BÁO CÁO THỰC HÀNH LAB01
LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG

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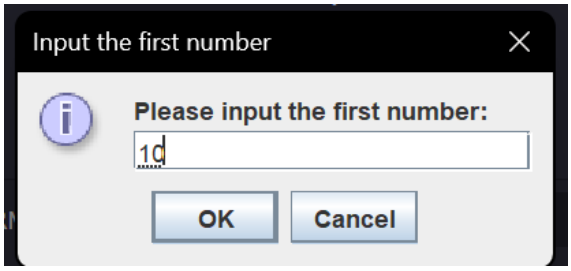
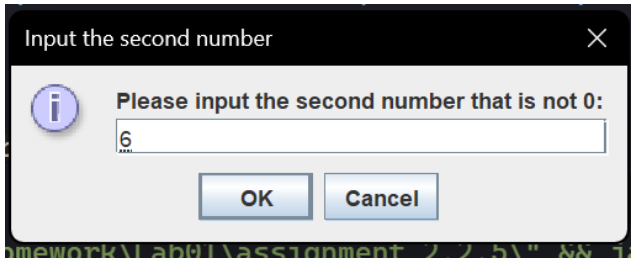
2.2 The Very First Java Programs

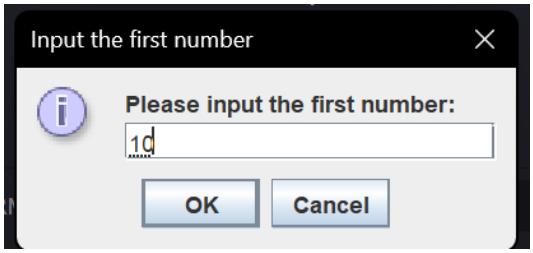
2.2.5 Write a program to calculate sum, difference, product, and quotient of 2 double numbers which are entered by users.

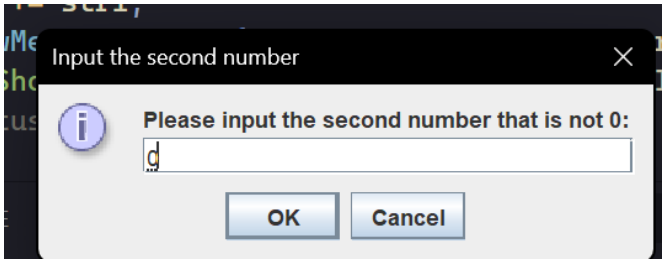
- TH!: second number != 0





- TH2: second number == 0

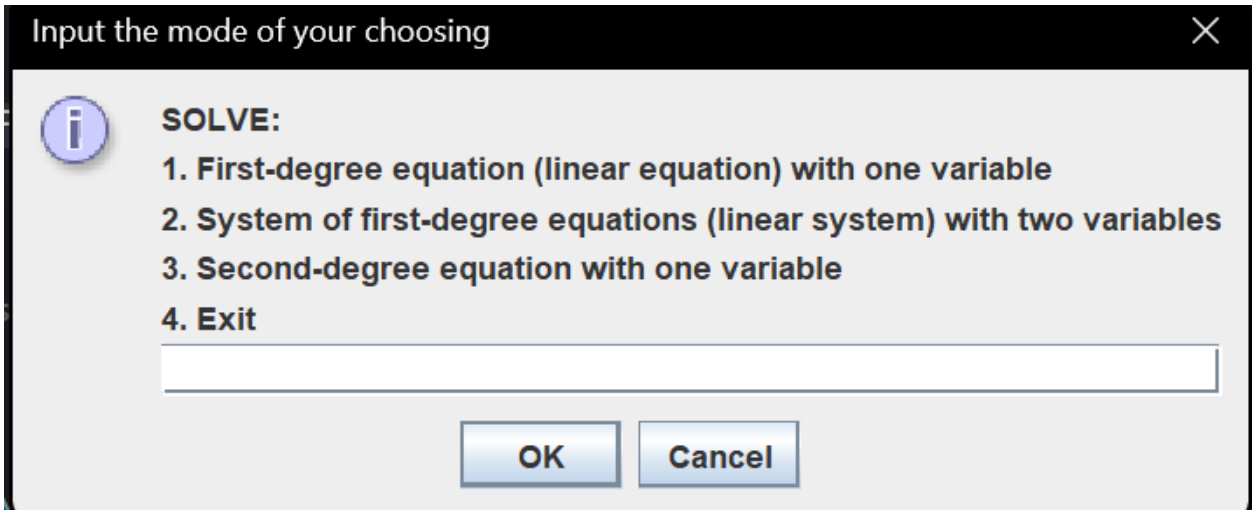




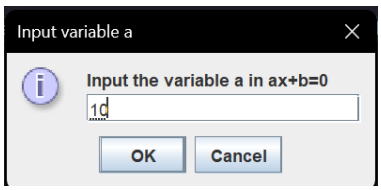
Code:

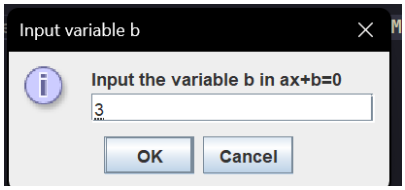
```java
//Write a program to calculate sum, difference, product, and quotient
// of 2 double numbers which are entered by users.
import javax.swing.JOptionPane;

public class Cal {
    Run | Debug
    public static void main(String[] args) {

        String strNum1, strNum2;
        double sum, difference, product, quotient;

        String strNotification = "";

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

        strNum2 = JOptionPane.showInputDialog(parentComponent:null,
                message:"Please input the second number that is not 0: ", title:"Input the second number",
                JOptionPane.INFORMATION_MESSAGE);

        double a = Double.parseDouble(strNum1), b = Double.parseDouble(strNum2);
        // sum
        sum = a + b;
        // difference
        difference = a - b;

        // product
        product = a * b;
        quotient = a / b;

        String str1 = "The sum is " + sum + " The difference is " + difference + " The product is " + product
                + " The quotient is " + quotient;
        strNotification += str1;
        JOptionPane.showMessageDialog(parentComponent:null, strNotification,
                title:"Show two numbers", JOptionPane.INFORMATION_MESSAGE);
        System.exit(status:0);
    }
}
```

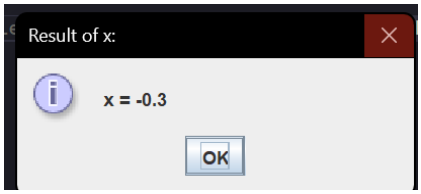
2.2.6 Write a program to solve:



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

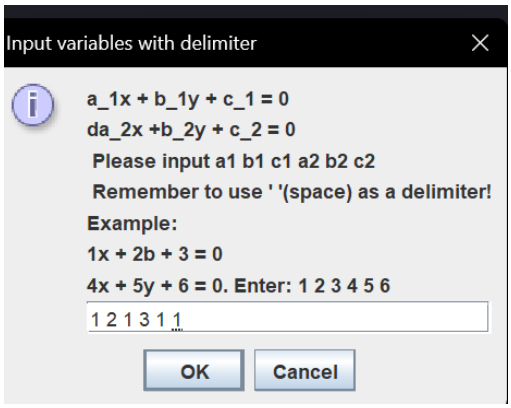


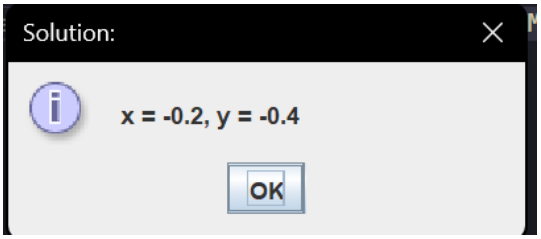




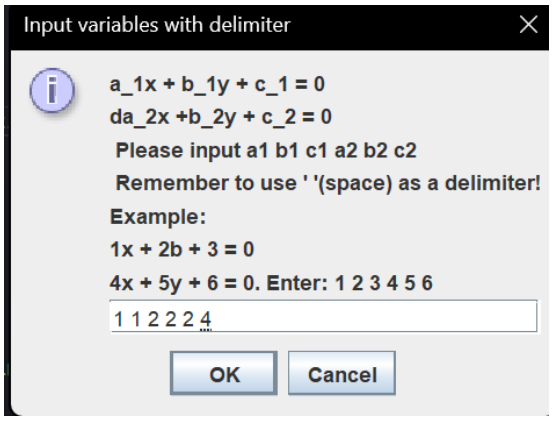
- The system of first-degree equations (linear system) with two variables:

  - Unique solutions:



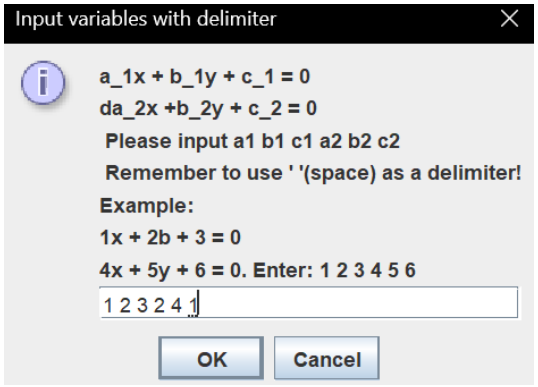


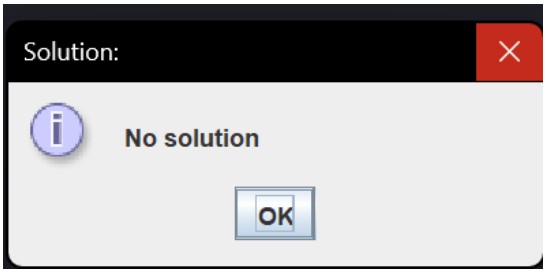
  - Infinite solutions:



  -

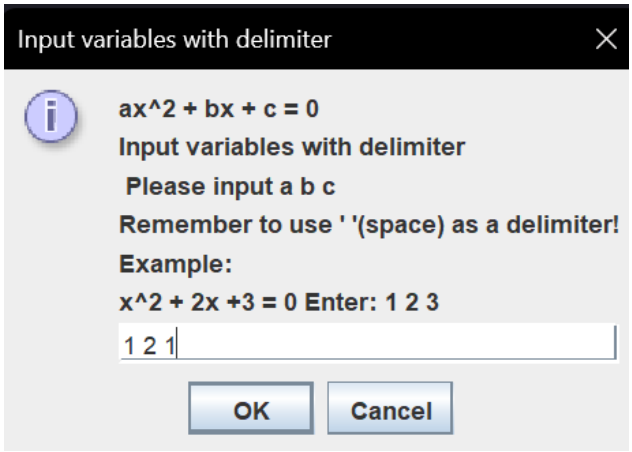
  - No solution:

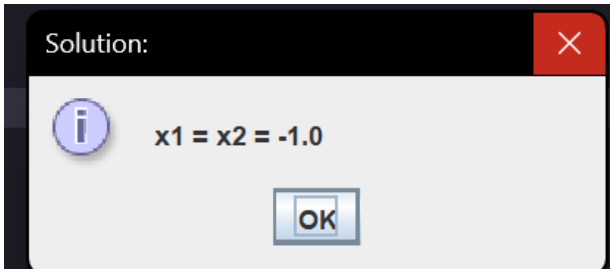




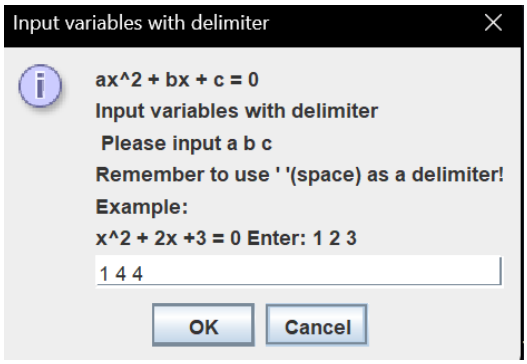
- The second-degree equation with one variable:

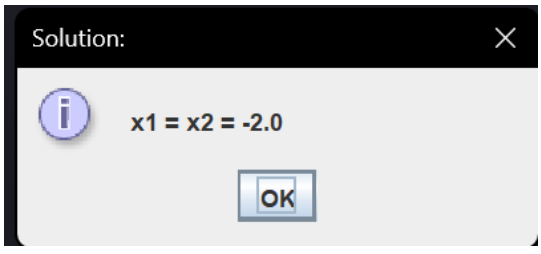
- x1, x2:



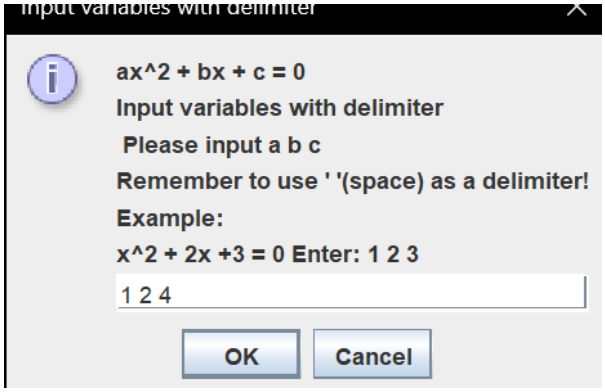


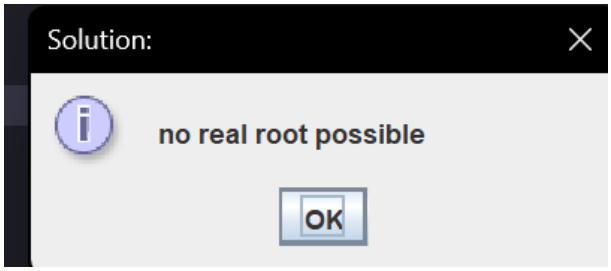
- x1 = x2:





- no real solutions:





- Exit: Press 4. Program ends.

Code:

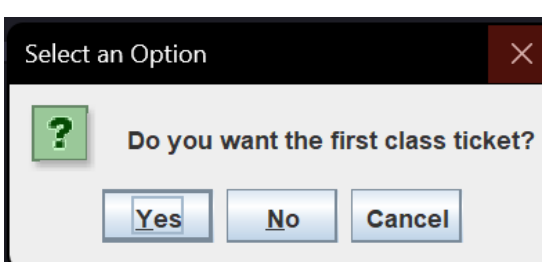
```
import java.awt.Component;
import javax.swing.JOptionPane;
import java.lang.Math; // for pow

public class EquationSolver {
    Run|Debug
    public static void main(String[] var0) {
        String strNotification = "";
        String m = JOptionPane.showInputDialog(parentComponent:null,
                message:"SOLVE:\n1. First-degree equation (linear equation) with one variable\n2. System of first-degree equations (linear system) with two variables\n3. Second-degree equation with one variable\n4. Exi
                title:"Input the mode of your choosing", messageType:1);
        int mode = Integer.parseInt(m);
        switch (mode) {
            case 1: // ax+b=0
                String num1 = JOptionPane.showInputDialog(parentComponent:null,
                        message:"Input the variable a in ax+b=0", title:"Input variable a ", messageType:1);
                String num2 = JOptionPane.showInputDialog(parentComponent:null,
                        message:"Input the variable b in ax+b=0", title:"Input variable b ", messageType:1);

                double a = Double.parseDouble(num1);
                if (a == 0) {
                    JOptionPane.showMessageDialog(parentComponent:null, message:"ERROR: infinite x ", title:"ERROR", JOptionPane.INFORMATION_MESSAGE);
                    break;
                }
                double b = Double.parseDouble(num2);
                double x = -(b / a);
                strNotification += "x = " + x;
                JOptionPane.showMessageDialog(parentComponent:null, strNotification, title:"Result of x:", JOptionPane.INFORMATION_MESSAGE);
                break;
            case 2: // ax + by = c
                    // dx + ey = f
                    // I want a cleaner user experience so i'll split the string up
                    // Enter a b c d e f, with the delimiter "|"
                    // String string ="bla-bla"
                String string = JOptionPane.showInputDialog(parentComponent:null,
                        message:"a_1x + b_1y + c_1 = 0\nda_2x +b_2y + c_2 = 0\n Please input a1 b1 c1 a2 b2 c2\n Remember to use ' '(space) as a delimiter!\nExample:\n1x + 2b + 3 = 0\n4x + 5y + 6 = 0. Enter: 1 2 3 4 5 6"
                        title:"Input variables with delimiter", messageType:1);
                String[] parts = string.split(regex:" "); // space is the delimiter
                // 0|1|2|3|4|5
                double a1 = Double.parseDouble(parts[0]);
                double b1 = Double.parseDouble(parts[1]);
                double c1 = Double.parseDouble(parts[2]);
                double a2 = Double.parseDouble(parts[3]);
                double b2 = Double.parseDouble(parts[4]);
                double c2 = Double.parseDouble(parts[5]);
```

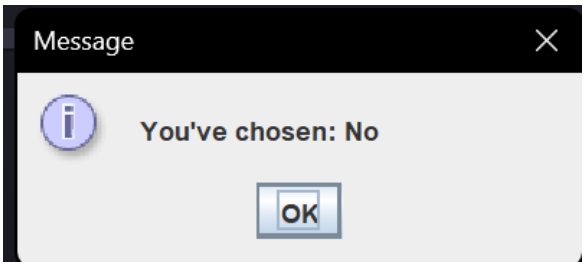
```
    public static void main(String[] var0) {
            double a1 = Double.parseDouble(parts[0]);
            double b1 = Double.parseDouble(parts[1]);
            double c1 = Double.parseDouble(parts[2]);
            double a2 = Double.parseDouble(parts[3]);
            double b2 = Double.parseDouble(parts[4]);
            double c2 = Double.parseDouble(parts[5]);

            if ((a1 / a2) == (b1 / b2)) {
               if ((a1 / a2) == (c1 / c2)) {
                  strNotification += "Infinite solutions";
               } else {
                  strNotification += "No solution";
               }
            } else { // if != => unique solutions
               double x_2 = (b1 * c2 - b2 * c1) / (a1 * b2 - a2 * b1);
               double y_2 = (a2 * c1 - a1 * c2) / (a1 * b2 - a2 * b1);
               strNotification += "x = " + x_2 + "," + " y = " + y_2;
            }
            JOptionPane.showMessageDialog(parentComponent:null, strNotification, title:"Solution:", JOptionPane.INFORMATION_MESSAGE);
            break;
         case 3: // ax^2 + bx + c = 0
            String longstringhehe = JOptionPane.showInputDialog(parentComponent:null,

                  message:"ax^2 + bx + c = 0\nInput variables with delimiter\n Please input a b c \nRemember to use ' '(space) as a delimiter!\nExample:\nx^2 + 2x +3 = 0 Enter: 1 2 3 ",
                  title:"Input variables with delimiter", messageType:1);
            String[] bits = longstringhehe.split(regex:" "); // space is the delimiter
            // 0|1|2|3|4|5
            double a_ = Double.parseDouble(bits[0]);
            double b_ = Double.parseDouble(bits[1]);
            double c_ = Double.parseDouble(bits[2]);
            if (a_==0){
               // a=0 case
               double x_ = -(c_/b_);
               strNotification += "Not a quadratic equation, x = " + x_;
               JOptionPane.showMessageDialog(parentComponent:null, strNotification, title:"Solution:", JOptionPane.INFORMATION_MESSAGE);
               break;

            }

            double discriminant = Math.pow(b_, b:2) - 4 * a_ * c_; // (num, power)
            if (discriminant > 0) {
               // different two roots
               double x1 = (-b_ + Math.sqrt(discriminant)) / (2 * a_);
               double x2 = (-b_ - Math.sqrt(discriminant)) / (2 * a_);
               strNotification += "x1 = "+x1+","+" x2 = "+x2;
            } else if (discriminant == 0) {
```

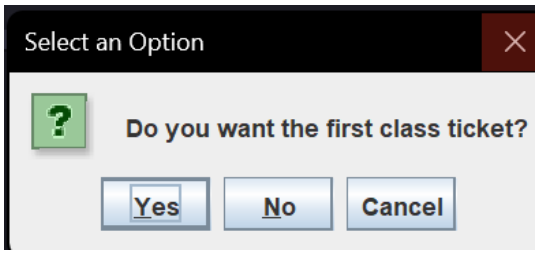
```
gnment_2.2.6 > J EquationSolver.java > EquationSolver > main(String[])
6   public class EquationSolver {
7      public static void main(String[] var0) {
9              double c_ = Double.parseDouble(bits[2]);
0              if (a_==0){
1                 // a=0 case
2                 double x_ = -(c_/b_);
3                 strNotification += "Not a quadratic equation, x = " + x_;
4                 JOptionPane.showMessageDialog(parentComponent:null, strNotification, title:"Solution:", JOptionPane.INFORMATION_MESSAGE);
5                 break;
6
7              }
8
9              double discriminant = Math.pow(b_, b:2) - 4 * a_ * c_; // (num, power)
0              if (discriminant > 0) {
1                 // different two roots
2                 double x1 = (-b_ + Math.sqrt(discriminant)) / (2 * a_);
3                 double x2 = (-b_ - Math.sqrt(discriminant)) / (2 * a_);
4                 strNotification += "x1 = "+x1+","+" x2 = "+x2;
5              } else if (discriminant == 0) {
6                 // two root = eachother
7                 double x_ = (-b_ + Math.sqrt(discriminant)) / (2 * a_);
8                 strNotification += "x1 = x2 = "+x_;
9              } else {
0                 // <0 : no real root
1                 strNotification += "no real root possible ";
2              }
3              JOptionPane.showMessageDialog(parentComponent:null, strNotification, title:"Solution:", JOptionPane.INFORMATION_MESSAGE);
4              break;
5           default:
6              break;
7        }
8
9        System.exit(status:0);
0     }
1  }
2
```

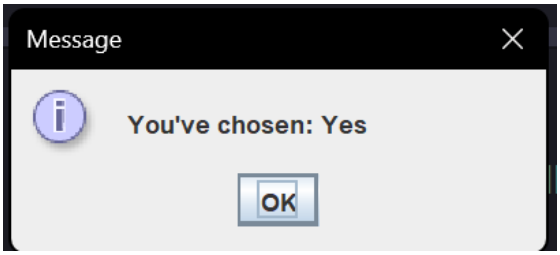
6 Exercises

6.1 Write, compile and run the ChoosingOption program









Code:

```java
import javax.swing.JOptionPane;
public class Bai61ChoosingOption {
    Run | Debug
    public static void main(String[] args) {
        int option = JOptionPane.showConfirmDialog(parentComponent:null, message:"Do you want the first class ticket?");

        javax.swing.JOptionPane.showMessageDialog(parentComponent:null, "You've chosen: "+
                (option == JOptionPane.YES_OPTION ? "Yes" : "No"));
        System.exit(status:0);

    }
}
```

Questions:

- What happens if users choose “Cancel”?

//Nothing happens when the user choose 'Cancel' in this code
/*Because YES_OPTION(condition) only decide whether its A 'Yes' or not a 'Yes' */

- How to customize the options to users, e.g. only two options: “Yes” and “No”, OR “I do” and “I don’t” (Suggestion: Use Javadocs or using Eclipse/Netbean IDE help).

JOptionPane *showOptionDialog* method

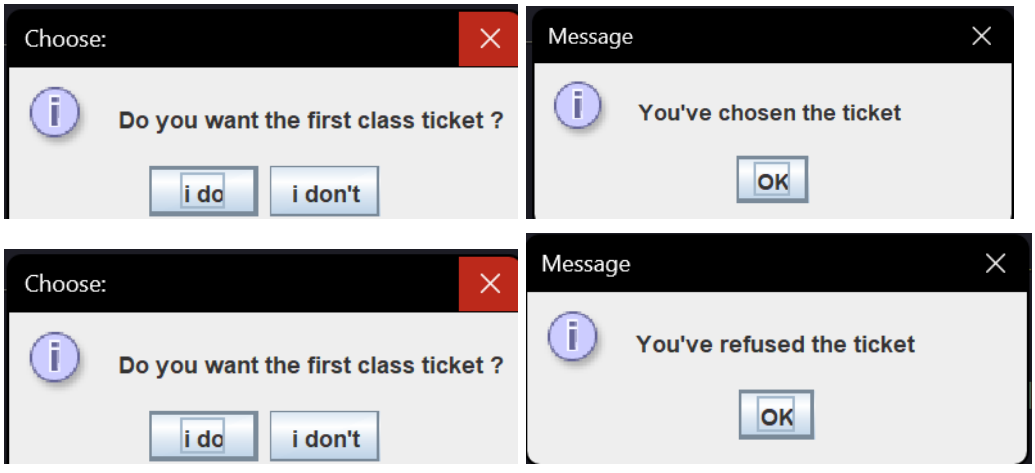
To limit input, but not restrict the user to a 'yes', 'no' or 'cancel', the JOptionPane showOptionDialog method can be used.

This method allows you to supply an array of objects to the dialog box. Each object is rendered, and the calling program receives the array index position of the option selected.

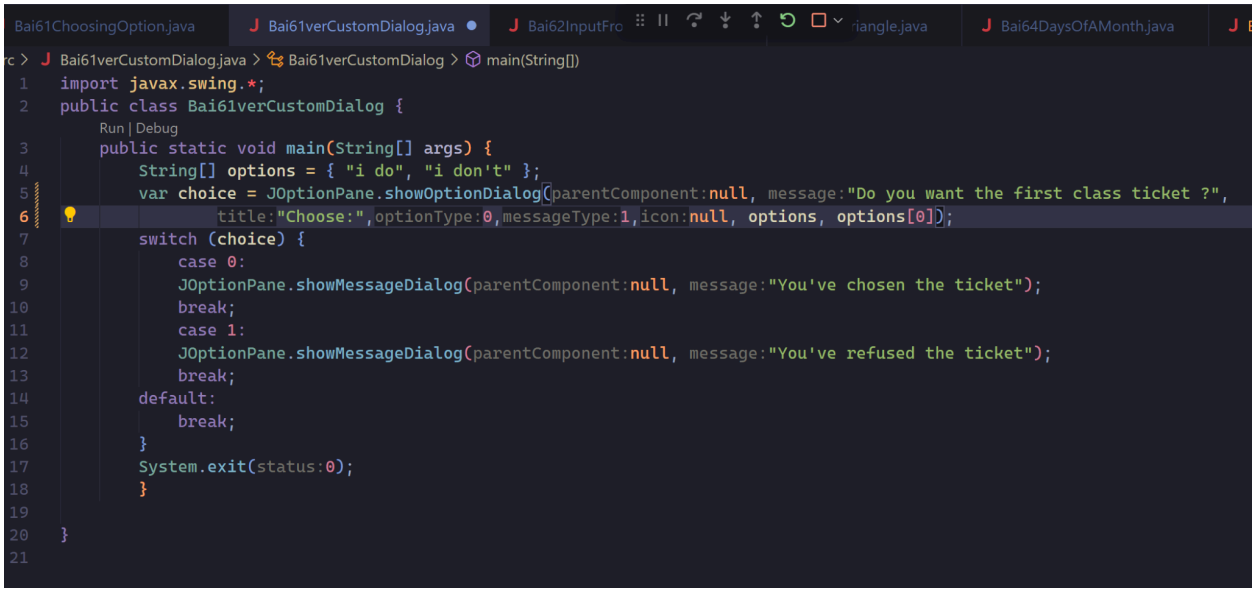
For example, the following JOptionPane *showOptionDialog* example asks the user to select a brownie, pie or cake as a dessert option.

```
import javax.swing.*;
public class ShowOptionDialogExample {

  public static void main(String[] args) {
    /* JOptionPane Java user input example */
    String[] options = { "brownie", "pie", "cake" };
    var dessert = JOptionPane.showOptionDialog(null, "Which dessert?", "Select one:",
                                               0, 3, null, options, options[0]);
    if (dessert == 0) {
      JOptionPane.showMessageDialog(null, "You chose a brownie!");
    }
    if (dessert == 1) {
      JOptionPane.showMessageDialog(null, "You chose pie.");
    }
    if (dessert == 2) {
      JOptionPane.showMessageDialog(null, "You chose cake!");
    }
  }
}
```

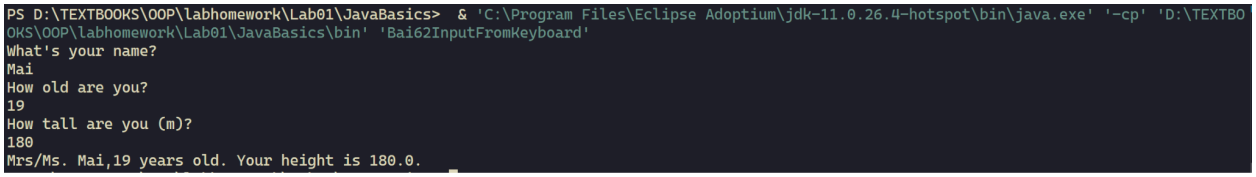
If the user selects the pie button, then the code returns an index of 1, which generates a JOptionPane message dialog box that displays the text, "You chose pie!"



Code: Tên file là Bai61verCustomDialog.java



6.2 Write a program for input/output from keyboard

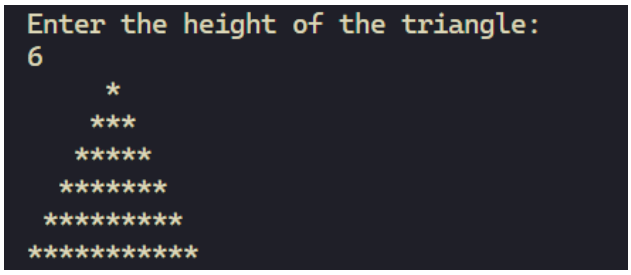


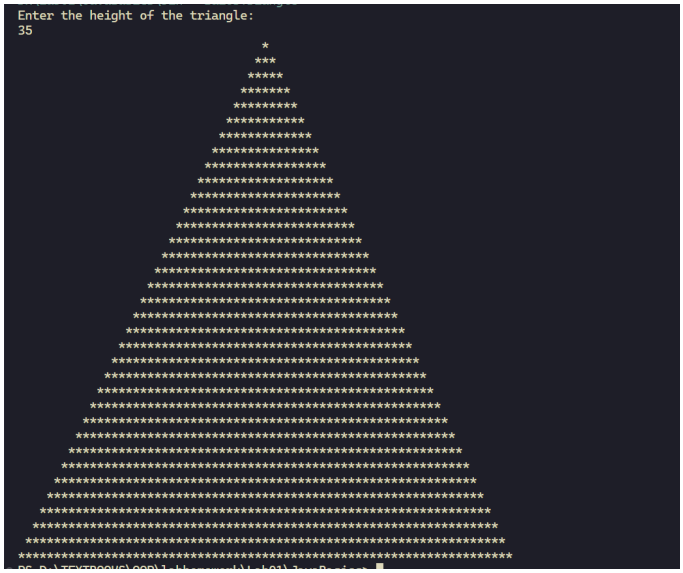
Code:

src > Bai62InputFromKeyboard.java > Bai62InputFromKeyboard > main(String[])

```java
import java.util.Scanner;

public class Bai62InputFromKeyboard {
    Run | Debug
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);

        System.out.println(x:"What's your name?");
        String strName = keyboard.nextLine();
        System.out.println(x:"How old are you?");
        int iAge = keyboard.nextInt();

        System.out.println(x:"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 + ".");
        keyboard.close();
    }
}

```

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

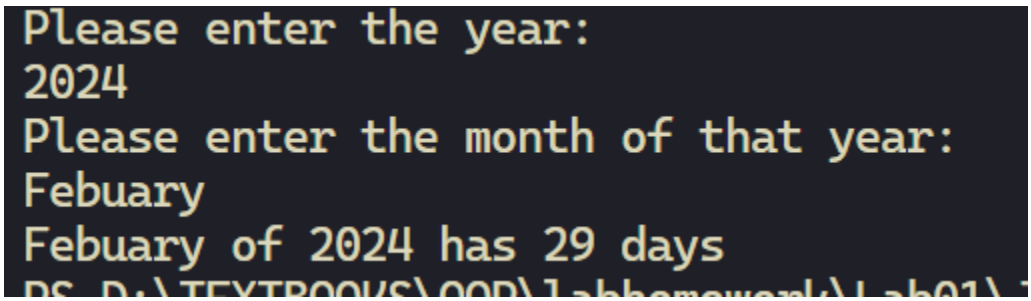


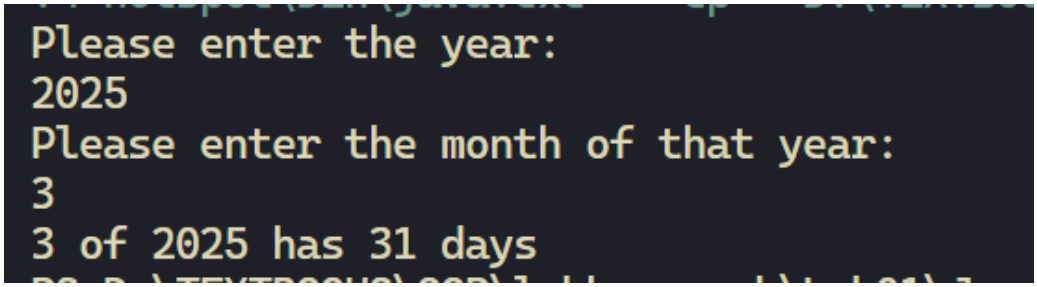


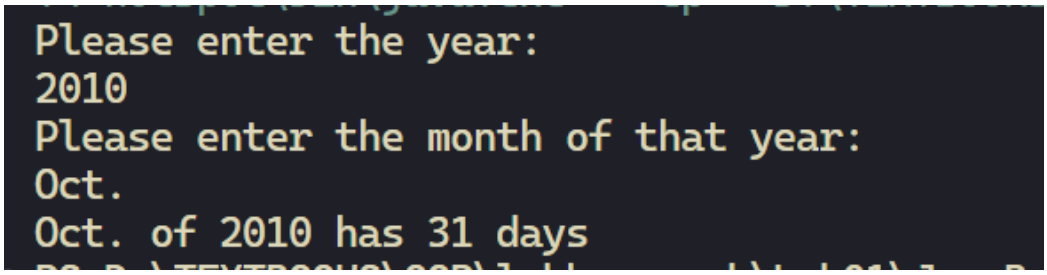
Code:

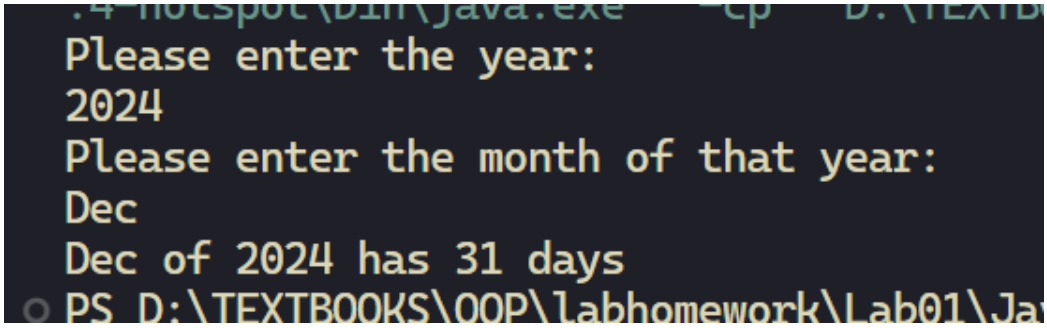
```java
Bai63Triangle.java > Bai63Triangle > main(String[])
import java.util.Scanner;

public class Bai63Triangle {
    Run | Debug
    public static void main(String[] args) {
        // write a program to display a triangle with a height of n stars '*'
        Scanner keyboard = new Scanner(System.in);
        System.out.println(x:"Enter the height of the triangle:");
        int n = Integer.valueOf(keyboard.nextLine());

        Triangle(n);

        keyboard.close();

    }

    public static void Triangle(int n) {


        for (int i = 1; i <= n; i++) {
            int step = (i * 2) - 1;
            String string = "";
            while (step > 0) {
                string += "*";
                step--;
            }
            // space before line = ( n - 1 ) - depth +1
            // = n - i
            int space_cnt = n-i;
            while (space_cnt > 0) {
                string = " " + string;
                space_cnt--;
            }

            System.out.println(string);

        }
    }
}
```

6.4 Write a program to display the number of days of a month, which is entered by users









Code:

```java
import java.util.Scanner;

public class Bai64DaysOfAMonth {
    Run | Debug
    public static void main(String[] args) {
        int days;
        Scanner keyboard = new Scanner(System.in);

        System.out.println(x:"Please enter the year: ");
        int year = Integer.valueOf(keyboard.nextLine());
        while (year < 0) {
            System.out.println(x:"Invalid year, please enter year again:");
            year = Integer.valueOf(keyboard.nextLine());
        }

        System.out.println(x:"Please enter the month of that year:");
        String inputmonth = keyboard.nextLine();
        int checkvalid_month = 0; // default false value

        while (checkvalid_month == 0) {
            if (inputmonth.equals(anObject:"January") || inputmonth.equals(anObject:"Jan.")
                    || inputmonth.equals(anObject:"Jan")
                    || inputmonth.equals(anObject:"1")) {
                checkvalid_month = 1;
                break;
            } else if (inputmonth.equals(anObject:"Febuary") || inputmonth.equals(anObject:"Feb.")
                    || inputmonth.equals(anObject:"Feb")
                    || inputmonth.equals(anObject:"2")) {
                checkvalid_month = 2;
                break;
            } else if (inputmonth.equals(anObject:"March") || inputmonth.equals(anObject:"Mar.")
                    || inputmonth.equals(anObject:"Mar")
                    || inputmonth.equals(anObject:"3")) {
                checkvalid_month = 3;
                break;
            } else if (inputmonth.equals(anObject:"April") || inputmonth.equals(anObject:"Apr.")
                    || inputmonth.equals(anObject:"Apr")
                    || inputmonth.equals(anObject:"4")) {
                checkvalid_month = 4;
                break;
            } else if (inputmonth.equals(anObject:"May")
                    || inputmonth.equals(anObject:"5")) {
                checkvalid_month = 5;
                break;
            } else if (inputmonth.equals(anObject:"June") || inputmonth.equals(anObject:"Jun")
                    || inputmonth.equals(anObject:"6")) {
                checkvalid_month = 3;
                break;
            } else if (inputmonth.equals(anObject:"July") || inputmonth.equals(anObject:"Jul")
                    || inputmonth.equals(anObject:"7")) {
                checkvalid_month = 7;
                break;
            } else if (inputmonth.equals(anObject:"August") || inputmonth.equals(anObject:"Aug.")
                    || inputmonth.equals(anObject:"Aug")
                    || inputmonth.equals(anObject:"8")) {
                checkvalid_month = 8;
                break;
            } else if (inputmonth.equals(anObject:"September") || inputmonth.equals(anObject:"Sep.")
                    || inputmonth.equals(anObject:"Sep")
                    || inputmonth.equals(anObject:"9")) {
                checkvalid_month = 9;
                break;
            } else if (inputmonth.equals(anObject:"October") || inputmonth.equals(anObject:"Oct.")
                    || inputmonth.equals(anObject:"Oct")
                    || inputmonth.equals(anObject:"10")) {
                checkvalid_month = 10;
                break;
            } else if (inputmonth.equals(anObject:"November") || inputmonth.equals(anObject:"Nov.")
                    || inputmonth.equals(anObject:"Nov")
                    || inputmonth.equals(anObject:"11")) {
                checkvalid_month = 11;
```

```
                checkvalid_month = 11;
                break;
            } else if (inputmonth.equals(anObject:"December") || inputmonth.equals(anObject:"Dec.")
                    || inputmonth.equals(anObject:"Dec")
                    || inputmonth.equals(anObject:"12")) {
                checkvalid_month = 12;
                break;
            }
            System.out.println(x:"Invalid month, please enter the month of that year:");
            inputmonth = keyboard.nextLine();

        }
        int month = checkvalid_month;
        if (year % 100 == 0 && year % 400 != 0) {
            // not lean
            days = NormalYearDays(month);
        } else if (year % 4 == 0) {
            // leap
            days = LeapYearDays(month);
        } else {
            // not leap
            days = NormalYearDays(month);
        }

        System.out.println(inputmonth + " of " + year + " has " + days + " days");
        keyboard.close();
    }

    public static int NormalYearDays(int month) {
        int days;
        if (month == 1 || month == 3 || month == 5 || month == 7
                || month == 8 || month == 10 || month == 12) {
            days = 31;
        } else if (month == 2) {
            days = 28;
        } else {
            days = 30;
        }
        return days;
    }

    public static int LeapYearDays(int month) {
        int days;
        if (month == 2) {
            days = 29;
            return days;
        } else {
            return NormalYearDays(month);
        }
    }
}
```

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

In this exercise i'll be using merge sort

```
Enter how many elements is in the array
10
Enter the array, each element is separated with a ' '(space):
1 4 5211 12 4 5 100 24 7 11
Sorted Array:
[1, 4, 4, 5, 7, 11, 12, 24, 100, 5211]
The sum of the array is 5379, average is 537
```

```
Enter how many elements is in the array
5
Enter the array, each element is separated with a ' '(space):
5 1 3 4 9
Sorted Array:
[1, 3, 4, 5, 9]
The sum of the array is 22, average is 4
```

Code:

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

public class Bai65NumericSort {
    // Merge sort
    void merge(int array[], int p, int q, int r) {
        int n1 = q - p + 1;
        int n2 = r - q;

        int L[] = new int[n1];
        int M[] = new int[n2];

        // fill the left and right array
        for (int i = 0; i < n1; i++)
            L[i] = array[p + i];
        for (int j = 0; j < n2; j++)
            M[j] = array[q + 1 + j];

        // Maintain current index of sub-arrays and main array
        int i, j, k;
        i = 0;
        j = 0;
        k = p;

        while (i < n1 && j < n2) {
            if (L[i] <= M[j]) // ascending order
            {
                array[k] = L[i];
                i++;
            } else {
                array[k] = M[j];
                j++;
            }
            k++;
        }

        while (i < n1) {
            array[k] = L[i];
            i++;
```

```
    while (j < n2) {
        array[k] = M[j];
        j++;
        k++;
    }
}

// Divide the array into two sub arrays, sort them and merge them
void mergeSort(int array[], int left, int right) {
    if (left < right) {

        int mid = (left + right) / 2;

        // recursive call to each sub arrays
        mergeSort(array, left, mid);
        mergeSort(array, mid + 1, right);

        // Merge the sorted sub arrays
        merge(array, left, mid, right);
    }
}

// Main method
Run | Debug
public static void main(String args[]) {

    Scanner key = new Scanner(System.in);
    // int[] array = { 15, 33, 132, 10, 9, 1, 5, 4 };

    System.out.println(x:"Enter how many elements is in the array");
    int n = Integer.valueOf(key.nextLine());

    int[] arr = new int[n];

    System.out.println(x:"Enter the array, each element is separated with a ' '(space):");
```

```
    Run | Debug
    public static void main(String args[]) {

        Scanner key = new Scanner(System.in);
        // int[] array = { 15, 33, 132, 10, 9, 1, 5, 4 };

        System.out.println(x:"Enter how many elements is in the array");
        int n = Integer.valueOf(key.nextLine());

        int[] arr = new int[n];

        System.out.println(x:"Enter the array, each element is separated with a ' '(space):");


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

        Bai65NumericSort merge_sort = new Bai65NumericSort();

        // Call mergeSort()
        merge_sort.mergeSort(arr, left:0, arr.length - 1);

        //sum using Arrays.stream()
        int sum = Arrays.stream(arr).sum();

        // average
        int ave = sum / n;


        // Output
        System.out.println(x:"Sorted Array:");
        System.out.println(Arrays.toString(arr));
        System.out.println("The sum of the array is "+sum+", average is "+ave);
        key.close();
    }
}
```

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

```
Enter the size of the matrices mxn
Example: for 2x3 enter 2 3
4 4
Array 1
Enter numbers of row 0, each separated by a ' '(space)
1 1 1 1
Enter numbers of row 1, each separated by a ' '(space)
1 2 3
4
Enter numbers of row 2, each separated by a ' '(space)
2 0 0 0
Enter numbers of row 3, each separated by a ' '(space)
1 4 6 2
Array 2
Enter numbers of row 0, each separated by a ' '(space)
1 1 0 0
Enter numbers of row 1, each separated by a ' '(space)
0 0 0 0
Enter numbers of row 2, each separated by a ' '(space)
5
5 5 5
Enter numbers of row 3, each separated by a ' '(space)
1 2 4 7
The sum matrice is:
2, 2, 1, 1,
1, 2, 3, 4,
7, 5, 5, 5,
2, 6, 10, 9,
```

Code:

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

public class Bai66AddMatricesSameSize {
    Run | Debug
    public static void main(String[] args) {
        Scanner key = new Scanner(System.in);
        System.out.println(x:"Enter the size of the matrices mxn\nExample: for 2x3 enter 2 3");
        int m = key.nextInt();
        int n = key.nextInt();

        //Enter the first array
        int[][] a1 = new int[m][n];
        System.out.println(x:"Array 1");
        for (int j = 0; j < m; j++) {
            System.out.println("Enter numbers of row "+j+", each separated by a ' '(space)");
            for (int i = 0; i < n; i++) {
                a1[j][i] = key.nextInt();
            }
        }
        //Enter the second array
        int[][] a2 = new int[m][n];
        System.out.println(x:"Array 2");
        for (int j = 0; j < m; j++) {
            System.out.println("Enter numbers of row "+j+", each separated by a ' '(space)");
            for (int i = 0; i < n; i++) {
                a2[j][i] = key.nextInt();
            }
        }
```

```java
        // Adding
        int[][] sumOfMatrices= new int[m][m];
        for (int j = 0; j < m; j++) {
            for (int i = 0; i < n; i++) {
                sumOfMatrices[j][i] = a2[j][i] + a1[j][i];
            }
        }
        //Display
        System.out.println(x:"The sum matrice is:");
        String message = "";
        for (int j = 0; j < m; j++) {
            for (int i = 0; i < n; i++) {
                message = message + sumOfMatrices[j][i];
                message += ", ";
            }
            message +="\n";
        }
        System.out.println(message);

        key.close();
    }
}
```