BÁO CÁO THỰC HÀNH LAB 01
LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG

2. First Programs

2.2. Very first Java Program

2.2.1. Write, compile the first Java application:

Bài code 1:

Main.java

C: > Users > Nam > Desktop > Main.java

```
1    public class Main {
2        public static void main(String[] args) {
3            System.out.println("Hello world!");
4        }
5    }
```

- Kết quả:

```
PS C:\Users\Nam\Desktop> javac Main.java
PS C:\Users\Nam\Desktop> java Main
Hello world!
PS C:\Users\Nam\Desktop>
```

Bài code 2:

```
1  package Lab01;
2
3  public class Ex1 {
4      public static void main(String[] args) {
5          System.out.println("Hello world!");
6          System.out.println("Toi la Tran Thanh Nam");
7      }
8  }
9
```

- Kết quả:

```
"C:\Program Files\Java\jdk-20\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2023.2.2\lib\idea
Hello world!
Toi la Tran Thanh Nam
```

Bài code 3:

```java
package Lab01;

public class Ex1 {
    public static void main(String[] args) {
        System.out.println("Hello world!");
        System.out.println("Toi la Tran Thanh Nam\nToi nam nay 20 tuoi\t sinh nam 2003");
    }
}
```

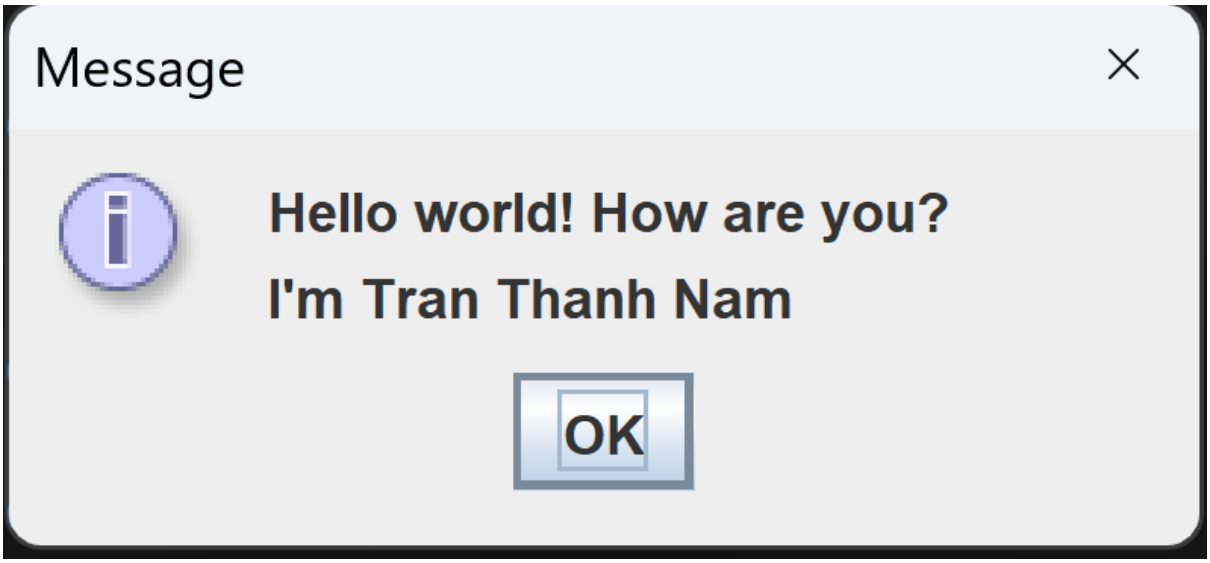
- Kết quả:

```
Run  Ex1
"C:\Program Files\Java\jdk-20\bin\java.exe" "-javaagent:
Hello world!
Toi la Tran Thanh Nam
Toi nam nay 20 tuoi  sinh nam 2003
```

2.2.2. Write, compile the first dialog Java program

```java
import javax.swing.JOptionPane;
public class FirstDialog{
    public static void main(String[] args) {
        JOptionPane.showMessageDialog( parentComponent: null,
                message: "Hello world! How are you?\nI'm Tran Thanh Nam");
        System.exit( status: 0);
    }
}
```

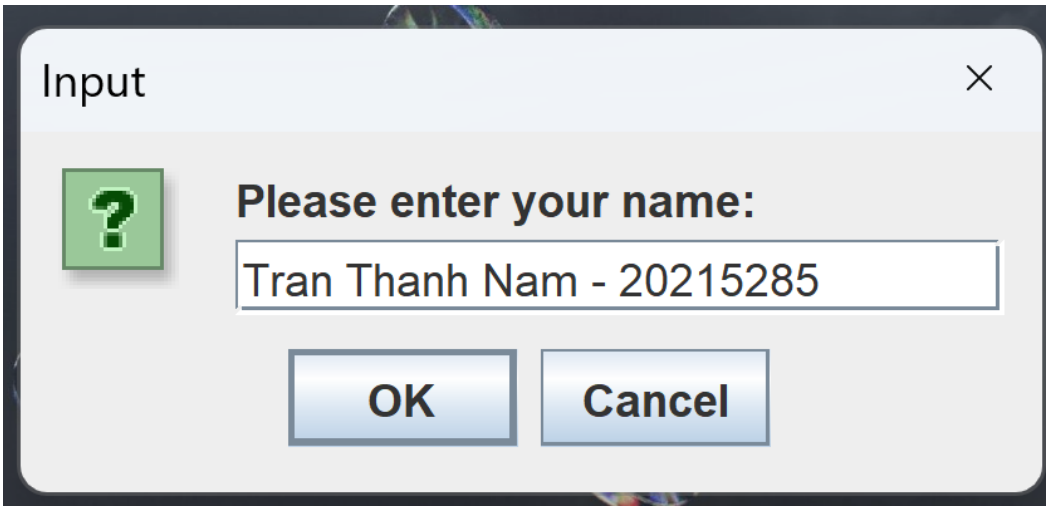
- Kết quả:

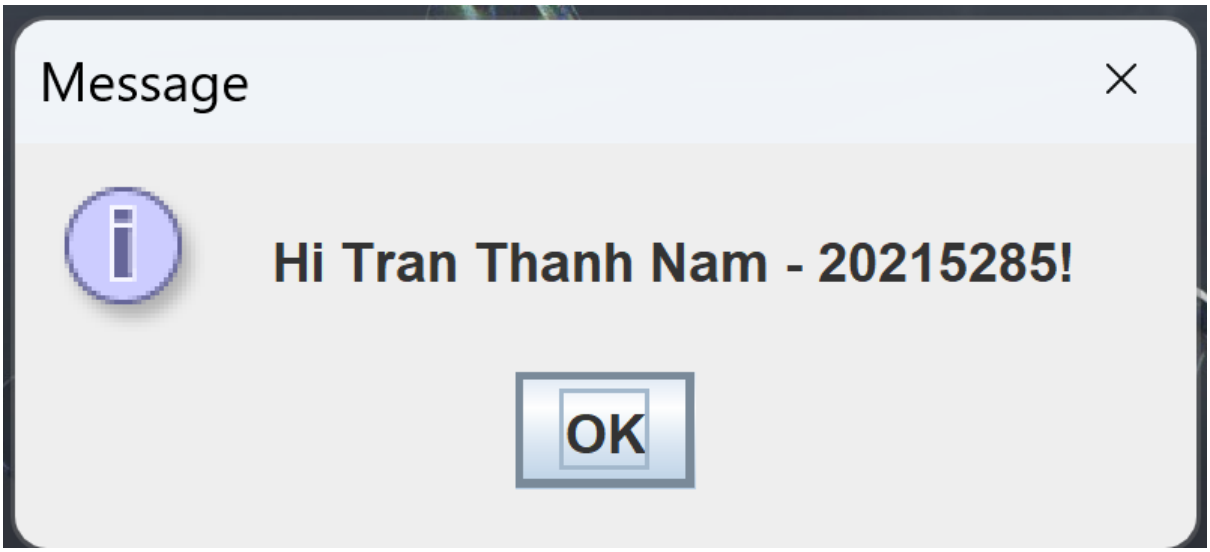


2.2.3. Write, compile the first input dialog Java application

```java
package Lab01;

import javax.swing.JOptionPane;
new *
public class HelloNameDialog {
    new *
    public static void main(String[] args) {

        String result;
        result = JOptionPane.showInputDialog("Please enter your name:");
        JOptionPane.showMessageDialog( parentComponent: null, message: "Hi " + result + "!");
        System.exit( status: 0);
    }
}
```

- Kết quả:



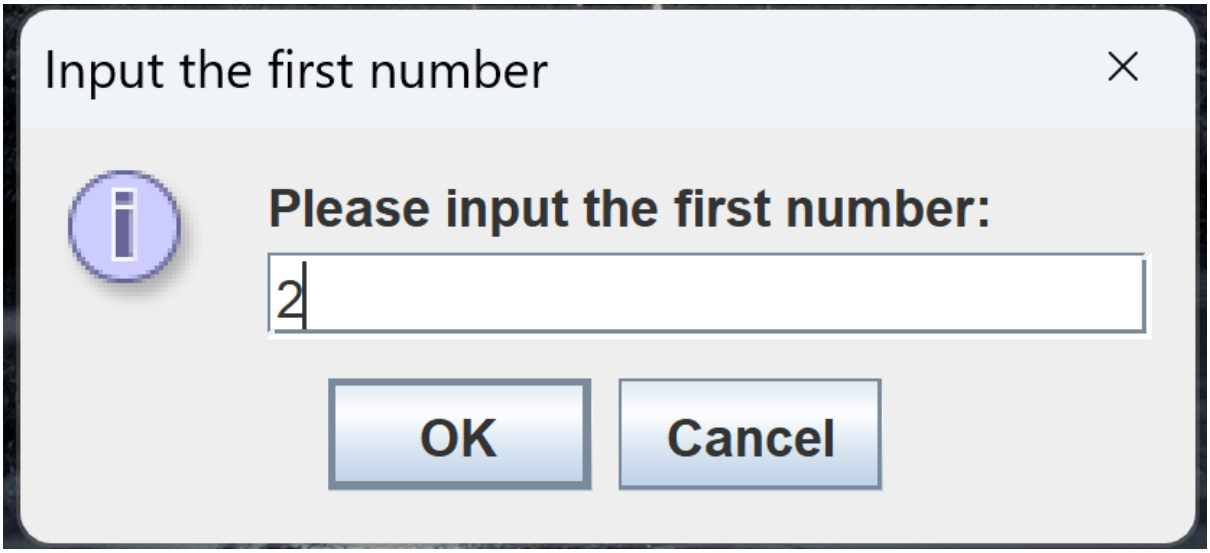


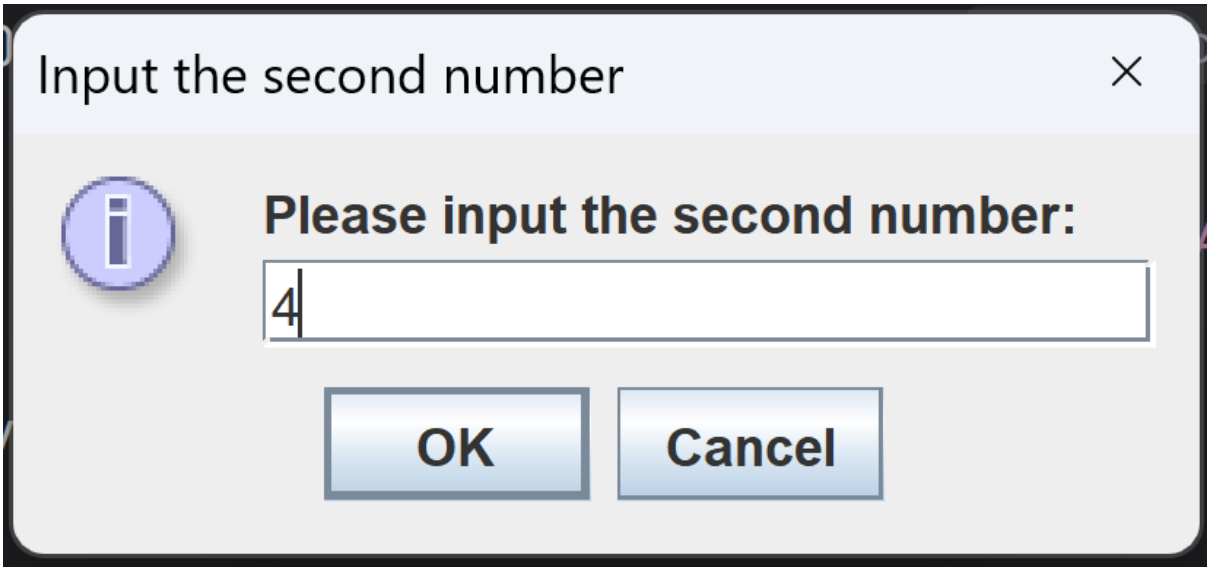
2.2.4. Write, compile, and run the following example:

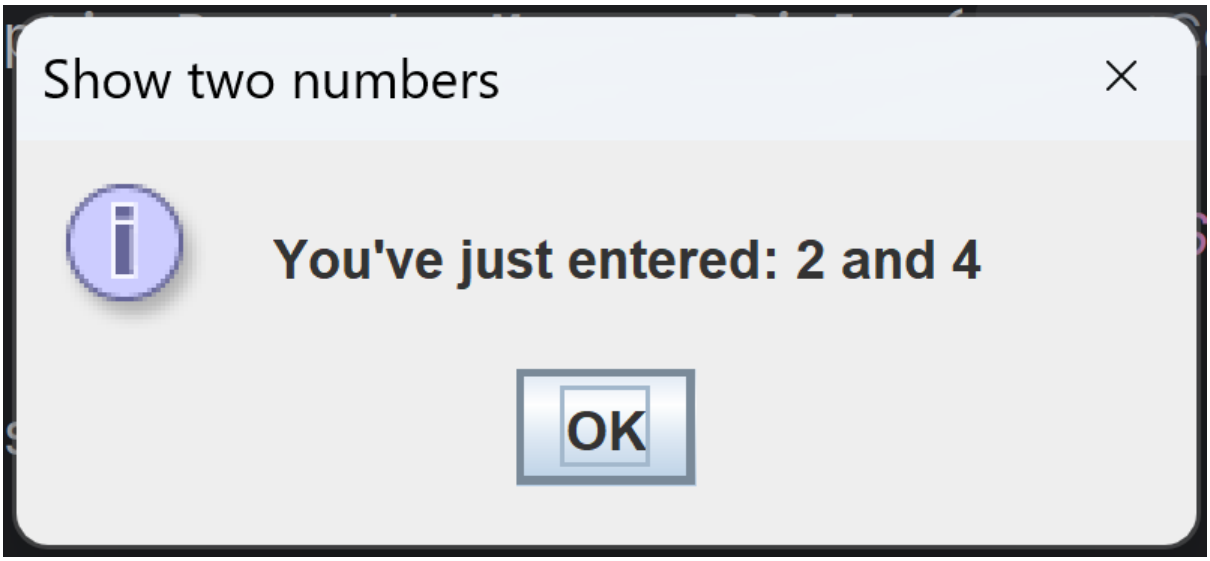
```
package Lab01;
import javax.swing.JOptionPane;
new *
public class ShowTwoNumbers {
    new *
    public static void main(String[] args) {

        String strNum1, strNum2;
        String strNotification = "You've just entered: ";

        strNum1 = JOptionPane.showInputDialog( parentComponent: null,
                message: "Please input the first number: ",
                title: "Input the first number",
                JOptionPane.INFORMATION_MESSAGE);

        strNotification += strNum1 + " and ";

        strNum2 = JOptionPane.showInputDialog( parentComponent: null,
                message: "Please input the second number: ",
                title: "Input the second number",
                JOptionPane.INFORMATION_MESSAGE);

```

```
20
21          strNotification += strNum2;
22
23          JOptionPane.showMessageDialog( parentComponent: null, strNotification,
24                  title: "Show two numbers",
25                  JOptionPane. INFORMATION_MESSAGE);
26
27          System.exit( status: 0);
28      }
29  }
30
```

- Kết quả:







2.2.5. Write a program to calculate sum, difference, product, and quotient of 2 double numbers which are entered by users.

Notes

- To convert from String to double, you can use

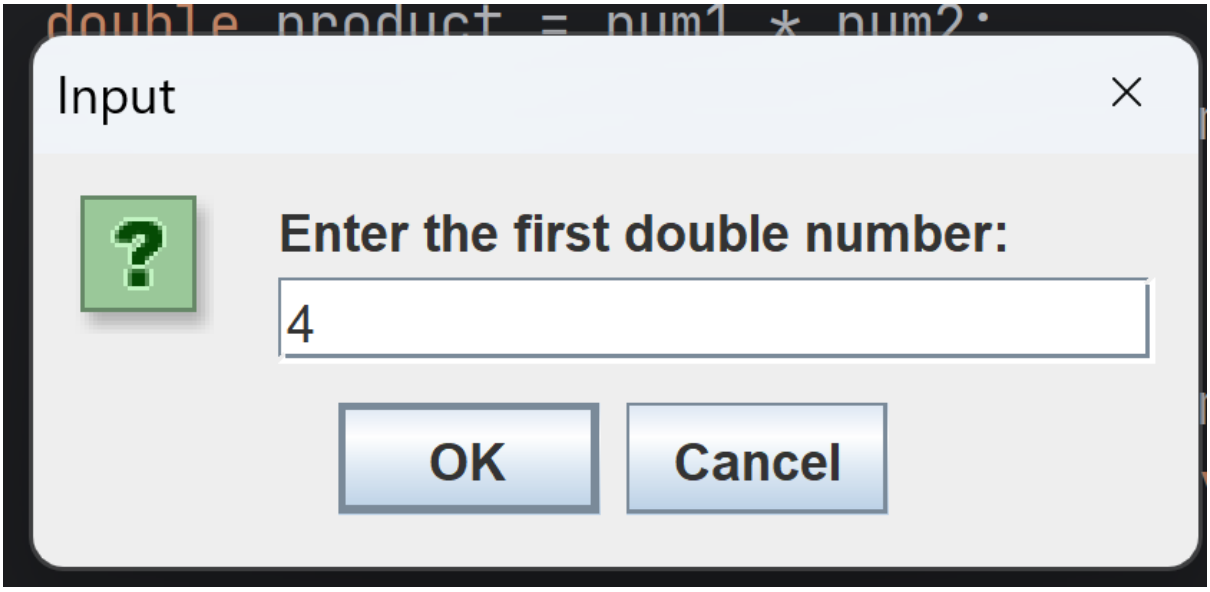
```
double num1 = Double.parseDouble(strNum1)
```

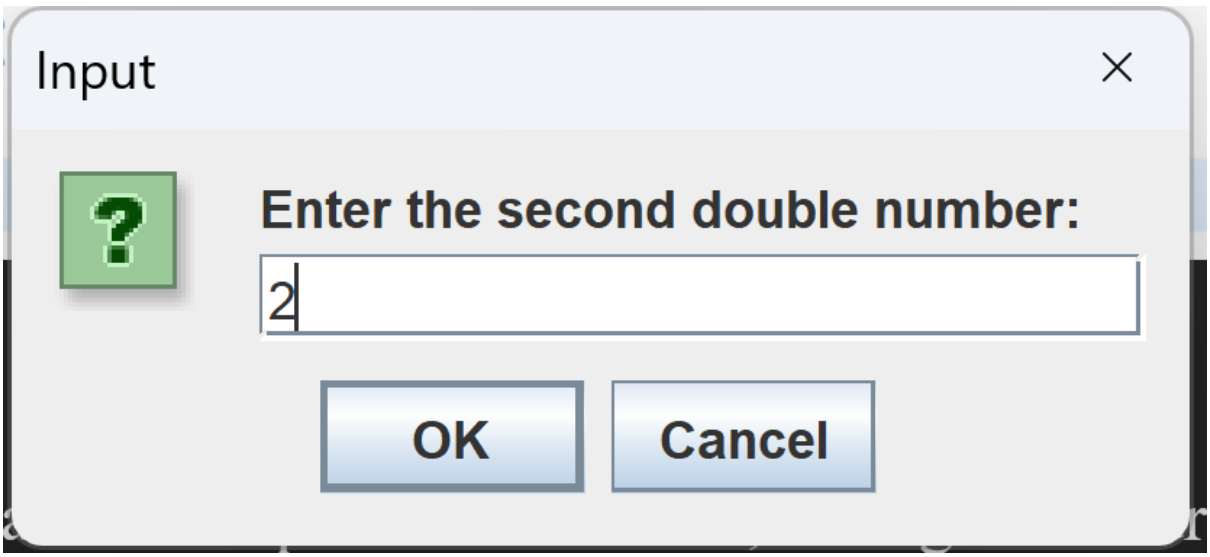
- Check the divisor of the division

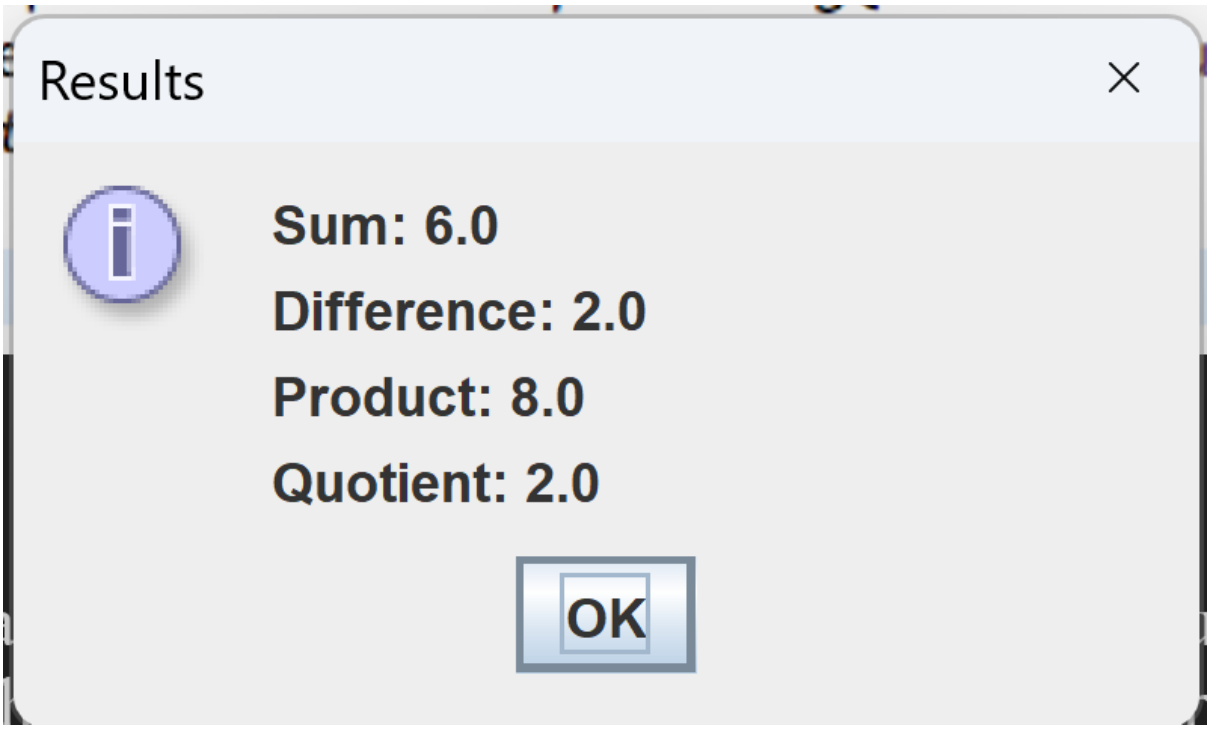
```
package Lab01;
import javax.swing.JOptionPane;
new *
public class Calculator {
    new *
    public static void main(String[] args) {
        // Nhap 2 so thuc
        String input1 = JOptionPane.showInputDialog("Enter the first double number:");
        String input2 = JOptionPane.showInputDialog("Enter the second double number:");

        // Convert
        double num1 = Double.parseDouble(input1);
        double num2 = Double.parseDouble(input2);

        // Calculate
        double sum = num1 + num2;
        double difference = num1 - num2;
        double product = num1 * num2;
        double quotient = (num2 != 0) ? (num1 / num2) : 0;

        // result message
        String resultMessage = "Sum: " + sum + "\nDifference: " + difference + "\nProduct: " +

```

```
18
19          // result message
20          String resultMessage = "Sum: " + sum + "\nDifference: " + difference +
21                  "\nProduct: " + product + "\nQuotient: " + quotient;
22
23          // Display
24          JOptionPane.showMessageDialog( parentComponent: null, resultMessage,
25                  title: "Results", JOptionPane.INFORMATION_MESSAGE);
26      }
27  }
```

- Kết quả:







2.2.6. Write a program to solve:

For simplicity, we only consider the real roots of the equations in this task.

- **The first-degree equation (linear equation) with one variable**

Note: A first-degree equation with one variable can have a form such as $ax + b = 0$ $(a \neq 0)$.

You should handle the case where the user input value 0 for a.

- **The system of first-degree equations (linear system) with two variables**

Note: A system of first-degree equations with two variables x_1 and x_2 can be written as follows.

$$a_{11}x_1 + a_{12}x_2 = b_1$$

$$a_{21}x_1 + a_{22}x_2 = b_2$$

You should handle the case where the values of the coefficients produce infinitely many solutions and the case where they produce no solution.

Hint:

Use the following determinants:

$$D = |a_{11}\ a_{12}\ a_{21}\ a_{22}\ | = a_{11}a_{22} - a_{21}a_{12} D_1 = |b_1\ a_{12}\ b_2\ a_{22}\ | = b_1a_{22} - b_2a_{12} D_2 = |a_{11}\ b_1\ a_{21}\ b_2\ | = a_{11}b_2 - a_{21}b_1$$

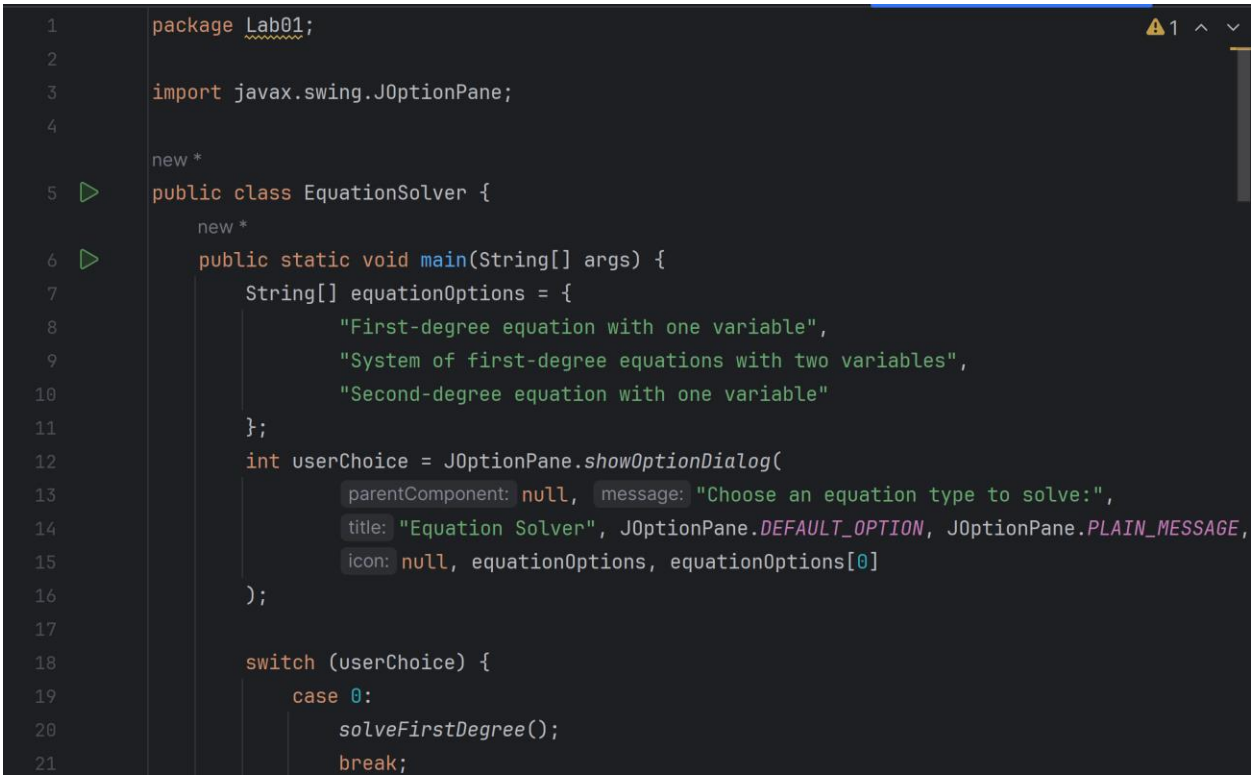
- **The second-degree equation with one variable**

Note: A second-degree equation with one variable (i.e., quadratic equation) can have a form such as $ax^2 + bx + c = 0$, where x is the variable, and a, b, and c are coefficients ($a \neq 0$).

You should handle the case where the values of the coefficients produce a double root & the case where they produce no root. You should also handle the case where the user input value 0 for a.

Hint:

Use the discriminant $\Delta = b^2 - 4ac$



```java
package Lab01;

import javax.swing.JOptionPane;

new *
public class EquationSolver {
    new *
    public static void main(String[] args) {
        String[] equationOptions = {
                "First-degree equation with one variable",
                "System of first-degree equations with two variables",
                "Second-degree equation with one variable"
        };
        int userChoice = JOptionPane.showOptionDialog(
                parentComponent: null, message: "Choose an equation type to solve:",
                title: "Equation Solver", JOptionPane.DEFAULT_OPTION, JOptionPane.PLAIN_MESSAGE,
                icon: null, equationOptions, equationOptions[0]
        );

        switch (userChoice) {
            case 0:
                solveFirstDegree();
                break;
```

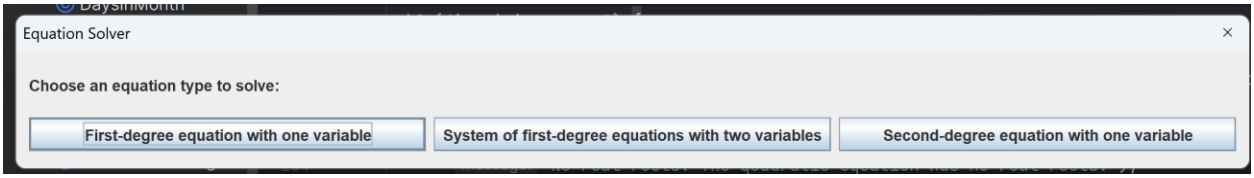
```
            case 1:
                solveLinearSystem();
                break;
            case 2:
                solveQuadratic();
                break;
            default:
                JOptionPane.showMessageDialog( parentComponent: null,  message: "Invalid choice"
        }
    }

    1 usage   new *
    private static void solveFirstDegree() {
        String strCoefficientA = JOptionPane.showInputDialog("Enter coefficient 'a':");
        double a = Double.parseDouble(strCoefficientA);

        if (a == 0) {
            JOptionPane.showMessageDialog( parentComponent: null,
                    message: "Invalid input: 'a' cannot be 0 in a first-degree equation.");
        } else {
            String strCoefficientB = JOptionPane.showInputDialog("Enter coefficient 'b':");
```

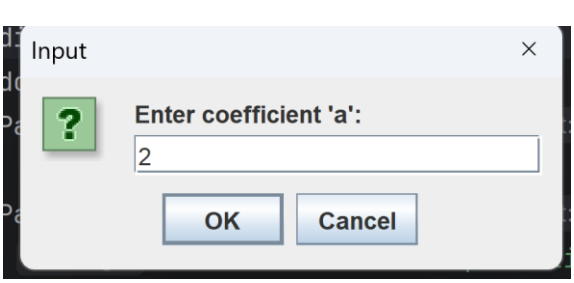
```
            double root = -b / a;
            JOptionPane.showMessageDialog( parentComponent: null,  message: "Root (x): " + root);
        }
    }

    1 usage   new *
    private static void solveLinearSystem() {
        String strA11 = JOptionPane.showInputDialog("Enter coefficient 'a11':");
        double a11 = Double.parseDouble(strA11);
        String strA12 = JOptionPane.showInputDialog("Enter coefficient 'a12':");
        double a12 = Double.parseDouble(strA12);
        String strA21 = JOptionPane.showInputDialog("Enter coefficient 'a21':");
        double a21 = Double.parseDouble(strA21);
        String strA22 = JOptionPane.showInputDialog("Enter coefficient 'a22':");
        double a22 = Double.parseDouble(strA22);

        String strB1 = JOptionPane.showInputDialog("Enter constant 'b1':");
        double b1 = Double.parseDouble(strB1);
        String strB2 = JOptionPane.showInputDialog("Enter constant 'b2':");
        double b2 = Double.parseDouble(strB2);

        double determinant = a11 * a22 - a21 * a12;
```

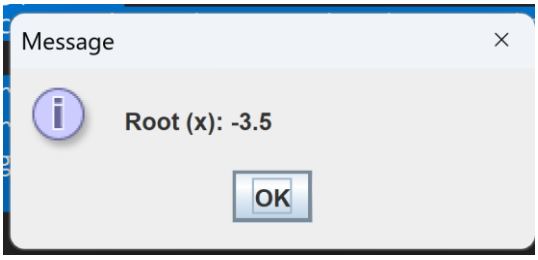
```
65          if (determinant == 0) {
66              if (a11 / a21 == b1 / b2) {
67                  JOptionPane.showMessageDialog( parentComponent: null,
68                          message: "Infinite solutions: The system has infinitely many solution
69              } else {
70                  JOptionPane.showMessageDialog( parentComponent: null,
71                          message: "No solution: The system has no solution.");
72              }
73          } else {
74              double x1 = (b1 * a22 - b2 * a12) / determinant;
75              double x2 = (a11 * b2 - a21 * b1) / determinant;
76              JOptionPane.showMessageDialog( parentComponent: null,
77                      message: "Roots (x1, x2): " + x1 + ", " + x2);
78          }
79      }
80
        1 usage  new *
81      private static void solveQuadratic() {
82          String strCoefficientA = JOptionPane.showInputDialog("Enter coefficient 'a':");
83          double a = Double.parseDouble(strCoefficientA);
84          String strCoefficientB = JOptionPane.showInputDialog("Enter coefficient 'b':");
85          double b = Double.parseDouble(strCoefficientB);
```

```
85          double b = Double.parseDouble(strCoefficientB);                    1
            String strCoefficientC = JOptionPane.showInputDialog("Enter coefficient 'c':");
87          double c = Double.parseDouble(strCoefficientC);
88
89          double discriminant = b * b - 4 * a * c;
90
91          if (a == 0) {
92              JOptionPane.showMessageDialog( parentComponent: null,
93                      message: "Invalid input: 'a' cannot be 0 in a quadratic equation.");
94          } else if (discriminant > 0) {
95              double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);
96              double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);
97              JOptionPane.showMessageDialog( parentComponent: null,
98                      message: "Roots (x1, x2): " + root1 + ", " + root2);
99          } else if (discriminant == 0) {
100             double doubleRoot = -b / (2 * a);
101             JOptionPane.showMessageDialog( parentComponent: null, message: "Double root: " + doub
102         } else {
103             JOptionPane.showMessageDialog( parentComponent: null,
104                     message: "No real roots: The quadratic equation has no real roots.");
105         }
106     }
107 }
108
```

- Kết quả:





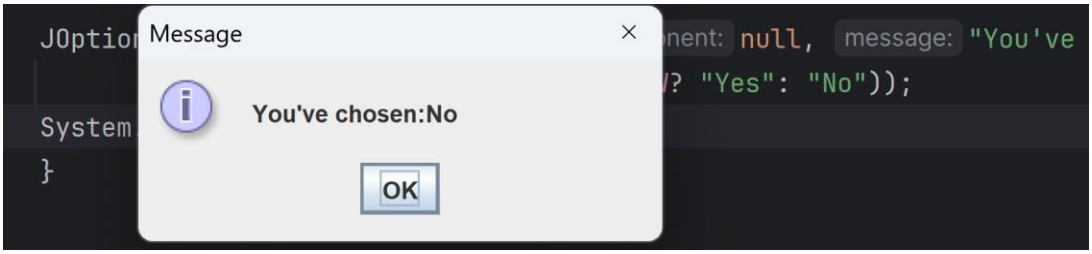


6. Exercises

6.1. Write, compile and run the ChoosingOption program:

```
1   package Lab01;
2   import javax.swing.JOptionPane;
    new *
3   public class ChoosingOption {
    new *
4   public static void main(String[] args) {
5       int option = JOptionPane.showConfirmDialog( parentComponent: null,
6               message: "Do you want to change to the first class ticket?");
7
8       JOptionPane.showMessageDialog( parentComponent: null, message: "You've chosen:"
9               + (option==JOptionPane.YES_OPTION? "Yes": "No"));
10      System.exit( status: 0);
11      }
12  }
```

- Kết quả:



6.2. Write a program for input/output from keyboard

```java
package Lab01;

import java.util.Scanner;
new *
public class InputFromKeyBoard{
    new *
    public static void main(String args[]){

        Scanner keyboard = new Scanner(System.in);
        System.out.println("What's your name?");
        String strName = keyboard.nextLine();
        System.out.println("How old are you?");
        int iAge = keyboard.nextInt();
        System.out.println("How tall are you (m)?");
        double dHeight = keyboard.nextDouble();

        System.out.println("Mrs/Ms." + strName + "," + iAge+" years old. " +
                "Your height is " + dHeight + " m.");

    }

}
```

- Kết quả:

```
"C:\Program Files\Java\jdk-20\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2023.2.2\lib\idea_r
What's your name?
nam
How old are you?
20
How tall are you (m)?
175
Mrs/Ms.nam,20 years old. Your height is 175.0 m.

Process finished with exit code 0
```

6.3. Write a program to display a triangle with a height of n stars (*), n is entered by users.

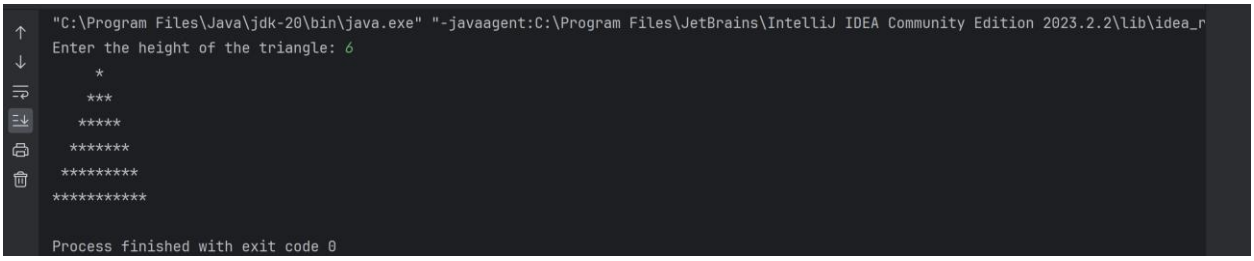
E.g. n=5:

```
    *
   ***
  *****
 *******
*********
```

Note: You must create a new Java project for this exercise.

```java
package Lab01;

import java.util.Scanner;

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

        System.out.print("Enter the height of the triangle: ");
        int n = scanner.nextInt();

        for (int i = 1; i <= n; i++) {
            // Print spaces to align the stars to the right
            for (int j = 1; j <= n - i; j++) {
                System.out.print(" ");
            }

            // Print the stars for this row
            for (int k = 1; k <= 2 * i - 1; k++) {
                System.out.print("*");
            }

            // Move to the next line for the next row
            System.out.println();
        }

        scanner.close();
    }
}
```

- Kết quả:



6.4. Write a program to display the number of days of a month, which is entered by users (both month and year). If it is an invalid month/year, ask the user to enter again.

Note: You must create a new Java project for this exercise.

- The user can either enter a month in its full name, abbreviation, in 3 letters, or in number. To illustrate, the valid inputs of *January* are January, Jan., Jan, and 1.
- The user must enter a year in a non-negative number and enter all the digits. For instance, the valid inputs of year *1999* is only 1999, but not 99, "one thousand nine hundred ninety-nine", or anything else.
- A year is either a common year of 365 days or a leap year of 366 days. Every year that is divisible by 4 is a leap year, except for years that are divisible by 100, but not by 400. For instance, year 1800 is not a leap year, yet year 2000 is a leap year. In a year, there are twelve months, which are listed in order as follows.

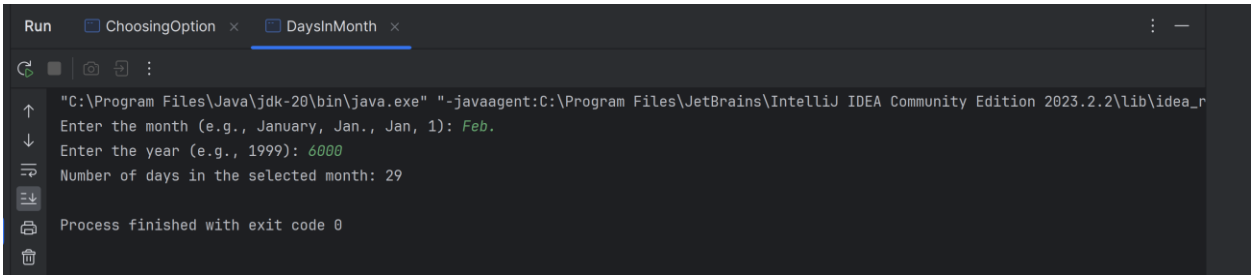
Month	January	February	March	April	May	June	July	August	September	October	November	December
Abbreviation	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
In 3 letters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
In Number	1	2	3	4	5	6	7	8	9	10	11	12
Days of Month in Common Year	31	28	31	30	31	30	31	31	30	31	30	31
Days of Month in Leap Year	31	**29**	31	30	31	30	31	31	30	31	30	31

```java
package Lab01;

import java.util.Scanner;

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

        // Input the month
        String inputMonth;
        int month = 0;
        while (true) {
            System.out.print("Enter the month (e.g., January, Jan., Jan, 1): ");
            inputMonth = scanner.nextLine().toLowerCase();
            switch (inputMonth) {
                case "january":
                case "jan.":
                case "jan":
                case "1":
                    month = 1;
                    break;
                case "february":
```

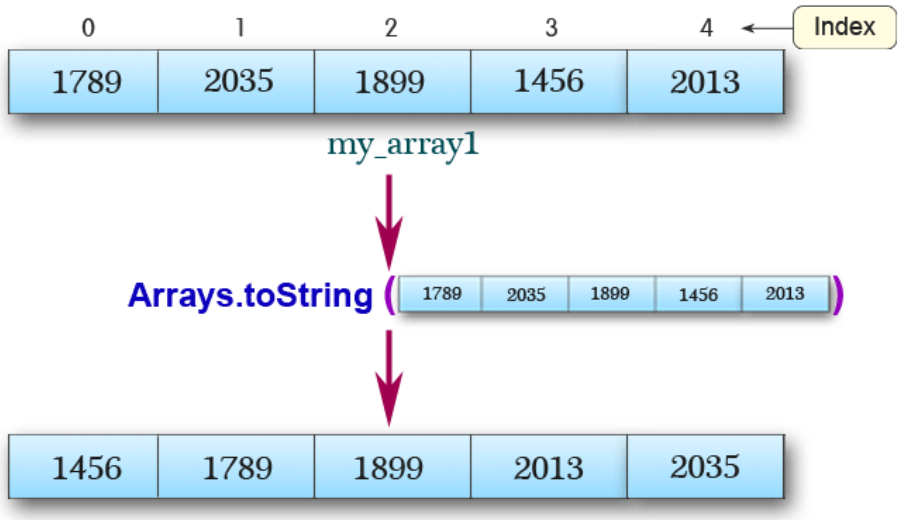
```java
        // Input the year
        int year;
        while (true) {
            System.out.print("Enter the year (e.g., 1999): ");
            if (scanner.hasNextInt()) {
                year = scanner.nextInt();
                if (year >= 0) {
                    break;
                }
            }
            System.out.println("Invalid year. Please enter a non-negative integer year.");
            scanner.next(); // Clear the invalid input
        }

        // Check for leap year
        boolean isLeapYear = (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);

        // Determine the number of days in the entered month
        int daysInMonth;
```

```java
        switch (month) {
            case 4:
            case 6:
            case 9:
            case 11:
                daysInMonth = 30;
                break;
            case 2:
                daysInMonth = isLeapYear ? 29 : 28;
                break;
            default:
                daysInMonth = 31;
                break;
        }

        // Display the result
        System.out.println("Number of days in the selected month: " + daysInMonth);

        scanner.close();
    }
}
```

- Kết quả:



6.5. Write a Java program to sort a numeric array, and calculate the sum and average value of array elements.



Note: You must create a new Java project for this exercise.

- The array can be entered by the user or a constant.

```java
package Lab01;

import java.util.Arrays;
import java.util.Scanner;

ttnamnktp *
public class SortedArray {
    ttnamnktp *
    public static void main(String[] args) {
        // Define the numeric array
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the length of array: ");
        int length = scanner.nextInt();
        int[] array = new int[length];

        for (int i = 0; i < length; i++) {
            array[i] = scanner.nextInt();
        }

        // Sort the array in ascending order
        Arrays.sort(array);
```

```java
        // Calculate the sum and average of array elements
        int sum = 0;
        for (int num : array) {
            sum += num;
        }
        double average = (double) sum / length;

        // Display the sorted array, sum, and average
        System.out.println("Sorted Array: " + Arrays.toString(array));
        System.out.println("Sum of Array Elements: " + sum);
        System.out.println("Average of Array Elements: " + average);
    }
}
```

- Kết quả:

```
"C:\Program Files\Java\jdk-20\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2023.2.2\lib\idea_r
Enter the length of array: 4
6
33
1
-8
Sorted Array: [-8, 1, 6, 33]
Sum of Array Elements: 32
Average of Array Elements: 8.0

Process finished with exit code 0
```

6.6. Write a Java program to add two matrices of the same size.

Note: You must create a new Java project for this exercise.

- The matrices can be entered by the user or constants.

```java
package Lab01;

import java.util.Scanner;

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

        // Input the number of rows and columns for the matrices
        System.out.print("Enter the number of rows: ");
        int rows = scanner.nextInt();
        System.out.print("Enter the number of columns: ");
        int columns = scanner.nextInt();

        // Initialize two matrices
        int[][] matrixA = new int[rows][columns];
        int[][] matrixB = new int[rows][columns];

        // Input elements for the first matrix
        System.out.println("Enter elements for the first matrix:");
        inputMatrixElements(scanner, matrixA);

        // Input elements for the second matrix
        System.out.println("Enter elements for the second matrix:");
        inputMatrixElements(scanner, matrixB);

        // Initialize the result matrix
        int[][] resultMatrix = new int[rows][columns];

        // Add the matrices
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < columns; j++) {
                resultMatrix[i][j] = matrixA[i][j] + matrixB[i][j];
            }
        }

        // Display the result matrix
        System.out.println("Matrix A:");
        displayMatrix(matrixA);
```

```
41          System.out.println("Matrix B:");
42          displayMatrix(matrixB);
43
44          System.out.println("Matrix A + Matrix B:");
45          displayMatrix(resultMatrix);
46
47          scanner.close();
48      }
49
50      // Function to input elements into a matrix
        2 usages  new *
51  @   public static void inputMatrixElements(Scanner scanner, int[][] matrix) {
52          for (int i = 0; i < matrix.length; i++) {
53              for (int j = 0; j < matrix[0].length; j++) {
54                  matrix[i][j] = scanner.nextInt();
55              }
56          }
57      }
58
```

```
58
59      // Function to display a matrix
        3 usages  new *
60  @   public static void displayMatrix(int[][] matrix) {
61          for (int[] row : matrix) {
62              for (int element : row) {
63                  System.out.print(element + " ");
64              }
65              System.out.println();
66          }
67      }
68  }
```

- Kết quả:

```
"C:\Program Files\Java\jdk-20\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2023.2.2\lib\idea_r
Enter the number of rows: 2
Enter the number of columns: 2
Enter elements for the first matrix:
2
3
1
5
Enter elements for the second matrix:
4
-4
-9
0
```


Matrix A:
2 3
1 5
Matrix B:
4 -4
-9 0
Matrix A + Matrix B:
6 -1
-8 5
Process finished with exit code 0