Lab Report

Course:

Object-Oriented Programming II
Course Code: CSE 2110

Lab Title:

OOP Lab II:

Submitted by:

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Submission Date:

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Problem 1: Hello World

Question: Write a Java program that prints "Hello, World!" to the console.
Sample Input: None
Sample Output: Hello, World!

Objectives:

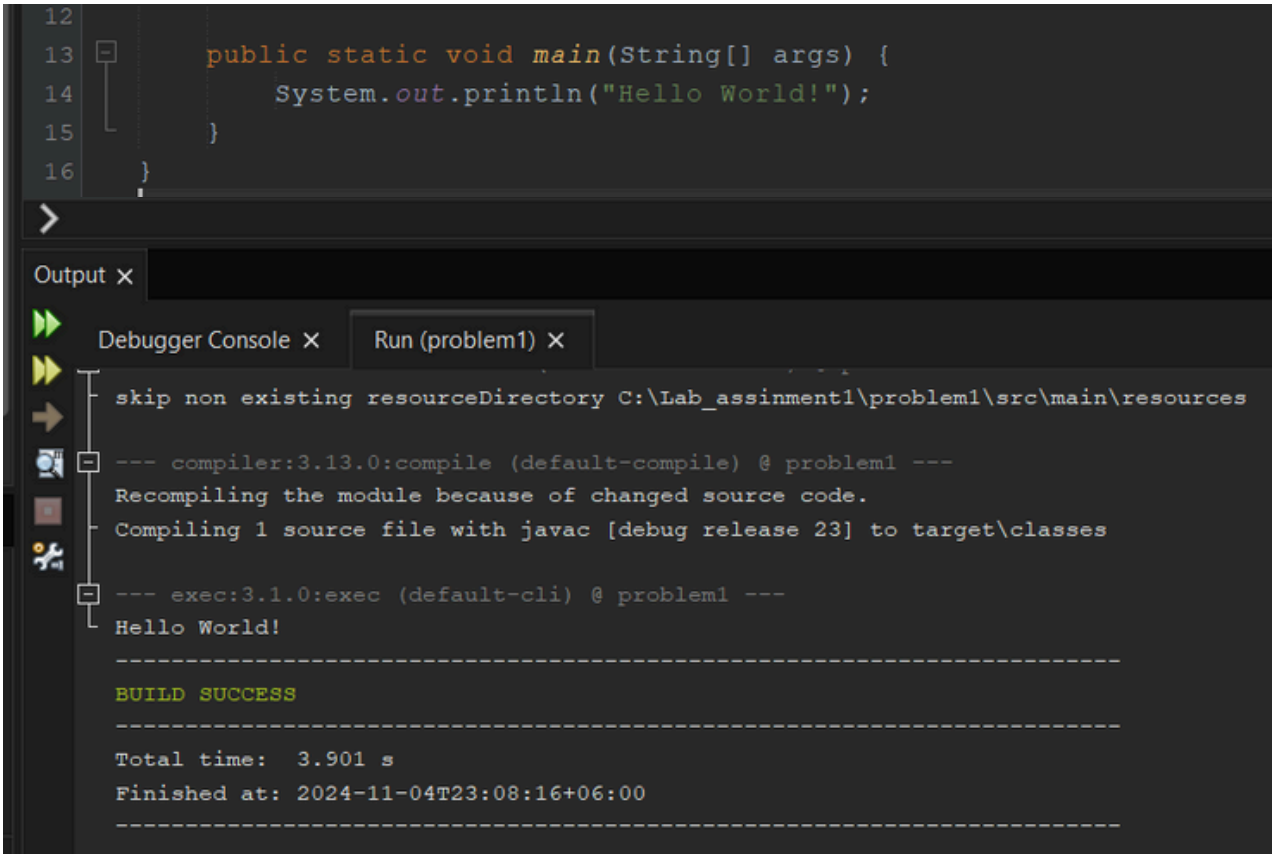
This lab experiment aims to familiarize myself with the basics of Java programming, including setting up the environment and writing a simple program to print output to the console. This task will also confirm that the Java development setup is working correctly.

Program:

```
public class Problem1 {

    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}
```

Output:

The program successfully printed the following output to the console:



Analysis and Results

The experiment confirmed that the Java environment is properly configured and that I can run a basic Java program. This task introduced:

- **Basic Syntax**: Familiarity with the `public class`, `public static void main(String[] args)`, and `System.out.println()` syntax in Java.
- **Understanding Console Output**: The `System.out.println()` method in Java outputs text to the console, which is essential for basic I/O operations.

Problem 2: Arithmetic Operations

Question: Write a program that takes two integers, performs addition, subtraction, multiplication, and division, and displays the results.
Sample Input: a = 10, b = 5
Sample Output:
Addition: 15
Subtraction: 5
Multiplication: 50
Division: 2

Objectives:

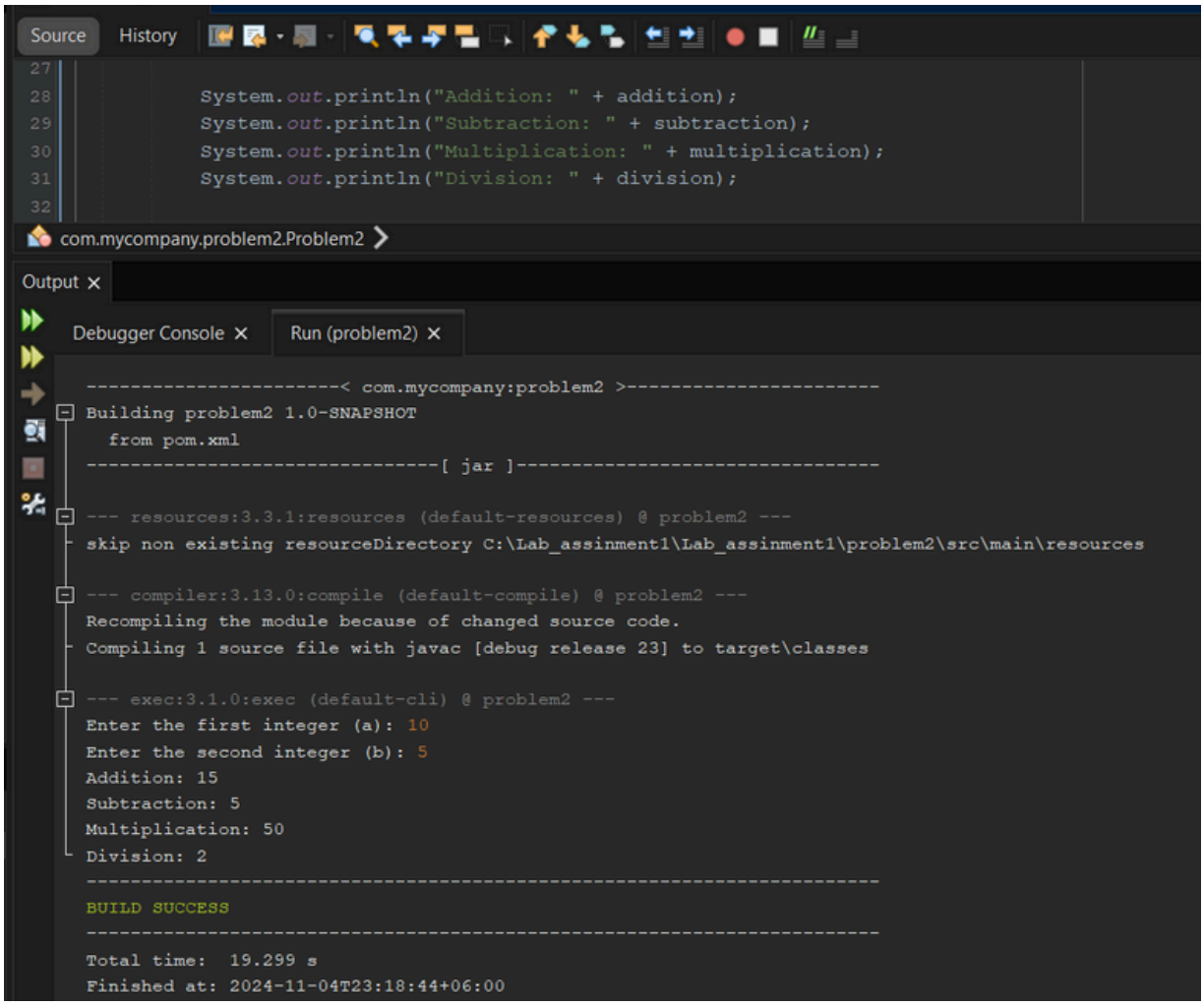
This lab experiment aims to perform basic arithmetic operations (addition, subtraction, multiplication, and division) on two integer inputs in Java. This exercise helps us understand how to handle arithmetic calculations and display results using the `System.out.println()` method.

Program:

```
public class Problem2 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first integer (a): ");
        int a = scanner.nextInt();

        System.out.print("Enter the second integer (b): ");
        int b = scanner.nextInt();

        int addition = a + b;
        int subtraction = a - b;
        int multiplication = a * b;
        int division = a / b;

        System.out.println("Addition: " + addition);
        System.out.println("Subtraction: " + subtraction);
        System.out.println("Multiplication: " + multiplication);
        System.out.println("Division: " + division);

        scanner.close();
    }
}
```

Output:

With the input values `a = 10` and `b = 5`, the program produced the following output:



Analysis and Results:

The experiment successfully demonstrated the use of arithmetic operators in Java and displayed correct results for basic operations. This task reinforced:

- **Arithmetic Operators**: Addition (`+`), subtraction (`-`), multiplication (`*`), and division (`/`) operators were used effectively.
- **User Input Handling**: The `Scanner` class was used to capture user input, which is essential for interactive console applications.
- **Error Handling Consideration**: While not included in this code, it highlighted the need to consider division by zero in real applications.

Overall, this lab exercise provided practical experience with Java's arithmetic operations and input/output handling.

Problem 3: Area of a Circle

Question: Write a Java program to calculate the area of a circle with a given radius.
Sample Input: radius = 7.5
Sample Output: Area of Circle: 176.71

Objectives:

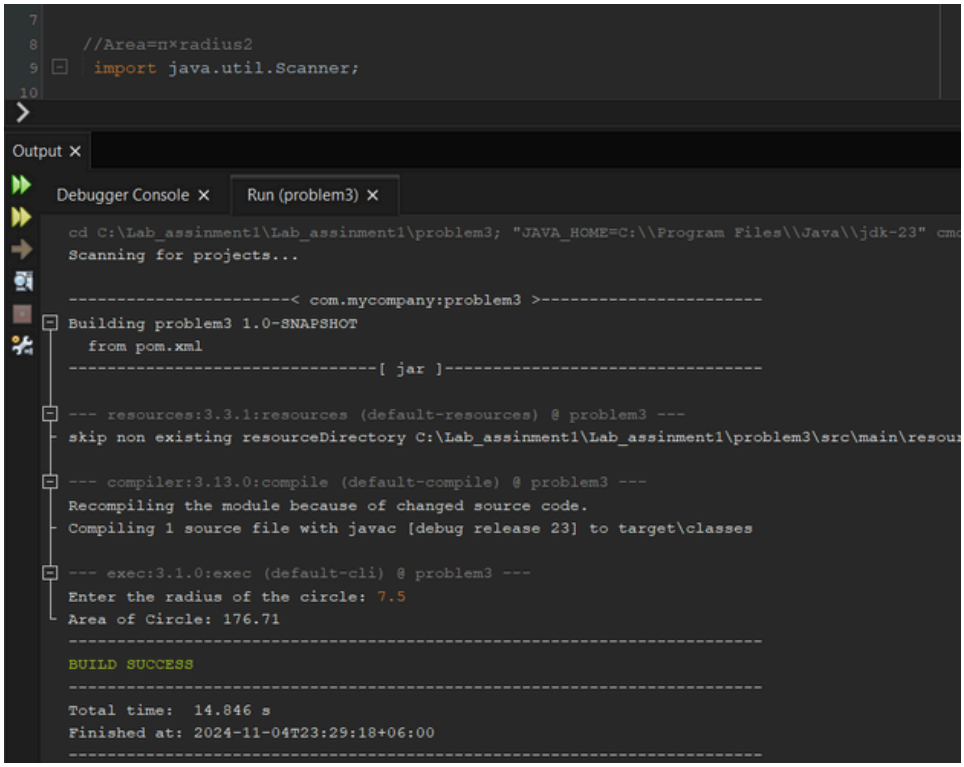
The objective of this lab experiment is to calculate the area of a circle given its radius using the formula Area= π * r² This task aims to practice using mathematical operations and understanding how to handle floating-point numbers in Java.

Program:

```
public class Problem3 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);

            System.out.print("Enter the radius of the circle: ");
            double radius = scanner.nextDouble();

            double area = Math.PI * radius * radius;

            System.out.printf("Area of Circle: %.2f", area);

            scanner.close();
        }
    }
```

Output:

With the input value of `radius = 7.5`, the program produced the following output:



Analysis and Results

The experiment successfully calculated the area of a circle based on the given radius. The results confirmed that the program implemented the mathematical formula correctly. This task helped reinforce the following concepts:

- **Mathematical Operations**: Understanding the formula for the area of a circle and implementing it in Java.
- **Floating-Point Precision**: Using `double` to handle decimal values and the `Math.PI` constant for accuracy.
- **Formatted Output**: The `System.out.printf` method was used to format the output to two decimal places, demonstrating the importance of user-friendly output formatting.

Overall, this lab exercise enhanced my understanding of basic geometric calculations and the use of Java for mathematical programming.

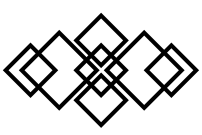
Problem 4: Temperature Conversion
Question: Convert temperature from Celsius to Fahrenheit using the formula F = (C * 9/5) + 32.
Sample Input: Celsius = 25
Sample Output: Temperature in Fahrenheit: 77.0

Objectives:

The objective of this lab experiment is to convert a temperature value from Celsius to Fahrenheit using the formula F=(C*9/5)+32. This task aims to practice the use of arithmetic operations and conversion formulas in Java.

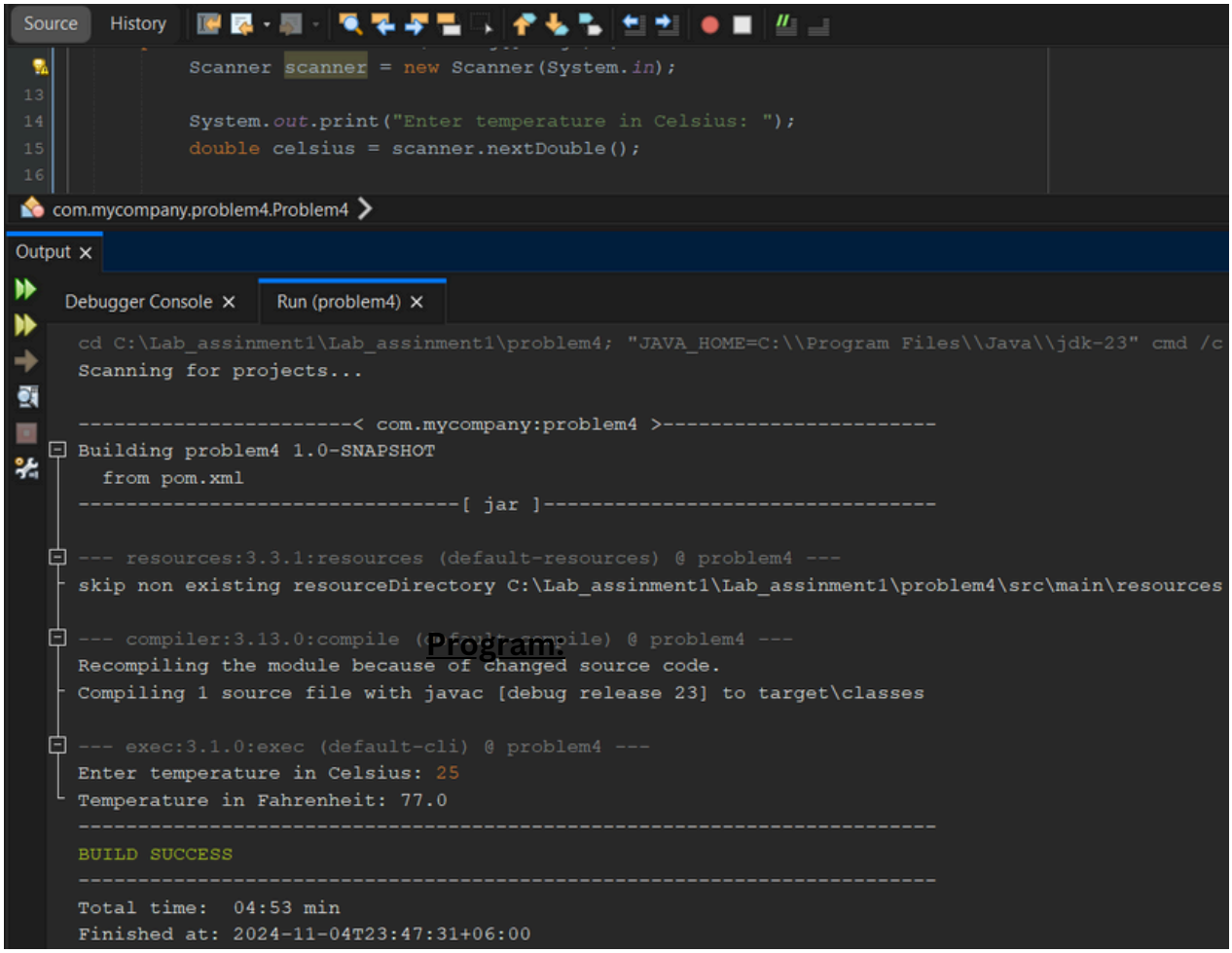
Program:

```
public class Problem4 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter temperature in Celsius: ");
        double celsius = scanner.nextDouble();

        double fahrenheit = (celsius * 9 / 5) + 32;

        System.out.printf("Temperature in Fahrenheit: %.1f", fahrenheit);

        scanner.close();
    }
}
```



Output:

With the input value of `Celsius = 25`, the program produced the following output:



Program:

Analysis and Results:

The experiment successfully converted the temperature from Celsius to Fahrenheit using the specified formula. This task helped reinforce the following concepts:

- **Understanding Temperature Conversion**: The mathematical formula for converting Celsius to Fahrenheit was implemented correctly.
- **Floating-Point Calculations**: Using `double` to handle decimal values, ensuring precision in calculations.
- **Formatted Output**: The `System.out.printf` method was used to format the output to one decimal place, demonstrating the importance of clear and precise presentation.

Overall, this lab exercise provided practical experience in handling arithmetic calculations in Java and reinforced the understanding of temperature conversion principles.

Problem 5: Swap Two Numbers

Question: Swap two numbers using a temporary variable.
Sample Input: x = 10, y = 20
Sample Output: After swap, x = 20, y = 10

Objectives:

The objective of this lab experiment is to swap the values of two numbers using a temporary variable. This task aims to practice variable manipulation and understand how to implement basic algorithms in Java.

Program:

```
public class Problem5 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the value of x: ");
        int x = scanner.nextInt();

        System.out.print("Enter the value of y: ");
        int y = scanner.nextInt();

        System.out.println("Before swap, x = " + x + ", y = " + y);

        int temp = x;
        x = y;
        y = temp;
        System.out.println("After swap, x = " + x + ", y = " + y);

        scanner.close();
    }
}
```

Output:

With the input values `x = 10` and `y = 20`, the program produced the following output:

```
16          int x = scanner.nextInt();
17
18          System.out.print("Enter the value of y: ");
19          int y = scanner.nextInt();
```

Output ×

Debugger Console × | Run (problem5) ×

```
--- resources:3.3.1:resources (default-resources) @ problem5 ---
skip non existing resourceDirectory C:\Lab_assinment1\Lab_assinment1\problem5\src\

--- compiler:3.13.0:compile (default-compile) @ problem5 ---
Nothing to compile - all classes are up to date.

--- exec:3.1.0:exec (default-cli) @ problem5 ---
Enter the value of x: 10
Enter the value of y: 20
Before swap, x = 10, y = 20
After swap, x = 20, y = 10
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  8.401 s
Finished at: 2024-11-04T23:55:42+06:00
------------------------------------------------------------------------
```

Analysis and Results:

The experiment successfully demonstrated the process of swapping two numbers using a temporary variable. This task reinforced the following concepts:

- **Variable Manipulation**: Understanding how to use a temporary variable to hold one value during the swap process.
- **Basic Input and Output**: Utilizing the `Scanner` class for input and the `System.out.println()` output method.
- **Code Structure**: Practicing clear and logical code structuring for basic operations.

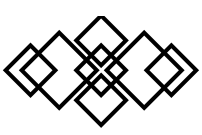
Overall, this lab exercise provided a hands-on experience with variable manipulation in Java and enhanced my understanding of basic algorithm implementation.

Problem 6: Simple Interest Calculator

Question: Calculate the simple interest based on principal, rate, and time.
Sample Input: principal = 10000, rate = 5, time = 3
Sample Output: Simple Interest: 1500.0

Objectives:

The objective of this lab experiment is to calculate the simple interest based on the principal amount, interest rate, and time period using the formula Simple interest (P*R*T)/100. This task aims to practice mathematical operations and understand input handling in Java.

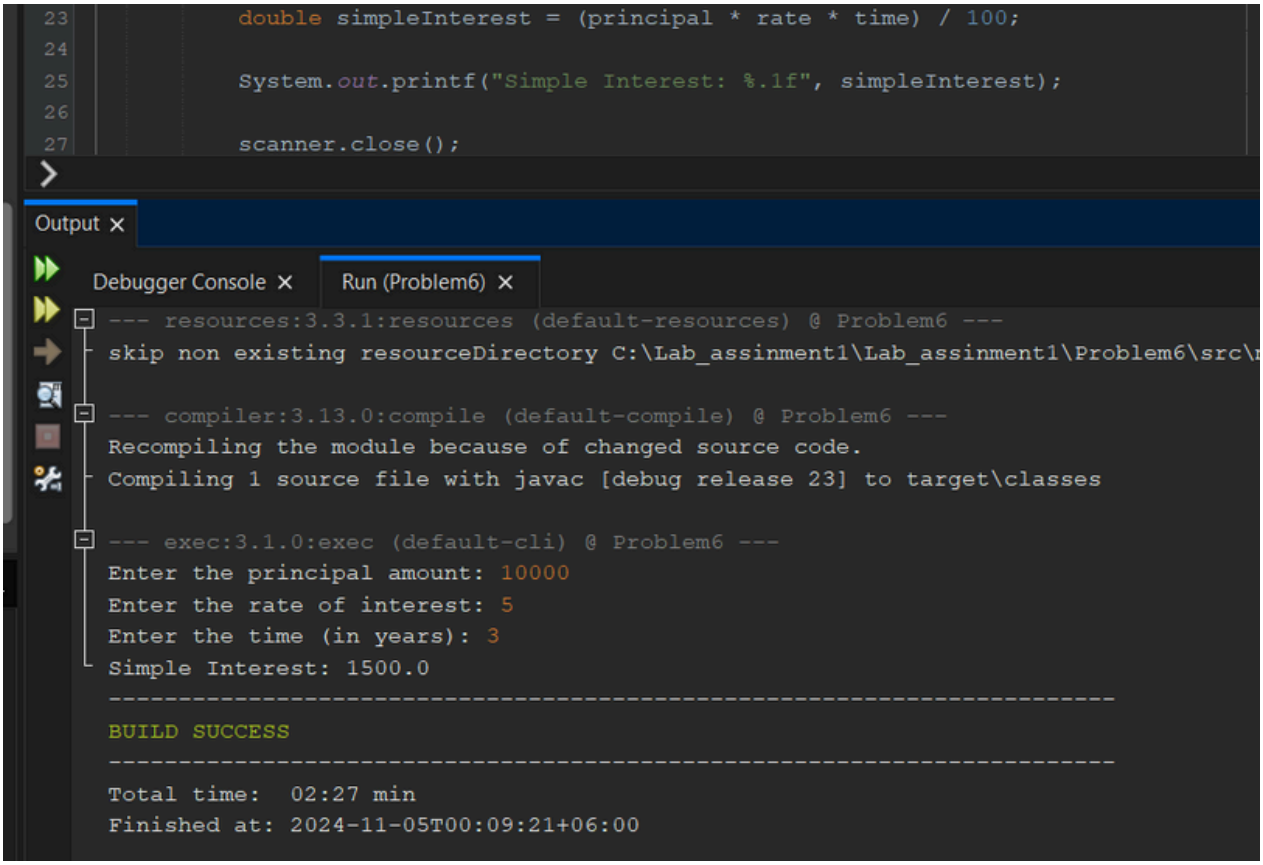


Program:

```
public class Problem6 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the principal amount: ");
        double principal = scanner.nextDouble();

        System.out.print("Enter the rate of interest: ");
        double rate = scanner.nextDouble();

        System.out.print("Enter the time (in years): ");
        double time = scanner.nextDouble();

        double simpleInterest = (principal * rate * time) / 100;

        System.out.printf("Simple Interest: %.1f", simpleInterest);

        scanner.close();
    }
}
```

Output:

With the input values `principal = 10000`, `rate = 5`, and `time = 3`, the program produced the following output:



Analysis and Results:

The experiment successfully calculated the simple interest based on the provided inputs. This task reinforced the following concepts:

- **Mathematical Operations**: Applying the formula for simple interest accurately to derive the output.
- **Data Types**: Using `double` to handle decimal values and ensure precision in financial calculations.
- **Formatted Output**: The use of `System.out.printf` to format the output to one decimal place demonstrated the importance of clarity in presentation.

Overall, this lab exercise provided practical experience in performing financial calculations in Java and reinforced my understanding of basic arithmetic operations.

Problem 7: Determine Odd or Even

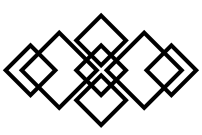
Question: Write a program to check if a number is odd or even.
Sample Input: num = 29
Sample Output: 29 is odd.

Objectives:

The objective of this lab experiment is to determine whether a given number is odd or even. This task aims to practice conditional statements in Java and understand how to perform simple arithmetic operations.

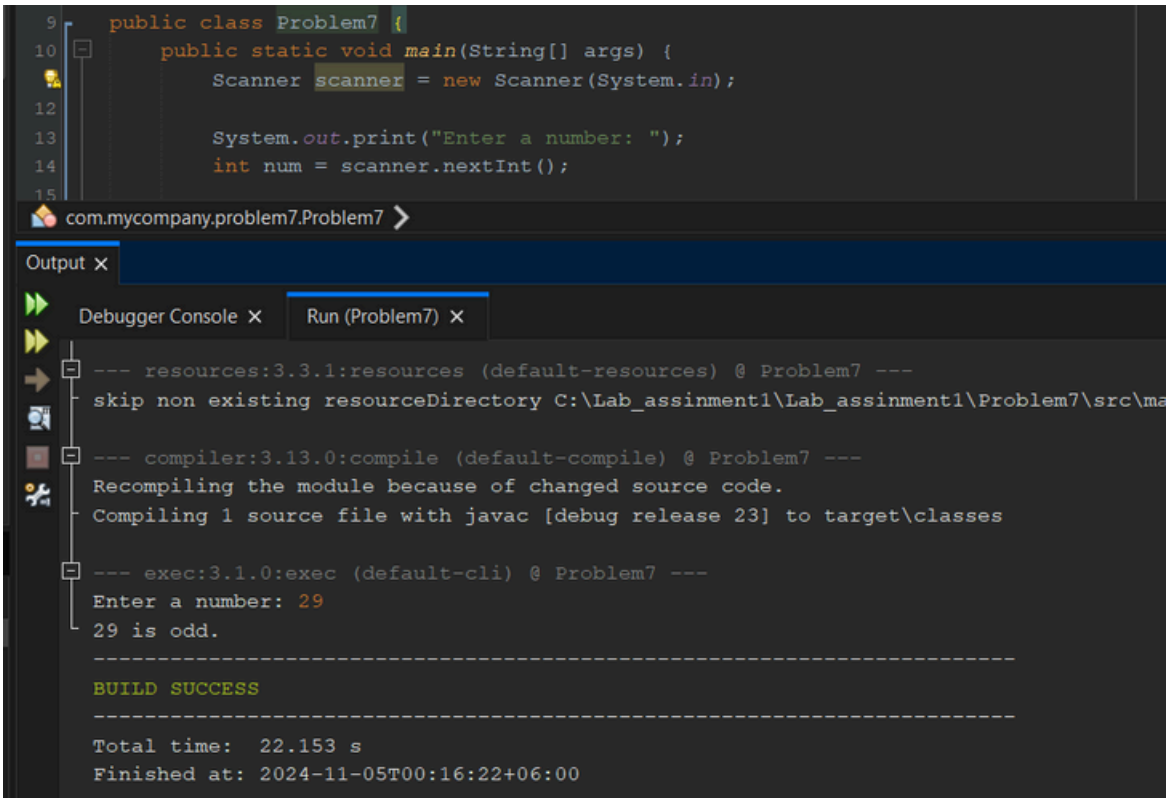
Program:

```
public class Problem7 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int num = scanner.nextInt();

        if (num % 2 == 0) {
            System.out.println(num + " is even.");
        } else {
            System.out.println(num + " is odd.");
        }

        scanner.close();
    }
}
```



Output:

With the input value of `num = 29`, the program produced the following output:



Analysis and Results:

The experiment successfully determined whether the given number is odd or even. This task reinforced the following concepts:

- **Conditional Statements**: Using the `if-else` structure to evaluate conditions and execute different blocks of code based on the evaluation.
- **Modulo Operator**: The use of the modulo operator (`%`) to check for evenness (i.e., `num % 2 == 0`) helped in understanding how to perform arithmetic checks.
- **User Input Handling**: The `Scanner` class was used effectively to capture user input.

Overall, this lab exercise provided a practical understanding of control flow in Java and enhanced my skills in working with conditional logic

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Problem 8: Find Maximum of Two Numbers

Question: Write a program to find the maximum of two numbers.
Sample Input: a = 15, b = 25
Sample Output: The maximum number is: 25

Objectives:

The objective of this lab experiment is to find the maximum of two numbers entered by the user. This task aims to practice using conditional statements and understanding how to compare values in Java.

Program:

```
public class Problem8 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first number (a): ");
        int a = scanner.nextInt();

        System.out.print("Enter the second number (b): ");
        int b = scanner.nextInt();

        int max = (a > b) ? a : b;

        System.out.println("The maximum number is: " + max);

        scanner.close();
    }
}
```

Output:

With the input values a = 15 and b = 25, the program produced the following output:

```
18          System.out.print("Enter the second number (b): ");
19          int b = scanner.nextInt();
20
21          int max = (a > b) ? a : b;
22
23          System.out.println("The maximum number is: " + max);
```

Output ×

Debugger Console × | Run (Problem8) ×

```
skip non existing resourceDirectory C:\Lab_assinment1\Lab_assinment1\Problem

--- compiler:3.13.0:compile (default-compile) @ Problem8 ---
Recompiling the module because of changed source code.
Compiling 1 source file with javac [debug release 23] to target\classes

--- exec:3.1.0:exec (default-cli) @ Problem8 ---
Enter the first number (a): 15
Enter the second number (b): 25
The maximum number is: 25
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  01:34 min
Finished at: 2024-11-05T00:23:01+06:00
```

Analysis and Results:

The experiment successfully determined the maximum of the two input numbers. This task reinforced the following concepts:

- **Conditional Statements**: Using the ternary operator (`? :`) for a concise way to evaluate which number is greater.
- **Input Handling**: Using the `Scanner` class effectively to capture user input for comparison.
- **Comparison Operators**: Understanding how to use relational operators (`>`) to compare values in Java.

Overall, this lab exercise enhanced my skills in value comparison and provided a practical understanding of control flow in programming.

Problem 9: Compute Average of Three Numbers

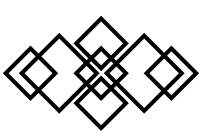
Question: Write a Java program to compute the average of three numbers.
Sample Input: num1 = 8.5, num2 = 7.3, num3 = 9.8
Sample Output: Average: 8.533333333333333

Objectives:

The objective of this lab experiment is to compute the average of three numbers provided by the user. This task aims to practice arithmetic operations and understand how to handle floating-point numbers in Java.

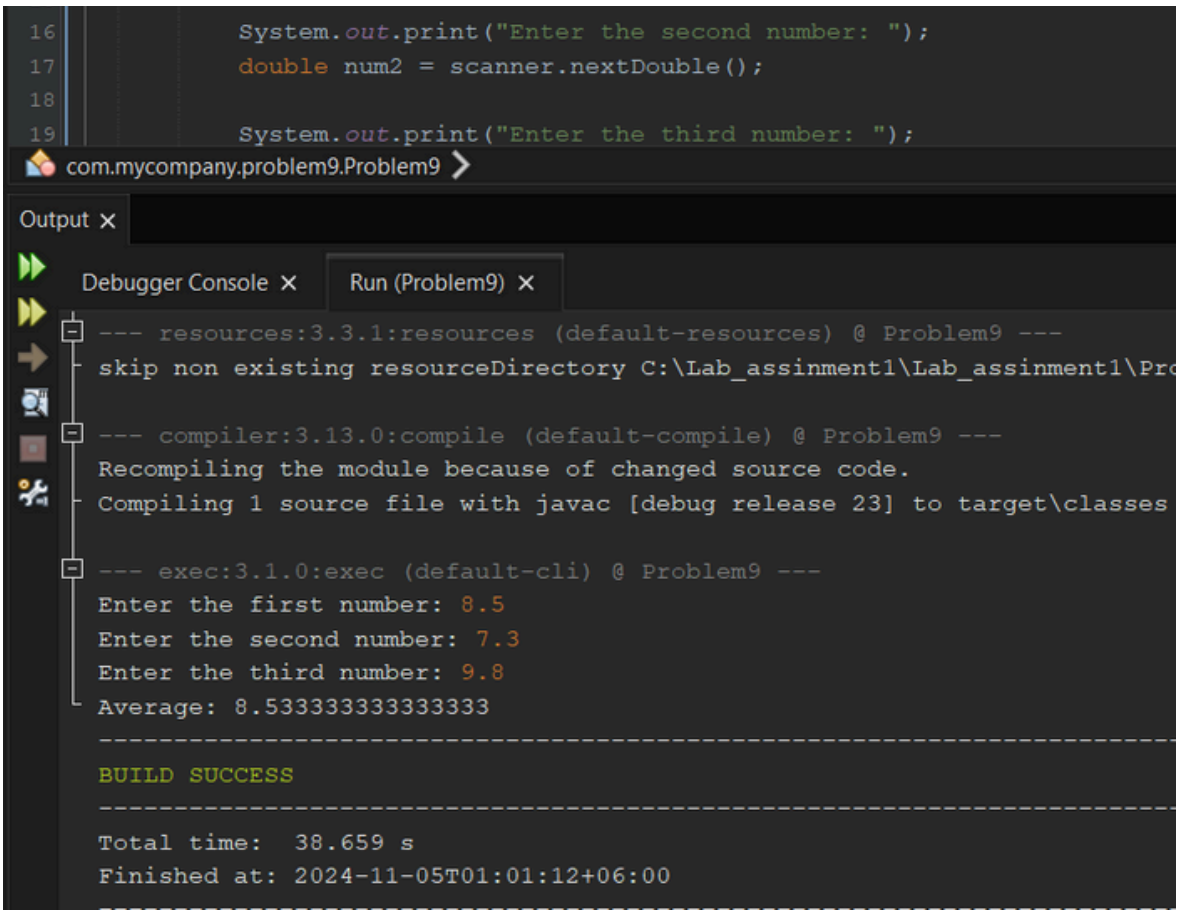
Program:

```
public class Problem9{
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first number: ");
        double num1 = scanner.nextDouble();

        System.out.print("Enter the second number: ");
        double num2 = scanner.nextDouble();

        System.out.print("Enter the third number: ");
        double num3 = scanner.nextDouble();

        double average = (num1 + num2 + num3) / 3;

        System.out.println("Average: " + average);

        scanner.close();
    }
}
```



Output:

With the input values `num1 = 8.5`, `num2 = 7.3`, and `num3 = 9.8`, the program produced the following output:



Analysis and Results:

The experiment successfully computed the average of the three input numbers. This task reinforced the following concepts:

- **Arithmetic Operations**: Understanding how to perform addition and division to calculate the average.
- **Handling Floating-Point Numbers**: Using `double` data type for accurate representation of decimal numbers.
- **Input and Output Handling**: Utilizing the `Scanner` class for input and displaying the result using `System.out.println()`.

Overall, this lab exercise provided practical experience in arithmetic calculations in Java and reinforced my understanding of how to handle multiple inputs and compute results effectively.

Problem 10: Sum of Digits

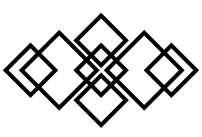
Question: Write a program to calculate the sum of digits of a given number.
Sample Input: number = 1234
Sample Output: Sum of digits: 10

Objectives:

The objective of this lab experiment is to calculate the sum of the digits of a given integer. This task aims to practice loops and arithmetic operations in Java, as well as to understand how to manipulate and analyze individual digits of a number.

Program:

```
public class Problem10 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int number = scanner.nextInt();
        int sum = 0;
        int temp = number;
        while (temp != 0) {
            sum += temp % 10;
            temp /= 10;
        }
        System.out.println("Sum of digits: " + sum);
        scanner.close();
    }
}
```



Output:

With the input value of `number = 1234`, the program produced the following output:

```
15          int sum = 0;
16          int temp = number;
17          while (temp != 0) {
18              sum += temp % 10;
```

```
Output ×
Debugger Console ×   Run (Problem10) ×
--- resources:3.3.1:resources (default-resources) @ Problem10 ---
skip non existing resourceDirectory C:\Lab_assinment1\Lab_assinment1\Problem10\src\

--- compiler:3.13.0:compile (default-compile) @ Problem10 ---
Recompiling the module because of changed source code.
Compiling 1 source file with javac [debug release 23] to target\classes

--- exec:3.1.0:exec (default-cli) @ Problem10 ---
Enter a number: 1234
Sum of digits: 10
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  15.141 s
Finished at: 2024-11-05T01:39:26+06:00
------------------------------------------------------------------------
```

Analysis and Results:

The experiment successfully calculated the sum of the digits of the given integer. This task reinforced the following concepts:

- **Looping Constructs**: Utilizing a `while` loop to iterate through the digits of the number until no digits remain.
- **Arithmetic Operations**: Using the modulo operator (`%`) to extract the last digit and integer division (`/`) to remove it from the number.
- **Input Handling**: Effectively using the `Scanner` class to capture user input.

Overall, this lab exercise provided practical experience in manipulating numbers at the digit level in Java and reinforced the understanding of basic control structures and arithmetic operations.

Thank you