

LAB 01 REPORT

OBJECT-ORIENTED PROGRAMMING

The Very First Java Programs

2.2.1 Write, compile the first Java application:

```

2
3  public class HelloWorld {
4      Run | Debug
5      public static void main(String[] args) {
6          System.out.println("Xin chao \n cac ban! ");
7          System.out.println("Hello \t world! ");
8      }
9

```

Result

The screenshot shows a Java code editor interface with the following details:

- Code Editor:** The left pane displays the `HelloWord.java` file content. The code is identical to the one shown above, printing "Xin chao \n cac ban!" and "Hello \t world!" to the console.
- Terminal:** The bottom pane shows the terminal output of the application's execution. It includes the command `cd "/Users/khadoan/Documents/Code/OOPLab/Lab01/FirstPrograms/" && javac HelloWorld.java && java HelloWorld`, followed by the program's output: "Xin chao", "cac ban!", "Hello world!".
- IDE UI:** The interface includes standard elements like a file tree on the left, a problems list (7 issues), an output panel, and a debug console. A sidebar on the right contains "Code Addi..." and "Code First..." options.

2.2.2 Write, compile the first dialog Java program

```

1 // package OOPLab.Lab01;
2
3 import javax.swing.JOptionPane;
4
5 public class FirstDialog{
6     Run | Debug
7     public static void main(String[] args) {
8         JOptionPane.showMessageDialog(null,message:"Hello world! How are you?");
9         System.exit(status:0);
10    }
11

```

HelloWorld.java FirstDialog.java U X

Code > OOPLab > Lab01 > FirstPrograms > FirstDialog.java > ...

```

1 // package OOPLab.Lab01;
2
3 import javax.swing.JOptionPane;
4
5 public class FirstDialog{
6     Run | Debug
7     public static void main(String[] args) {
8         JOptionPane.showMessageDialog(null,message:"Hello world! How are you?");
9         System.exit(status:0);
10    }
11

```

PROBLEMS 7 OUTPUT DEBUG CONSOLE TERMINAL GITLENS

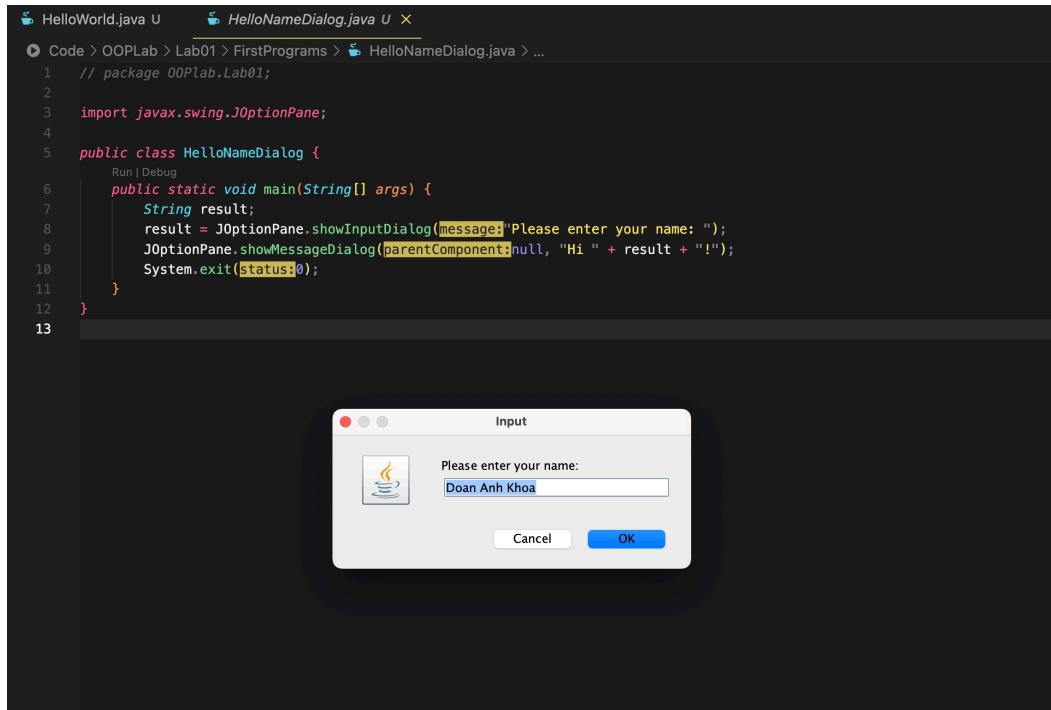
Hello world!

- ~/Documents/Code/OOPLab/Lab01/FirstPrograms > main !13 ?5 ✓ < 08:17:58
- javac HelloWorld.java ✓ < 08:19:11
- ~/Documents/Code/OOPLab/Lab01/FirstPrograms > main !13 ?5 ✓ < 08:19:18
- java HelloWorld ✓ < 08:20:57
- Xin chào
cac ban!
Hello world!

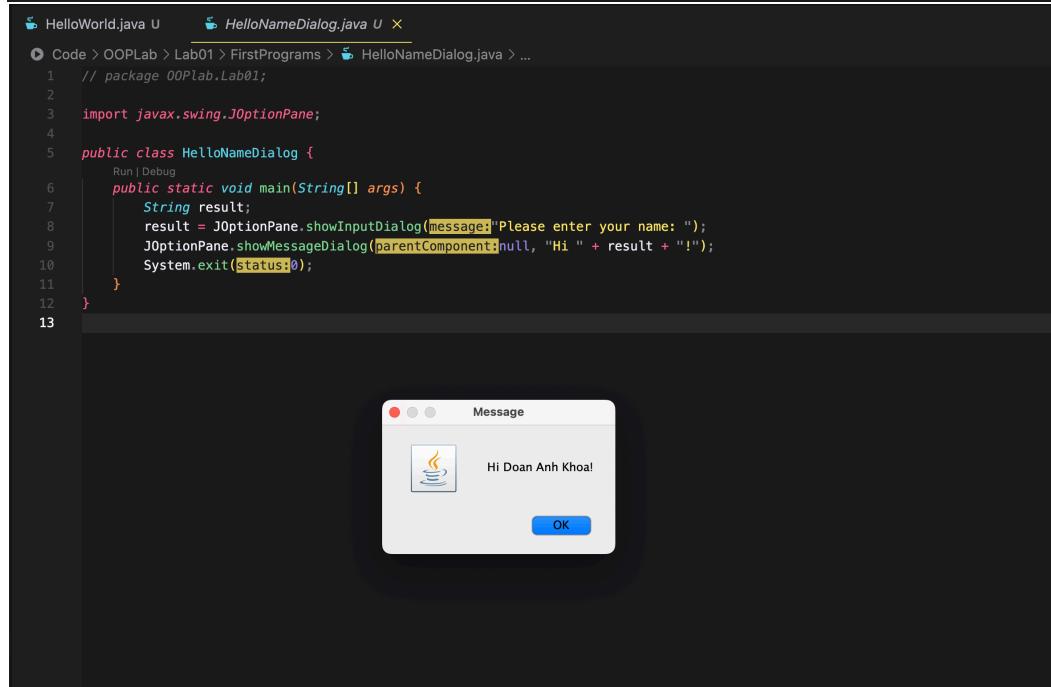
Ln 11, Col 1 Spaces: 4 UTF-8 LF () Java Go Live 🔍 🔍

2.2.3 Write, compile the first input dialog Java application

```
1 // package borlab.Lab01;
2
3 import javax.swing.JOptionPane;
4
5 public class HelloNameDialog {
6     Run | Debug
7     public static void main(String[] args) {
8         String result;
9         result = JOptionPane.showInputDialog(message:"Please enter your name:");
10        JOptionPane.showMessageDialog(parentComponent:null, "Hi " + result + "!");
11    }
12 }
13
```



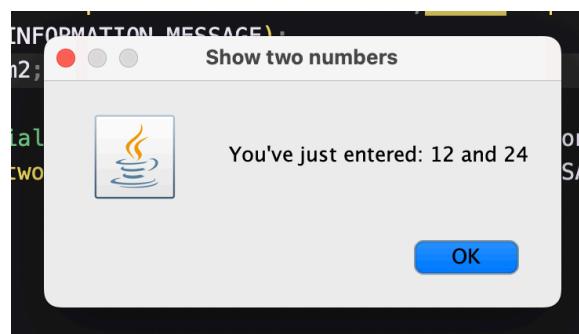
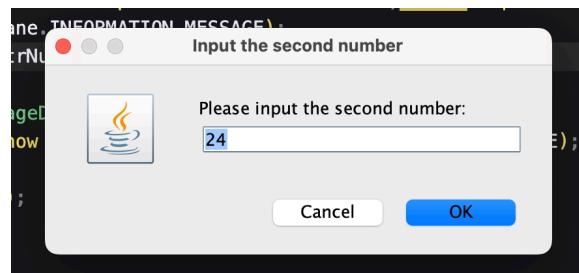
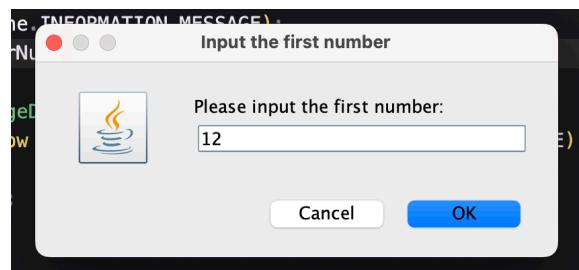
```
1 // package OOPLab;
2
3 import javax.swing.JOptionPane;
4
5 public class HelloNameDialog {
6     Run | Debug
7     public static void main(String[] args) {
8         String result;
9         result = JOptionPane.showInputDialog(message:"Please enter your name: ");
10        JOptionPane.showMessageDialog(parentComponent:null, "Hi " + result + "!");
11    }
12 }
13
```



```
1 // package OOPLab;
2
3 import javax.swing.JOptionPane;
4
5 public class HelloNameDialog {
6     Run | Debug
7     public static void main(String[] args) {
8         String result;
9         result = JOptionPane.showInputDialog(message:"Please enter your name: ");
10        JOptionPane.showMessageDialog(parentComponent:null, "Hi " + result + "!");
11    }
12 }
13
```

2.2.4 Write, compile, and run the following example:

```
2 import javax.swing.JOptionPane;
3
4 public class ShowTwoNumbers {
5     Run | Debug
6     public static void main(String[] args) {
7         String strNum1, strNum2;
8         String strNotification = "You've just entered: ";
9
10        strNum1 = JOptionPane.showInputDialog(parentComponent:null,
11            message:"Please input the first number:",title:"Input the first number",
12            JOptionPane.INFORMATION_MESSAGE);
13        strNotification += strNum1 + " and ";
14
15        strNum2 = JOptionPane.showInputDialog(parentComponent:null,
16            message:"Please input the second number:",title:"Input the second number",
17            JOptionPane.INFORMATION_MESSAGE);
18        strNotification += strNum2;
19
20        JOptionPane.showMessageDialog(parentComponent:null, strNotification,
21            title:"Show two numbers", JOptionPane.INFORMATION_MESSAGE);
22
23        System.exit(status:0);
24
25    }
26
27 }
```



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

```

2
3 import javax.swing.JOptionPane;
4
5 public class Calculator {
6     Run | Debug
7     public static void main(String[] args) {
8
9         double num1 = Double.parseDouble(JOptionPane.showInputDialog(message:"Input the first number: "));
10        double num2 = Double.parseDouble(JOptionPane.showInputDialog(message:"Input the second number: "));
11
12        double sum = num1 + num2;
13        double difference = num1 - num2;
14        double product = num1 * num2;
15        double quotient;
16
17        if (num2 == 0) {
18            JOptionPane.showMessageDialog(parentComponent:null, message:"Cannot divide by zero");
19            quotient = Double.NaN;
20        } else {
21            quotient = num1 / num2;
22        }
23
24        String strNotification = "Sum: " + sum +
25                    "\nDifference: " + difference +
26                    "\nProduct: " + product +
27                    "\nQuotient: " + quotient;
28
29        JOptionPane.showMessageDialog(parentComponent:null, strNotification);
30
31        System.exit(status:0);
32    }
}

```

```

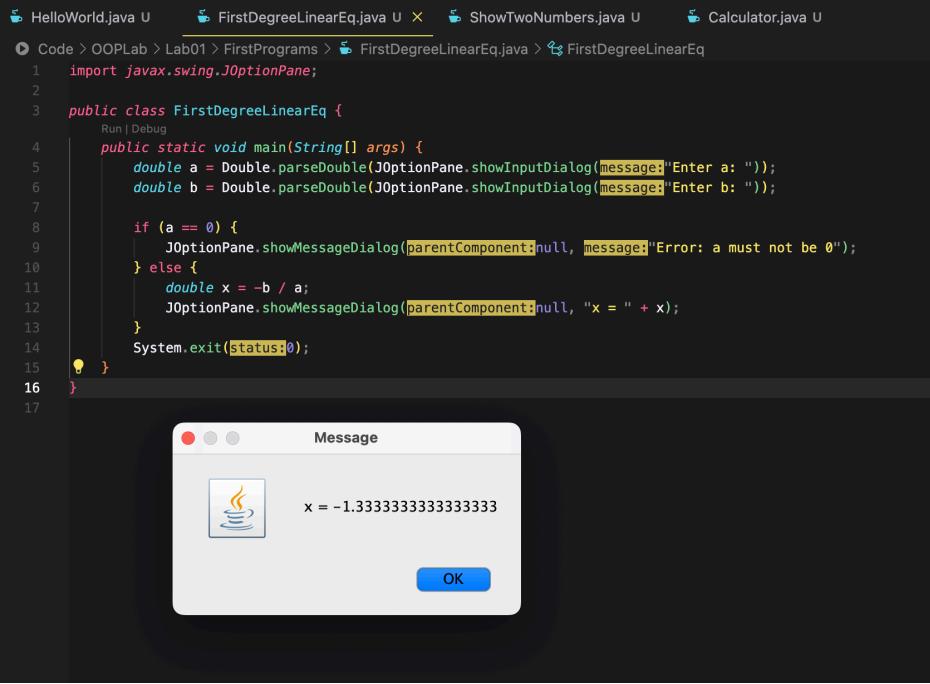
HelloWorld.java U ShowTwoNumbers.java U Calculator.java U X
Code > OOPLab > Lab01 > FirstPrograms > Calculator.java > Calculator > main(String[])
1 // package OOPLab.Lab01;
2
3 import javax.swing.JOptionPane;
4
5 public class Calculator {
6     Run | Debug
7     public static void main(String[] args) {
8
9         double num1 = Double.parseDouble(JOptionPane.showInputDialog(message:"Input the first number: "));
10        double num2 = Double.parseDouble(JOptionPane.showInputDialog(message:"Input the second number: "));
11
12        double sum = num1 + num2;
13        double difference = num1 - num2;
14        double product = num1 * num2;
15        double quotient;
16
17        if (num2 == 0) {
18            JOptionPane.showMessageDialog(parentComponent:null, message:"Cannot divide by zero");
19            quotient = Double.NaN;
20        } else {
21            quotient = num1 / num2;
22        }
23
24        String strNotification = "Sum: " + sum +
25                    "\nDifference: " + difference +
26                    "\nProduct: " + product +
27                    "\nQuotient: " + quotient;
28
29        JOptionPane.showMessageDialog(parentComponent:null, strNotification);
30
31        System.exit(status:0);
32    }
}

```

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



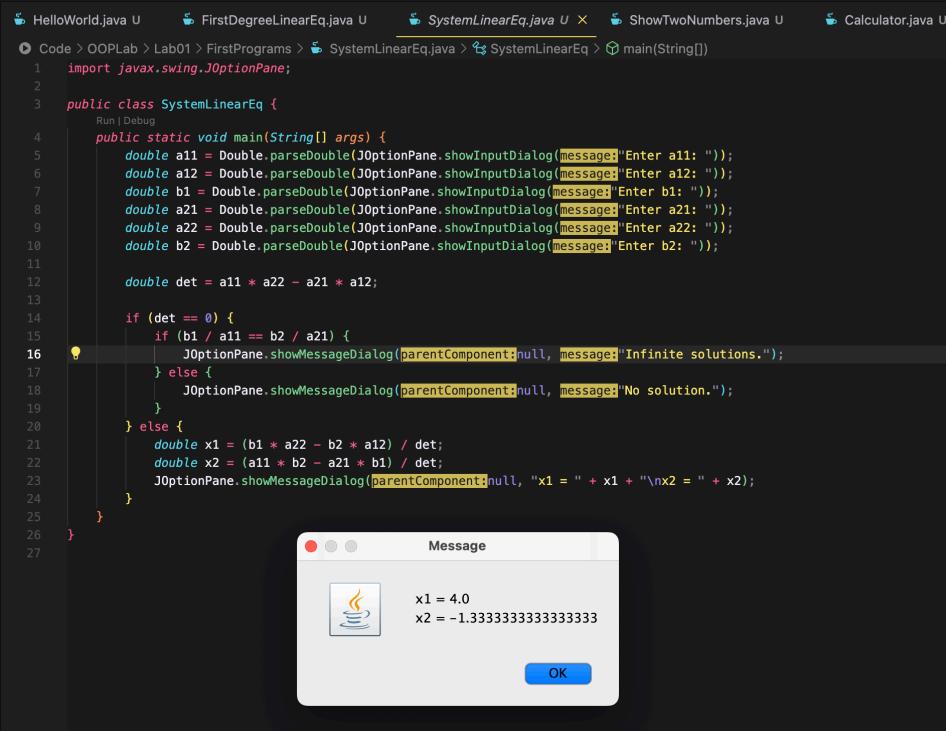
The screenshot shows a Java IDE interface with several tabs at the top: HelloWorld.java U, FirstDegreeLinearEq.java U, ShowTwoNumbers.java U, and Calculator.java U. Below the tabs, there is a code editor containing the following Java code:

```

1 import javax.swing.JOptionPane;
2
3 public class FirstDegreeLinearEq {
4     public static void main(String[] args) {
5         double a = Double.parseDouble(JOptionPane.showInputDialog("Enter a: "));
6         double b = Double.parseDouble(JOptionPane.showInputDialog("Enter b: "));
7
8         if (a == 0) {
9             JOptionPane.showMessageDialog(null, "Error: a must not be 0");
10        } else {
11            double x = -b / a;
12            JOptionPane.showMessageDialog(null, "x = " + x);
13        }
14        System.exit(status:0);
15    }
16 }
```

Below the code editor, a message dialog box titled "Message" is displayed. It contains a small coffee cup icon and the text "x = -1.3333333333333333". A blue "OK" button is at the bottom right of the dialog.

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



The screenshot shows a Java IDE interface with several tabs at the top: HelloWorld.java U, FirstDegreeLinearEq.java U, SystemLinearEq.java U, ShowTwoNumbers.java U, and Calculator.java U. Below the tabs, there is a code editor containing the following Java code:

```

1 import javax.swing.JOptionPane;
2
3 public class SystemLinearEq {
4     public static void main(String[] args) {
5         double a11 = Double.parseDouble(JOptionPane.showInputDialog("Enter a11: "));
6         double a12 = Double.parseDouble(JOptionPane.showInputDialog("Enter a12: "));
7         double b1 = Double.parseDouble(JOptionPane.showInputDialog("Enter b1: "));
8         double a21 = Double.parseDouble(JOptionPane.showInputDialog("Enter a21: "));
9         double a22 = Double.parseDouble(JOptionPane.showInputDialog("Enter a22: "));
10        double b2 = Double.parseDouble(JOptionPane.showInputDialog("Enter b2: "));
11
12        double det = a11 * a22 - a21 * a12;
13
14        if (det == 0) {
15            if (b1 / a11 == b2 / a21) {
16                JOptionPane.showMessageDialog(null, "Infinite solutions.");
17            } else {
18                JOptionPane.showMessageDialog(null, "No solution.");
19            }
20        } else {
21            double x1 = (b1 * a22 - b2 * a12) / det;
22            double x2 = (a11 * b2 - a21 * b1) / det;
23            JOptionPane.showMessageDialog(null, "x1 = " + x1 + "\nx2 = " + x2);
24        }
25    }
26 }
27 }
```

Below the code editor, a message dialog box titled "Message" is displayed. It contains a small coffee cup icon and the text "x1 = 4.0" and "x2 = -1.3333333333333333". A blue "OK" button is at the bottom right of the dialog.

- The second-degree equation with one variable

The screenshot shows a Java code editor with several files listed in the top bar: HelloWorld.java, FirstDegreeLinearEq.java, SecondDegreeEq.java (selected), ShowTwoNumbers.java, and Calculator.java. The code in SecondDegreeEq.java handles user input for coefficients a, b, and c, calculates the discriminant delta, and finds two distinct real roots if delta > 0. A message dialog box titled "Message" is displayed, showing "Two distinct roots" followed by the values x1 = -1.0 and x2 = -2.0.

```

1 import javax.swing.JOptionPane;
2
3 public class SecondDegreeEq {
4     public static void main(String[] args) {
5         double a = 0;
6         while (a == 0) {
7             a = Double.parseDouble(JOptionPane.showInputDialog("Enter a: "));
8             if (a == 0) {
9                 JOptionPane.showMessageDialog(parentComponent:null, "a cannot be zero");
10            }
11        }
12        double b = Double.parseDouble(JOptionPane.showInputDialog("Enter b: "));
13        double c = Double.parseDouble(JOptionPane.showInputDialog("Enter c: "));
14
15        double delta = b*b - 4*a*c;
16        if (delta == 0) {
17            double root = -b / (2 * a);
18            JOptionPane.showMessageDialog(parentComponent:null, "One double root \nx1 = x2 = " + root);
19        } else if (delta < 0) {
20            JOptionPane.showMessageDialog(parentComponent:null, "No real root");
21        } else {
22            double root1 = (-b + Math.sqrt(delta)) / (2 * a);
23            double root2 = (-b - Math.sqrt(delta)) / (2 * a);
24            JOptionPane.showMessageDialog(parentComponent:null, "Two distinct roots \nx1 = " + root1 + "\nx2 = " + root2);
25        }
26    }
27 }
28
29 }
30 }
31

```

6 Exercises

6.1 Write, compile and run the ChoosingOption program:

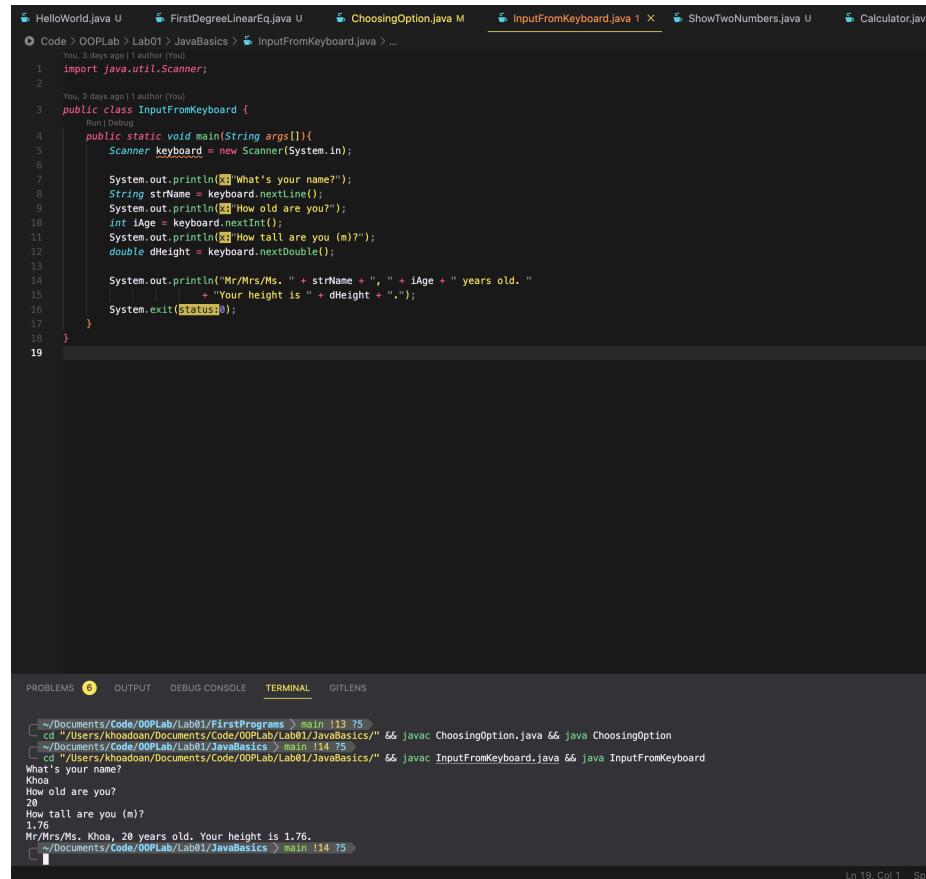
The screenshot shows a Java code editor with files HelloWorld.java, FirstDegreeLinearEq.java, ChoosingOption.java (selected), and ShowTwoNumbers.java. The code in ChoosingOption.java prompts the user with a confirmation dialog asking if they want to change to a first-class ticket. If "Yes" is selected, it prints a confirmation message and exits. A message dialog box titled "Confirmation" is displayed, asking "Do you want to change to the first class ticket?" with "Yes" and "No" buttons.

```

1 import javax.swing.JOptionPane;
2
3 public class ChoosingOption {
4     public static void main(String[] args) {
5         int option = JOptionPane.showConfirmDialog(parentComponent:null,
6             "Do you want to change to the first class ticket?", "Confirmation",
7             JOptionPane.YES_NO_OPTION);
8
9         JOptionPane.showMessageDialog(parentComponent:null, "You've chosen: "
10             + (option == JOptionPane.YES_OPTION? "Yes": "No"));
11         System.exit(status:0);
12     }
13 }
14
15 }
16

```

6.2 Write a program for input/output from keyboard



```

1 import java.util.Scanner;
2
3 public class InputFromKeyboard {
4     public static void main(String args[]){
5         Scanner keyboard = new Scanner(System.in);
6
7         System.out.println("What's your name?");
8         String strName = keyboard.nextLine();
9         System.out.println("How old are you?");
10        int iAge = keyboard.nextInt();
11        System.out.println("How tall are you (m)?");
12        double dHeight = keyboard.nextDouble();
13
14        System.out.println("Mr/Mrs/Ms. " + strName + ", " + iAge + " years old. "
15                           + "Your height is " + dHeight + ".");
16        System.exit(0);
17    }
18 }
19

```

PROBLEMS 6 OUTPUT DEBUG CONSOLE TERMINAL GITLENS

```

~/.Documents/Code/OOPLab/Lab01/FirstPrograms > main !13 ?5
cd "/Users/khoaan/Documents/Code/OOPLab/Lab01/JavaBasics/" && javac ChoosingOption.java && java ChoosingOption
~/.Documents/Code/OOPLab/Lab01/JavaBasics > main !14 ?5
cd "/Users/khoaan/Documents/Code/OOPLab/Lab01/JavaBasics/" && javac InputFromKeyboard.java && java InputFromKeyboard
What's your name?
Khoa
How old are you?
28
How tall are you (m)?
1.76
Mr/Mrs/Ms. Khoa, 28 years old. Your height is 1.76.
~/.Documents/Code/OOPLab/Lab01/JavaBasics > main !14 ?5

```

Line 19, Col 1 - Spacing

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

```

HelloWorld.java U FirstDegreeLinearEq.java U ChoosingOption.java M DisplayTriangle.java 1 X ShowTwoNumber...
Code > OOPLab > Lab01 > DisplayTriangle > DisplayTriangle.java > main(String[])
You, 3 days ago | 1 author (You)
import java.util.Scanner;
You, 3 days ago | 1 author (You)
public class DisplayTriangle {
    Run | Debug
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Input the height of the triangle: ");
        int n = scanner.nextInt();
        for (int i=1; i<=n;i++) {
            for (int j=1;j<=n-i;j++) System.out.print(" ");
            for (int j = 1; j <= 2 * i - 1; j++) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL GITLENS

```

How tall are you (m)?
1.76
Mr/Mrs/Ms. Khoa, 20 years old. Your height is 1.76.
cd "/Users/khoadoan/Documents/Code/OOPLab/Lab01/JavaBasics" > main !14 ?5
Input the height of the triangle:
*
***
*****
*****
*****
*****
~ /Documents/Code/OOPLab/Lab01/DisplayTriangle > main !14 ?5

```

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.

```

1 import java.util.Scanner;
2
3 public class DaysInAMonth {
4     Run | Debug
5     public static void main(String[] args) {
6         Scanner scanner = new Scanner(System.in);
7         String[] monthFullNames = {"January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December"};
8         String[] monthAbbreviations = {"Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov", "Dec"};
9         String[] monthNumbers = {"1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12"};
10        int[] monthDays = {31, 28, 31, 30, 31, 30, 31, 30, 31, 30, 31, 30, 31};
11        boolean isValidMonth = false;
12        boolean isValidYear = false;
13        int month = 0;
14        int year = 0;
15
16        while (!isValidMonth) {
17            System.out.print("Enter the month (in full name, abbreviation, in 3 letters, or in number): ");
18            String monthInput = scanner.nextLine();
19            for (int i = 0; i <= 11; i++) {
20                if (monthInput.equals(monthFullNames[i]) || monthInput.equals(monthAbbreviations[i])
21                    || monthInput.equals(month3Letters[i]) || monthInput.equals(monthNumbers[i]))
22                {
23                    month = i;
24                    isValidMonth = true;
25                }
26            }
27            if (!isValidMonth) {
28                System.out.println("Invalid month! Please try again.");
29            }
30        }
31
32        while (!isValidYear) {
33            System.out.print("Enter the year (in non-negative number): ");
34            String yearInput = scanner.nextLine();
35            try {
36                year = Integer.parseInt(yearInput);
37                if (year < 0) {
38                    System.out.println("Year must be a non-negative number. Please try again.");
39                } else {
40                    isValidYear = true;
41                }
42            } catch (NumberFormatException e) {
43                System.out.println("Invalid year format. Please try again.");
44            }
45        }
46
47        int days = monthDays[month];
48        if ((year % 4 == 0 && year % 100 != 0) || year % 400 == 0) days += 1;
49
50        System.out.println(monthFullNames[month] + " " + year + " has " + days + " days.\n");
51    }
52    System.exit(status);
53}

```

```

~/Documents/Code/OOPLab/Lab01/DisplayTriangle > main !14 ?5
~/Documents/Code/OOPLab/Lab01/DisplayTriangle > main !14 ?5
cd "/Users/khoadan/Documents/Code/OOPLab/Lab01/DaysInMonth/" && javac DaysInAMonth.java && java DaysInAMonth
Enter the month (in full name, abbreviation, in 3 letters, or in number): 2
Enter the year (in non-negative number): 2016
February 2016 has 29 days.

~/Documents/Code/OOPLab/Lab01/DaysInMonth > main !14 ?5

```

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

```

1 import java.util.Arrays;
2 import java.util.Scanner;
3
4 public class WorkWithArray {
5     Run | Debug
6     public static void main(String[] args) {
7         Scanner scanner = new Scanner(System.in);
8         int n, sum=0;
9         System.out.print("Enter number of elements in the array: ");
10        n = scanner.nextInt();
11        int arr[] = new int[n];
12        for (int i = 0; i <= n - 1; i++) {
13            System.out.print("Enter element a["+i+"]: ");
14            arr[i] = scanner.nextInt();
15            sum += arr[i];
16        }
17
18        Arrays.sort(arr);
19        double averageValue = (double)((double)sum / n);
20
21        System.out.println("Array elements in increasing order: " + Arrays.toString(arr));
22        System.out.println("Sum of array elements : " + sum);
23        System.out.println("Average value of array elements : " + averageValue);
24    }
25}

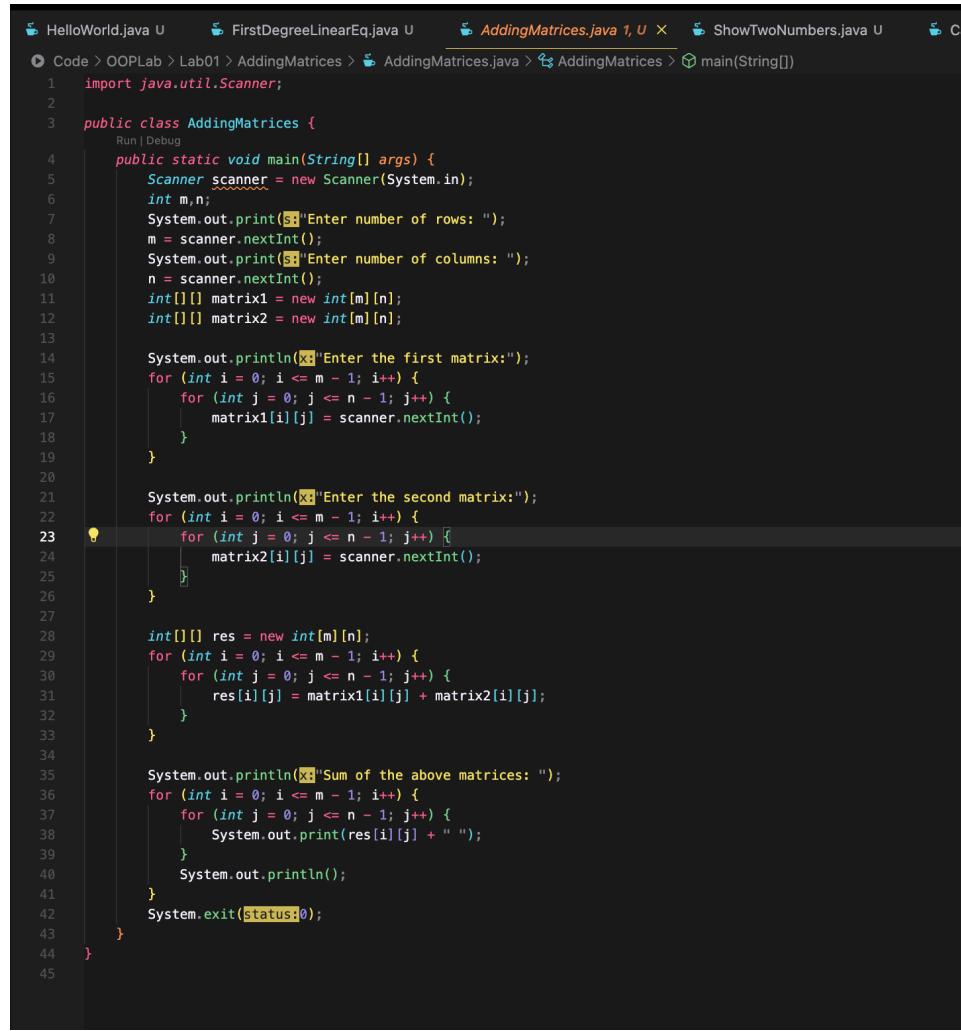
```

```

~/Documents/Code/OOPLab/Lab01/DaysInMonth > main !14 ?5
cd "/Users/khadoan/Documents/Code/OOPLab/Lab01/Array/" && javac WorkWithArray.java && java WorkWithArray
Enter number of elements in the array: 5
Enter element a[0]: 1
Enter element a[1]: 2
Enter element a[2]: 3
Enter element a[3]: -4
Enter element a[4]: 5
Array elements in increasing order: [-4, 1, 2, 3, 5]
Sum of array elements : 7
Average value of array elements : 1.4
~/Documents/Code/OOPLab/Lab01/Array > main !14 ?5

```

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



```

HelloWorld.java U      FirstDegreeLinearEq.java U      AddingMatrices.java 1, U X      ShowTwoNumbers.java U      Ca
Code > OOPLab > Lab01 > AddingMatrices > AddingMatrices.java > AddingMatrices > main(String[])
Run | Debug

1 import java.util.Scanner;
2
3 public class AddingMatrices {
4     Run | Debug
5         Scanner scanner = new Scanner(System.in);
6         int m,n;
7         System.out.print("Enter number of rows: ");
8         m = scanner.nextInt();
9         System.out.print("Enter number of columns: ");
10        n = scanner.nextInt();
11        int[][] matrix1 = new int[m][n];
12        int[][] matrix2 = new int[m][n];
13
14        System.out.println("Enter the first matrix:");
15        for (int i = 0; i <= m - 1; i++) {
16            for (int j = 0; j <= n - 1; j++) {
17                matrix1[i][j] = scanner.nextInt();
18            }
19        }
20
21        System.out.println("Enter the second matrix:");
22        for (int i = 0; i <= m - 1; i++) {
23            for (int j = 0; j <= n - 1; j++) {
24                matrix2[i][j] = scanner.nextInt();
25            }
26        }
27
28        int[][] res = new int[m][n];
29        for (int i = 0; i <= m - 1; i++) {
30            for (int j = 0; j <= n - 1; j++) {
31                res[i][j] = matrix1[i][j] + matrix2[i][j];
32            }
33        }
34
35        System.out.println("Sum of the above matrices: ");
36        for (int i = 0; i <= m - 1; i++) {
37            for (int j = 0; j <= n - 1; j++) {
38                System.out.print(res[i][j] + " ");
39            }
40            System.out.println();
41        }
42        System.exit(status:0);
43    }
44}

```

```

Average value of array elements : 1.4
~/Documents/Code/OOPLab/Lab01/Array > main !14 ?5
cd "/Users/khadoan/Documents/Code/OOPLab/Lab01/AddingMatrices/" && javac AddingMatrices.java && java AddingMatrices
Enter number of rows: 3
Enter number of columns: 3
Enter the first matrix:
1 2 3
4 5 6
7 8 9
Enter the second matrix:
9 8 7
6 5 4
3 2 1
Sum of the above matrices:
10 10 10
10 10 10
10 10 10
~/Documents/Code/OOPLab/Lab01/AddingMatrices > main !14 ?5

```