Ex.No:	**Implementation of Classes, Constructors and Methods**
Date:	

AIM:

To write a program to implementation of Class, Constructors and Methods.

ALGORITHM:

STEP 1: Start the program.

STEP 2: Create a class Employee

STEP 3: Inside the class Employee, create and variable baseSalary and a Construtor to assign the baseSalary that give in the main class

STEP 4: In the class, there is a method calculateSalary to add 20% of baseSalary to the baseSalary.

STEP 5: In the main class, create an object for the class and pass the baseSalary to the Constructor.

STEP 6: Then print the employees calculateSalary for all the employees.

STEP 7: Stop the program.

PROGRAM:

```
class Employee {
 private double baseSalary;

 public Employee(double baseSalary) {
    this.baseSalary = baseSalary;
 }

 public double calculateSalary() {
    return baseSalary + 0.2 * baseSalary;
 }
}
public class prac1 {
 public static void main(String[] args) {
```

```
    Employee emp1 = new Employee(50000);
    Employee emp2 = new Employee(40000);
    Employee emp3 = new Employee(60000);
    Employee emp4 = new Employee(30000);
    Employee emp5 = new Employee(20000);
    System.out.println("1nd Employee salary adding 20% bonus:"+emp1.calculateSalary());
    System.out.println("2nd Employee salary adding 20% bonus:"+emp2.calculateSalary());
    System.out.println("3rd Employee salary adding 20% bonus:"+emp3.calculateSalary());
    System.out.println("4th Employee salary adding 20% bonus:"+emp4.calculateSalary());
    System.out.println("5th Employee salary adding 20% bonus:"+emp5.calculateSalary());
 }
}
```

OUTPUT:

```
<terminated> prac1 [Java Application] C:\Program Files\Java\jdk-21\bin\java
1nd Employee salary adding 20% bonus:60000.0
2nd Employee salary adding 20% bonus:48000.0
3rd Employee salary adding 20% bonus:72000.0
4th Employee salary adding 20% bonus:36000.0
5th Employee salary adding 20% bonus:24000.0
```

RESULT:

Ex.No:	**Implementation of Hierarchical Inheritance**
Date:	

AIM:

To Write a java program to implement hierarchical inheritance.

ALGORITHM:

STEP 1: Start the program.

STEP 2: Define a superclass with common properties and behaviours that you want to share among multiple subclasses.

STEP 3: Define subclasses that inherit from the superclass. Each subclass will have its own unique properties and behaviours in addition to those inherited from the superclass.

STEP 4: If necessary, override methods from the superclass in the subclasses to provide specialized behaviour.

STEP 5: Create objects of the subclasses and use them to access both inherited and subclass-specific methods.

STEP 6: Stop the program.

PROGRAM:

```
class Animal {
   void eat() {
      System.out.println("Animal is eating...");
   }
}

class Dog extends Animal {
   void bark() {
      System.out.println("Dog is barking...");
   }
}
```

```
class Cat extends Animal {
    void meow() {
        System.out.println("Cat is meowing...");
    }
}

public class Main {
    public static void main(String[] args) {
        Dog dog = new Dog();
        Cat cat = new Cat();

        dog.eat();
        dog.bark();
        cat.eat();
        cat.meow();
    }
}
```

OUTPUT :

```
Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Admin\Desktop\OOPS> javac Main.java
PS C:\Users\Admin\Desktop\OOPS> java Main
Animal is eating...
Dog is barking...
Animal is eating...
Cat is meowing...
PS C:\Users\Admin\Desktop\OOPS>
```

RESULT:

Ex.No:	Implementation of Multilevel Inheritance
Date:	

AIM:

To write java program to implement multilevel inheritance.

ALGORITHM:

STEP 1: Create a class name as shape and method name as display

STEP 2: Create a rectangle class and inheritance the Shape class

STEP 3: Create a class name as Cube and inheritance the rectangle class and create method to display the volume

STEP 4: In main class to create an object as a class Cube It will call a method use this object

STEP 5: Stop the program

PROGRAM:

```
class Shape {
      public void display() {
     System.out.println("Inside display");
   }
}
class Rectangle extends Shape {
   public void area() {
     System.out.println("Inside area");
   }
}
class Cube extends Rectangle {
   public void volume() {
     System.out.println("Inside volume");
   }
}
```

```
public class Tester {
  public static void main(String[] arguments) {
    Cube cube = new Cube();
    cube.display();
    cube.area();
    cube.volume();
  }
}
```

OUTPUT:

```
Output
java -cp /tmp/li7xJmhtUO/Tester
Inside display
Inside area
Inside volume

=== Code Execution Successful ===
```

RESULT:

Ex.No:	**Implementation of Math Package**
Date:	

AIM:

To write a Java Program to demonstrate various arithmetic calculation using Package

ALGORITHEM:

STEP1: Start the Program

STEP2: Create a new class name as ArithmeticCalculation and it define main method

STEP3: Get the input from the user and store the variable num1, num2

STEP4: Use the Math methods to perform the Arithmetic Calculations and Print it

STEP5: End the process

PROGRAM:

```
package program;
import java.util.Scanner;
public class ArithmeticCalculation {
	public static void main(String[] args) {
		Scanner sc=new Scanner (System.in);
		System.out.println("Enter the First Number : ");
		int num1=sc.nextInt();
		System.out.println("Enter the Second Number : ");
		int num2=sc.nextInt();
		System.out.println("Addition	of two numbers : "+ Math.addExact(num1,
		num2));
		System.out.println("Subraction	of two numbers : "+
		Math.subtractExact(num1, num2));
		System.out.println("Multiplication of two numbers : "+
		Math.multiplyExact(num1, num2));
		System.out.println("Devision	of two numbers : "+ (double)num1/num2);
	}
}
```

OUTPUT:

```
Console ×
<terminated> lab5 [Java Application] C:\Users\sur93\.p2\pool
Enter the First Number :
10
Enter the Second Number :
20
Addition       of two numbers : 30
Subraction     of two numbers : -10
Multiplication of two numbers : 200
Devision       of two numbers : 0.5
```

RESULT:

Ex.No:	Implementation of Abstract Class
Date:	

AIM:

To write a java program to implement abstract class.

ALGORITHM:

Step 1: Start the program**.**

Step 2: create abstract class 'Animal' with an abstract method 'sound()'.

Step 3: Define a concrete subclass 'Dog' that extends 'Animal' and implements the 'Sound()' method to print "Meow!".

Step 4: In the 'Main' method ,to create instances of 'Dog' and 'cat' and assing them to variable of type 'Animal'.

Step 5: To call the 'sound' method on the 'Dog' and 'cat' instances to print their respective sounds.

Step 6: stop the program.

PROGRAM:

```
abstract class Animal {
   abstract void sound();
}
class Dog extends Animal {
   void sound() {
      System.out.println("Woof!");
   }
}
class Cat extends Animal {
   void sound() {
      System.out.println("Meow!");
   }
}
public class MainAB{
```

```
    public static void main(String[] args) {
        Animal dog = new Dog();
        Animal cat = new Cat();

        dog.sound();
        cat.sound();
    }
}
```

OUTPUT:

```
PROBLEMS 30   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS

PS C:\Users\91966\Desktop\java> javac MainAB.java
PS C:\Users\91966\Desktop\java> java MainAB
Woof!
Meow!
PS C:\Users\91966\Desktop\java>
```

RESULT:

Ex.No:	Implementation of String Handling
Date:	

AIM:

To write a java program to implement string handling.

ALGORITHM:

Step 1: Start the program.

Step 2: Import the Scanner class from java.util package.

Step 3: Create a class named StringHandlingExample.

Step 4: Define the main method inside the class**.**

Step 5: Initialize a Scanner object to take input from the user.

Step 6: Prompt the user to enter their aim, algorithm, and program one by one using println statements.

Step 7: Read the input provided by the user for aim, algorithm, and program using the nextLine() method of Scanner and store them in respective String variables.

Step 8: Print the entered aim, algorithm, and program as output.

Step 9: Close the Scanner object to release the resources

Step 10: stop the program.

PROGRAM:

```
public class StringHandlingExample {
   public static void main(String[] args) {

      String str1 = "Hello";
      String str2 = "World";

      String result = str1 + " " + str2;
      System.out.println("Concatenated String: " + result);

      int length = result.length();
      System.out.println("Length of String: " + length);
```

```
        String sub = result.substring(0, 5);
        System.out.println("Substring: " + sub);

        String upperCase = result.toUpperCase();
        System.out.println("Uppercase: " + upperCase);

        String lowerCase = result.toLowerCase();
        System.out.println("Lowercase: " + lowerCase);

        String replaced = result.replace('o', 'x');
        System.out.println("Replaced String: " + replaced);
    }
}
```

OUTPUT:

```
Output

java -cp /tmp/abb57XlveL/StringHandlingExample
Concatenated String: Hello World
Length of String: 11
Substring: Hello
Uppercase: HELLO WORLD
Lowercase: hello world
Replaced String: Hellx Wxrld

=== Code Execution Successful ===
```

RESULT:

Ex.No:	Implementation of Exception Handling
Date:	

AIM:

To Write a java program to implement exception handling.

ALGORITHM:

STEP 1: Start the program.

STEP 2: Wrap the code that might throw an exception inside **try** block.

STEP 3: Immediately after the **try** block, include a **catch** block to catch the specific type of exception.

STEP 4: Inside the **catch** block, write code to handle the exception, such as displaying an error message.

STEP 5: Optionally, include a **finally** block for cleanup operations, which will execute regardless of whether an exception occurs.

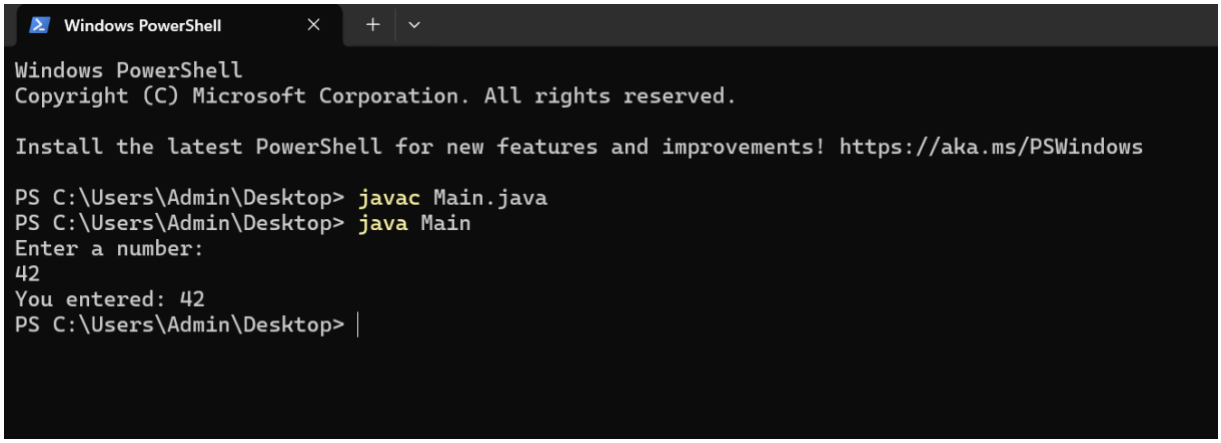
STEP 6: Stop the program.

PROGRAM:

```
import java.util.Scanner;


public class Main {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);


      try {


         System.out.println("Enter a number:");
          int num = scanner.nextInt();
          System.out.println("You entered: " + num);
      } catch (Exception e) {
          System.out.println("Error: Input must be a valid integer.");
```

```
        } finally {
            scanner.close();
        }
    }
}
```

OUTPUT :



RESULT:

Ex.No:	Implementation of LinkedList class
Date:	

AIM:

To Write a java program to demonstrate linked list class.

ALGORITHM:

STEP 1: Create a new node with the given data.

STEP 2: Check if the head of the linked list is null.

- If the head is null, set the head to point to the new node and exit the method.

STEP 3: If the head is not null, create a reference variable current and set it to point to the head node.

STEP 4: Traverse the list until you reach the last node.

- Start a loop that continues until current.next is null.
- Inside the loop, update current to point to the next node in the list (current.next).

STEP 5: Once the loop exits, current will be pointing to the last node in the list.

STEP 6: Set the next reference of the last node (current.next) to point to the new node created in step 1.

STEP 7: Exit the method.

PROGRAM:

```
public class LinkedList {

    private Node head;

    private static class Node {
        int data;
        Node next;

        public Node(int data) {
```

```
        this.data = data;
        this.next = null;
    }
}

public void add(int data) {
    Node newNode = new Node(data);

    if (head == null) {
        head = newNode;
    } else {
        Node current = head;
        while (current.next != null) {
            current = current.next;
        }
        current.next = newNode;
    }
}

public void printList() {
    Node current = head;
    while (current != null) {
        System.out.print(current.data + " -> ");
        current = current.next;
    }
    System.out.println("null");
}

public static void main(String[] args) {
    LinkedList list = new LinkedList();
```

```
        list.add(1);
        list.add(2);
        list.add(3);
        list.add(4);
        list.add(5);

        System.out.println("Linked List:");
        list.printList();
    }
}
```

OUTPUT:

```
java -cp /tmp/kx34BnFnzc/LinkedList
Linked List:
1 -> 2 -> 3 -> 4 -> 5 -> null

=== Code Execution Successful ===
```

RESULT:

Ex.No:	**Implementation of HashSet class**
Date:	

AIM:

To write a java program to demonstrate hashset class.

ALGORITHM:

Step 1: Start the program.

Step 2: Import the required classes from the java.util package (HashSet and Iterator).

Step 3: Create a class named HashSetExample.

Step 4: Define the main method inside the class.

Step 5: Create a HashSet named hashSet to store strings.

Step 6: Add elements ("Apple", "Banana", "Orange") to the hashSet. Note that duplicate elements are ignored.

Step 7: Display the contents of the HashSet.

Step 8: Output the size of the HashSet.

Step 9: Remove the element "Banana" from the HashSet.

Step 10: Check if the element "Apple" exists in the HashSet.

Step 11: Iterate over the HashSet using an iterator and print each element.

Step 12: Clear the HashSet.

Step 13: Check if the HashSet is empty.

PROGRAM:

```
import java.util.HashSet;

import java.util.Iterator;


public class HashSetExample {

   public static void main(String[] args) {


      HashSet<String> hashSet = new HashSet<>();
```

```
        hashSet.add("Apple");
        hashSet.add("Banana");
        hashSet.add("Orange");
        hashSet.add("Apple"); // Duplicate elements are ignored


        System.out.println("HashSet: " + hashSet);


        System.out.println("Size of HashSet: " + hashSet.size());

        hashSet.remove("Banana");

        System.out.println("Contains 'Apple': " + hashSet.contains("Apple"));


        System.out.println("Iterating over the HashSet:");
        Iterator<String> iterator = hashSet.iterator();
        while (iterator.hasNext()) {
            System.out.println(iterator.next());
        }

        hashSet.clear();


        System.out.println("Is HashSet empty? " + hashSet.isEmpty());
    }
}
```

OUTPUT:

Main.java | Output

```
java -cp /tmp/7kOlqlZ5I1/HashSetExample
HashSet: [Apple, Orange, Banana]
Size of HashSet: 3
Contains 'Apple': true
Iterating over the HashSet:
Apple
Orange
Is HashSet empty? true

=== Code Execution Successful ===
```

RESULT:

Ex.No:	Implementation of File Handling
Date:	

AIM:

To write a java program to file handling (Create, Read, Write, Delete) with name and absolute path of the file

ALGORITHM:

STEP1: Start the program.

STEP2: Create a file with the class name as File_hande and import all the file packages.

STEP3: Define the file name and file path.

STEP4: Define a function with name "createfile" to create a new text file by using the file name and path as parameters.

File file = new File(filePath + fileName);

STEP5: Define a function with name "writefile" to write into the text file by using the file name, file path and content to be written as parameters.

writer.write(content);

STEP6: Define a function with name "readfile" to read the text file by using the file name and file path as parameters.

FileReader reader = new FileReader(filePath + fileName);

STEP7: Define a function with name "deletefile " to delete a file by using the file name and path as parameters.

file.delete()

STEP8: In the main class call all the functions to execute.

STEP9**:** Stop the process.

PROGRAM:

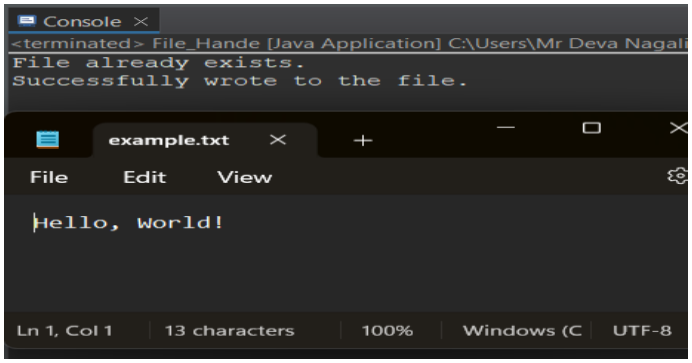
```
package Basics;


import java.io.File;

import java.io.FileReader;

import java.io.FileWriter;
```

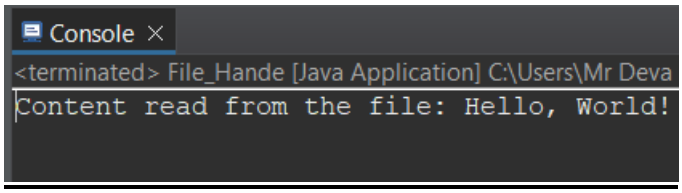
```
import java.io.IOException;

public class File_Hande {

	public static void main(String[] args) {

		String fileName = "example.txt";
		String filePath = "D:/notes/Java/";

		createFile(fileName, filePath);

		writeFile(fileName, filePath, "Hello, World!");

		String content = readFile(fileName, filePath);
		System.out.println("Content read from the file: " + content);

		deleteFile(fileName, filePath);
	}

	public static void createFile(String fileName, String filePath) {
		try {
			File file = new File(filePath + fileName);
			if (file.createNewFile()) {
				System.out.println("File created: " + file.getName());
				System.out.println("Absolute Path: " + file.getAbsolutePath());
			} else {
				System.out.println("File already exists.");
			}
		} catch (IOException e) {
			System.out.println("An error occurred while creating the file.");
```

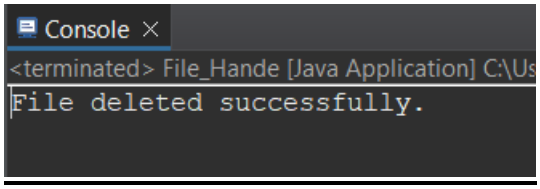
```
            e.printStackTrace();
        }
    }

    public static void writeFile(String fileName, String filePath, String content) {
        try {
            FileWriter writer = new FileWriter(filePath + fileName);
            writer.write(content);
            writer.close();
            System.out.println("Successfully wrote to the file.");
        } catch (IOException e) {
            System.out.println("An error occurred while writing to the file.");
            e.printStackTrace();
        }
    }

    public static String readFile(String fileName, String filePath) {
        StringBuilder content = new StringBuilder();
        try {
            FileReader reader = new FileReader(filePath + fileName);
            int character;
            while ((character = reader.read()) != -1) {
                content.append((char) character);
            }
            reader.close();
        } catch (IOException e) {
            System.out.println("An error occurred while reading the file.");
            e.printStackTrace();
        }
        return content.toString();
```

```
    }

    public static void deleteFile(String fileName, String filePath) {
        File file = new File(filePath + fileName);
        if (file.delete()) {
            System.out.println("File deleted successfully.");
        } else {
            System.out.println("Failed to delete the file.");
        }
    }
}
```

OUTPUT :







RESULT:

Ex.No:	Calculator Application
Date:	

AIM:

To write a java program to create a calculator application.

ALGORITHM:

STEP 1: Initialization

a.] The program starts by importing necessary packages and defining the main class CalculatorWithGUI, which extends Frame and implements ActionListener.

b.] Inside the class, various components are declared, including a JTextField for displaying input and output, a JPanel for holding buttons, an array of button strings, an array of JButton objects, and variables to store numbers, results, and mathematical operators.

STEP 2: Constructor (Calculator With GUI()):

a.] This method sets up the GUI components.

b.] It initializes the font and creates a text field (textInput) and a panel (panel).

c.] It sets the layout of the panel to a 5x4 grid.

d.] It creates buttons using the button strings, sets their font, adds action listeners, and adds them to the panel.

e.] Finally, it adds a window listener to exit the program when the window is closed.

STEP 3: Action Performed (actionPerformed(ActionEvent ae)):

a.] This method is invoked whenever a button is clicked.

b.] It retrieves the text from the clicked button and performs different actions based on the text.

c.] If the button represents an arithmetic operator (+, -, *, /, ^, √, %), it sets the operator (charSymbol) and stores the first operand (num1), then clears the text field for the next input.

d.] If the button is "C" (clear), it clears the text field and resets num1.

e.] If the button is the backspace symbol (\u232b), it removes the last character from the text field.

f.] If the button is "=" (equals), it calculates the result based on the stored operator and operands, then displays the result in the text field.

g.] If the button is a digit, it appends the digit to the text field.

STEP 4: Main Method (main()):

a.] This method creates an instance of CalculatorWithGUI, sets its title, size, and colors, and makes it visible.

PROGRAM:

```
import javax.swing.*;

import java.awt.*;

import java.awt.event.*;

import static java.lang.Double.parseDouble;


class CalculatorWithGUI extends Frame implements ActionListener {


  JTextField textInput;

  JPanel panel;


  String[] btnString = { "7", "8", "9", "+", "4", "5", "6", "-", "1", "2", "3", "*", "C",
"0", "=", "÷", "^", "√", "%", "\u232b"};


  int n = 20; //number of buttons

  JButton[] btn = new JButton[n];

  double num1 = 0;

  double num2 = 0;

  String result = " ";

  char charSymbol;


  public CalculatorWithGUI() {


    Font f = new Font("MONOSPACED", Font.BOLD, 18);


    textInput = new JTextField(10);
```

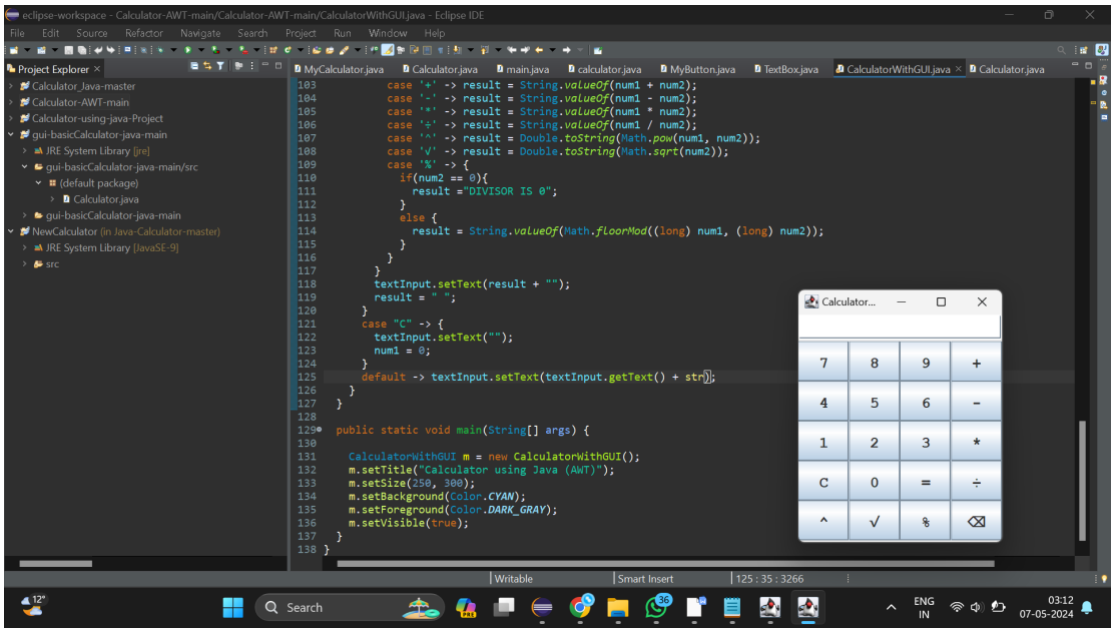
```
  textInput.setFont(f);

  panel = new JPanel();

  add(textInput, "North");
  add(panel, "Center");

  panel.setLayout(new GridLayout(5, 4));

  for (int i = 0; i < n; i++) {

    btn[i] = new JButton(btnString[i]);
    btn[i].setFont(f);
    btn[i].addActionListener(this);
    panel.add(btn[i]);
  }

  addWindowListener(new WindowAdapter() {

    public void windowClosing(WindowEvent we) {
      System.exit(0);
    }
  });
}

public void actionPerformed(ActionEvent ae) {

  String str = ae.getActionCommand();

  switch (str) {
```

```
case "+" -> {
  charSymbol = '+';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "-" -> {
  charSymbol = '-';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "*" -> {
  charSymbol = '*';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "÷" -> {
  charSymbol = '÷';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "^"-> {
  charSymbol = '^';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "√"-> {
  charSymbol = '√';
  textInput.setText("");
}
case "%" -> {
```

```
  charSymbol = '%';
  num1 = parseDouble(textInput.getText());
  textInput.setText("");
}
case "\u232b" -> {
  String theText = textInput.getText();
  if (theText.length() == 0) {
    result = "";
  } else {
    result = theText.substring(0, theText.length()-1);
  }
  textInput.setText(result + "");
  result = " ";
}
case "=" -> {
  num2 = parseDouble(textInput.getText());
  switch (charSymbol) {
    case '+' -> result = String.valueOf(num1 + num2);
    case '-' -> result = String.valueOf(num1 - num2);
    case '*' -> result = String.valueOf(num1 * num2);
    case '÷' -> result = String.valueOf(num1 / num2);
    case '^' -> result = Double.toString(Math.pow(num1, num2));
    case '√' -> result = Double.toString(Math.sqrt(num2));
    case '%' -> {
      if(num2 == 0){
        result ="DIVISOR IS 0";
      }
      else {
        result = String.valueOf(Math.floorMod((long) num1, (long) num2));
      }
```

```
        }
      }
      textInput.setText(result + "");
      result = " ";
    }
    case "C" -> {
      textInput.setText("");
      num1 = 0;
    }
    default -> textInput.setText(textInput.getText() + str);
  }
}

public static void main(String[] args) {

  CalculatorWithGUI m = new CalculatorWithGUI();
  m.setTitle("Calculator using Java (AWT)");
  m.setSize(250, 300);
  m.setBackground(Color.CYAN);
  m.setForeground(Color.DARK_GRAY);
  m.setVisible(true);
}
}
```

OUTPUT:



RESULT: