max of the 'n' numbers using user input from CLI.

```java
class Solution2 {
   public static void main(String ...args) {
        int sum = 0, min = Integer.parseInt(args[0]),
        max = Integer.parseInt(args[0]), n = args.length;

        System.out.print("Given 'n' numbers:  ");
        for(String num : args) {
            System.out.print(num + " ");
            int x = Integer.parseInt(num);
            sum += x;
            if(x < min) {
                min = x;
            }
            if(x > max) {
                max = x;
            }
        }
        System.out.println("\n\nMax Value: " + max);
        System.out.println("Min Value: " + min);
        System.out.println("The Sum of Integers: " + sum);
        System.out.println("The Average of Integers: " + (float)sum/n);
   }
}
```

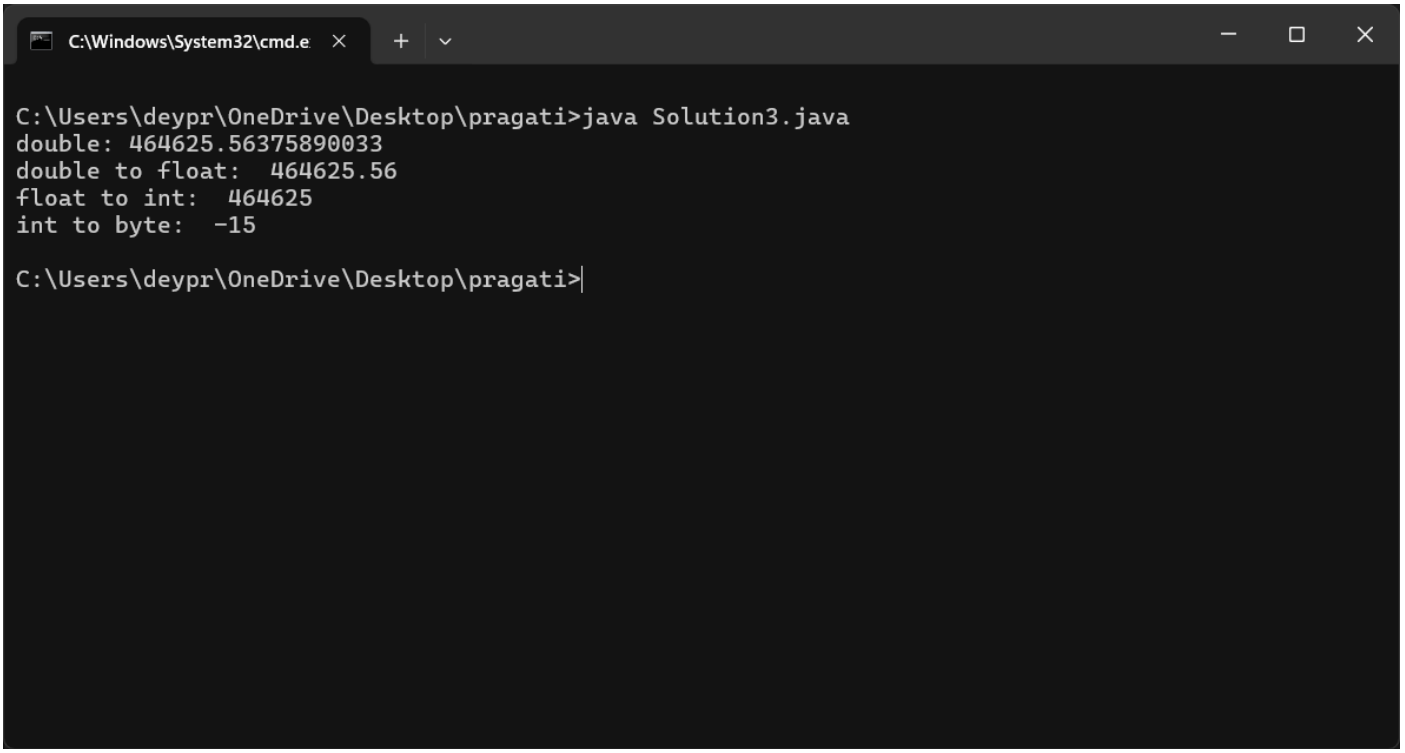
Output:



3. Write a program to demonstrate type casting.

```java
class Solution3 {
   public static void main(String []args) {
        double d = 464625.56375890033;
        System.out.println("double: " + d);

        float ff = (float)d;
        System.out.println("double to float:  " + ff);

        int n = (int)ff;
        System.out.println("float to int:  " + n);

        byte b = (byte)n;
        System.out.println("int to byte:  " + b);
   }
}
```

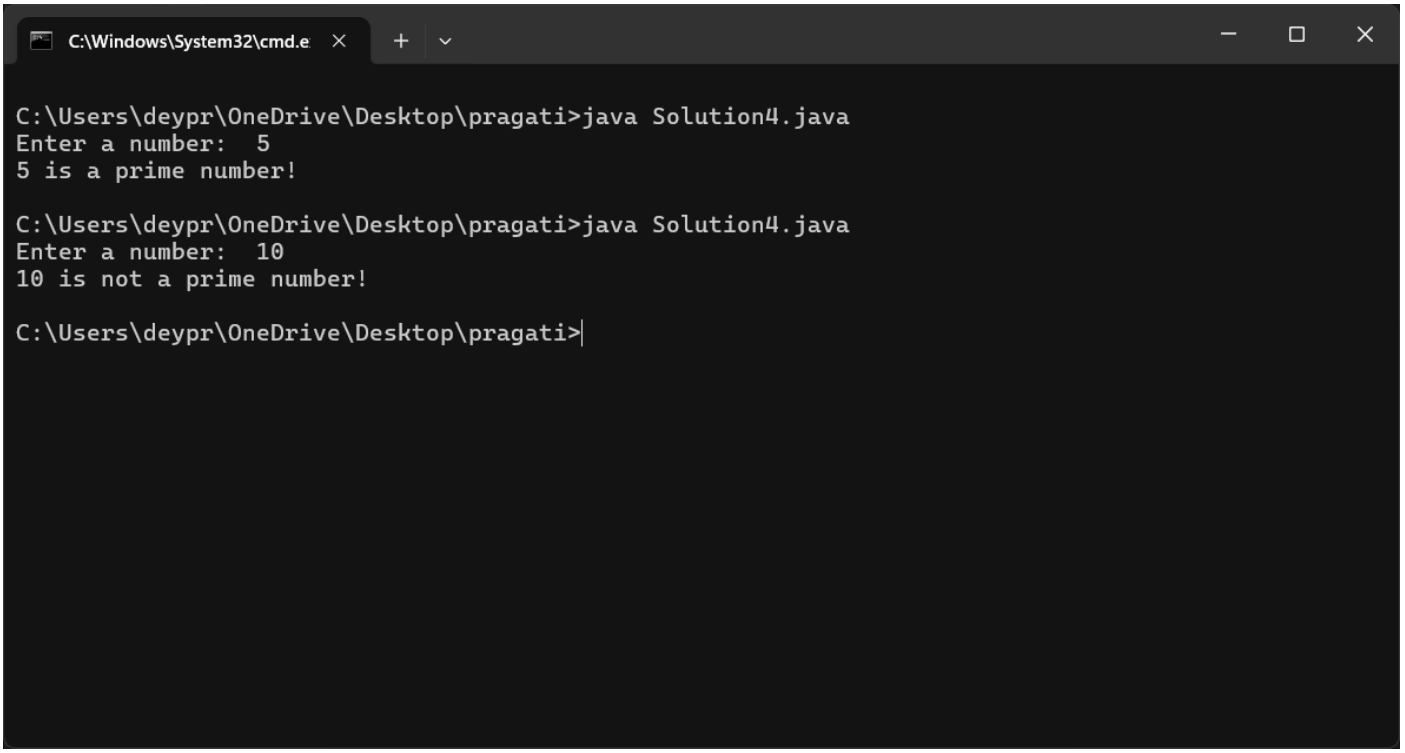
Output:



4. Write a program to check whether the given number is prime or not.

```java
import java.util.Scanner;
class Solution4 {
   static void checkPrime(int n) {
        if(n == 1) {
            System.out.println(n + " is neither prime nor composite!");
            return;
        }
        for(int i = 2; i < (int) n/2; i++) {
            if(n % i == 0) {
                System.out.println(n + " is not a prime number!");
                return;
            }
        }
        System.out.println(n + " is a prime number!");
   }
   public static void main(String []args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number:  ");
        int num = sc.nextInt();
        checkPrime(num);
        sc.close();
   }
}
```

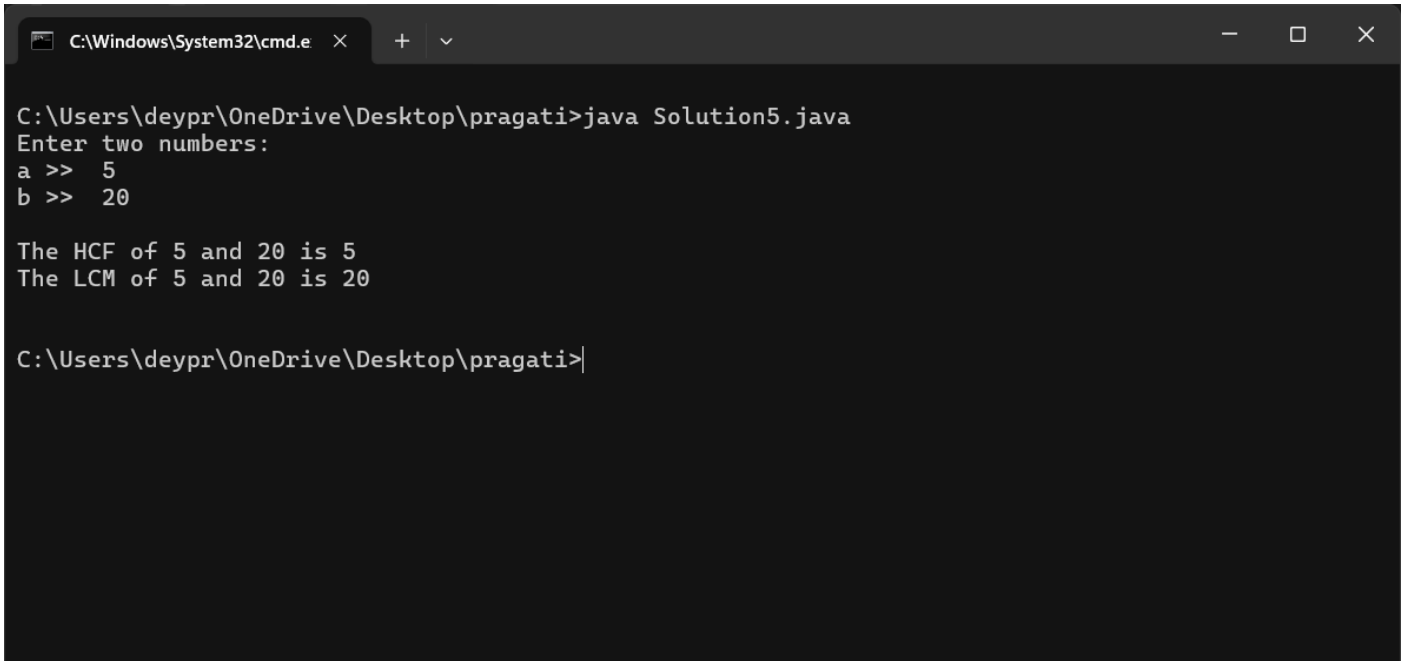
Output:



5. Write a program to find out the HCF and LCM.

```java
import java.util.Scanner;
class Solution5 {
   static int findHCF(int a, int b) {
        while(b != 0) {
            int temp = b;
            b = a % b;
            a = temp;
        }
        return a;
   }
   static int findLCM(int a, int b) {
        return (a * b) / findHCF(a, b);
   }
   public static void main(String []args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter two numbers: \na >>  ");
        int a = sc.nextInt();
        System.out.print("b >>  ");
        int b = sc.nextInt();
        int hcf = findHCF(a, b), lcm = findLCM(a, b);
        System.out.printf("\nThe HCF of %d and %d is %d", a, b, hcf);
        System.out.printf("\nThe LCM of %d and %d is %d\n\n", a, b, lcm);
        sc.close();
   }
}
```

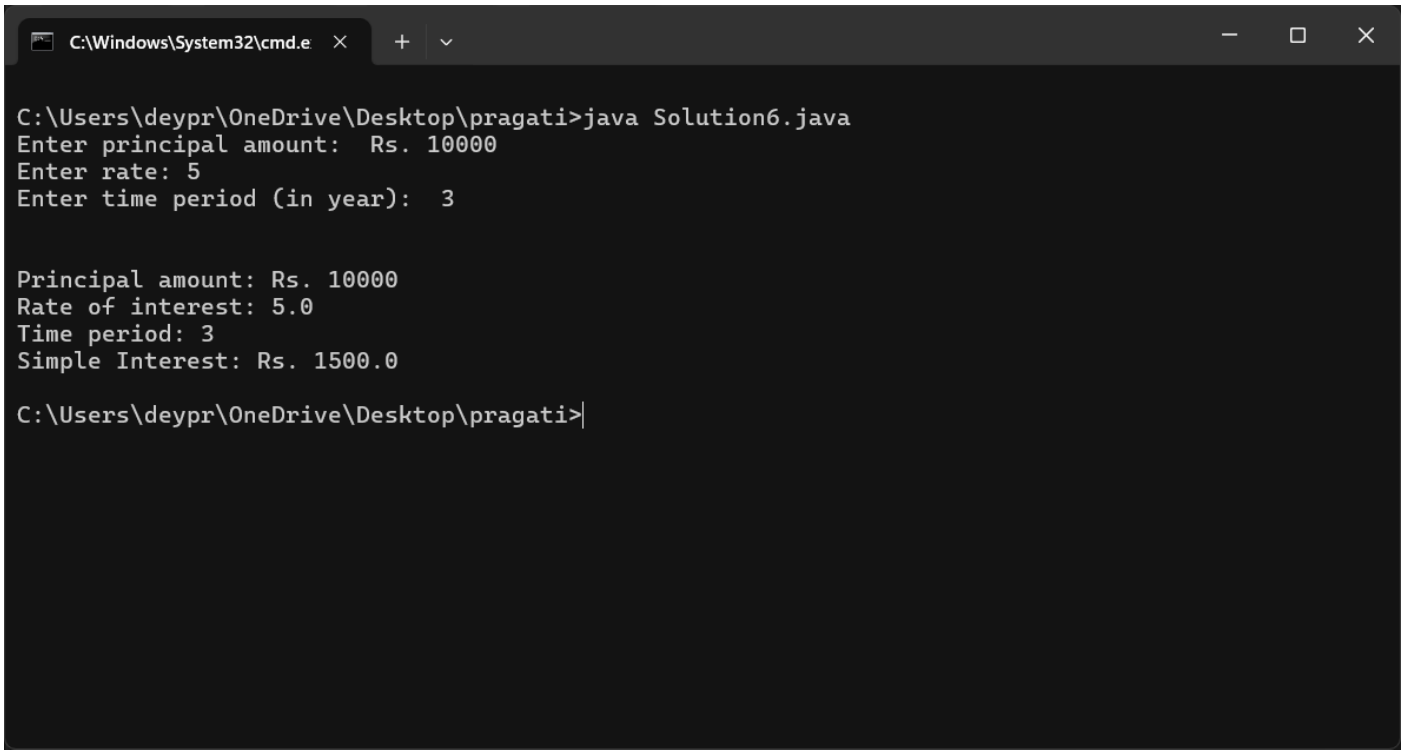
Output:



6. Write a program to calculate Simple Interest and data is taken as input from users.

```java
import java.util.Scanner;
class Solution6 {
   static void calculateSI(int principal, float rate, int time) {
        System.out.println("\n\nPrincipal amount: Rs. " + principal);
        System.out.println("Rate of interest: " + rate);
        System.out.println("Time period: " + time);
        float si = (principal * rate * time) / 100;
        System.out.println("Simple Interest: Rs. " + si);
   }
   public static void main(String []args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter principal amount:  Rs. ");
        int p = sc.nextInt();
        System.out.print("Enter rate: ");
        float r = sc.nextFloat();
        System.out.print("Enter time period (in year):  ");
        int t = sc.nextInt();
        calculateSI(p, r, t);
        sc.close();
   }
}
```

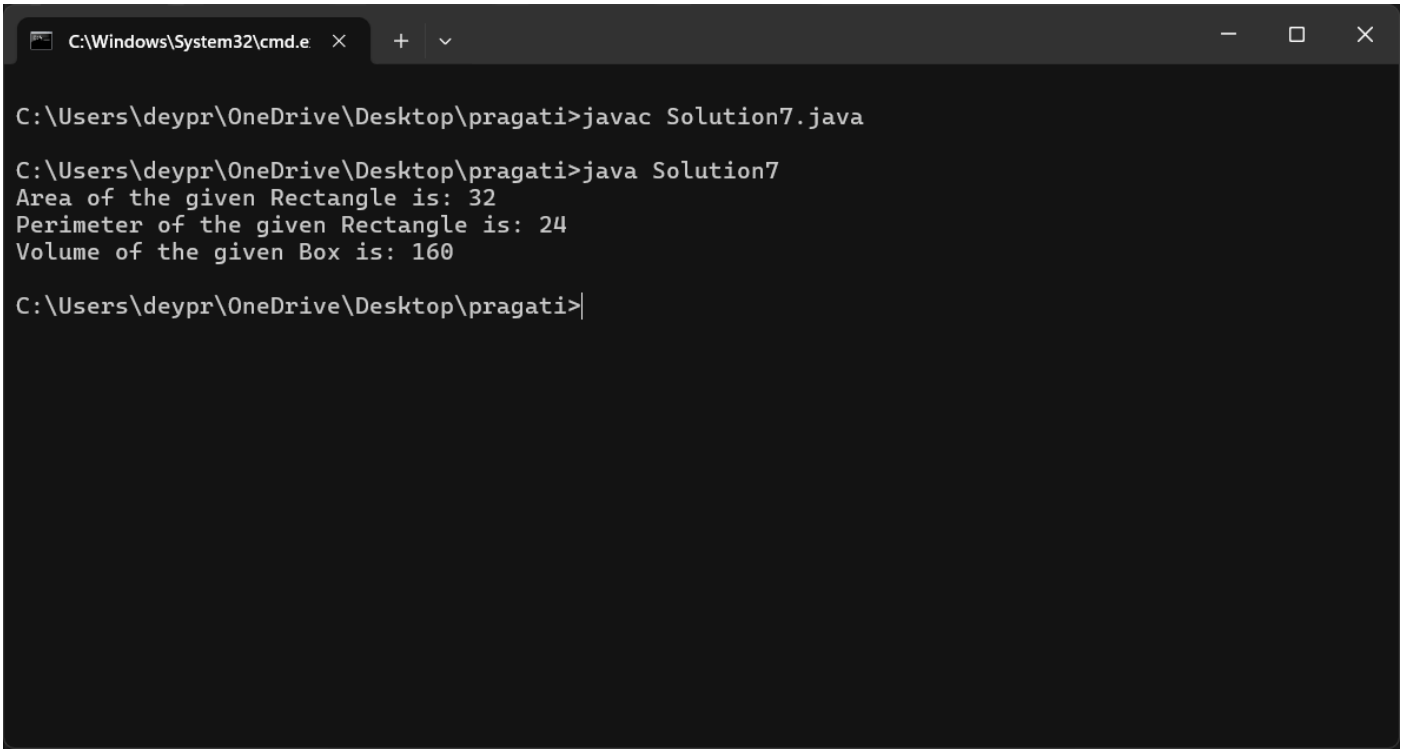
Output:



7. Write a program to create a simple class to find out the Area and Perimeter of Rectangle and Box using super and this keyword.

```
class Rectangle {
   int l, b;
   Rectangle(int l, int b) {
        this.l = l;
        this.b = b;
   }

   void calcArea() {
        System.out.println("Area of the given Rectangle is: " + l*b);
   }

   void calcPerimeter() {
        int p = 2*(l+b);
        System.out.println("Perimeter of the given Rectangle is: " + p);
   }
}

class Box extends Rectangle {
   int h;
   Box(int l, int b, int h) {
        super(l, b);
        this.h = h;
   }

   void calcVolume() {
        System.out.println("Volume of the given Box is: " + l*b*h);
   }
}

class Solution7 {
   public static void main(String []args) {
        Rectangle r = new Rectangle(8, 4);
        r.calcArea();
        r.calcPerimeter();

        Box b = new Box(8, 4, 5);
        b.calcVolume();
   }
}
```

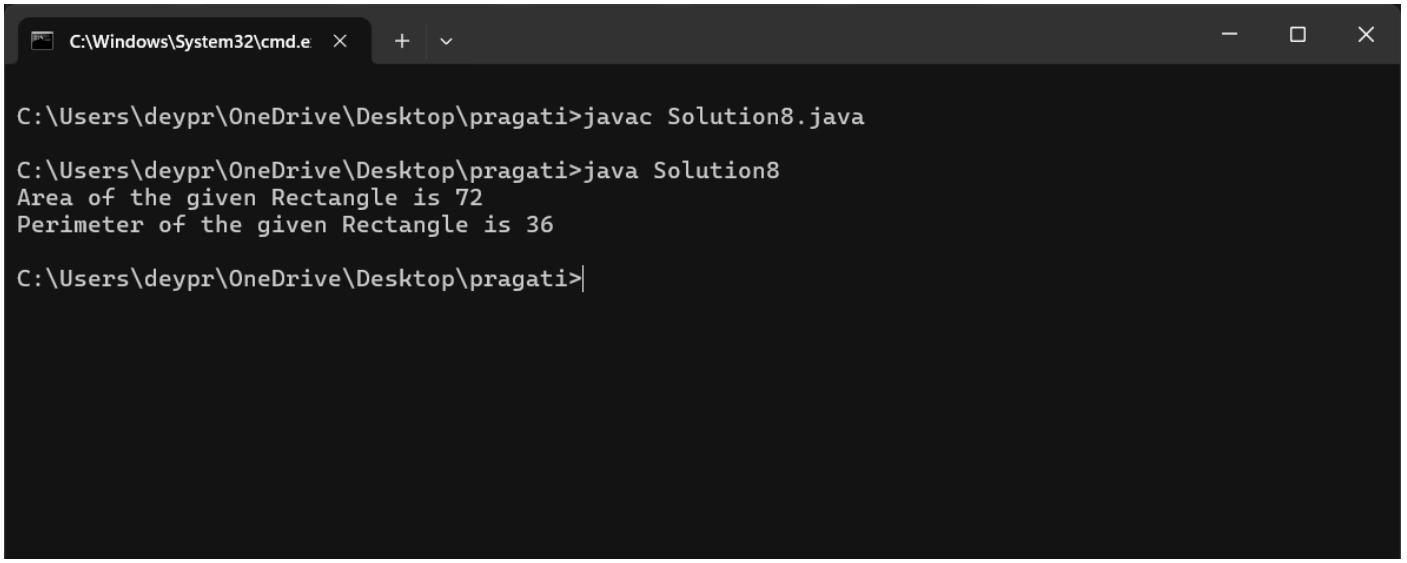
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>javac Solution7.java
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution7
Area of the given Rectangle is: 32
Perimeter of the given Rectangle is: 24
Volume of the given Box is: 160
C:\Users\deypr\OneDrive\Desktop\pragati>

8. Write a program to design a class Shape to implement runtime polymorphism using abstract methods and classes.

```
abstract class Shape {
    abstract void calcArea();
    abstract void calcPerimeter();
}
class Rectangle extends Shape {
    int length, width;
    Rectangle(int length, int width) {
        this.length = length;
        this.width = width;
    }
    void calcArea() {
        int area = length * width;
        System.out.println("Area of the given Rectangle is " + area);
    }
    void calcPerimeter() {
        int p = 2 * (length + width);
        System.out.println("Perimeter of the given Rectangle is " + p);
    }
}
class Solution8 {
    public static void main(String []args) {
        Rectangle r = new Rectangle(12, 6);
        r.calcArea();
        r.calcPerimeter();
    }
}
```

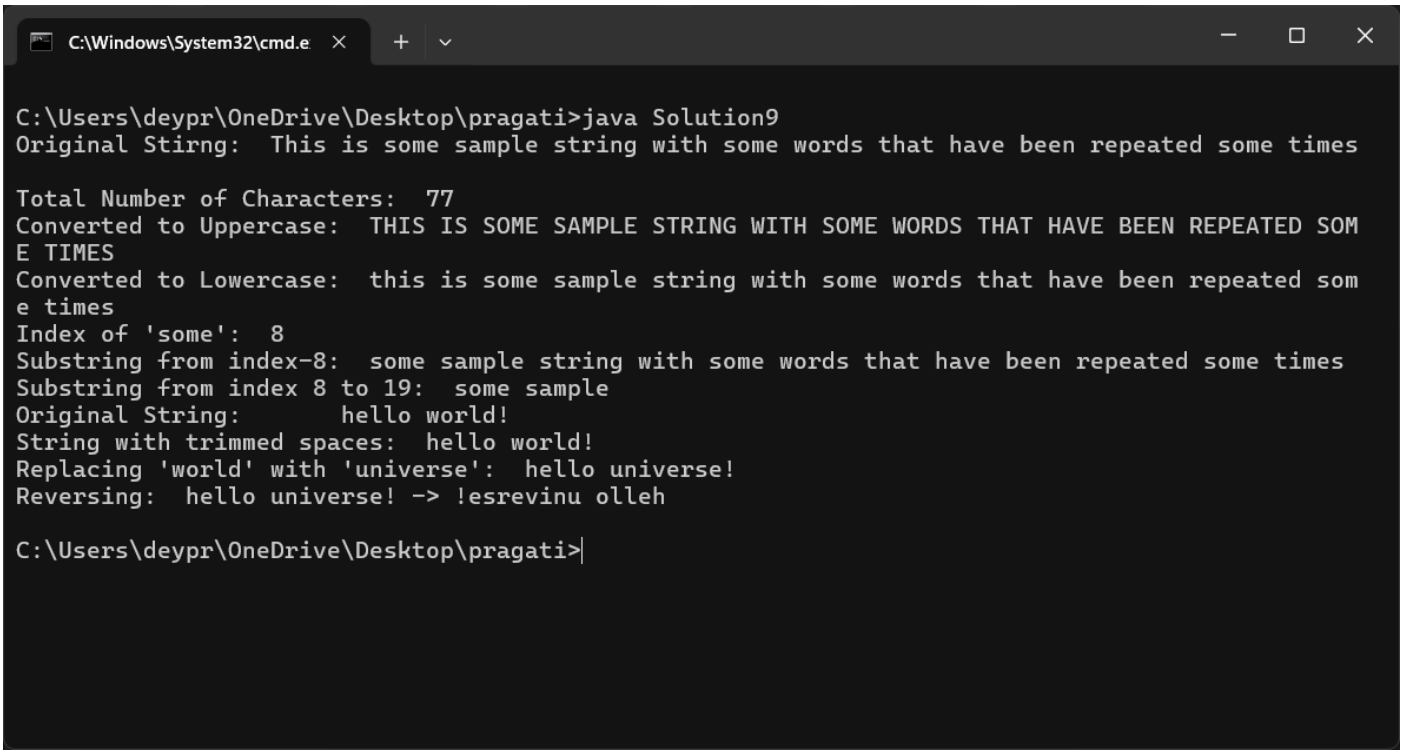
Output:



9. Write a program to demonstrate the use of different String class methods.

```
class Solution9 {
   public static void main(String []args) {
        String msg = "This is some sample string with some words";
        System.out.println("Original String:  " + msg + "\n");

        int len = msg.length();
        System.out.println("Total Number of Characters:  " + len);

        String uppr = msg.toUpperCase();
        System.out.println("Converted to Uppercase:  " + uppr);

        String lowr = msg.toLowerCase();
        System.out.println("Converted to Lowercase:  " + lowr);

        int idxs = msg.indexOf("some");
        System.out.println("Index of 'some':  " + idxs);

        String subs1 = msg.substring(8), subs2 = msg.substring(8, 19);
        System.out.println("Substring from index-8:  " + subs1);
        System.out.println("Substring from index 8 to 19:  " + subs2);

        String ms = "     hello world!      ";
        System.out.println("Original String:  " + ms);

        ms = ms.trim();
        System.out.println("String with trimmed spaces:  " + ms);

        ms = ms.replace("world", "universe");
        System.out.println("Replacing 'world' with 'universe':  " + ms);

        StringBuffer rev = new StringBuffer(ms).reverse();
        System.out.println("Reversing:  " + ms + " -> " + rev);
   }
}
```

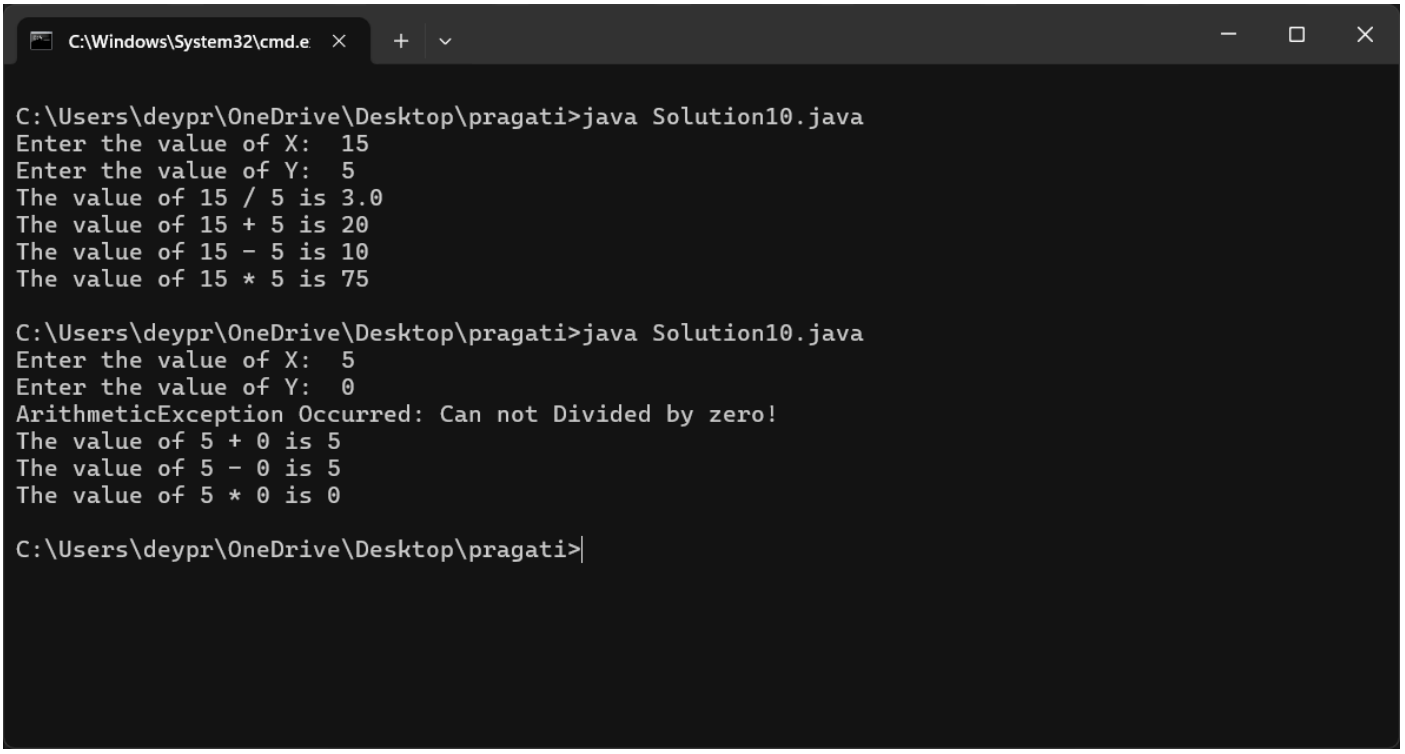
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution9
Original Stirng: This is some sample string with some words that have been repeated some times
Total Number of Characters: 77
Converted to Uppercase: THIS IS SOME SAMPLE STRING WITH SOME WORDS THAT HAVE BEEN REPEATED SOM
E TIMES
Converted to Lowercase: this is some sample string with some words that have been repeated som
e times
Index of 'some': 8
Substring from index-8: some sample string with some words that have been repeated some times
Substring from index 8 to 19: some sample
Original String: hello world!
String with trimmed spaces: hello world!
Replacing 'world' with 'universe': hello universe!
Reversing: hello universe! -> !esrevinu olleh
C:\Users\deypr\OneDrive\Desktop\pragati>

10. Write a program to handle multiple Exceptions.

```
import java.util.Scanner;
import java.util.InputMismatchException;

class Solution10 {
   public static void main(String[] args) {
        Scanner s = new Scanner(System.in);
        int x1 = 0, y1 = 0;
        try {
            System.out.print("Enter the value of X:  ");
            int x = s.nextInt();
            System.out.print("Enter the value of Y:  ");
            int y = s.nextInt();
            x1 = x;
            y1 = y;
            float div = x / y;
            System.out.println("The value of "+x+" / "+y+" is "+div);
        }
        catch(InputMismatchException nfe) {
            System.out.println("Values of X & Y must be an integer!");
            return;
        }
        catch(ArithmeticException ex) {
            System.out.println("Can not Divided by zero!");
        }
        catch(Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
        finally {
            s.close();
        }
        int sum = x1 + y1;
        int sub = x1 - y1;
        int mul = x1 * y1;

        System.out.println("The value of "+x1+" + "+y1+" is "+sum);
        System.out.println("The value of "+x1+" - "+y1+" is "+sub);
        System.out.println("The value of "+x1+" * "+y1+" is "+mul);
   }
}
```

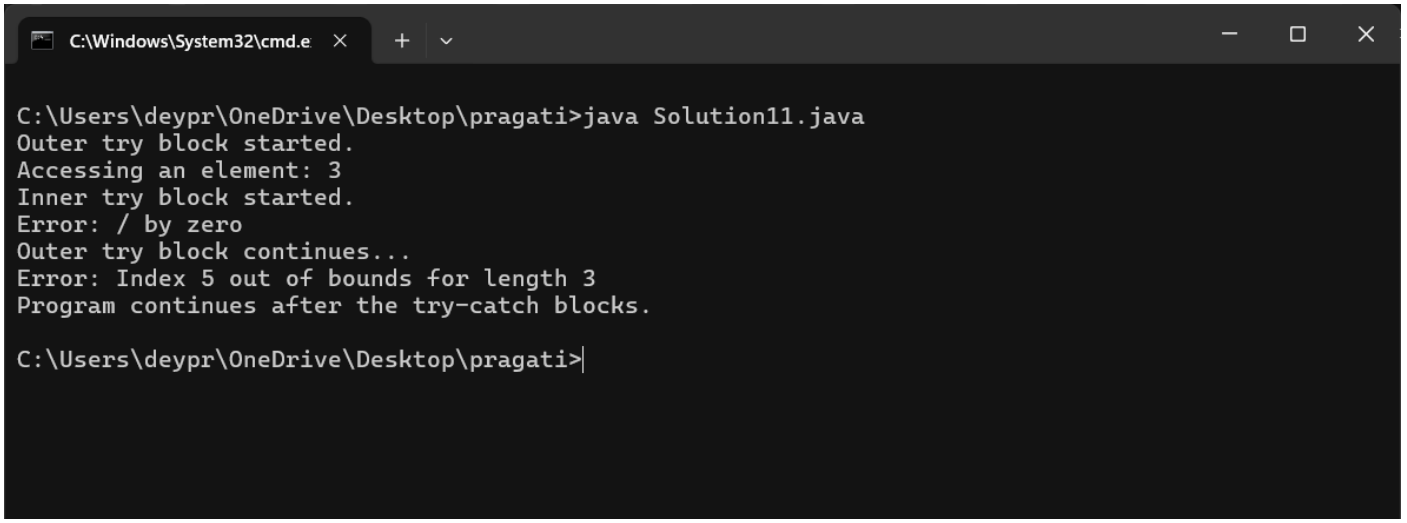
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution10.java
Enter the value of X: 15
Enter the value of Y: 5
The value of 15 / 5 is 3.0
The value of 15 + 5 is 20
The value of 15 - 5 is 10
The value of 15 * 5 is 75
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution10.java
Enter the value of X: 5
Enter the value of Y: 0
ArithmeticException Occurred: Can not Divided by zero!
The value of 5 + 0 is 5
The value of 5 - 0 is 5
The value of 5 * 0 is 0
C:\Users\deypr\OneDrive\Desktop\pragati>

11. Write a program to implement nested try-catch blocks to handle Exception.

```java
class Solution11 {
    public static void main(String[] args) {
        try {
            // Outer try block
            System.out.println("Outer try block started.");
            int[] num = {1, 2, 3};
            System.out.println("Accessing an element: " + num[2]);
            try {
                // Inner try block
                System.out.println("Inner try block started.");
                int result = 10 / 0;
                System.out.println("Result: " + result);
            }
            catch(ArithmeticException e) {
                System.out.println("Error: " + e.getMessage());
            }
            System.out.println("Outer try block continues...");
            System.out.println("Accessing an invalid index: " + num[5]);
        }
        catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("Error: " + e.getMessage());
        }
        System.out.println("Continues after the try-catch blocks.");
    }
}
```

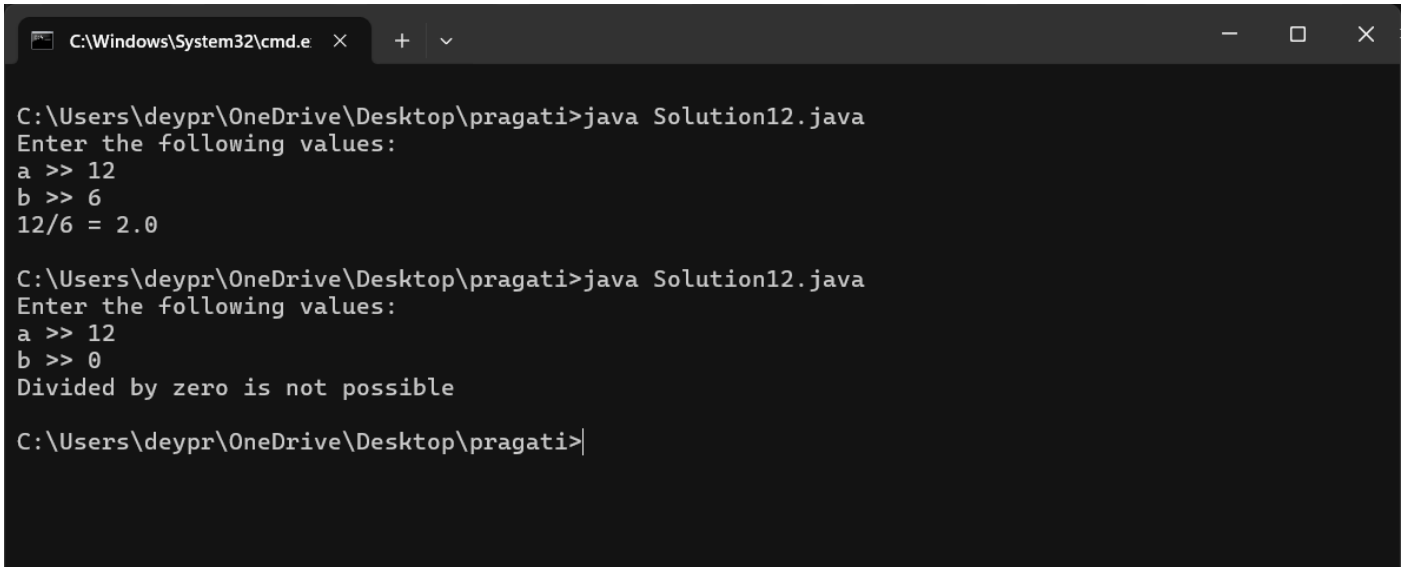
Output:



12. Write a program that implements throw and throws.

```
import java.util.Scanner;
class Solution12 {
   static void divide(int a, int b) throws ArithmeticException {
        if(b == 0) {
           throw new ArithmeticException("Divided by zero not possible");
        }
        else {
           float res = (float) a / b;
           System.out.println(a + "/" + b + " = " + res);
        }
   }
   public static void main(String[] args) {
        try {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter the following values:  \na >> ");
            int a = sc.nextInt();
            System.out.print("b >> ");
            int b = sc.nextInt();
            divide(a, b);
        }
        catch(ArithmeticException ae) {
            System.out.println(ae.getMessage());
        }
   }
}
```

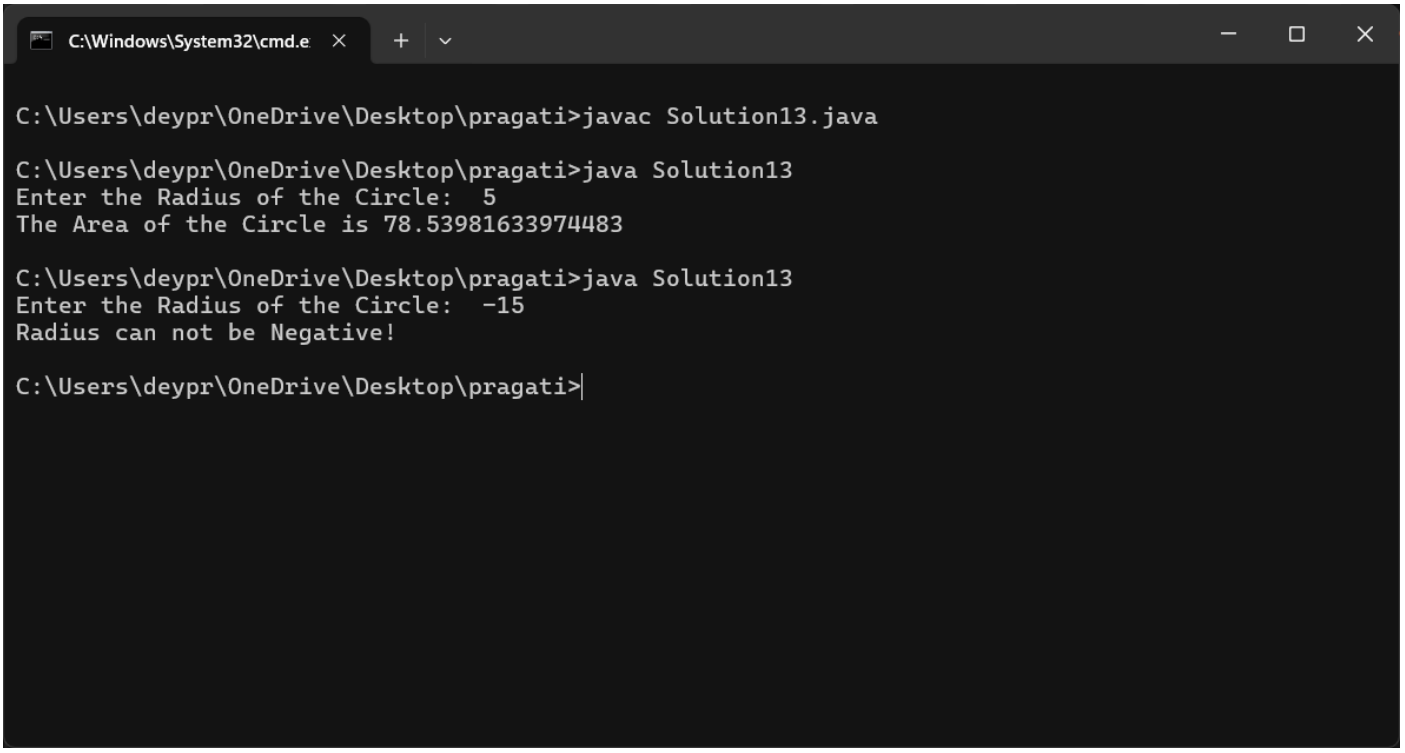
Output:



13. Write a program to implement custom Exceptions.

```
import java.util.Scanner;

class NegativeRadiusException extends Exception {
    @Override
    public String getMessage() {
        return "Radius can not be Negative!";
    }

    @Override
    public String toString() {
        return "Radius can not be Negative!";
    }
}

class Solution13 {
    static void calcCircleArea(int rad) throws NegativeRadiusException {
        if(rad < 0) {
            throw new NegativeRadiusException();
        }
        else {
        double area  = Math.PI * rad * rad;
        System.out.println("The Area of the Circle is " + area);
        }
    }

    public static void main(String[] args) {
        System.out.print("Enter the Radius of the Circle:  ");
        int radius = new Scanner(System.in).nextInt();
        try {
            calcCircleArea(radius);
        }
        catch(NegativeRadiusException nre) {
            System.out.println(nre.getMessage());
        }
    }
}
```

Output:

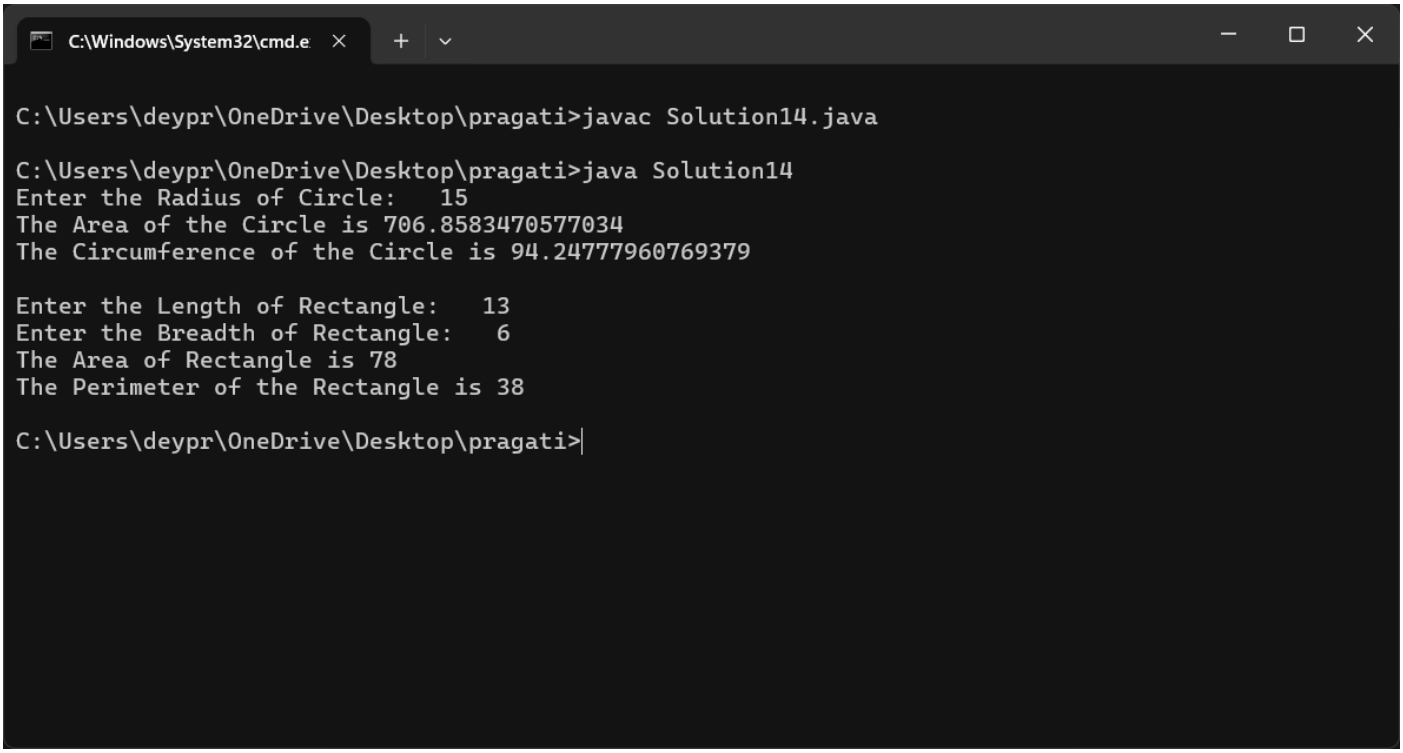

C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>javac Solution13.java
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution13
Enter the Radius of the Circle: 5
The Area of the Circle is 78.53981633974483
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution13
Enter the Radius of the Circle: -15
Radius can not be Negative!
C:\Users\deypr\OneDrive\Desktop\pragati>

14. Write a program to implement the concept of multiple interfaces.

```
import java.util.Scanner;
interface Area {
   public void calcArea();
}

interface Perimeter {
   public void calcPerimeter();
}

class Circle implements Area, Perimeter {
   int radius;
   Circle(int radius) {
       this.radius = radius;
   }
   public void calcArea() {
       double area = Math.PI * radius * radius;
       System.out.println("The Area of the Circle is "+ area);
   }
   public void calcPerimeter() {
       double peri = 2 * Math.PI * radius;
       System.out.println("The Circumference of the Circle is "+ peri);
   }
}

class Rectangle implements Area, Perimeter {
   int l, b;
   Rectangle(int length, int breadth) {
       l = length;
       b = breadth;
   }
   public void calcArea() {
       int area = l*b;
       System.out.println("The Area of Rectangle is "+ area);
   }
   public void calcPerimeter() {
       int peri = 2*(l+b);
       System.out.println("The Perimeter of the Rectangle is "+peri);
   }
}
```

```java
class Solution14 {
   public static void main(String[ ] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the Radius of Circle:    ");
        int radius = sc.nextInt();
        Circle cc = new Circle(radius);
        cc.calcArea();
        cc.calcPerimeter();
        System.out.println("");
        System.out.print("Enter the Length of Rectangle:    ");
        int length = sc.nextInt();
        System.out.print("Enter the Breadth of Rectangle:    ");
        int breadth = sc.nextInt();
        Rectangle rr = new Rectangle(length, breadth);
        rr.calcArea();
        rr.calcPerimeter();
        sc.close();
   }
}
```

Output:

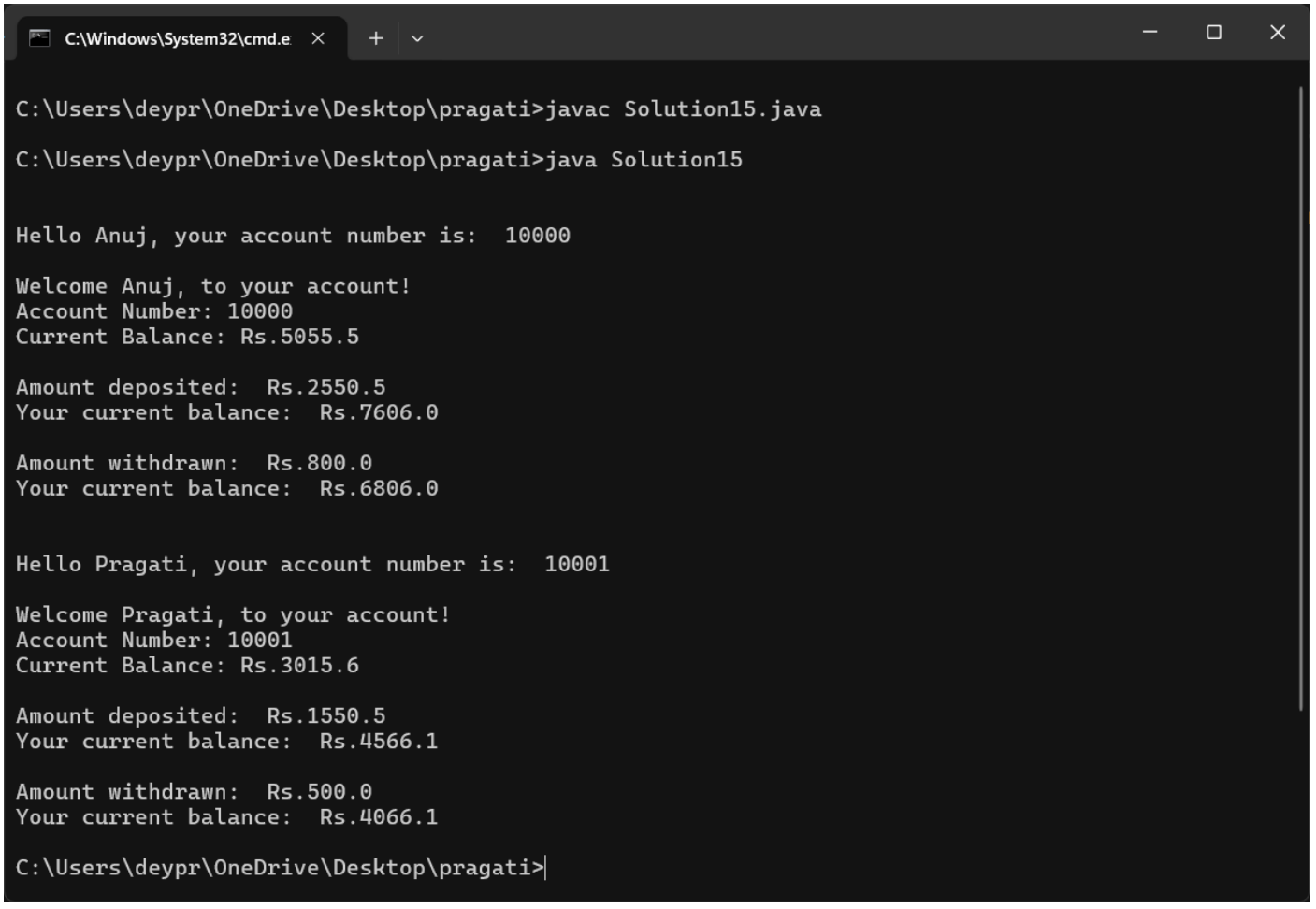


15. Write a program to design a class account using the inheritance and static that show all functions of the bank(withdrawal, deposit) and generate account numbers dynamically.

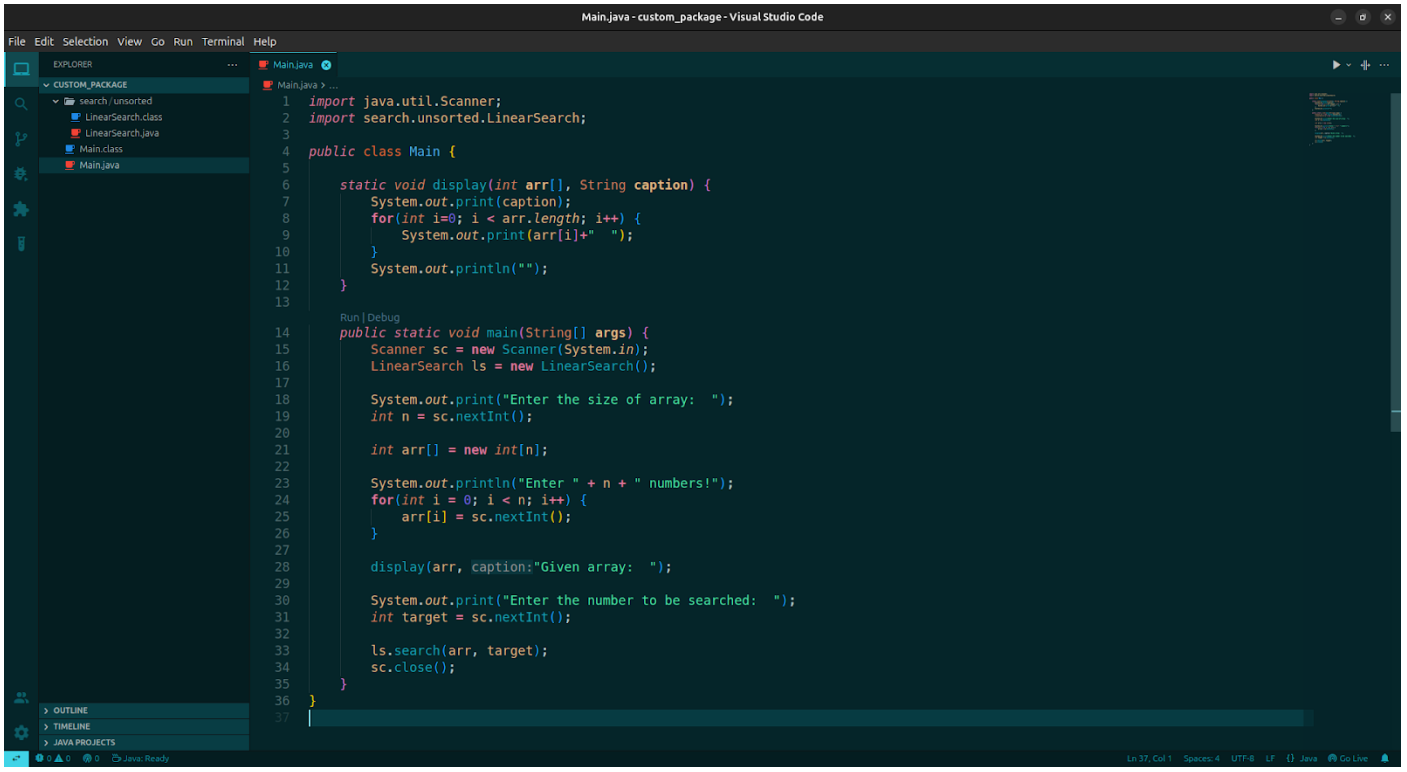
```
class Bank {

   static int account_number_generator = 10000;
   String name;
   int acc_no;
   float balance;

   Bank(String name, float min_deposit_amount) {
       this.name = name;
       this.acc_no = account_number_generator;
       this.balance = min_deposit_amount;
       System.out.printf("\n\nHello %s, your account number is: %d", name, acc_no);
       account_number_generator++;
   }

   void display() {
       System.out.println("\n\nWelcome " + name + ", to your account!");
       System.out.println("Account Number: " + acc_no);
       System.out.println("Current Balance: Rs." + balance);
   }

   void getBalance() {
       System.out.println("Your current balance:  Rs." + balance);
   }

   void withdraw(float amt) {
       if(balance <= amt || balance == 1000) {
           System.out.println("Sorry! you can't withdraw money!");
       }
       else {
           balance -= amt;
           System.out.println("\nAmount withdrawn:  Rs." + amt);
           getBalance();
       }
   }

   void deposit(float amt) {
       if(amt == 0.0) {
           System.out.println("Sorry! you can't deposit Rs. 0.0");
       }
       else {
           balance += amt;
           System.out.println("\nAmount deposited:  Rs." + amt);
           getBalance();
       }
   }
}
```

```java
class Solution15 {
   public static void main(String[] args) {
        Bank user1 = new Bank("Anuj", 5055.5f);
        user1.display();
        user1.deposit(2550.5f);
        user1.withdraw(800);

        Bank user2 = new Bank("Pragati", 3015.6f);
        user2.display();
        user2.deposit(1550.5f);
        user2.withdraw(500);
   }
}
```

Output:



16. Write a program to create a package that accesses the member of the external class as well as the same package.



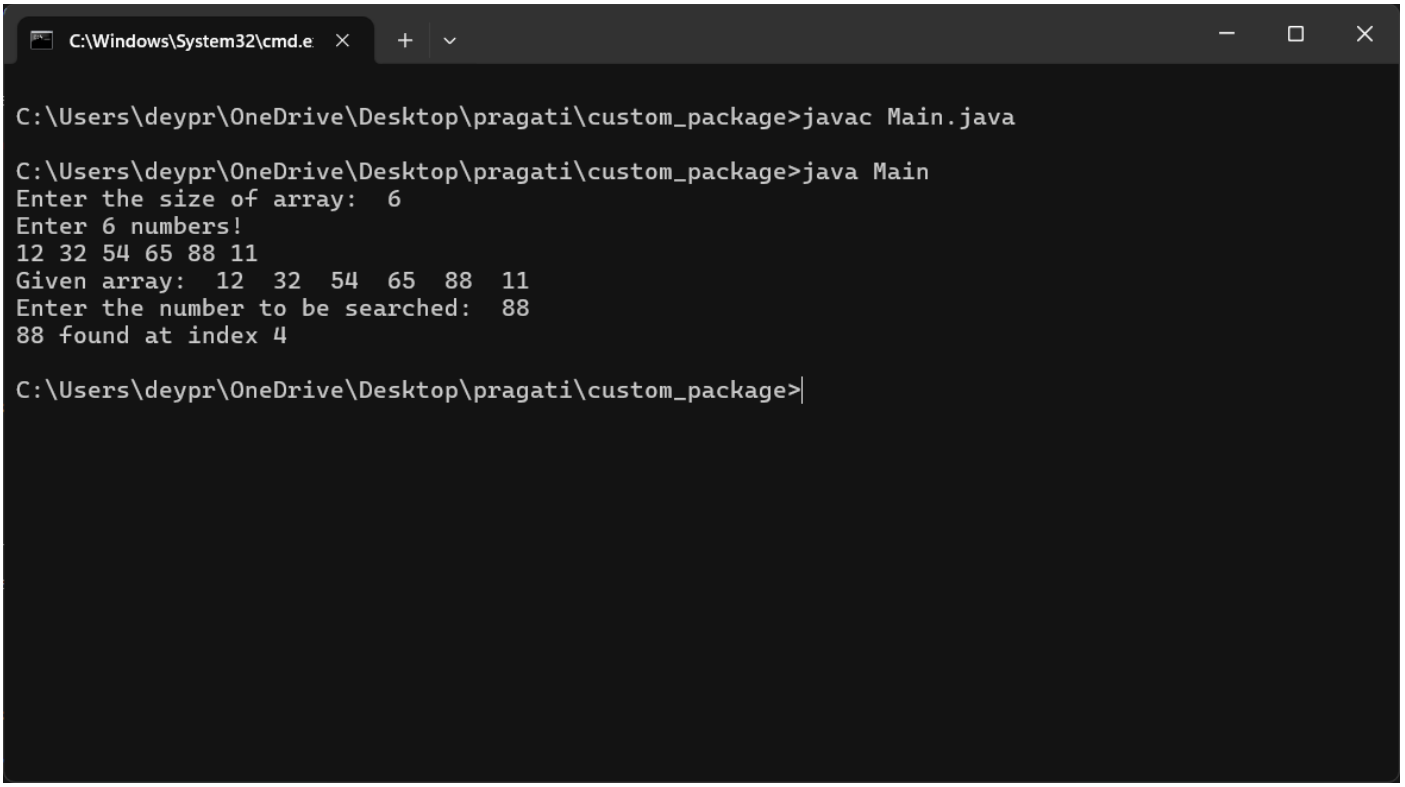
Location: custom_package/search/unsorted/LinearSearch.java

```
package search.unsorted;

public class LinearSearch {

   public void search(int[] arr, int x) {
        for(int i=0; i < arr.length; i++) {
            if(arr[i]==x) {
                System.out.println(x + " found at index " + i);
                return;
            }
        }
        System.out.println(x + " not found in this array!");
    }
}
```

Location: custom_package/Main.java

```
import java.util.Scanner;
import search.unsorted.LinearSearch;

public class Main {

   static void display(int arr[], String caption) {
       System.out.print(caption);
       for(int i=0; i < arr.length; i++) {
           System.out.print(arr[i]+"  ");
       }
       System.out.println("");
   }

   public static void main(String[] args) {
       Scanner sc = new Scanner(System.in);
       LinearSearch ls = new LinearSearch();

       System.out.print("Enter the size of array:  ");
       int n = sc.nextInt();

       int arr[] = new int[n];

       System.out.println("Enter " + n + " numbers!");
       for(int i = 0; i < n; i++) {
           arr[i] = sc.nextInt();
       }

       display(arr, "Given array:  ");

       System.out.print("Enter the number to be searched:  ");
       int target = sc.nextInt();

       ls.search(arr, target);
       sc.close();
   }
}
```

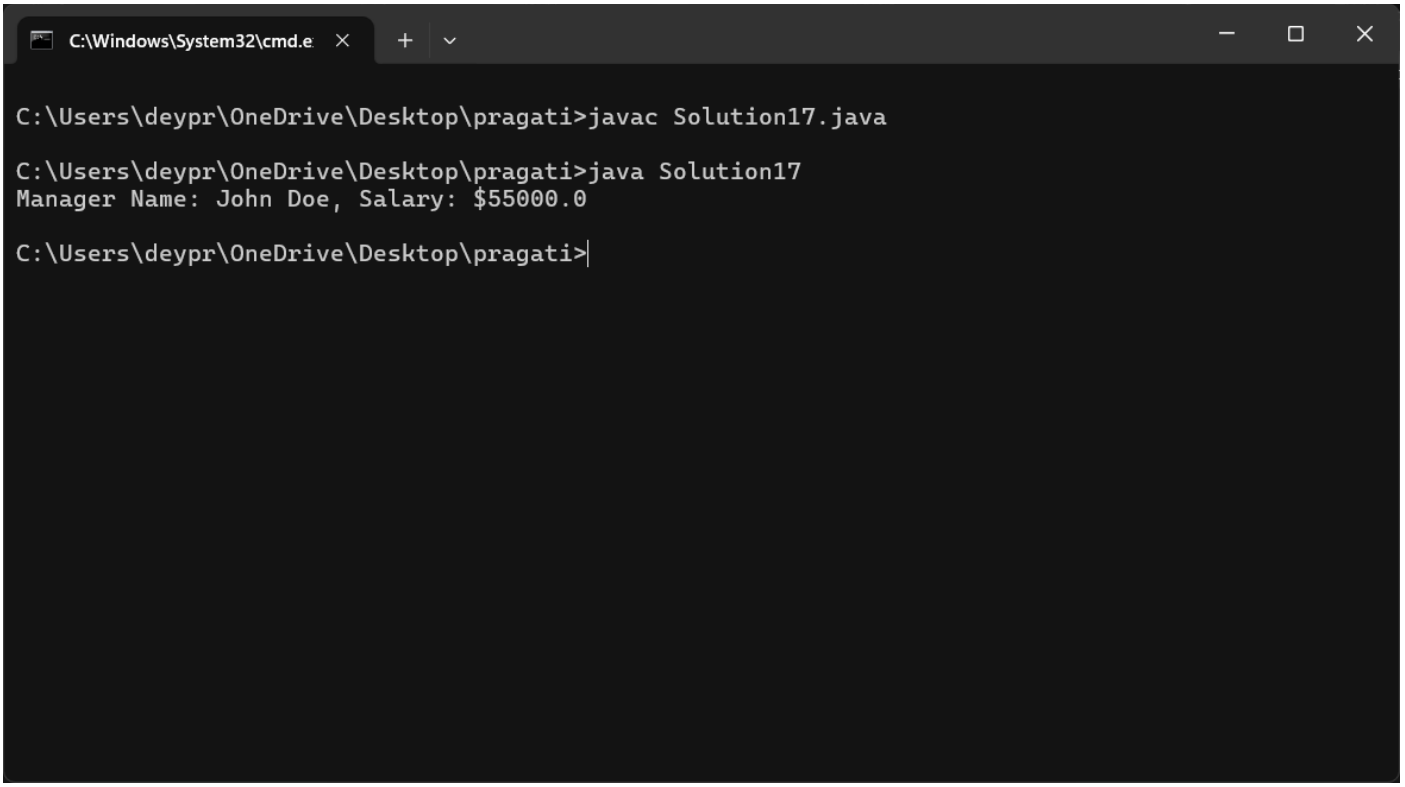
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\custom_package>javac Main.java
C:\Users\deypr\OneDrive\Desktop\pragati\custom_package>java Main
Enter the size of array: 6
Enter 6 numbers!
12 32 54 65 88 11
Given array: 12 32 54 65 88 11
Enter the number to be searched: 88
88 found at index 4
C:\Users\deypr\OneDrive\Desktop\pragati\custom_package>

17. Write a program that shows the partial implementation of Interface (Calculation of Salary of Employee).

```
interface SalaryCalculator {
    double calculateSalary();
    String getDetails();          // Abstract method
}

abstract class Employee implements SalaryCalculator {
    String name;
    private double baseSalary;
    private double bonus;

    public Employee(String name, double baseSalary, double bonus) {
        this.name = name;
        this.baseSalary = baseSalary;
        this.bonus = bonus;
    }
    @Override
    public double calculateSalary() {
        return baseSalary + bonus;
    }
    // getDetails() method remains abstract in this class
}

class Manager extends Employee {
    public Manager(String name, double baseSalary, double bonus) {
        super(name, baseSalary, bonus);
    }
    @Override
    public String getDetails() {
        return "Manager Name: " + name + ", Salary: $"+calculateSalary();
    }
}

public class Solution17 {
    public static void main(String[] args) {
        Employee manager = new Manager("John Doe", 50000, 5000);
        System.out.println(manager.getDetails());
    }
}
```

Output:

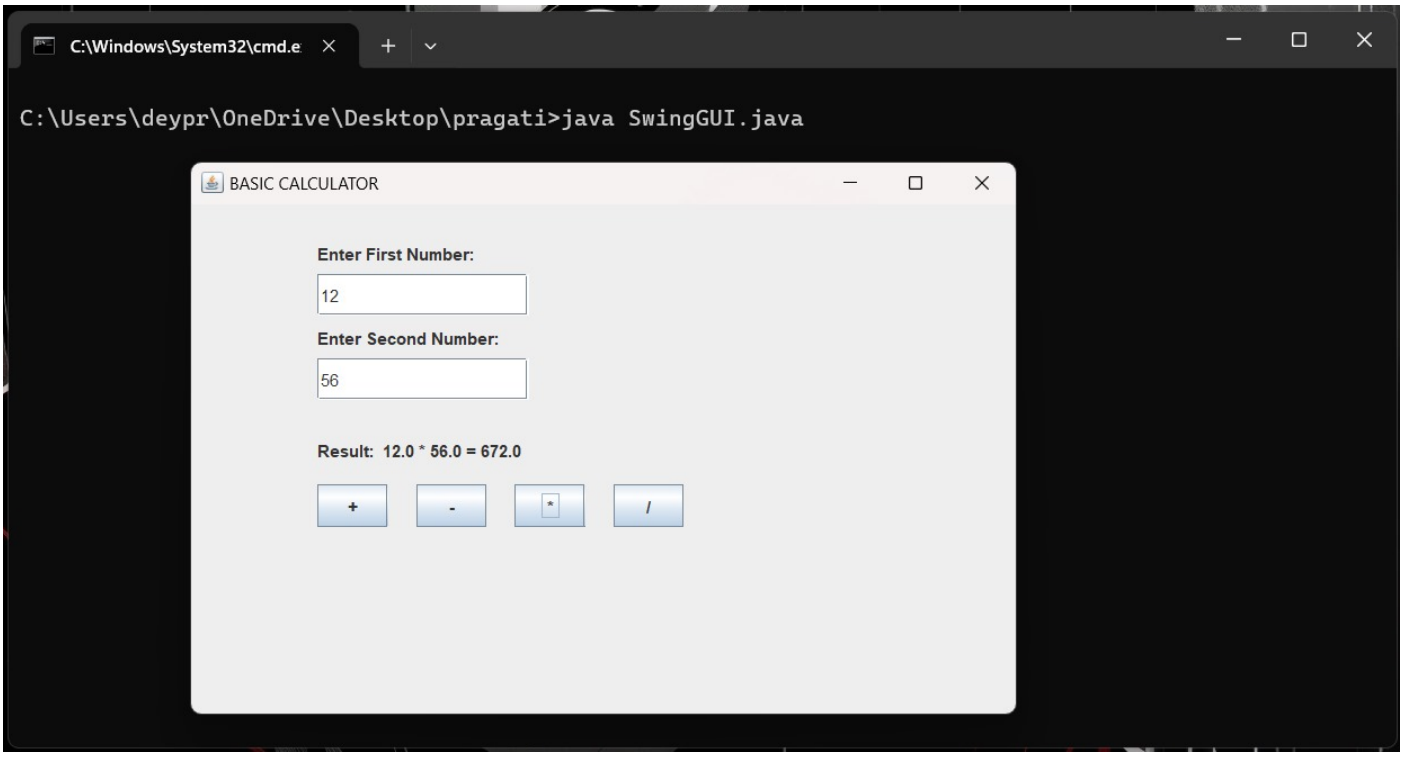

C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>javac Solution17.java
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution17
Manager Name: John Doe, Salary: $55000.0
C:\Users\deypr\OneDrive\Desktop\pragati>

18. Write a program to create an Arithmetic Math Calculator using Java Swing and AWT Event Handling.

```
import javax.swing.*;
import java.awt.event.*;

class SwingGUI extends JFrame implements ActionListener {
   JTextField t1, t2;
   JLabel lb1, lb2, lb3;
   JButton sum_btn, sub_btn, mul_btn, div_btn;

   public SwingGUI() {
        super("BASIC CALCULATOR");
        lb1 = new JLabel("Enter First Number:  ");
        lb1.setBounds(90, 20, 150, 30);
        add(lb1);

        t1 = new JTextField(30);
        t1.setBounds(90, 50, 150, 30);
        add(t1);

        lb2 = new JLabel("Enter Second Number:  ");
        lb2.setBounds(90, 80, 150, 30);
        add(lb2);

        t2 = new JTextField(30);
        t2.setBounds(90, 110, 150, 30);
        add(t2);

        lb3 = new JLabel("Result:  ");
        lb3.setBounds(90, 160, 250, 30);
        add(lb3);

        sum_btn = new JButton(" + ");
        sum_btn.setBounds(90, 200, 50, 30);
        add(sum_btn);
        sum_btn.addActionListener(this);

        sub_btn = new JButton(" - ");
        sub_btn.setBounds(160, 200, 50, 30);
        add(sub_btn);
        sub_btn.addActionListener(this);
```

```
        mul_btn = new JButton(" * ");
        mul_btn.setBounds(230, 200, 50, 30);
        add(mul_btn);
        mul_btn.addActionListener(this);

        div_btn = new JButton(" / ");
        div_btn.setBounds(300, 200, 50, 30);
        add(div_btn);
        div_btn.addActionListener(this);

        setLayout(null);
        setSize(600, 400);
        setVisible(true);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }

    @Override
    public void actionPerformed(ActionEvent e) {
        float a = Float.parseFloat(t1.getText());
        float b = Float.parseFloat(t2.getText());

        if (e.getSource().equals(sum_btn)) {
            float sum = a + b;
            lb3.setText("Result:  "+a+" + "+b+" = "+String.valueOf(sum));
        }
        else if (e.getSource().equals(sub_btn)) {
            float sub = a - b;
            lb3.setText("Result:  "+a+" - "+b+" = "+String.valueOf(sub));
        }
        else if (e.getSource().equals(mul_btn)) {
            float mul = a * b;
            lb3.setText("Result:  "+a+" * "+b+" = "+String.valueOf(mul));
        }
        else if (e.getSource().equals(div_btn)) {
            double div = a / (b * 1.0);
            lb3.setText("Result:  "+a+" / "+b+" = "+String.valueOf(div));
        }
    }

    public static void main(String[] args) {
        SwingGUI gui = new SwingGUI();
    }
}
```

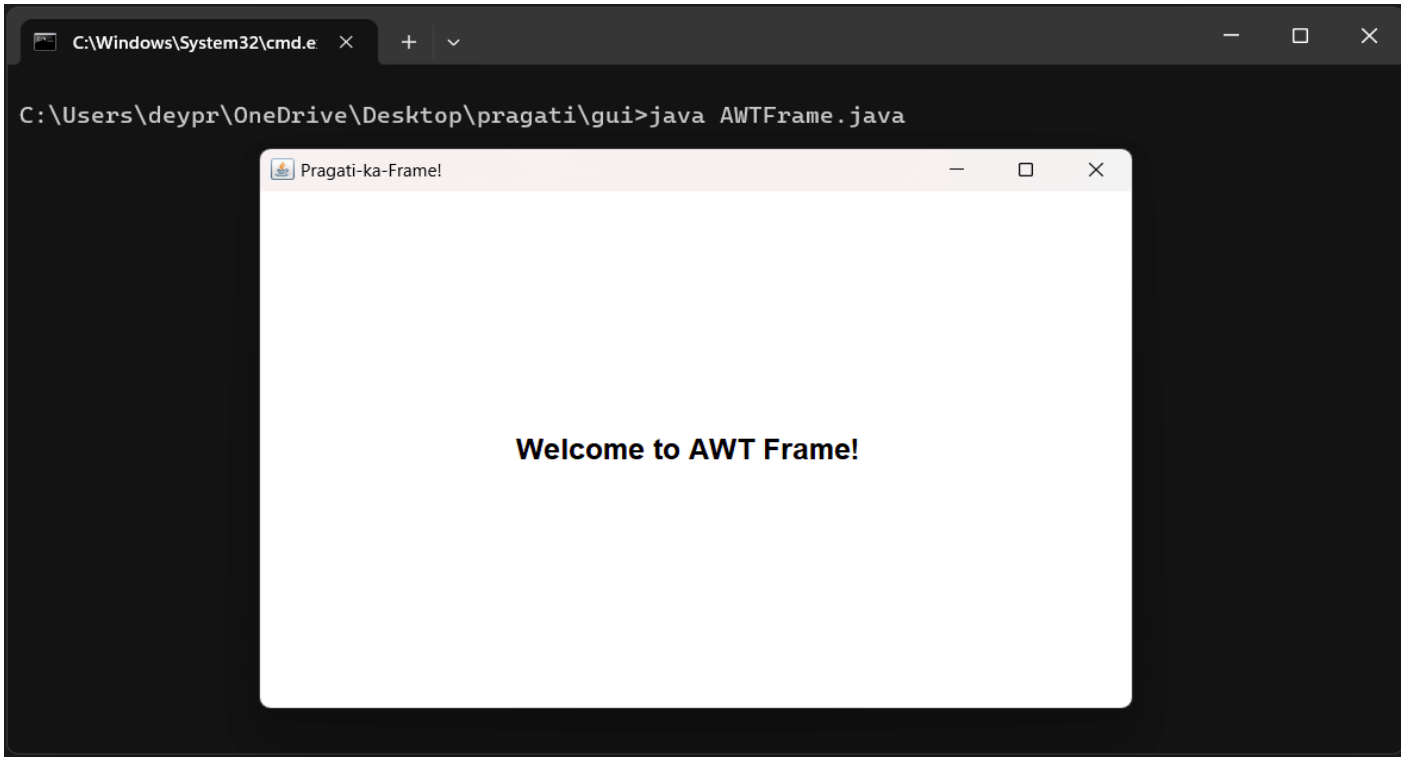
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>java SwingGUI.java
BASIC CALCULATOR
Enter First Number:
12
Enter Second Number:
56
Result: 12.0 * 56.0 = 672.0
+
-
*
/

19. Write a program to create a frame window using Frame class. (AWT)

```java
import java.awt.*;
import java.awt.event.*;

class AWTFrame {
    public static void main(String[] args) {
        Frame frame = new Frame("Pragati-ka-Frame!");
        frame.setSize(600, 400);
        frame.setLayout(new GridBagLayout());
        Label lb = new Label("Welcome to AWT Frame!");
        lb.setFont(new Font("Arial", Font.BOLD, 20));
        frame.add(lb);
        frame.setVisible(true);
        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });
    }
}
```

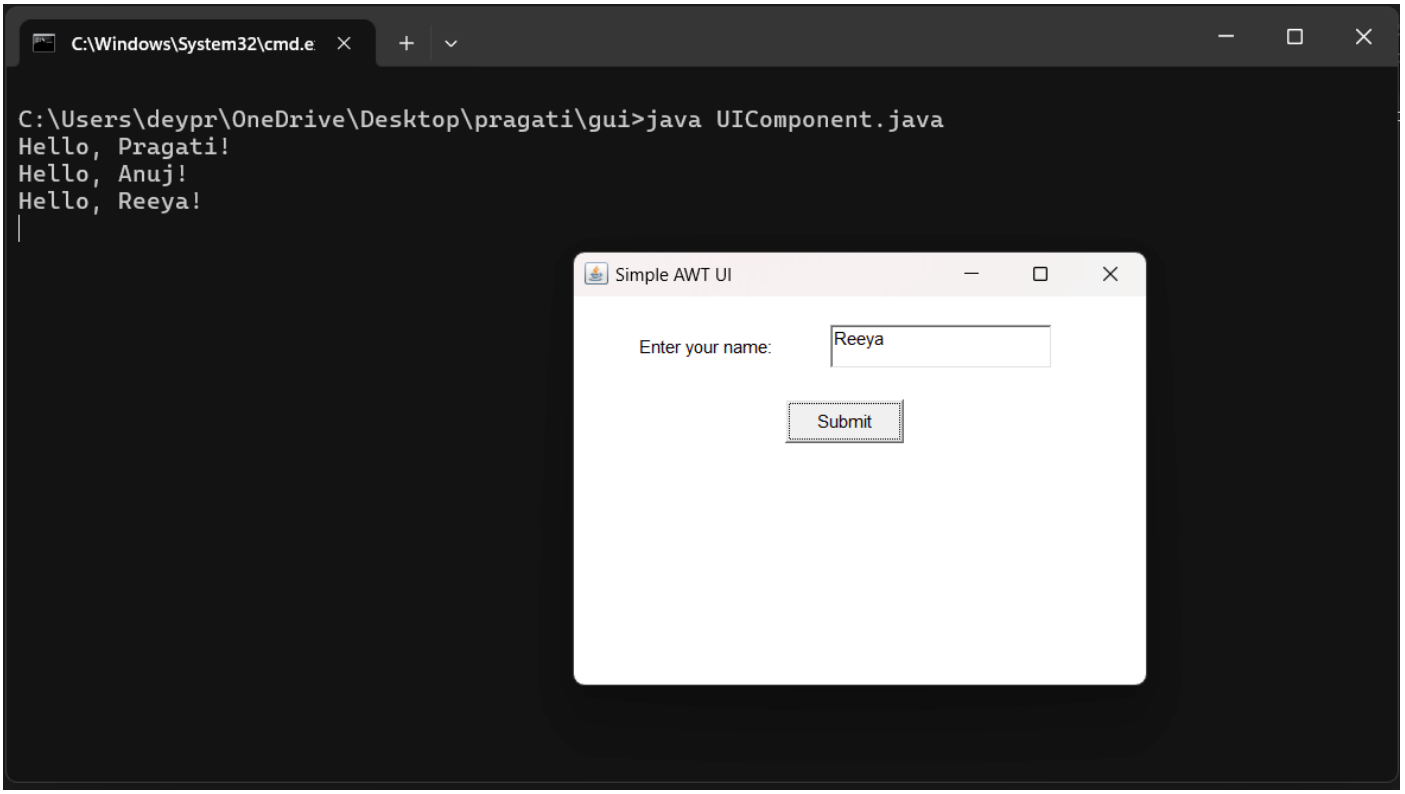
Output:



20. Write a program to create UI components on frame windows using Frame class. (AWT)

```
import java.awt.*;
import java.awt.event.*;

class UIComponent {
   public static void main(String[] args) {
        Frame frame = new Frame("Simple AWT UI");
        frame.setSize(400, 300);
        frame.setLayout(null);
        // Add a Label
        Label label = new Label("Enter your name:");
        label.setBounds(50, 50, 120, 30);
        frame.add(label);
        // Add a TextField
        TextField textField = new TextField();
        textField.setBounds(180, 50, 150, 30);
        frame.add(textField);
        // Add a Button
        Button button = new Button("Submit");
        button.setBounds(150, 100, 80, 30);
        frame.add(button);
        // Add an Action Listener for the Button
        button.addActionListener(e -> {
            String name = textField.getText();
            System.out.println("Hello, " + name + "!");
        });
        // Add Window Listener to close the frame
        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });
        // Make the frame visible
        frame.setVisible(true);
   }
}
```

Output:

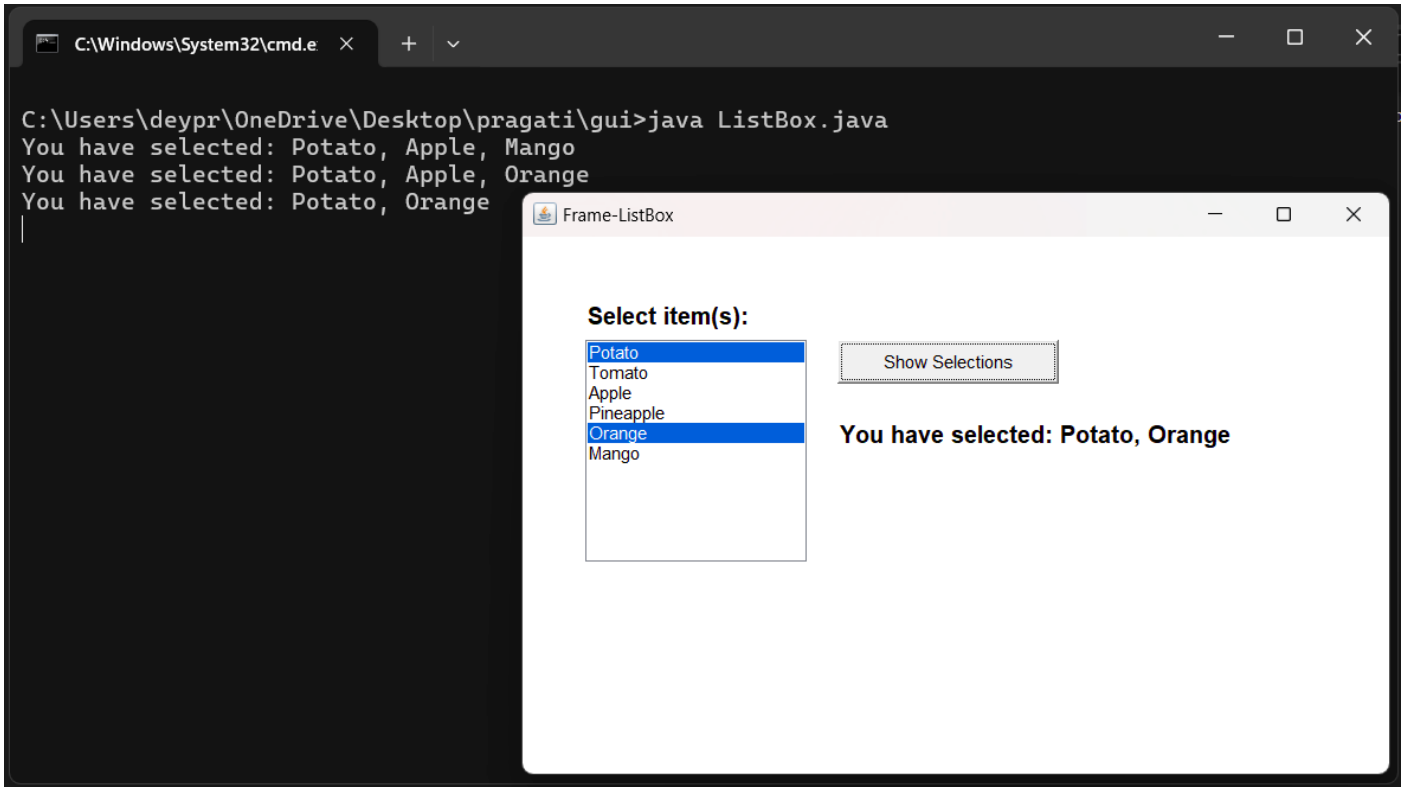

C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\gui>java UIComponent.java
Hello, Pragati!
Hello, Anuj!
Hello, Reeya!
Simple AWT UI
Enter your name:
Reeya
Submit

21. Write a program to implement ListBox. (AWT)

```
import java.awt.*;
import java.awt.event.*;

public class ListBox {
   public static void main(String[] args) {
        Frame frame = new Frame("Frame-ListBox");
        frame.setSize(600, 400);
        frame.setLayout(null);
        // Create a Label
        Label label = new Label("Select item(s):");
        label.setFont(new Font("Arial", Font.BOLD, 16));
        label.setBounds(50, 70, 250, 30);
        frame.add(label);

        List listBox = new List(6, true);
        listBox.setBounds(50, 100, 150, 150);
        listBox.add("Potato");
        listBox.add("Tomato");
        listBox.add("Apple");
        listBox.add("Pineapple");
        listBox.add("Orange");
        listBox.add("Mango");
        frame.add(listBox);
        // Create a Button to show selected items
        Button button = new Button("Show Selections");
        button.setBounds(220, 100, 150, 30);
        frame.add(button);
        // Create a Label to display the selected items
        Label resultLabel = new Label();
        resultLabel.setBounds(220, 150, 350, 30);
        resultLabel.setFont(new Font("Arial", Font.BOLD, 16));
        frame.add(resultLabel);
        // Add an Action Listener to the Button
        button.addActionListener(e -> {
            String[] selectedItems = listBox.getSelectedItems();
            if (selectedItems.length > 0) {
                String s = "You have selected: ";
                StringBuilder result = new StringBuilder(s);
                for (String item : selectedItems) {
                    result.append(item).append(", ");
                }
```

```
                // Remove the trailing comma and space
                result.setLength(result.length() - 2);
                resultLabel.setText(result.toString());
                System.out.println(result.toString());
            }
            else {
                resultLabel.setText("No item selected");
                System.out.println("No item selected");
            }
        });

        // Add a Window Listener to handle window close events
        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });

        frame.setVisible(true);
    }
}
```

Output:

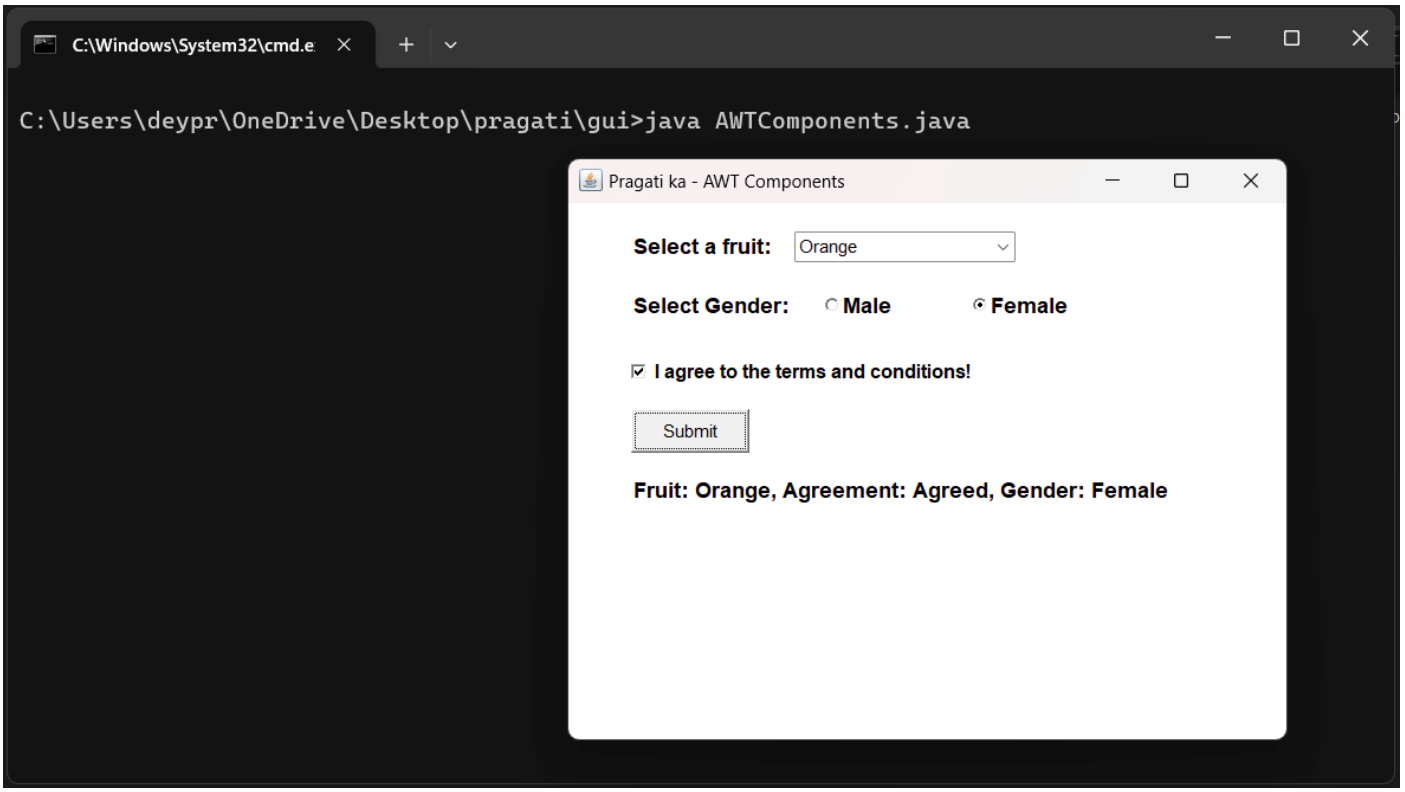


22. Write a program to implement Choice, Checkbox, RadioButton with AWT event handling. (AWT)

```
import java.awt.*;
import java.awt.event.*;

public class AWTComponents {
   public static void main(String[] args) {
        Frame frame = new Frame("Pragati ka - AWT Components");
        frame.setSize(500, 400);
        frame.setLayout(null);

        // ----- Choice (Dropdown) -----
        Label choiceLabel = new Label("Select a fruit:");
        choiceLabel.setFont(new Font("Arial", Font.BOLD, 14));
        choiceLabel.setBounds(50, 50, 100, 20);
        frame.add(choiceLabel);

        Choice choice = new Choice();
        choice.setBounds(160, 50, 150, 20);
        choice.add("Apple");
        choice.add("Banana");
        choice.add("Orange");
        frame.add(choice);

        // ----- Radio Buttons -----
        Label genderLabel = new Label("Select Gender:");
        genderLabel.setFont(new Font("Arial", Font.BOLD, 14));
        genderLabel.setBounds(50, 90, 120, 20);
        frame.add(genderLabel);

        CheckboxGroup genderGroup = new CheckboxGroup();

        Checkbox maleRadio = new Checkbox("Male",genderGroup, false);
        maleRadio.setFont(new Font("Arial", Font.BOLD, 14));
        maleRadio.setBounds(180, 90, 80, 20);

        Checkbox femaleRadio = new Checkbox("Female",genderGroup, false);
        femaleRadio.setFont(new Font("Arial", Font.BOLD, 14));
        femaleRadio.setBounds(280, 90, 100, 20);
        frame.add(maleRadio);
        frame.add(femaleRadio);
```

```
        // ----- Checkbox -----
        Checkbox checkbox = new Checkbox("I agree to the terms!");
        checkbox.setFont(new Font("Arial", Font.BOLD, 13));
        checkbox.setBounds(50, 130, 250, 30);
        frame.add(checkbox);

        // ----- Button to Show Selections -----
        Button submitButton = new Button("Submit");
        submitButton.setBounds(50, 170, 80, 30);
        frame.add(submitButton);

        // ----- Label to Display Results -----
        Label resultLabel = new Label();
        resultLabel.setBounds(50, 210, 400, 30);
        frame.add(resultLabel);

        // ----- Event Handling -----
        submitButton.addActionListener(e -> {
            String selectedFruit = choice.getSelectedItem();
            String agreement = checkbox.getState() ?
            "Agreed":"Not Agreed";
            String gender = genderGroup.getSelectedCheckbox() != null ?
            genderGroup.getSelectedCheckbox().getLabel():"Not Selected";

            resultLabel.setFont(new Font("Arial", Font.BOLD, 14));
            resultLabel.setText("Fruit: " + selectedFruit +
            ", Agreement: " + agreement + ", Gender: " + gender);
        });

        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });

        frame.setVisible(true);
    }
}
```

Output:

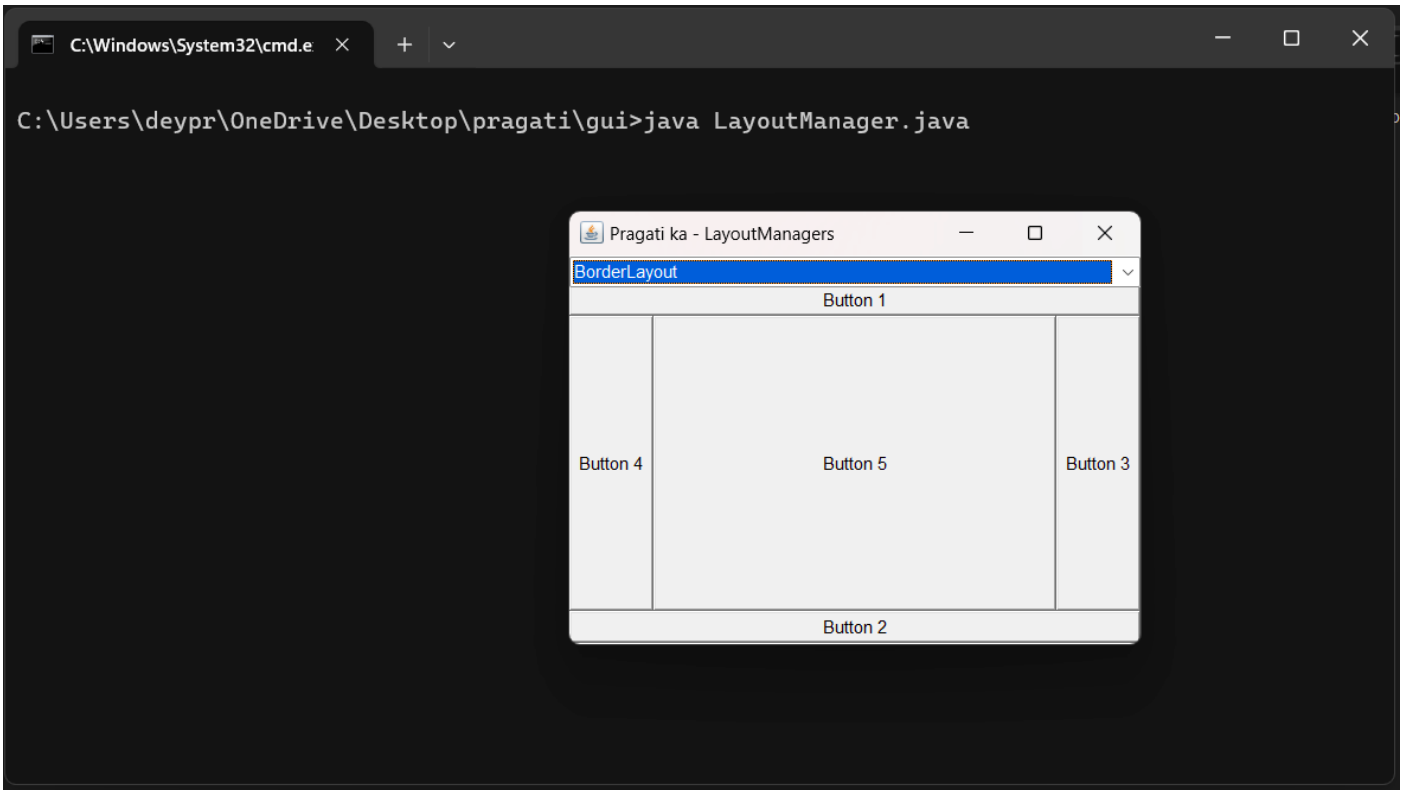

C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\gui>java AWTComponents.java
Pragati ka - AWT Components
Select a fruit:
Orange
Select Gender:
Male
Female
I agree to the terms and conditions!
Submit
Fruit: Orange, Agreement: Agreed, Gender: Female

23. Write a program to implement LayoutManager. (AWT)

```
import java.awt.*;
import java.awt.event.*;

public class LayoutManager {
   public static void main(String[] args) {
        Frame frame = new Frame("Pragati ka - LayoutManagers");
        frame.setSize(400, 300);

        // Create panel and buttons
        Panel panel = new Panel();
        Button btn1 = new Button("Button 1");
        Button btn2 = new Button("Button 2");
        Button btn3 = new Button("Button 3");
        Button btn4 = new Button("Button 4");
        Button btn5 = new Button("Button 5");

        // Add dropdown (Choice) to select LayoutManager
        Choice layoutChoice = new Choice();
        layoutChoice.add("FlowLayout");
        layoutChoice.add("BorderLayout");
        layoutChoice.add("GridLayout");

        // Event listener to switch layouts
        layoutChoice.addItemListener(e -> {
            panel.removeAll();
            panel.add(btn1);
            panel.add(btn2);
            panel.add(btn3);
            panel.add(btn4);
            panel.add(btn5);

            switch (layoutChoice.getSelectedItem()) {

                case "FlowLayout" ->
                panel.setLayout(new FlowLayout());

                case "BorderLayout" -> {
                    panel.setLayout(new BorderLayout());
                    panel.add(btn1, BorderLayout.NORTH);
```

```
                    panel.add(btn2, BorderLayout.SOUTH);
                    panel.add(btn3, BorderLayout.EAST);
                    panel.add(btn4, BorderLayout.WEST);
                    panel.add(btn5, BorderLayout.CENTER);
                }

                case "GridLayout" ->
                    panel.setLayout(new GridLayout(2, 2));
            }
            panel.validate();
        });

        // Set default layout and add components
        panel.setLayout(new FlowLayout());
        panel.add(btn1);
        panel.add(btn2);
        panel.add(btn3);
        panel.add(btn4);
        panel.add(btn5);

        // Add dropdown and panel to frame
        frame.add(layoutChoice, BorderLayout.NORTH);
        frame.add(panel, BorderLayout.CENTER);

        // Handle window closing
        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });

        frame.setVisible(true);
    }
}
```

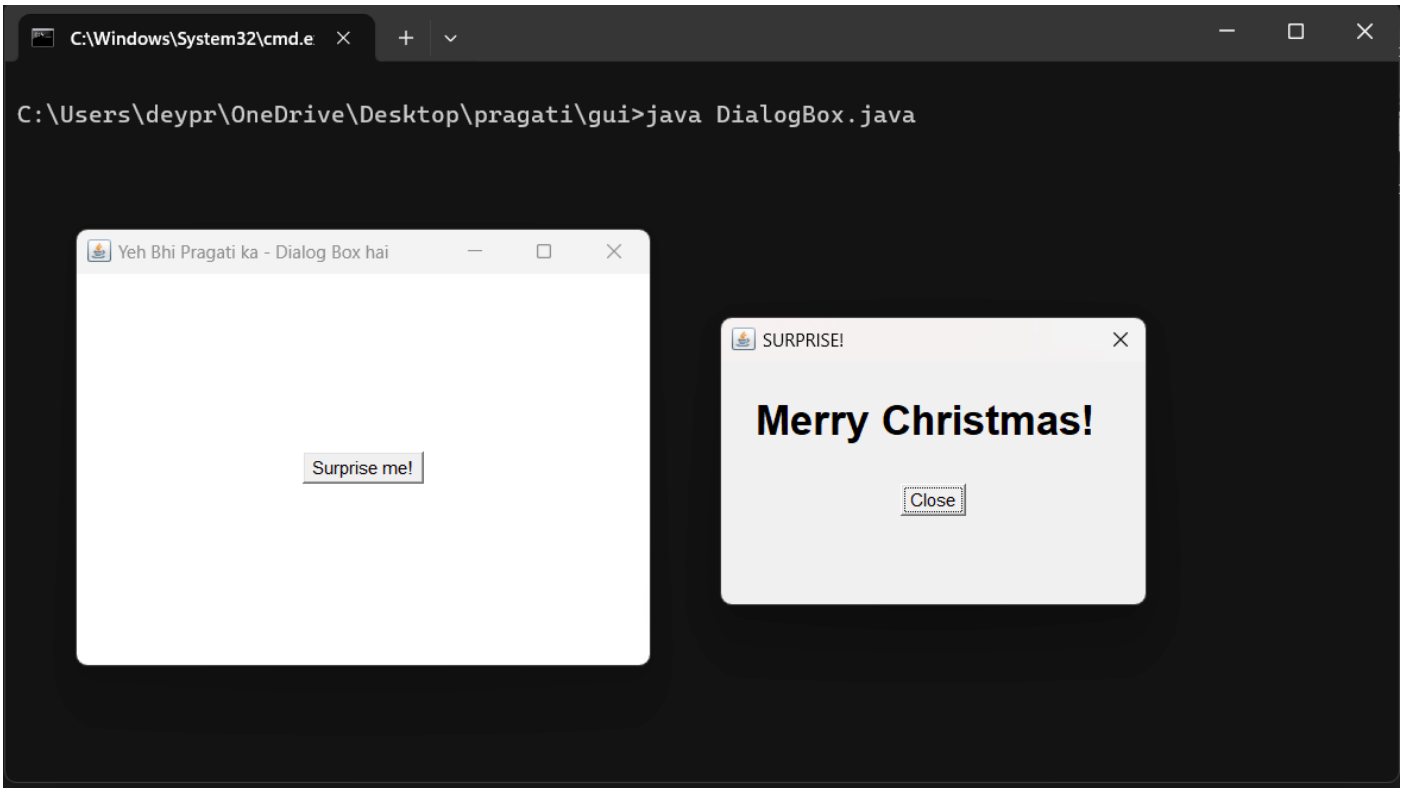
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\gui>java LayoutManager.java
Pragati ka - LayoutManagers
BorderLayout
Button 1
Button 4
Button 5
Button 3
Button 2

24. Write a program to implement a Dialog box. (AWT)

```
import java.awt.*;
import java.awt.event.*;

public class DialogBox {
   public static void main(String[] args) {
        Frame frame = new Frame("Yeh Bhi Pragati ka-Dialog Box hai");
        frame.setSize(400, 300);
        frame.setLayout(new GridBagLayout());
        Button button = new Button("Surprise me!");
        frame.add(button);

        // Create a modal dialog with a message and a close button
        Dialog dialog = new Dialog(frame, "SURPRISE!", true);
        dialog.setSize(300, 200);
        dialog.setLayout(new FlowLayout(FlowLayout.CENTER, 10, 20));

        // Add a label and a close button to the dialog
        Label message = new Label("Merry Christmas!");
        message.setFont(new Font("Arial", Font.BOLD, 28));
        Button closeButton = new Button("Close");
        dialog.add(message);
        dialog.add(closeButton);

        // Event to show the dialog
        button.addActionListener(e -> dialog.setVisible(true));
        // Event to close the dialog
        closeButton.addActionListener(e -> dialog.setVisible(false));

        // Handle frame closing
        frame.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent e) {
                frame.dispose();
                System.exit(0);
            }
        });

        frame.setVisible(true);
   }
}
```

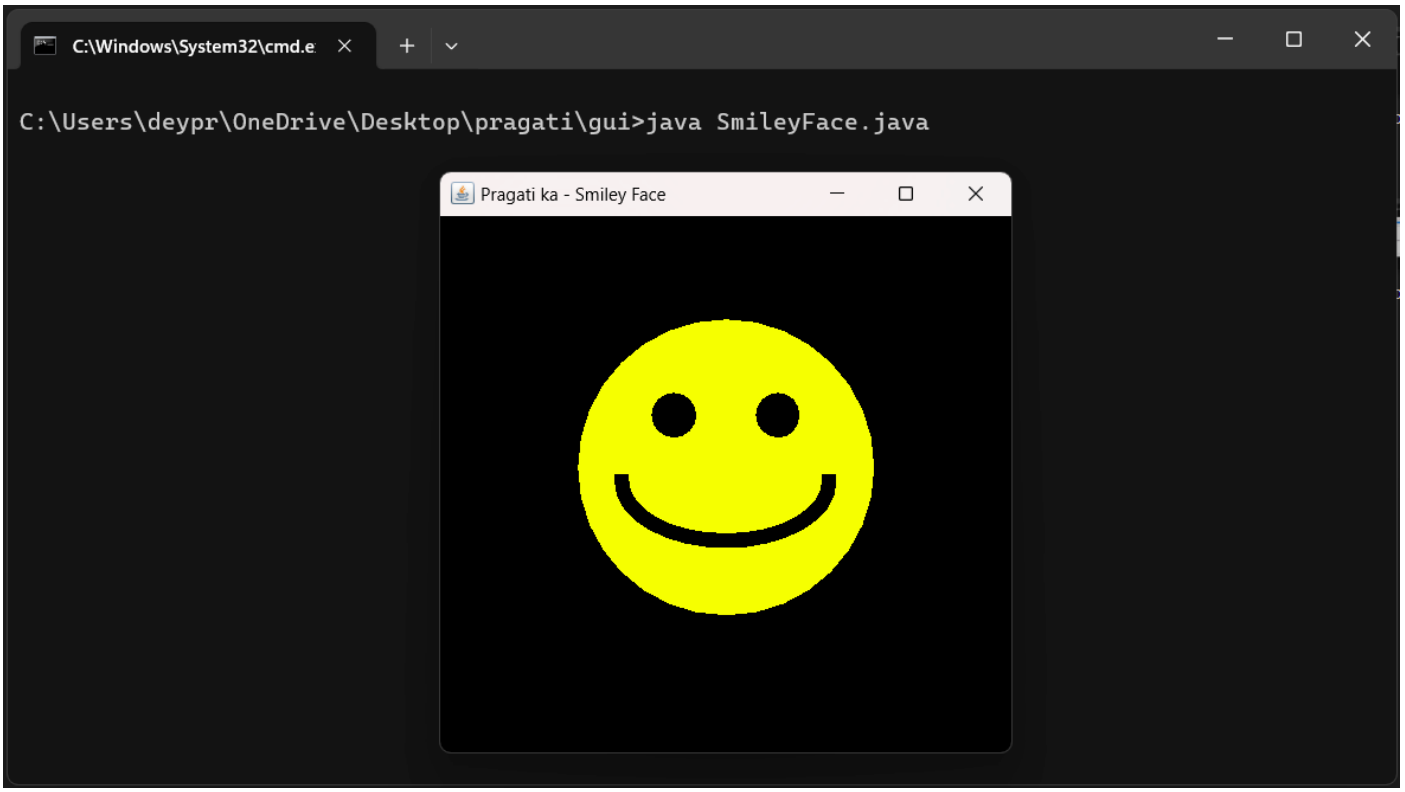
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\gui>java DialogBox.java
Yeh Bhi Pragati ka - Dialog Box hai
Surprise me!
SURPRISE!
Merry Christmas!
Close

25. Write a program to implement Smiley face. (AWT)

```
import java.awt.*;
import java.awt.event.*;

public class SmileyFace extends Frame {

   public SmileyFace() {
       setSize(400, 400);            // Set the window size
       setTitle("Pragati ka - Smiley Face"); // Set the window title
       setVisible(true);             // Make the window visible
       setBackground(Color.BLACK);   // Set the background color to black
   }

   // Override the paint method to draw the smiley face
   public void paint(Graphics g) {
       Graphics2D g2d = (Graphics2D) g;
       g2d.setColor(Color.YELLOW);
       g2d.fillOval(100, 100, 200, 200); // Draw face (circle)

       // Set color for the eyes (black)
       g2d.setColor(Color.BLACK);
       g2d.fillOval(150, 150, 30, 30); // Left eye
       g2d.fillOval(220, 150, 30, 30); // Right eye

       // Set color for the mouth (black)
       g2d.setColor(Color.BLACK);
       // Set a thicker stroke for the mouth
       g2d.setStroke(new BasicStroke(10));
       // Draw a smoother arc (bigger arc for a smoother curve)
       g2d.drawArc(130, 170, 140, 80, 0, -180);    // Draw mouth (arc)
   }

   public static void main(String[] args) {
       SmileyFace smiley = new SmileyFace();
       // Handle window closing event
       smiley.addWindowListener(new WindowAdapter() {
           public void windowClosing(WindowEvent e) {
               System.exit(0);
           }
       });
   }
}
```

Output:

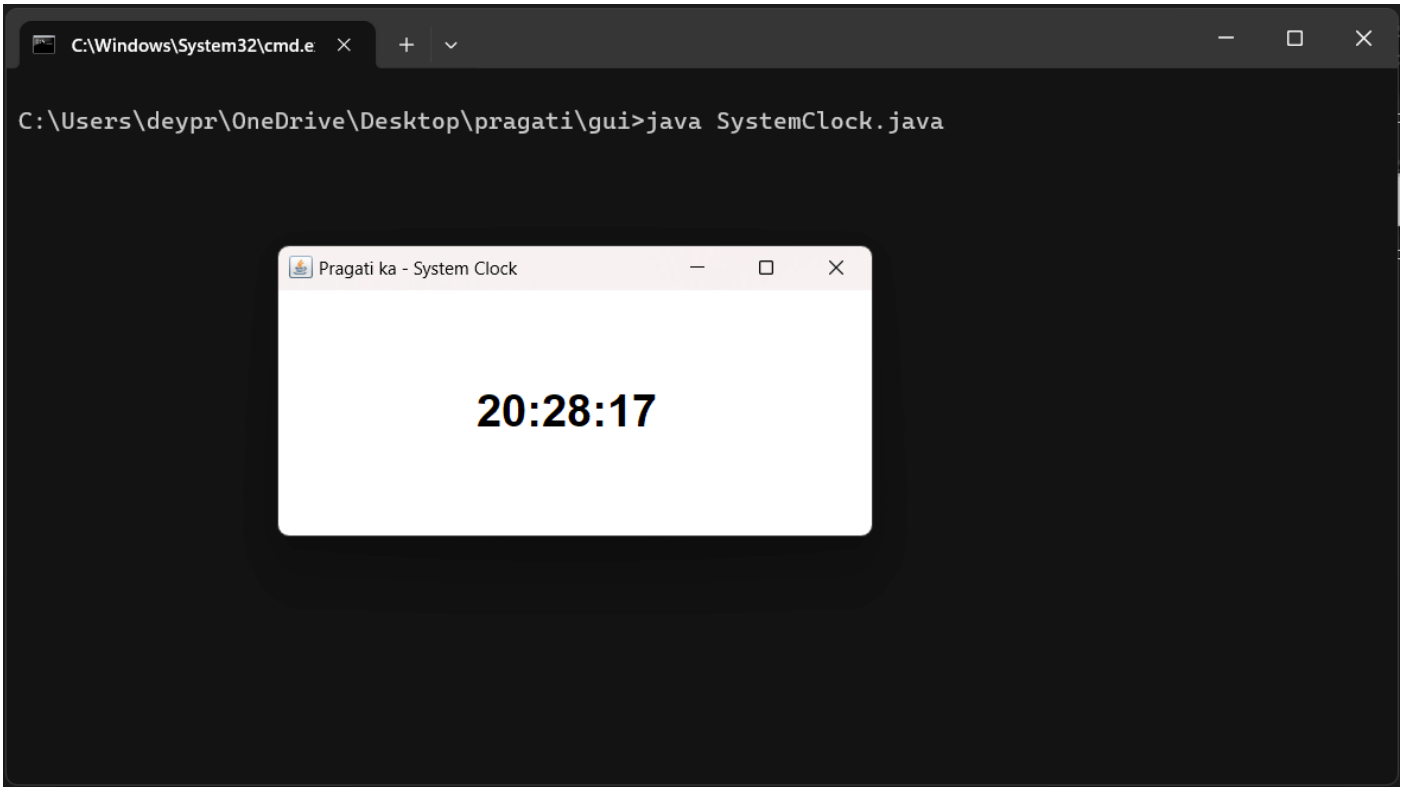

C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati\gui>java SmileyFace.java
Pragati ka - Smiley Face

26. Write a program to implement System Clock. (AWT)

```
import java.awt.*;
import java.awt.event.*;
import java.text.SimpleDateFormat;
import java.util.Date;

public class SystemClock extends Frame {
   private Label timeLabel;

   public SystemClock() {
       setSize(400, 200);
       setTitle("Pragati ka - System Clock");
       setLayout(new GridBagLayout());
       setVisible(true);

       // Create a label to display time
       timeLabel = new Label();
       timeLabel.setFont(new Font("Arial", Font.BOLD, 30));
       add(timeLabel);

       // Handle window closing event
       addWindowListener(new WindowAdapter() {
           public void windowClosing(WindowEvent e) {
               System.exit(0);
           }
       });
       updateClock();
   }

   // Method to update the clock every second
   private void updateClock() {
       Thread clockThread = new Thread(() -> {
           while (true) {
               // Get the current system time
               SimpleDateFormat t = new SimpleDateFormat("HH:mm:ss");

               String time = t.format(new Date());

               timeLabel.setText(time);
```

```
                try {
                //  Wait for 1 second before updating the time again
                    Thread.sleep(1000);
                }
                catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        });
        clockThread.start();  // Start the clock thread
    }

    public static void main(String[] args) {
        new SystemClock();
    }
}
```

Output:

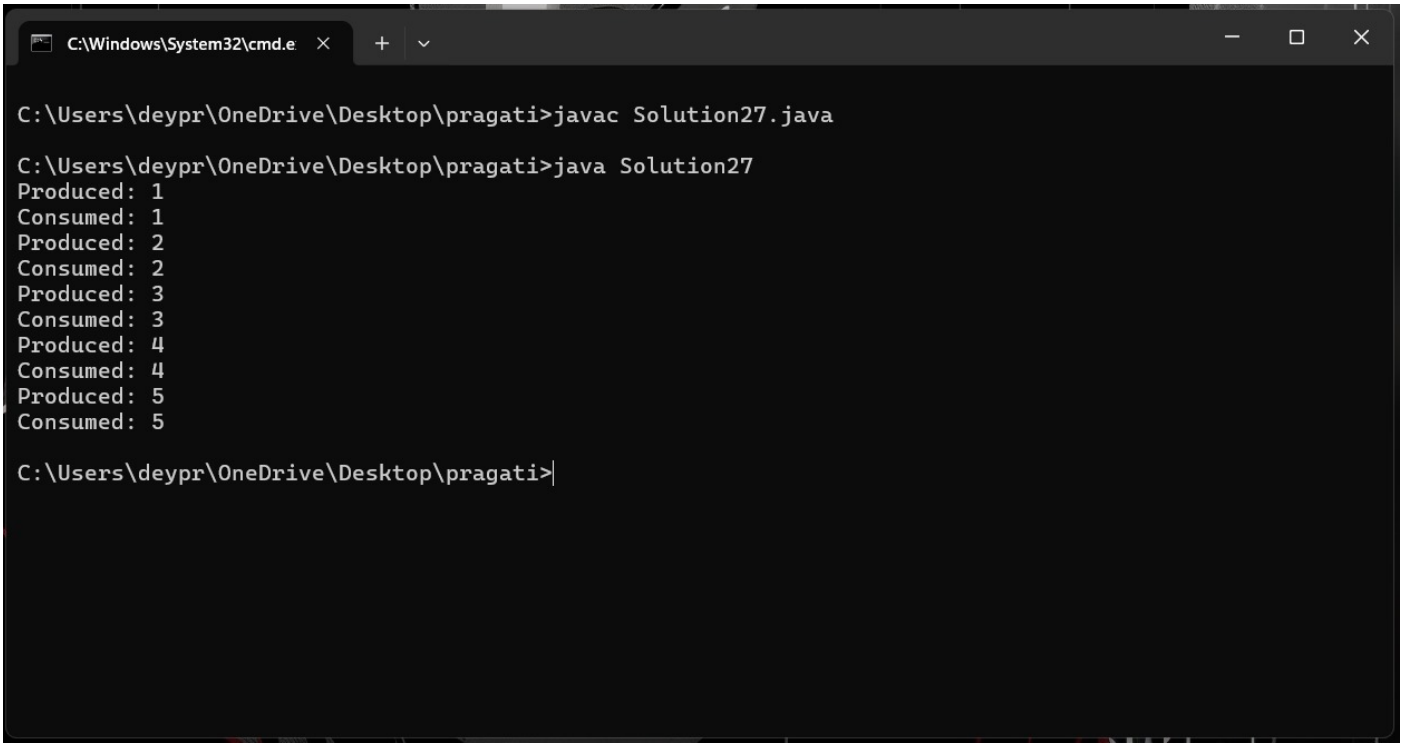


27. Write a program to implement Inter-Thread Communication.

```
class SharedResource {
    private int data;
    private boolean isAvailable = false;

    // Method to produce data
    public synchronized void produce(int value) {
        while (isAvailable) {
            try {
                wait(); // Wait until the data is consumed
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
        data = value;
        isAvailable = true;
        System.out.println("Produced: " + data);
        notify(); // Notify the consumer that data is available
    }

    // Method to consume data
    public synchronized void consume() {
        while (!isAvailable) {
            try {
                wait(); // Wait until the data is produced
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
        System.out.println("Consumed: " + data);
        isAvailable = false;
        notify(); // Notify the producer that the data has been consumed
    }
}

class Producer extends Thread {
    private SharedResource sharedResource;
    public Producer(SharedResource sharedResource) {
        this.sharedResource = sharedResource;
    }
```

```
    @Override
    public void run() {
        for (int i = 1; i <= 5; i++) {
            sharedResource.produce(i);
            try {
                Thread.sleep(500);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

class Consumer extends Thread {
    private SharedResource sharedResource;
    public Consumer(SharedResource sharedResource) {
        this.sharedResource = sharedResource;
    }

    @Override
    public void run() {
        for (int i = 1; i <= 5; i++) {
            sharedResource.consume();
            try {
                Thread.sleep(1000);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

public class Solution27 {
    public static void main(String[] args) {
        SharedResource sharedResource = new SharedResource();
        Producer producer = new Producer(sharedResource);
        Consumer consumer = new Consumer(sharedResource);
        producer.start();
        consumer.start();
    }
}
```

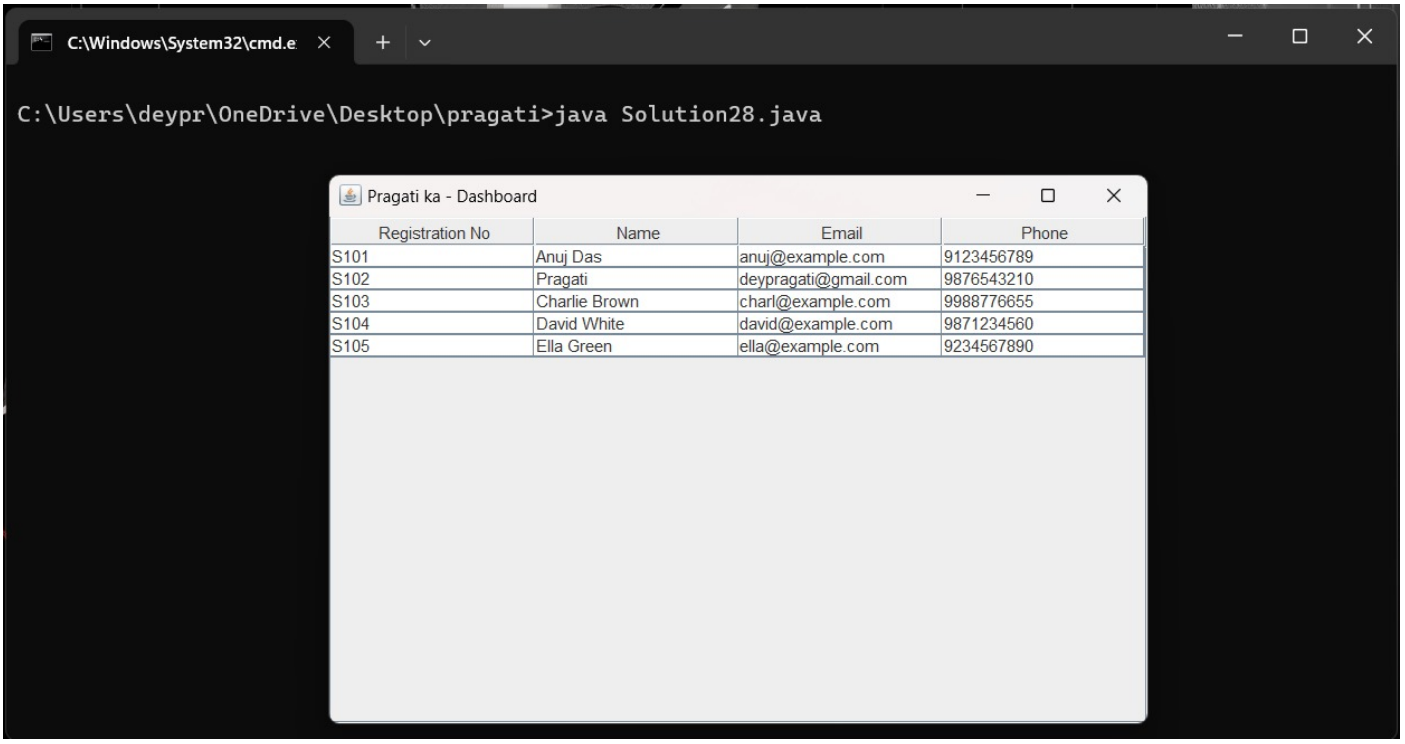
Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>javac Solution27.java
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution27
Produced: 1
Consumed: 1
Produced: 2
Consumed: 2
Produced: 3
Consumed: 3
Produced: 4
Consumed: 4
Produced: 5
Consumed: 5
C:\Users\deypr\OneDrive\Desktop\pragati>

28. Write a program to create a Frame that displays the student information. (Swing)

```
import java.awt.*;
import javax.swing.*;
import javax.swing.table.DefaultTableModel;

public class Solution28 extends JFrame {

    public Solution28() {
        setTitle("Pragati ka - Dashboard");
        setSize(600, 400);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        setLocationRelativeTo(null);

        String[] header = {"Registration No", "Name", "Email", "Phone"};
        Object[][] data = {
            {"S101", "Anuj Das", "anuj@example.com", "9876543210"},
            {"S102", "Pragati", "deypragati@example.com", "9123456789"},
            {"S103", "Charlie Brown", "charl@example.com", "9988776655"},
            {"S104", "David White", "david@example.com", "9871234560"},
            {"S105", "Ella Green", "ella@example.com", "9234567890"}
        };

        DefaultTableModel tmodel = new DefaultTableModel(data, header);
        JTable studentTable = new JTable(tmodel);
        JScrollPane scrollPane = new JScrollPane(studentTable);
        add(scrollPane, BorderLayout.CENTER);
    }

    public static void main(String[] args) {
        SwingUtilities.invokeLater(() -> {
            Solution28 frame = new Solution28();
            frame.setVisible(true);
        });
    }
}
```

Output:


C:\Windows\System32\cmd.e
C:\Users\deypr\OneDrive\Desktop\pragati>java Solution28.java
Pragati ka - Dashboard
Registration No
Name
Email
Phone
S101
Anuj Das
anuj@example.com
9123456789
S102
Pragati
deypragati@gmail.com
9876543210
S103
Charlie Brown
charl@example.com
9988776655
S104
David White
david@example.com
9871234560
S105
Ella Green
ella@example.com
9234567890

29. Write a simple JDBC program to retrieve student information after connecting to the database.

```
import java.sql.*;

class JDBC_CLI {
   private Connection con;
   // Database Credentials
   private static final String BASE = "jdbc:mysql://localhost:3306/";
   private static final String DB = "student_records";
   private static final String DB_URL = BASE + DB;
   private static final String DB_USER = "root";
   private static final String DB_PASS = "whatever07";

   JDBC_CLI() {
       connect();
   }

   private void connect() {
       try {
           Class.forName("com.mysql.cj.jdbc.Driver");
           con = DriverManager.getConnection(DB_URL, DB_USER, DB_PASS);
           System.out.println("Successfully connected to database!");
           viewStudents();
       }
       catch (ClassNotFoundException e) {
           System.out.println("MySQL JDBC Driver not found!");
       }
       catch (SQLException e) {
           System.out.println("Database connection failed!);
       }
   }

   private void printTable(ResultSet rs) throws SQLException {
       ResultSetMetaData metaData = rs.getMetaData();
       int columnCount = metaData.getColumnCount();
       System.out.println("TABLE:: " + metaData.getTableName(1) + "\n");
       for (int i = 1; i <= columnCount; i++) {
           if(i == 1) {
               System.out.printf("%-10s", metaData.getColumnName(i));
           }
```

```
            else {
                System.out.printf("%-30s", metaData.getColumnName(i));
            }
        }
        System.out.println();
        System.out.println("=".repeat(columnCount * 20));

        // Print the data rows
        while (rs.next()) {
            for (int i = 1; i <= columnCount; i++) {
                if(i == 1) {
                    System.out.printf("%-10s", rs.getString(i));
                }
                else {
                    System.out.printf("%-30s", rs.getString(i));
                }
            }
            System.out.println();
        }
    }

    private void viewStudents() {
        try {
            String query = "SELECT * FROM student_info";
            Statement stmt = con.createStatement();
            ResultSet rs = stmt.executeQuery(query);
            printTable(rs);
        }
        catch (SQLException e) {
            System.out.println("Unable to retrieve details!”);
        }
    }

    public static void main(String[] args) {
        JDBC_CLI admin = new JDBC_CLI();
    }
}
```

Output:

```
Successfully connected to database!
2001    Anuj Das                    anujdas@gmail.com                   8638756810
2002    PRAGATI DEY                 deypragati.study@gmail.com          7578950187
2003    Parita Dey                  deypari.19@gmail.com                1234567890
2004    Prayag Dey                  miprayag@gmail.com                  7788556688
2005    Riyanjita Ozah              riya@gmail.com                      7586321524

Process finished with exit code 0
```

30. Write a program to create a GUI using Swing that performs database operations.

```
import java.sql.*;
import javax.swing.*;
import java.awt.event.*;
import java.text.MessageFormat;
import net.proteanit.sql.DbUtils;
import javax.swing.table.DefaultTableModel;

public class StudentsRecord extends JFrame implements ActionListener {
   // Database credentials
   private static final String BASE_URL = "jdbc:mysql://localhost:3306/";
   private static final String DB_NAME = "students_record";
   private static final String DB_URL = BASE_URL + DB_NAME;
   private static final String DB_USER = "root";
   private static final String DB_PASSWORD = "whatever07";

   private Connection con;

   // Swing components
   private JTextField regn_no, name, email, phone, search_by_regn_no;
   private JButton create, printb, update, delete, search, reset, exit;
   private JTable tab_data = new JTable();
   private JScrollPane table_Panel;
   // Constructor
   public StudentsRecord() {
       super("Student Records Dashboard");
       connectToDatabase();
       initializeGUI();
       loadTable("SELECT * FROM student_info");
   }

   private void loadTable(String query) {
       try {
           PreparedStatement pst = con.prepareStatement(query);
           ResultSet rs = pst.executeQuery();
           tab_data.setModel(DbUtils.resultSetToTableModel(rs));
           table_Panel.setViewportView(tab_data);
       }
       catch (SQLException e) {
           JOptionPane.showMessageDialog(null,
               "Error loading data: " + e.getMessage(),
               "Database Error", JOptionPane.ERROR_MESSAGE);
       }
   }
```

```
private void connectToDatabase() {
    try {
        Class.forName("com.mysql.cj.jdbc.Driver");
        con = DriverManager.getConnection(
            DB_URL,
            DB_USER,
            DB_PASSWORD
        );
        System.out.println("Connection Successful!");
    }
    catch (ClassNotFoundException e) {
        JOptionPane.showMessageDialog(this,
            "MySQL JDBC Driver not found: " + e.getMessage(),
            "Driver Error", JOptionPane.ERROR_MESSAGE);
    }
    catch (SQLException e) {
        JOptionPane.showMessageDialog(this,
            "Database con failed: " + e.getMessage(),
            "Connection Error", JOptionPane.ERROR_MESSAGE);
    }
}

private void initializeGUI() {
    // Set frame properties
    setLayout(null);
    setVisible(true);
    setLocationRelativeTo(null);
    setSize(800, 650);
    setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    // Create labels and text fields
    JLabel regn_no_label = new JLabel("Registration Number:");
    regn_no_label.setBounds(50, 50, 150, 35);
    add(regn_no_label);

    regn_no = new JTextField();
    regn_no.setBounds(200, 50, 300, 35);
    add(regn_no);

    JLabel name_label = new JLabel("Full Name:");
    name_label.setBounds(50, 100, 150, 35);
    add(name_label);

    name = new JTextField();
    name.setBounds(200, 100, 300, 35);
    add(name);

    JLabel email_label = new JLabel("Email:");
    email_label.setBounds(50, 150, 150, 35);
    add(email_label);
```

```
        email = new JTextField();
        email.setBounds(200, 150, 300, 35);
        add(email);

        JLabel phone_label = new JLabel("Phone Number:");
        phone_label.setBounds(50, 200, 150, 35);
        add(phone_label);

        phone = new JTextField();
        phone.setBounds(200, 200, 300, 35);
        add(phone);

        JLabel search_label = new JLabel("Search by Registration Number:");
        search_label.setBounds(50, 300, 250, 35);
        add(search_label);

        search_by_regn_no = new JTextField();
        search_by_regn_no.setBounds(250, 300, 250, 35);
        add(search_by_regn_no);

        // Create and position buttons
        create = new JButton("Add New");
        create.setBounds(550, 50, 100, 35);
        create.addActionListener(this);
        add(create);

        search = new JButton("Search");
        search.setBounds(550, 300, 100, 35);
        search.addActionListener(this);
        add(search);

        update = new JButton("Update");
        update.setBounds(550, 100, 100, 35);
        update.addActionListener(this);
        add(update);

        delete = new JButton("Delete");
        delete.setBounds(550, 150, 100, 35);
        delete.addActionListener(this);
        add(delete);


        reset = new JButton("Reset");
        reset.setBounds(550, 200, 100, 35);
        reset.addActionListener(this);
        add(reset);

        printb = new JButton("Print");
        printb.setBounds(550, 250, 100, 35);
        printb.addActionListener(new ActionListener() {
```

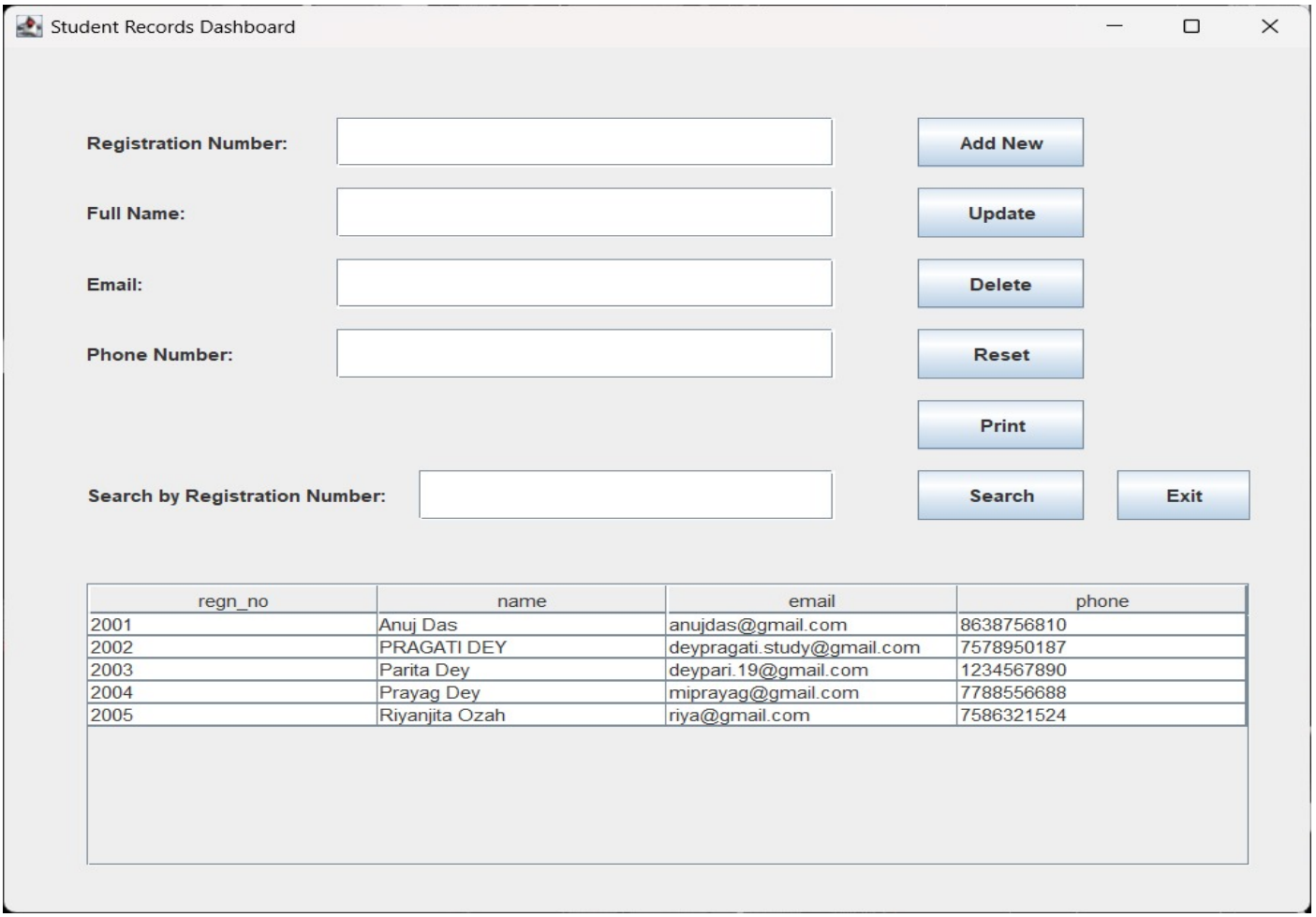
```
        @Override
        public void actionPerformed(ActionEvent e) {
            String hmsg = "Printing in Progress";
            String fmsg = "Page-{0, number, integer}";
            MessageFormat headr = new MessageFormat(hmsg);
            MessageFormat footr = new MessageFormat(fmsg);
            try {
                tab_data.print(JTable.PrintMode.NORMAL, headr, footr);
            }
            catch (Exception ex) {
                throw new RuntimeException(ex);
            }
        }
    });
    add(printb);

    exit = new JButton("Exit");
    exit.setBounds(670, 300, 80, 35);
    exit.addActionListener(this);
    add(exit);
    // Initialize and set bounds for table and scroll pane
    table_Panel = new JScrollPane(tab_data);
    table_Panel.setBounds(50, 380, 700, 200);
    tab_data.addMouseListener(new MouseAdapter() {
        @Override
        public void mouseClicked(MouseEvent e) {
            super.mouseClicked(e);
            DefaultTableModel rec = (DefaultTableModel) tab_data.getModel();
            int selectedRow = tab_data.getSelectedRow();
            String s_regn, s_name, s_email, s_phone;
            s_regn = rec.getValueAt(selectedRow,0).toString();
            s_name = rec.getValueAt(selectedRow,1).toString();
            s_email = rec.getValueAt(selectedRow,2).toString();
            s_phone = rec.getValueAt(selectedRow,3).toString();
            regn_no.setText(s_regn);
            name.setText(s_name);
            email.setText(s_email);
            phone.setText(s_phone);
        }
    });
    add(table_Panel);
}

@Override
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == exit) {
        try {
            if (con != null && !con.isClosed()) {
                con.close();
            }
        }
```

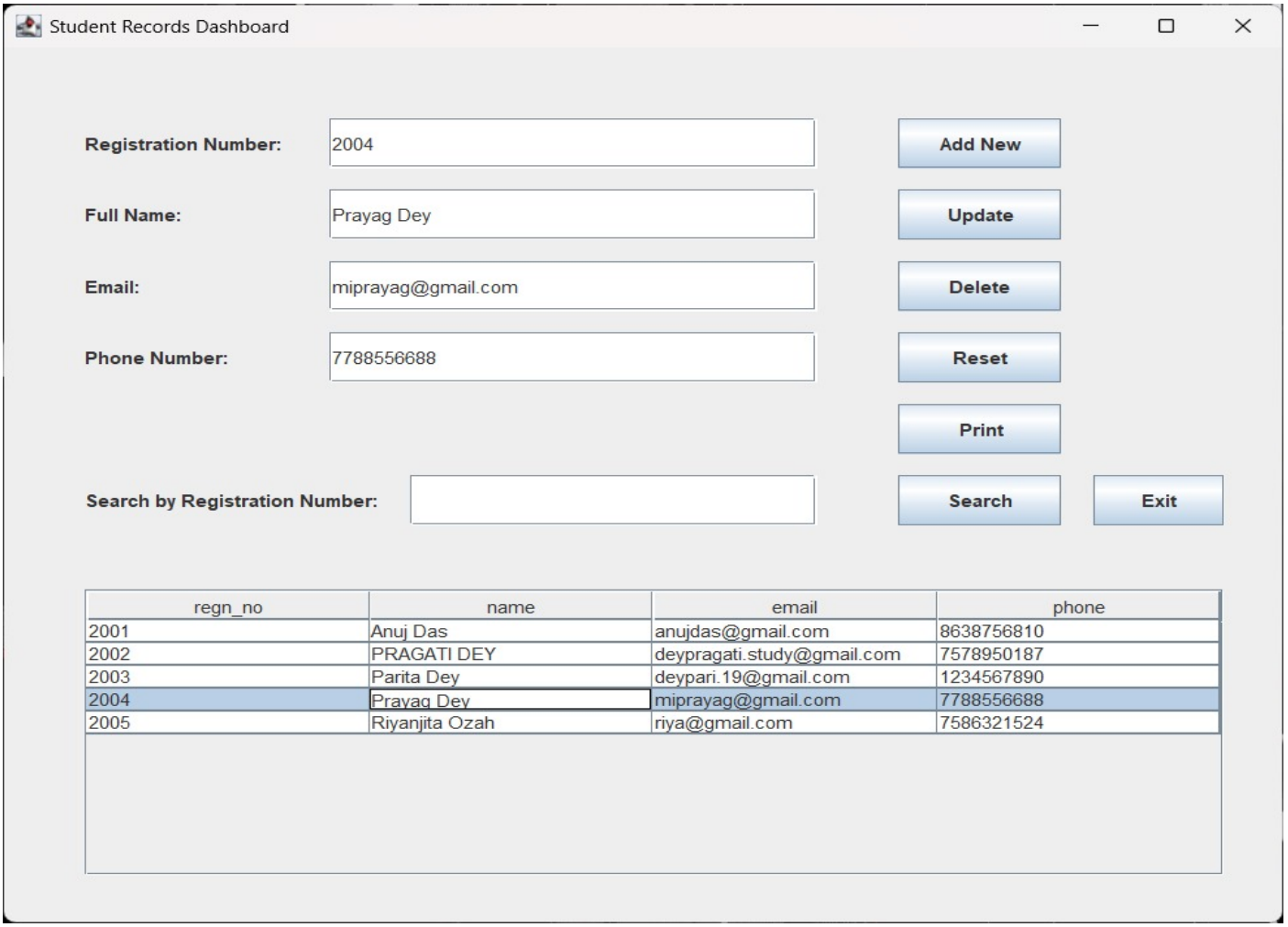
```
            catch (SQLException ex) {
                ex.printStackTrace();
            }
            System.exit(0);
        }
        else if (e.getSource() == create) {
            addStudent();
        }
        else if (e.getSource() == update) {
            updateStudent();
        }
        else if (e.getSource() == delete) {
            deleteStudent();
        }
        else if (e.getSource() == reset) {
            resetFields();
        }
        else if(e.getSource() == search) {
            searchStudent();
        }
    }

    private void resetFields() {
        regn_no.setText("");
        name.setText("");
        email.setText("");
        phone.setText("");
        search_by_regn_no.setText("");
        loadTable("SELECT * FROM student_info");
    }

    private void addStudent() {
        try {
            String insertQuery =
            "INSERT INTO student_info (regn_no, name, email, phone) VALUES (?,?,?,?)";
            PreparedStatement pstmt = con.prepareStatement(insertQuery);
            pstmt.setString(1, regn_no.getText());
            pstmt.setString(2, name.getText());
            pstmt.setString(3, email.getText());
            pstmt.setString(4, phone.getText());
            int rowsAffected = pstmt.executeUpdate();
            JOptionPane.showMessageDialog(this,
                rowsAffected + " student record added successfully!");

            loadTable("SELECT * FROM student_info");
            resetFields();
        }
        catch (SQLException ex) {
            JOptionPane.showMessageDialog(this,
                "Error adding student: " + ex.getMessage(),
                "Database Error", JOptionPane.ERROR_MESSAGE);
```

```
    }
}

private void updateStudent() {
    try {
        String updateQuery =
        "UPDATE student_info SET name = ?, email = ?, phone = ? WHERE regn_no = ?";
        PreparedStatement pstmt = con.prepareStatement(updateQuery);
        pstmt.setString(1, name.getText());
        pstmt.setString(2, email.getText());
        pstmt.setString(3, phone.getText());
        pstmt.setString(4, regn_no.getText());

        int rowsAffected = pstmt.executeUpdate();
        JOptionPane.showMessageDialog(this,
            rowsAffected + " student record updated successfully!");

        loadTable("SELECT * FROM student_info");
        resetFields();
    }
    catch (SQLException ex) {
        JOptionPane.showMessageDialog(this,
            "Error updating student: " + ex.getMessage(),
            "Database Error", JOptionPane.ERROR_MESSAGE);
    }
}

private void deleteStudent() {
    try {
        String deleteQuery = "DELETE FROM student_info WHERE regn_no = ?";
        PreparedStatement pstmt = con.prepareStatement(deleteQuery);
        pstmt.setString(1, regn_no.getText());

        int rowsAffected = pstmt.executeUpdate();
        JOptionPane.showMessageDialog(this,
            rowsAffected + " student record deleted successfully!");

        loadTable("SELECT * FROM student_info");
        resetFields();
    }
    catch (SQLException ex) {
        JOptionPane.showMessageDialog(this,
            "Error deleting student: " + ex.getMessage(),
            "Database Error", JOptionPane.ERROR_MESSAGE);
    }
}

private void searchStudent() {
    try {
        String searchQuery = "SELECT * FROM student_info WHERE regn_no = ?";
        PreparedStatement pstmt = con.prepareStatement(searchQuery);
```

```
            pstmt.setString(1, search_by_regn_no.getText());
            ResultSet rs = pstmt.executeQuery();

            if (rs.next()) {
                String stud_regn = rs.getString("regn_no");
                loadTable("SELECT * FROM student_info WHERE regn_no = " + stud_regn);
                regn_no.setText(stud_regn);
                name.setText(rs.getString("name"));
                email.setText(rs.getString("email"));
                phone.setText(rs.getString("phone"));
                JOptionPane.showMessageDialog(this, "Record found!");
            }
            else {
                JOptionPane.showMessageDialog(this,
                    "No record found with the given Registration Number.");
            }
        }
        catch (SQLException ex) {
            JOptionPane.showMessageDialog(this,
                "Error searching student: " + ex.getMessage(),
                "Database Error", JOptionPane.ERROR_MESSAGE);
        }
    }

    public static void main(String[] args) {
        SwingUtilities.invokeLater(() -> new StudentsRecord());
    }
}
```

Output:


Student Records Dashboard
Registration Number:
Full Name:
Email:
Phone Number:
Add New
Update
Delete
Reset
Print
Search by Registration Number:
Search
Exit
regn_no
name
email
phone
2001
Anuj Das
anujdas@gmail.com
8638756810
2002
PRAGATI DEY
deypragati.study@gmail.com
7578950187
2003
Parita Dey
deypari.19@gmail.com
1234567890
2004
Prayag Dey
miprayag@gmail.com
7788556688
2005
Riyanjita Ozah
riya@gmail.com
7586321524


Student Records Dashboard
Registration Number:
2004
Full Name:
Prayag Dey
Email:
miprayag@gmail.com
Phone Number:
7788556688
Add New
Update
Delete
Reset
Print
Search by Registration Number:
Search
Exit
regn_no
name
email
phone
2001
Anuj Das
anujdas@gmail.com
8638756810
2002
PRAGATI DEY
deypragati.study@gmail.com
7578950187
2003
Parita Dey
deypari.19@gmail.com
1234567890
2004
Prayag Dey
miprayag@gmail.com
7788556688
2005
Riyanjita Ozah
riya@gmail.com
7586321524