Lab 1. Environment Setup & Java Basics

IT3103 – 7850868 – Thực hành Lập Trình Hướng Đối Tượng

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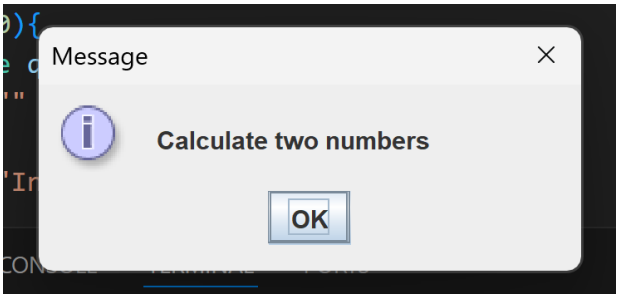
Bài 2.2.5. **Write a program to calculate sum, difference, product, and quotient of 2 double numbers which are entered by users.**

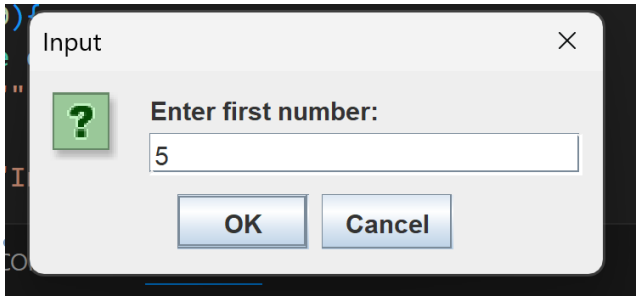
- **1. Code**

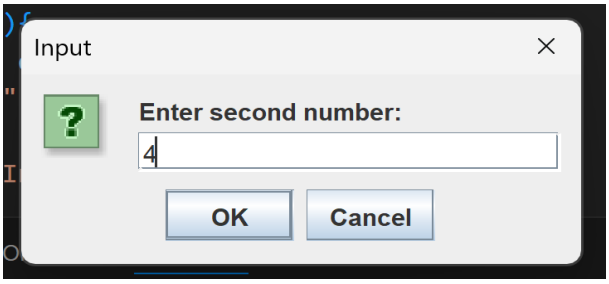
```
import javax.swing.JOptionPane;

public class Operation {
    public static void main(String[] args){
        String number1 = JOptionPane.showInputDialog("Enter first number: ");
        String number2 = JOptionPane.showInputDialog("Enter second number:
");     double num1 = Double.parseDouble(number1);
        double num2 = Double.parseDouble(number2);
        double sum = num1 + num2;
        double difference = num1 - num2;
        double product = num1 * num2;
        String qt;
        if(num2!=0){
            double quotient = num1/num2;
            qt = "" + quotient;
        }else{
            qt = "Invalid";
        }

        JOptionPane.showMessageDialog(null,
            "Sum: "+ sum +
            "\nDifference: "+ difference +
            "\nProduct: "+ product +
            "\nQuotient: "+ qt
        );
    }
}
```

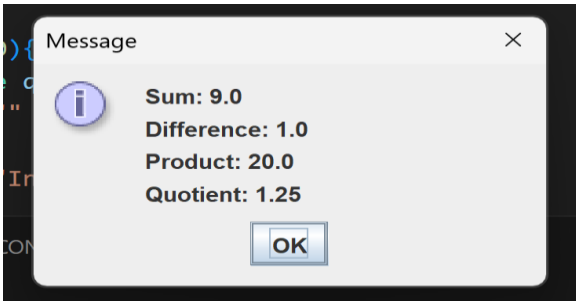
2. Run

- **Case 1 Divisor != 0**

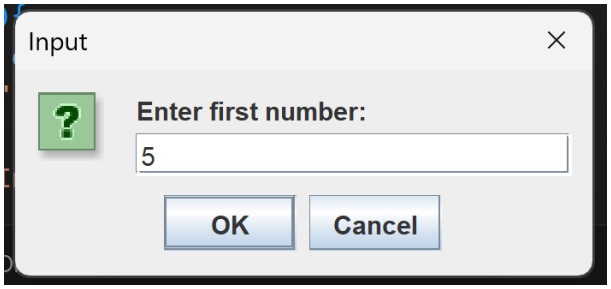


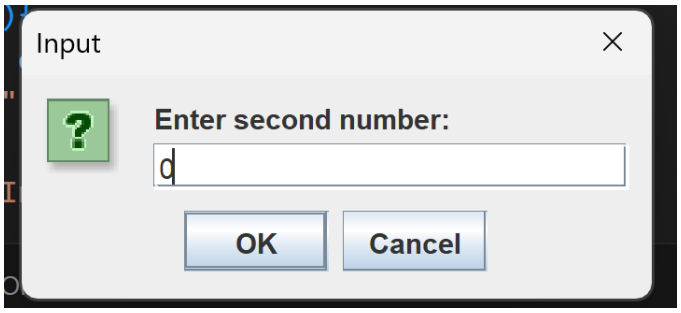


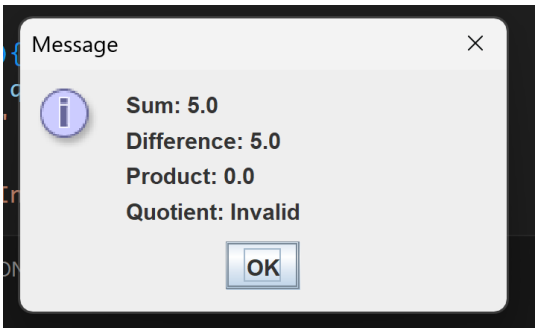




- **Case 2 Divisor == 0**







  - **The Program did not do the divisor and printed out Invalid**

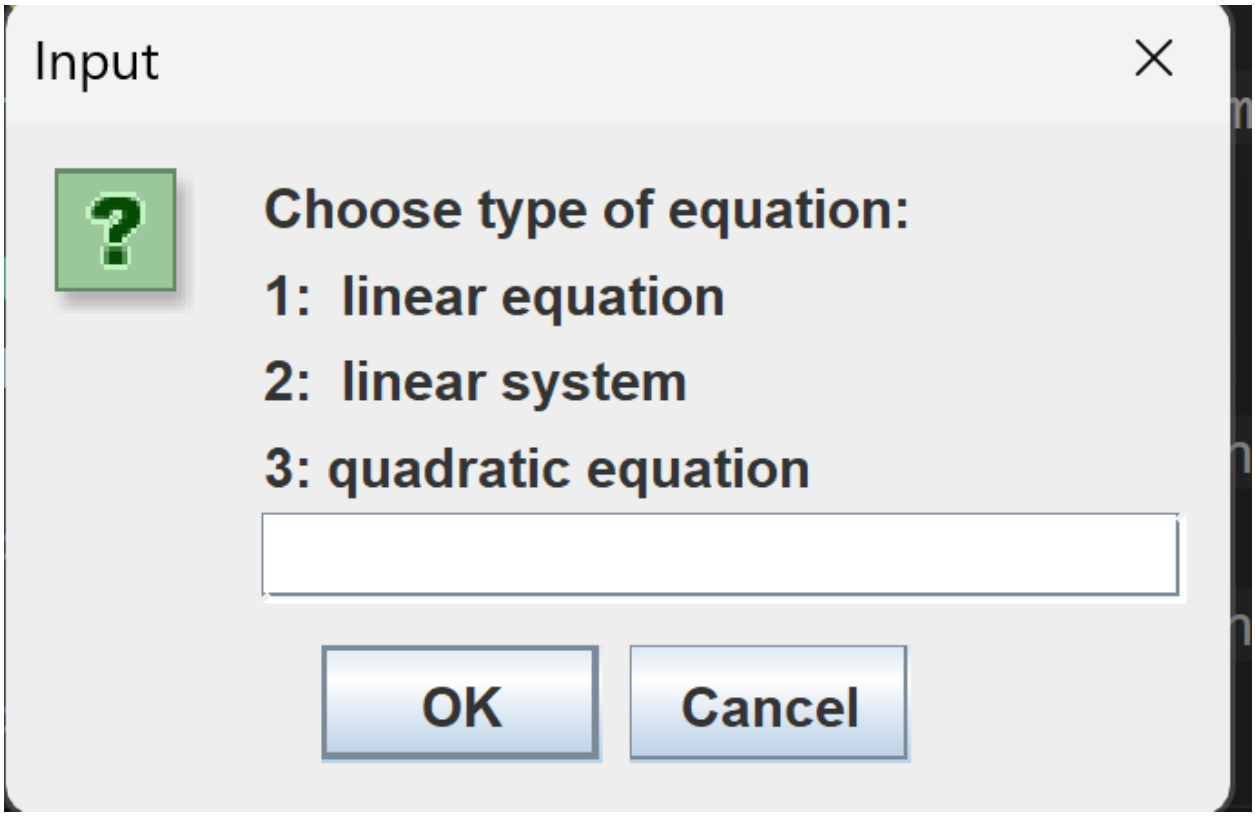
Bài 2.2.6. Write a program to solve

1. Code

```java
import javax.swing.JOptionPane;

public class solveEquation{
    public static void main(String[] args){
        double inp = getDouble("Choose type of equation:\n1:  linear equation\n2:  linear system\n3:
quadratic equation\n");
        if(inp==1){
          //Solve first degree equation
            double a = getDouble("Enter a: ");
            double b = getDouble("Enter b: ");
            String ans = a==0 ? "No solution" :"" + -b/a;
            JOptionPane.showMessageDialog(null,ans);
        }else if(inp==2){
          //Solve system of first degree equation
            double a11,a12,a21,a22,b1,b2;
            a11=getDouble("Enter a11: ");
            a12=getDouble("Enter a12: ");
            b1=getDouble("Enter b1: ");
            a21=getDouble("Enter a21: ");
            a22=getDouble("Enter a22: ");
            b2=getDouble("Enter b2: ");

            double D=a11*a22-a21*a12;
            double D1=b1*a22-b2*a12;
            double D2=a11*b2-a21*b1;

            if(D==0){
                if(D1==0&&D2==0){
                    JOptionPane.showMessageDialog(null,"Infinitely many solutions");
                }else{
                    JOptionPane.showMessageDialog(null,"No solution");
                }
            }else{
                JOptionPane.showMessageDialog(null, "x1: "+D1/D+"\nx2: "+D2/D);
            }

        }else if(inp==3){
          //Solve second degree equation
            double a=getDouble("Enter a: ");
            double b=getDouble("Enter b: ");
            double c=getDouble("Enter c: ");
            if(a==0){
                JOptionPane.showMessageDialog(null, "One solution\nx:  "+(-c/b));
            }else{
                double D = b*b-4*a*c;
                if(D<0){
                    JOptionPane.showMessageDialog(null, "No solution");
                }else if(D==0){
                    JOptionPane.showMessageDialog(null,"One solution\nx: "+(-b/2*a));
                }else{
                    double sqrD=Math.sqrt(D);
                    double x1=(-b+sqrD)/2*a;
                    double x2=(-b-sqrD)/2*a;
                    JOptionPane.showMessageDialog(null,"Two solutions\nx1: "+x1+"\nx2: "+x2);
                }
            }
        }
    }
    //Input & parse to Double
    private static double getDouble(String message){
        String sn = JOptionPane.showInputDialog(message);
        double n=Double.parseDouble(sn);
        return n;
    }
}
```

2. Run

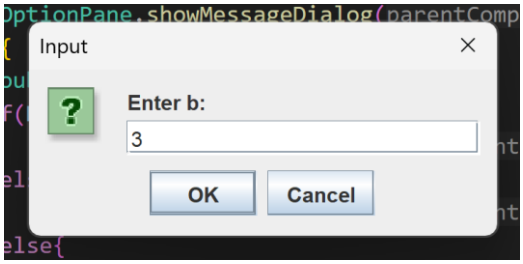
a. Choice window

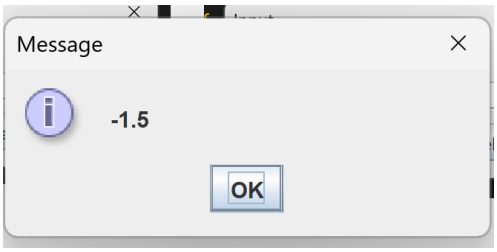


Nhập 1, 2, 3 để giải theo yêu cầu

b. Test

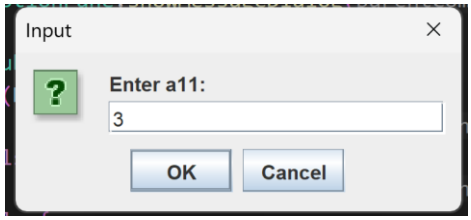
i. Linear equation

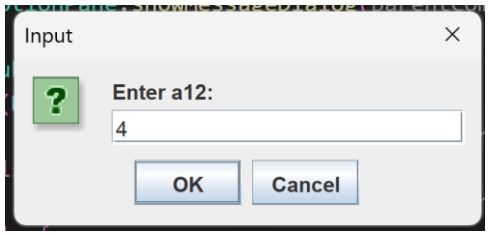


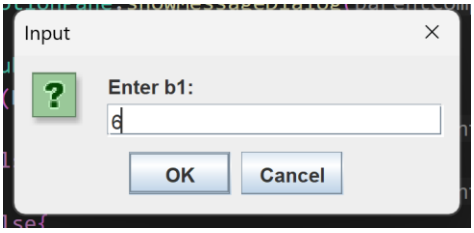


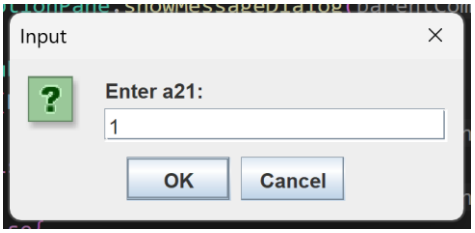
ii. System of linear equations

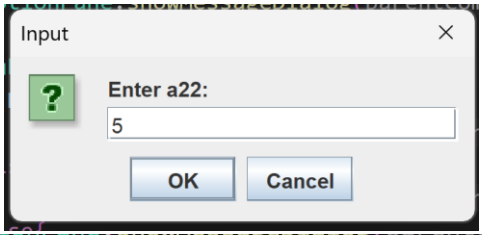
Case 1:

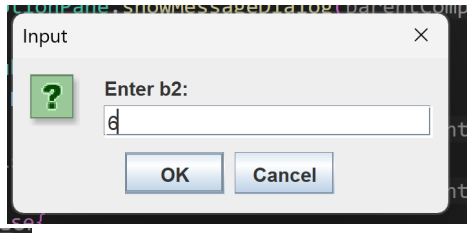

Input
Enter a11:
3
OK
Cancel

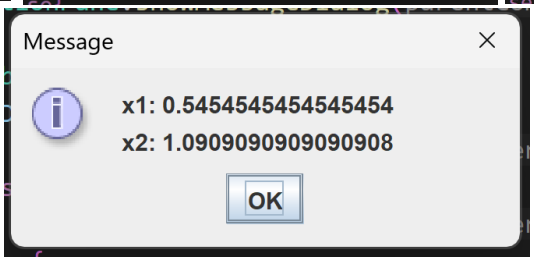

Input
Enter a12:
4
OK
Cancel


Input
Enter b1:
6
OK
Cancel

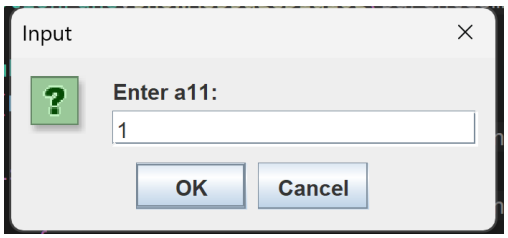

Input
Enter a21:
1
OK
Cancel

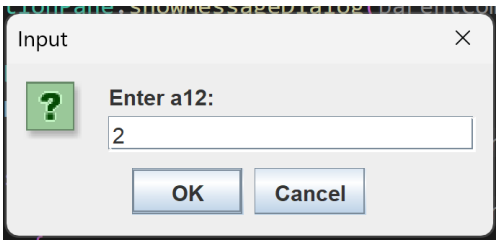

Input
Enter a22:
5
OK
Cancel

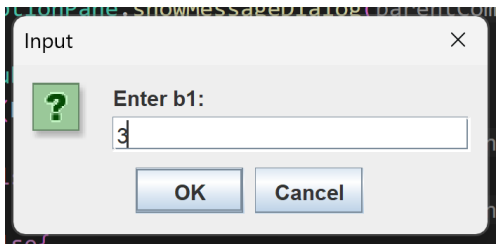

Input
Enter b2:
6
OK
Cancel

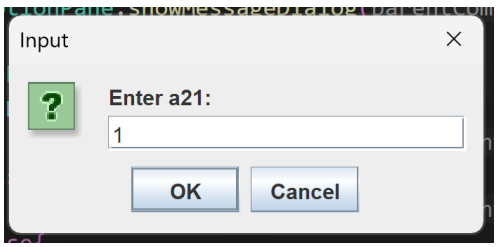

Message
x1: 0.5454545454545454
x2: 1.0909090909090908
OK

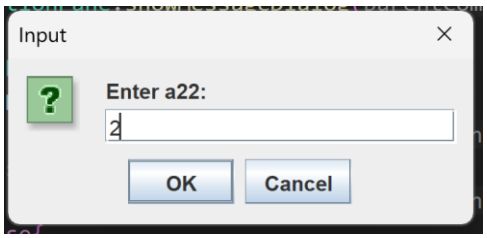
Case 2:

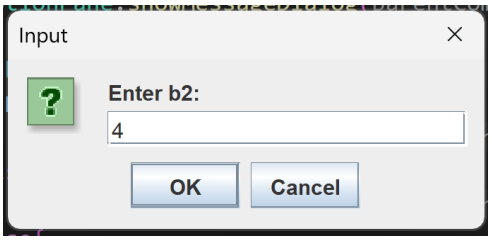

Input
Enter a11:
1
OK
Cancel

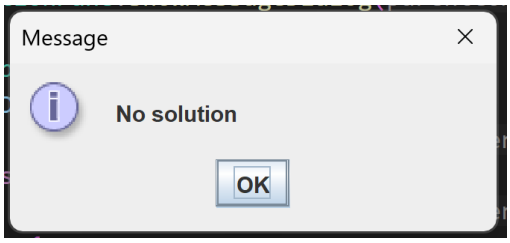

Input
Enter a12:
2
OK
Cancel


Input
Enter b1:
3
OK
Cancel

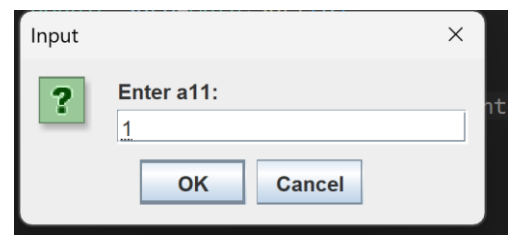

Input
Enter a21:
1
OK
Cancel

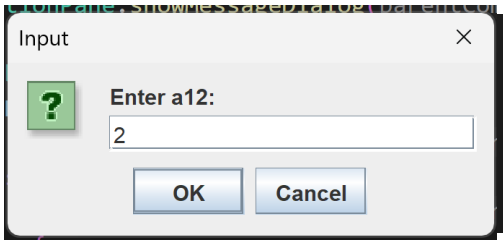

Input
Enter a22:
2
OK
Cancel

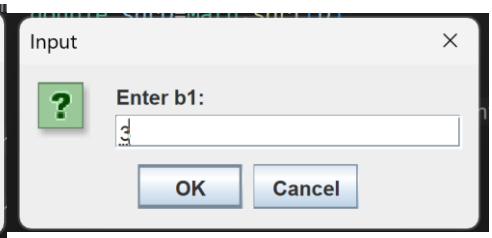

Input
Enter b2:
4
OK
Cancel

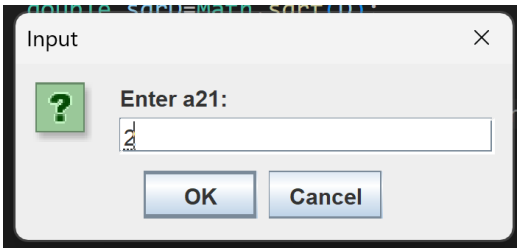

Message
No solution
OK

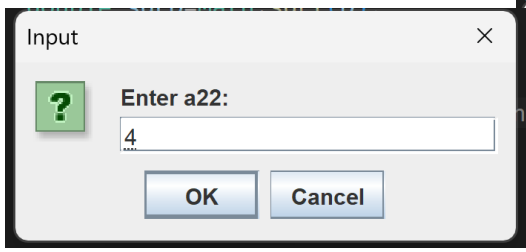
Case 3:

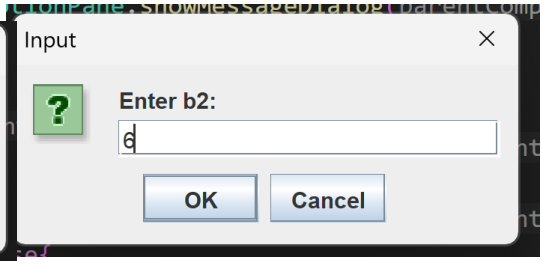


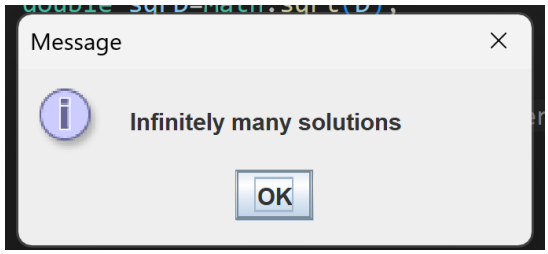






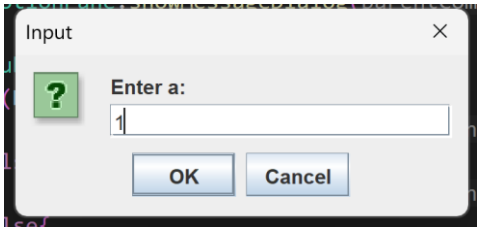


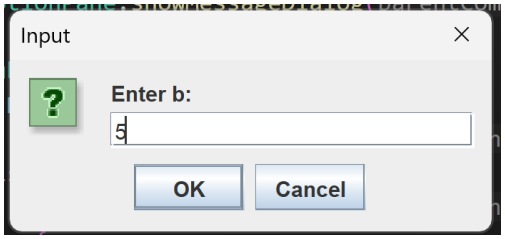


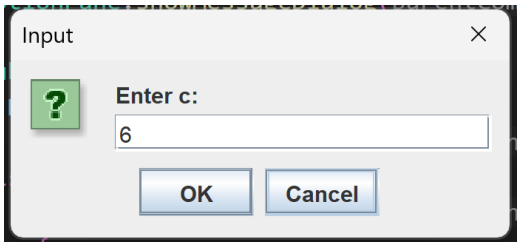


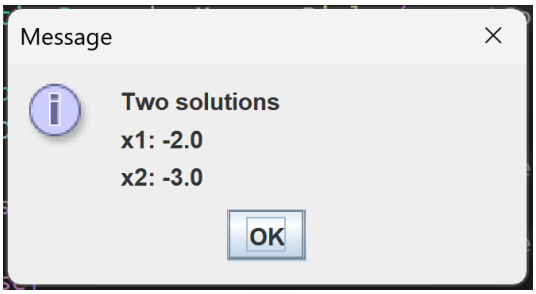
iii. Quadratic equation

Case 1:

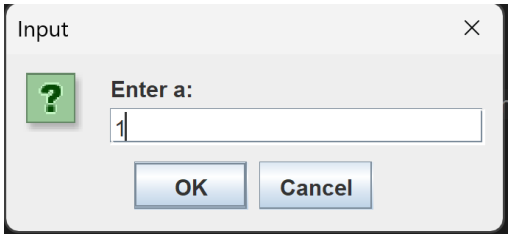


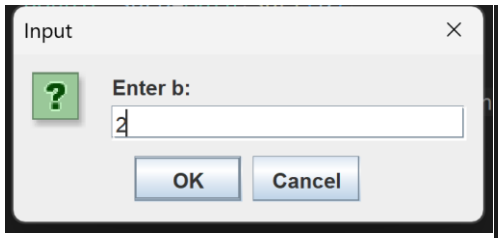


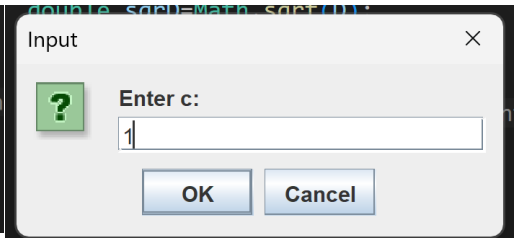


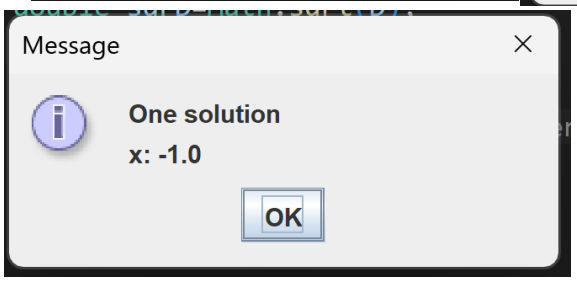


Case 2:

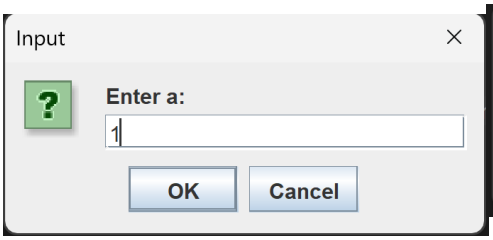


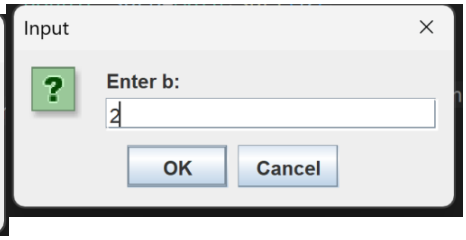


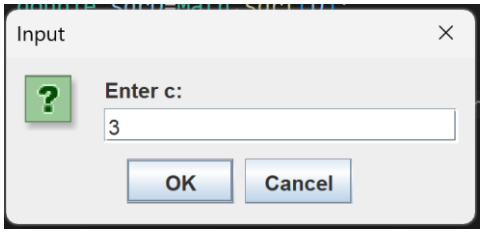


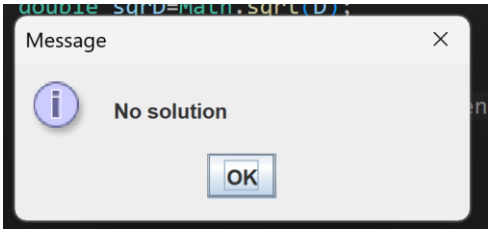


Case 3:









Bài 6.1. Write, compile and run the ChoosingOption program

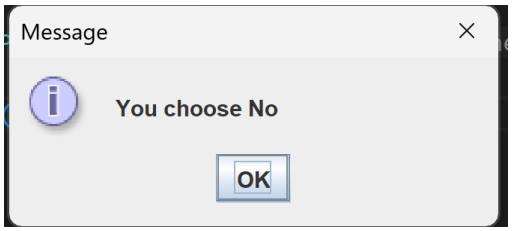
1. Code

```
import javax.swing.JOptionPane;

public class ChoosingOption {
    public static void main(String[] args){
        int option = JOptionPane.showConfirmDialog(null,
            "Do you want to change first class ticket?"
        );
        JOptionPane.showMessageDialog(null,"You've choosen:
"           +(option==JOptionPane.YES_OPTION?"Yes":"No")
        );
        System.exit(0);
    }
}
```

2. Run

3. Question

- What happens if users choose “Cancel”?
  - JOptionPane.showConfirmDialog() would return either one of these
    - JOptionPane.YES_OPTION (0) if pick Yes
    - JOptionPane.NO_OPTION (1) if pick No
    - JOptionPane.CANCEL_OPTION (2) if pick Cancel
  - But the program only check for JoptionPane.YES_OPTION all other option would be a NO, then if the user choosed Cancel, The program would still return: You’ve choosen: No



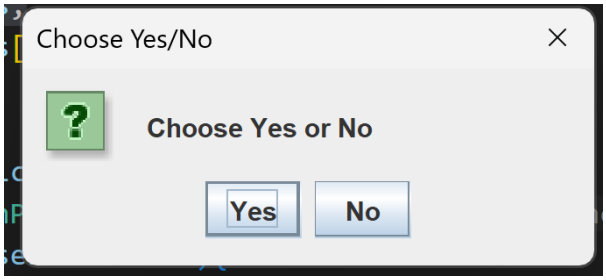
- How to customize the options to users, e.g. only two options: “Yes” and “No”.

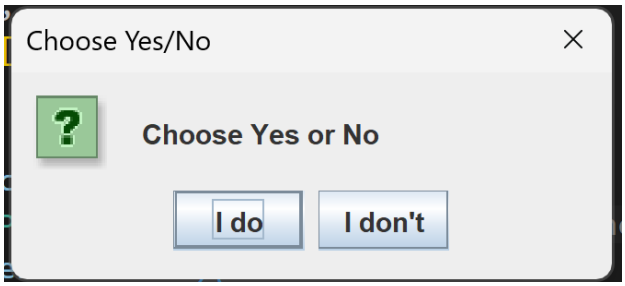
By default using JOptionPane.showConfirmDialog() would show 3 option: Yes, No and Cancel. To customize it, we can use JOptionPane.showOptionDialog() instead

1. Code

```java
import javax.swing.JOptionPane;

public class ChoosingOption {
    public static void main(String[] args){
        String[] options = {"I do", "I don't"};
        int userChoice = JOptionPane.showOptionDialog(
            null,
            "Choose Yes or No",
            "Choose Yes/No",
            JOptionPane.DEFAULT_OPTION,
            JOptionPane.QUESTION_MESSAGE,
            null,
            options,
            options[0]
        );

        if(userChoice==0){
            JOptionPane.showMessageDialog(null, "You choose Yes");
        }else if(userChoice==1){
            JOptionPane.showMessageDialog(null, "You choose No");
        }else{
            JOptionPane.showMessageDialog(null, "U closed the pane");
        }
        System.exit(0);
    }
}
```

2. Run





Bài 6.2. Write a program for input/output from keyboard Code – Compile – Run

1. Code

```java
import java.util.Scanner;

public class InputFromKeyboard {
    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();

        // similar to other data types
        // nextByte(), nextShort(), nextLong()
        // nextFloat(), nextBoolean()

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

2. Run

```
What's your name?
duc anh
How old are you?
5
How tall are you (m)?
180
Mrs/Ms. duc anh, 5 years old. Your height is 180.0.
```

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

E.g. n = 5:

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

- **Code & Run**

```java
import java.util.Scanner;

public class Triangle {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the height of the triangle (n):
");      int n = scanner.nextInt();
        for (int i = 1; i <= n; i++) {
            for (int j = 1; j <= n - i; j++) {
                System.out.print(" ");
            }
            for (int k = 1; k <= 2 * i - 1; k++) {
                System.out.print("*");
            }
            System.out.println();
        }
        scanner.close();
    }
}
```

```
Enter the height of the triangle (n): 5
    *
   ***
  *****
 *******
*********
```

Bài 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.**

Code

```java
import java.util.Scanner;

public class Table {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int year;
        while (true) {
            System.out.print("Enter a valid year (non-negative): ");
            if (scanner.hasNextInt()) {
                year = scanner.nextInt();
                if (year >= 0) {
                    scanner.nextLine();
                    break;
                }
            } else {
                scanner.next();
            }
            System.out.println("Invalid year! Please enter a valid year.");
            scanner.nextLine();
        }

        int month;
        while (true) {
            System.out.print("Enter a month (number 1-12, full name, or abbreviation):
");          String input = scanner.nextLine().trim().toLowerCase();
            month = convertMonth(input);
            if (month != -1) {
                break;
            }
            System.out.println("Invalid month! Please enter a valid month.");
        }

        int days = getDaysInMonth(month, year);
        System.out.println("The month you entered has " + days + " days.");
        scanner.close();
    }

    private static int convertMonth(String input) {
        switch (input) {
            case "1": case "january": case "jan.": case "jan": return 1;
            case "2": case "february": case "feb.": case "feb": return 2;
            case "3": case "march": case "mar.": case "mar": return 3;
            case "4": case "april": case "apr.": case "apr": return 4;
            case "5": case "may": return 5;
            case "6": case "june": case "jun.": case "jun": return 6;
            case "7": case "july": case "jul.": case "jul": return 7;
            case "8": case "august": case "aug.": case "aug": return 8;
            case "9": case "september": case "sep.": case "sep": return 9;
            case "10": case "october": case "oct.": case "oct": return 10;
            case "11": case "november": case "nov.": case "nov": return 11;
            case "12": case "december": case "dec.": case "dec": return 12;
            default: return -1;
        }
    }

    private static int getDaysInMonth(int month, int year) {
        switch (month) {
            case 1: case 3: case 5: case 7: case 8: case 10: case 12:
                return 31;
            case 4: case 6: case 9: case 11:
                return 30;
            case 2:
                return isLeapYear(year) ? 29 : 28;
        }
        return -1;
    }

    private static boolean isLeapYear(int year) {
        return (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);
    }
}
```

- **Test 1**

```
Enter a valid year (non-negative): 2006
Enter a month (number 1-12, full name, or abbreviation): 12
The month you entered has 31 days.
```

- **Test 2**

```
Enter a valid year (non-negative): 2019
Enter a month (number 1-12, full name, or abbreviation): feb.
The month you entered has 28 days.
```

Bài 6.5

- **Code & Run**

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

public class ArraySorter {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the number of elements in the array:
");      int size = scanner.nextInt();
        int[] myArray = new int[size];
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < size; i++) {
            System.out.print("Element " + (i + 1) + ": ");
            myArray[i] = scanner.nextInt();
        }
        scanner.close();

        Arrays.sort(myArray);

        int sum = 0;
        for (int number : myArray) {
            sum += number;
        }

        double average = 0;
        if (myArray.length > 0) {
             average = (double) sum / myArray.length;
        }

        System.out.println("\n Results ");
        System.out.println("Sorted array: " +
Arrays.toString(myArray));      System.out.println("Sum of array elements: " + sum);
        System.out.println("Average of array elements: " + average);
    }
}
```

```
Enter the number of elements in the array: 3
Enter the elements of the array:
Element 1: 2
Element 2: 12
Element 3: 12

 Results
Sorted array: [2, 12, 12]
Sum of array elements: 26
Average of array elements: 8.666666666666666
```

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

- **Code & Run**

```java
import java.util.Arrays;

public class AddTwoMatrices {
    public static void main(String[] args) {
        int[][] matrixA = {
            {1, 2, 3},
            {4, 5, 6},
            {7, 8, 9}
        };
        int[][] matrixB = {
            {9, 8, 7},
            {6, 5, 4},
            {3, 2, 1}
        };
        int rows = matrixA.length;
        int cols = matrixA[0].length;
        int[][] resultMatrix = new int[rows][cols];

        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                resultMatrix[i][j] = matrixA[i][j] + matrixB[i]
[j];
            }
        }

        System.out.println("Matrix A:");
        printMatrix(matrixA);

        System.out.println("Matrix B:");
        printMatrix(matrixB);

        System.out.println("Sum of Matrix A and Matrix B:");
        printMatrix(resultMatrix);
    }

    private static void printMatrix(int[][] matrix) {
        for (int[] row : matrix) {
            System.out.println(Arrays.toString(row));
        }
        System.out.println();
    }
}
```

```
Matrix A:
[1, 2, 3]
[4, 5, 6]
[7, 8, 9]

Matrix B:
[9, 8, 7]
[6, 5, 4]
[3, 2, 1]

Sum of Matrix A and Matrix B:
[10, 10, 10]
[10, 10, 10]
[10, 10, 10]
```