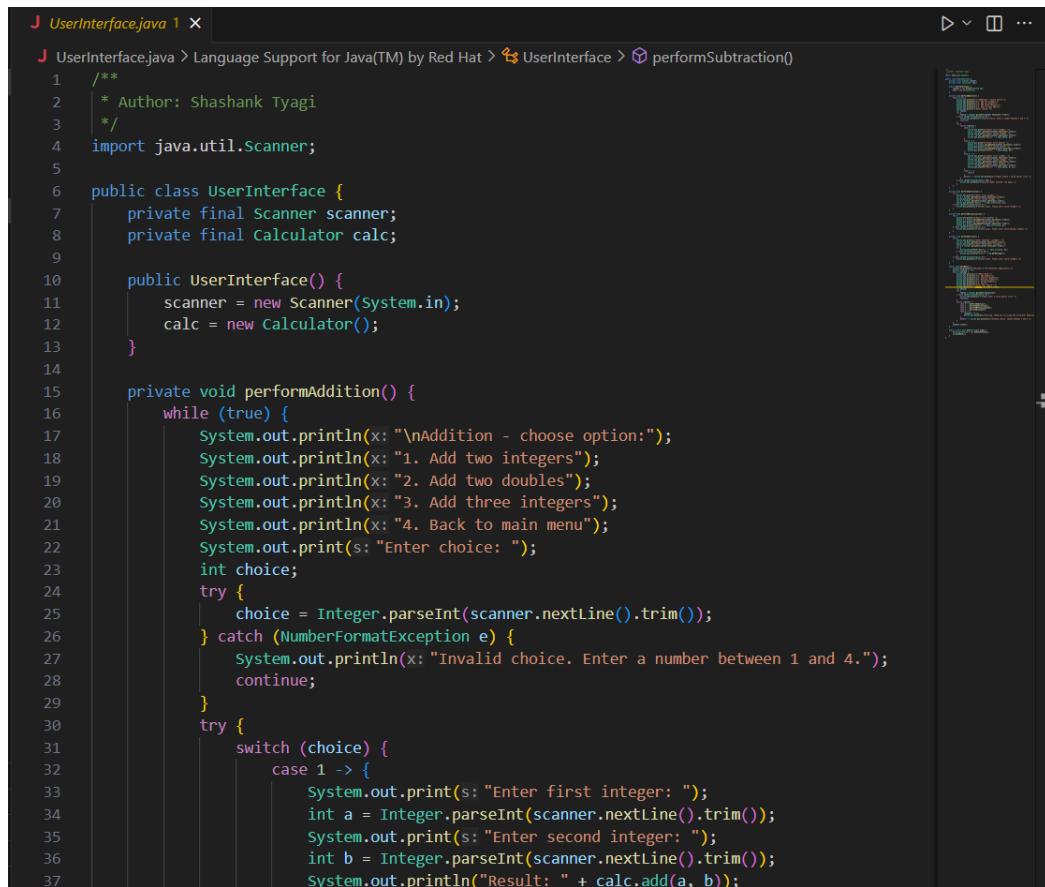


## Assignment Number: 02

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COURSE- BCA(AI&DS)



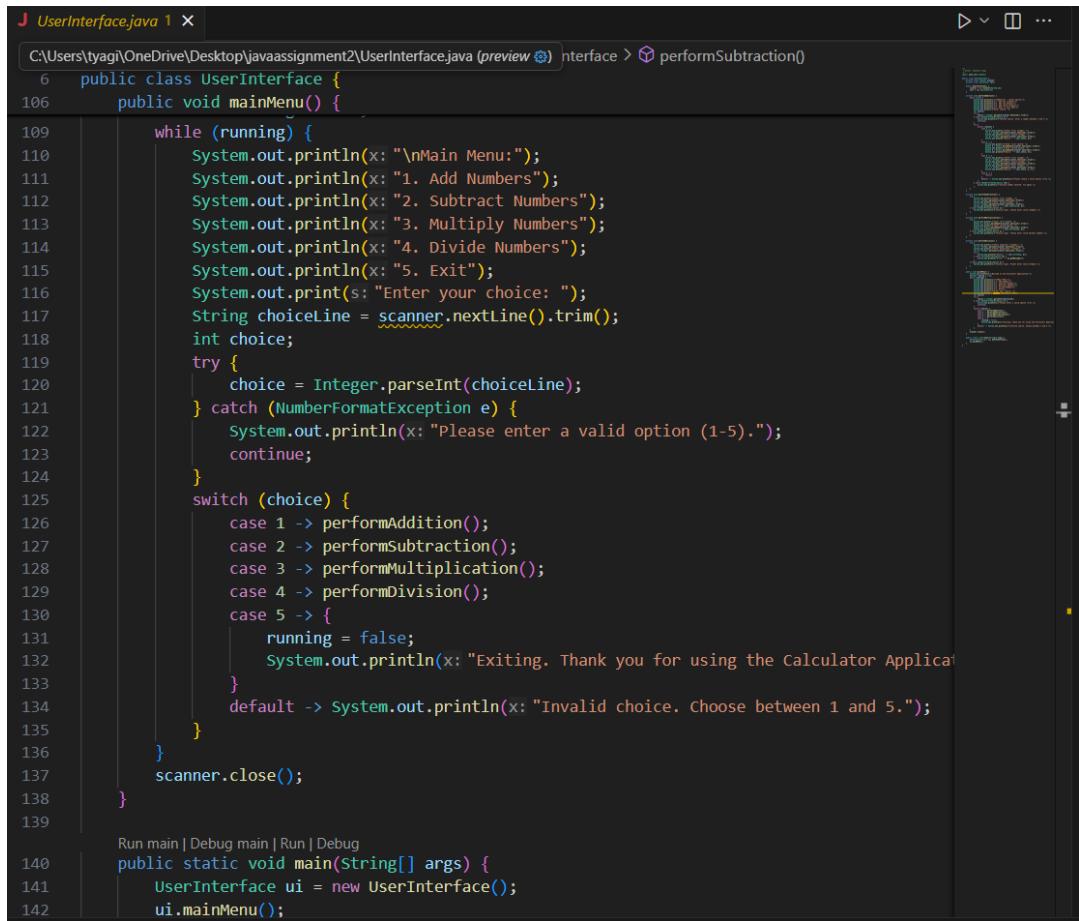
The screenshot shows a Java code editor window with the file `UserInterface.java` open. The code implements a user interface for a calculator. It uses a `Scanner` to read input from the console and a `Calculator` object to perform arithmetic operations. The code handles four choices: adding two integers, adding two doubles, adding three integers, or returning to the main menu. It includes error handling for invalid input.

```
1  /**
2  * Author: shashank Tyagi
3  */
4  import java.util.Scanner;
5
6  public class UserInterface {
7      private final Scanner scanner;
8      private final Calculator calc;
9
10     public UserInterface() {
11         scanner = new Scanner(System.in);
12         calc = new Calculator();
13     }
14
15     private void performAddition() {
16         while (true) {
17             System.out.println("nAddition - choose option:");
18             System.out.println("1. Add two integers");
19             System.out.println("2. Add two doubles");
20             System.out.println("3. Add three integers");
21             System.out.println("4. Back to main menu");
22             System.out.print("Enter choice: ");
23             int choice;
24             try {
25                 choice = Integer.parseInt(scanner.nextLine().trim());
26             } catch (NumberFormatException e) {
27                 System.out.println("Invalid choice. Enter a number between 1 and 4.");
28                 continue;
29             }
30             try {
31                 switch (choice) {
32                     case 1 -> {
33                         System.out.print("Enter first integer: ");
34                         int a = Integer.parseInt(scanner.nextLine().trim());
35                         System.out.print("Enter second integer: ");
36                         int b = Integer.parseInt(scanner.nextLine().trim());
37                         System.out.println("Result: " + calc.add(a, b));
38                     }
39                 }
40             }
41         }
42     }
43
44     private void performSubtraction() {
45         System.out.println("nSubtraction - choose option:");
46         System.out.println("1. Subtract two integers");
47         System.out.println("2. Subtract two doubles");
48         System.out.println("3. Subtract three integers");
49         System.out.println("4. Back to main menu");
50         System.out.print("Enter choice: ");
51         int choice;
52         try {
53             choice = Integer.parseInt(scanner.nextLine().trim());
54         } catch (NumberFormatException e) {
55             System.out.println("Invalid choice. Enter a number between 1 and 4.");
56             continue;
57         }
58         try {
59             switch (choice) {
60                 case 1 -> {
61                     System.out.print("Enter first integer: ");
62                     int a = Integer.parseInt(scanner.nextLine().trim());
63                     System.out.print("Enter second integer: ");
64                     int b = Integer.parseInt(scanner.nextLine().trim());
65                     System.out.println("Result: " + calc.subtract(a, b));
66                 }
67             }
68         }
69     }
70
71     private void performMultiplication() {
72         System.out.println("nMultiplication - choose option:");
73         System.out.println("1. Multiply two integers");
74         System.out.println("2. Multiply two doubles");
75         System.out.println("3. Multiply three integers");
76         System.out.println("4. Back to main menu");
77         System.out.print("Enter choice: ");
78         int choice;
79         try {
80             choice = Integer.parseInt(scanner.nextLine().trim());
81         } catch (NumberFormatException e) {
82             System.out.println("Invalid choice. Enter a number between 1 and 4.");
83             continue;
84         }
85         try {
86             switch (choice) {
87                 case 1 -> {
88                     System.out.print("Enter first integer: ");
89                     int a = Integer.parseInt(scanner.nextLine().trim());
90                     System.out.print("Enter second integer: ");
91                     int b = Integer.parseInt(scanner.nextLine().trim());
92                     System.out.println("Result: " + calc.multiply(a, b));
93                 }
94             }
95         }
96     }
97
98     private void performDivision() {
99         System.out.println("nDivision - choose option:");
100        System.out.println("1. Divide two integers");
101        System.out.println("2. Divide two doubles");
102        System.out.println("3. Divide three integers");
103        System.out.println("4. Back to main menu");
104        System.out.print("Enter choice: ");
105        int choice;
106        try {
107            choice = Integer.parseInt(scanner.nextLine().trim());
108        } catch (NumberFormatException e) {
109            System.out.println("Invalid choice. Enter a number between 1 and 4.");
110            continue;
111        }
112        try {
113            switch (choice) {
114                case 1 -> {
115                    System.out.print("Enter first integer: ");
116                    int a = Integer.parseInt(scanner.nextLine().trim());
117                    System.out.print("Enter second integer: ");
118                    int b = Integer.parseInt(scanner.nextLine().trim());
119                    System.out.println("Result: " + calc.divide(a, b));
120                }
121            }
122        }
123    }
124
125    private void performExit() {
126        System.out.println("nExiting program...");
127    }
128
129    public void start() {
130        Scanner scanner = new Scanner(System.in);
131        System.out.println("nWelcome to the calculator!");
132        System.out.println("nPlease select an operation:");
133        System.out.println("1. Addition");
134        System.out.println("2. Subtraction");
135        System.out.println("3. Multiplication");
136        System.out.println("4. Division");
137        System.out.println("5. Exit");
138        System.out.print("Enter choice: ");
139        int choice;
140        try {
141            choice = Integer.parseInt(scanner.nextLine().trim());
142        } catch (NumberFormatException e) {
143            System.out.println("Invalid choice. Enter a number between 1 and 5.");
144            continue;
145        }
146        try {
147            switch (choice) {
148                case 1 -> performAddition();
149                case 2 -> performSubtraction();
150                case 3 -> performMultiplication();
151                case 4 -> performDivision();
152                case 5 -> performExit();
153            }
154        }
155    }
156}
```

```

38 }
39     case 2 -> {
40         System.out.print(s: "Enter first double: ");
41         double a = Double.parseDouble(scanner.nextLine().trim());
42         System.out.print(s: "Enter second double: ");
43         double b = Double.parseDouble(scanner.nextLine().trim());
44         System.out.println("Result: " + calc.add(a, b));
45     }
46     case 3 -> {
47         System.out.print(s: "Enter first integer: ");
48         int a = Integer.parseInt(scanner.nextLine().trim());
49         System.out.print(s: "Enter second integer: ");
50         int b = Integer.parseInt(scanner.nextLine().trim());
51         System.out.print(s: "Enter third integer: ");
52         int c = Integer.parseInt(scanner.nextLine().trim());
53         System.out.println("Result: " + calc.add(a, b, c));
54     }
55     case 4 -> {
56         return;
57     }
58     default -> System.out.println(x: "Please choose a valid option (1-4).");
59 }
60 } catch (NumberFormatException nfe) {
61     System.out.println(x: "Invalid number entered. Try again.");
62 }
63 }
64 }
65
66 private void performSubtraction() {
67     try {
68         System.out.print(s: "Enter first integer: ");
69         int a = Integer.parseInt(scanner.nextLine().trim());
70         System.out.print(s: "Enter second integer: ");
71         int b = Integer.parseInt(scanner.nextLine().trim());
72         System.out.println("Result: " + calc.subtract(a, b));
73     } catch (NumberFormatException e) {
74         System.out.println(x: "Invalid input. Please enter valid integers.");
75     }
76 }
77
78 private void performMultiplication() {
79     try {
80         System.out.print(s: "Enter first double: ");
81         double a = Double.parseDouble(scanner.nextLine().trim());
82         System.out.print(s: "Enter second double: ");
83         double b = Double.parseDouble(scanner.nextLine().trim());
84         System.out.println("Result: " + calc.multiply(a, b));
85     } catch (NumberFormatException e) {
86         System.out.println(x: "Invalid input. Please enter valid decimal numbers.");
87     }
88 }
89
90 private void performDivision() {
91     try {
92         System.out.print(s: "Enter numerator (integer): ");
93         int a = Integer.parseInt(scanner.nextLine().trim());
94         System.out.print(s: "Enter denominator (integer): ");
95         int b = Integer.parseInt(scanner.nextLine().trim());
96         try {
97             System.out.println("Result: " + calc.divide(a, b));
98         } catch (ArithException ae) {
99             System.out.println("Error: " + ae.getMessage());
100        }
101    } catch (NumberFormatException e) {
102        System.out.println(x: "Invalid input. Please enter valid integers.");
103    }
104 }
105
106 public void mainMenu() {
107     System.out.println(x: "Welcome to the Calculator Application!");

```



```
J UserInterface.java 1 X
C:\Users\tyagi\OneDrive\Desktop\javaassignment2\UserInterface.java (preview ⓘ) interface > ⚡ performSubtraction()
6  public class UserInterface {
106     public void mainMenu() {
107         while (running) {
108             System.out.println(x: "\nMain Menu:");
109             System.out.println(x: "1. Add Numbers");
110             System.out.println(x: "2. Subtract Numbers");
111             System.out.println(x: "3. Multiply Numbers");
112             System.out.println(x: "4. Divide Numbers");
113             System.out.println(x: "5. Exit");
114             System.out.print(s: "Enter your choice: ");
115             String choiceLine = scanner.nextLine().trim();
116             int choice;
117             try {
118                 choice = Integer.parseInt(choiceLine);
119             } catch (NumberFormatException e) {
120                 System.out.println(x: "Please enter a valid option (1-5).");
121                 continue;
122             }
123             switch (choice) {
124                 case 1 -> performAddition();
125                 case 2 -> performSubtraction();
126                 case 3 -> performMultiplication();
127                 case 4 -> performDivision();
128                 case 5 -> {
129                     running = false;
130                     System.out.println(x: "Exiting. Thank you for using the Calculator Application.");
131                 }
132                 default -> System.out.println(x: "Invalid choice. Choose between 1 and 5.");
133             }
134         }
135     }
136     scanner.close();
137 }
138
139
Run main | Debug main | Run | Debug
140     public static void main(String[] args) {
141         UserInterface ui = new UserInterface();
142         ui.mainMenu();
143     }
144 }
```

```
137     scanner.close();
138 }
139
Run main | Debug main | Run | Debug
140     public static void main(String[] args) {
141         UserInterface ui = new UserInterface();
142         ui.mainMenu();
143     }
144 }
```

OUTPUT –

```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULTS
PS C:\Users\tyagi\OneDrive\Desktop\javaassignment2> cd "c:\Users\tyagi\OneDrive\Desktop\javaassignment2\" ; if ($?) { javac UserInterface.java } ; if ($?) { java UserInterface }
Welcome to the Calculator Application!

Main Menu:
1. Add Numbers
2. Subtract Numbers
3. Multiply Numbers
4. Divide Numbers
5. Exit
Enter your choice: cd "c:\Users\tyagi\OneDrive\Desktop\javaassignment2\" ; if (?) { javac UserInterface.java } ; if (?) { java UserInterface }
Please enter a valid option (1-5).

Main Menu:
1. Add Numbers
2. Subtract Numbers
3. Multiply Numbers
4. Divide Numbers
5. Exit
Enter your choice: 1

Addition - choose option:
1. Add two integers
2. Add two doubles
3. Add three integers
4. Back to main menu
Enter choice: 1
Enter first integer: 5
Enter second integer: 8
Result: 13

Addition - choose option:
1. Add two integers
2. Add two doubles
3. Add three integers
4. Back to main menu
Enter choice: 4

Main Menu:
1. Add Numbers
2. Subtract Numbers
```

```
Main Menu:
1. Add Numbers
2. Subtract Numbers
3. Multiply Numbers
4. Divide Numbers
5. Exit
Enter your choice: 5
Exiting. Thank you for using the Calculator Application!
```

# Explanation

The program is a **menu-based calculator application** built using Java. It follows **Object-Oriented Programming (OOP)** principles and is divided into two parts:

1. A *Calculator* class that performs all calculations
2. A *UserInterface* class that handles all user interactions

Your provided code is the **UserInterface**, which manages input/output and connects the user to the calculator logic.

## 1. Role of the UserInterface Class

The UserInterface is responsible for:

- Displaying menus to the user
- Taking input through the keyboard
- Validating that input
- Calling the correct methods of the Calculator class
- Showing the results back to the user

It essentially works as the **front-end** of the calculator application.

## 2. How Input Handling Works

A Scanner object is used to read everything typed by the user.

Input is first taken as a **string**, then converted into integers or doubles.

If the user types something invalid (like letters instead of numbers), the program catches errors and shows a helpful message instead of crashing.

## 3. Addition Operation (Multiple Options)

The program gives four choices under Addition:

- Add two integers
- Add two decimal numbers
- Add three integers
- Go back to the main menu

This uses **method overloading**, meaning the Calculator class has several add() methods with different parameter types and counts.

The program keeps showing the addition menu until the user returns to the main menu.

## 4. Subtraction, Multiplication, and Division

These methods do the following:

### Subtraction

Takes two integers from the user and subtracts them.

### **Multiplication**

Takes two double values and multiplies them.

### **Division**

Takes two integers and divides them.

If the user tries to divide by zero, the Calculator class throws an error, which is safely caught and displayed.

## **5. Main Menu Loop**

The heart of the program is the **main menu**, which repeatedly displays these choices:

1. Add Numbers
2. Subtract Numbers
3. Multiply Numbers
4. Divide Numbers
5. Exit

The user selects an option, and the program calls the appropriate method.

This process continues in a loop until the user chooses **Exit**, which ends the program gracefully.

## **6. Exception Handling**

The program uses exception handling to ensure:

- Wrong menu inputs don't crash the program
- Non-numeric inputs are handled properly
- Division by zero shows a clear error message

This makes the application user-friendly and safe.