Laboratory Work

Subject: Java Technologies
Branch: B.Tech. (CE)
Semester: IV
Batch: II

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Lab-1

Q.1

Write a Java program to display “Hello World”.

Ans.

```
package inheritance;

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

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA
Hello World

Process finished with exit code 0
```

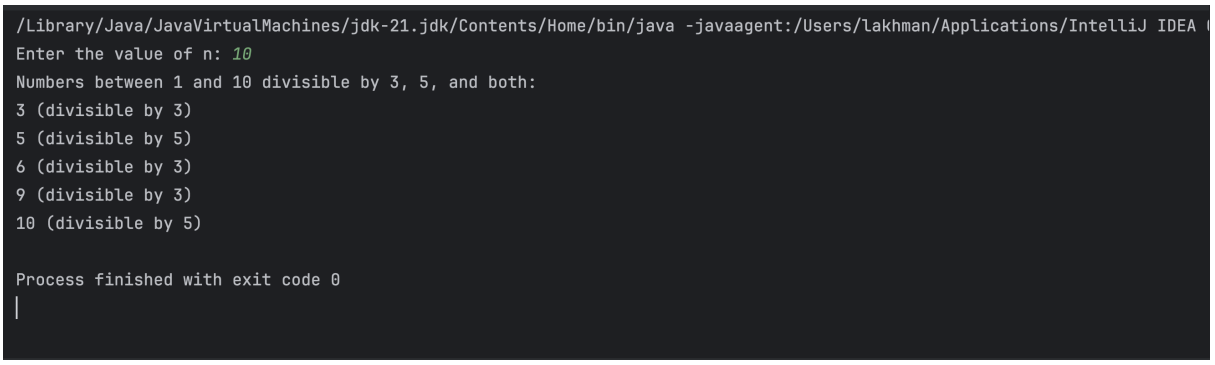
Q.2

Write a Java program to print numbers between 1 to n which are divisible by 3, 5 and by both(3 and 5) by taking n as an input from the user.

Ans.

```
package inheritance;

import java.util.Scanner;

public class DivisibleByThreeAndFive {
```

```
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the value of n: ");
        int n = scanner.nextInt();
        scanner.close();

        System.out.println("Numbers between 1 and " + n + " divisible by 3, 5, and
both:");

        for (int i = 1; i <= n; i++) {
            if (i % 3 == 0 && i % 5 == 0) {
                System.out.println(i + " (divisible by 3 and 5)");
            } else if (i % 3 == 0) {
                System.out.println(i + " (divisible by 3)");
            } else if (i % 5 == 0) {
                System.out.println(i + " (divisible by 5)");
            }
        }
    }
}
```

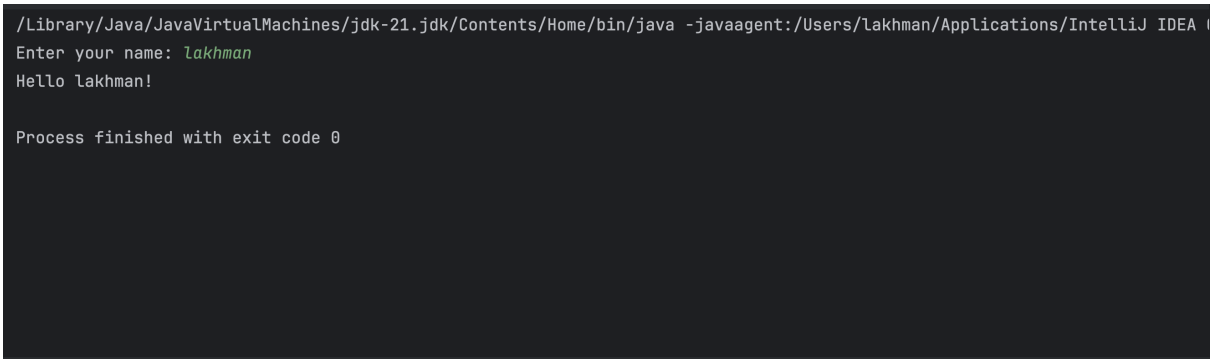


Q.3

Write a class named Greeter that prompts the user for his or her name, and then prints
a personalized greeting. As an example, if the user entered "Era", the program should
respond "Hello Era!".

Ans.

```
import java.util.Scanner;

public class Greeter {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter your name: ");
        String userName = scanner.nextLine();
        scanner.close();
        System.out.println("Hello " + userName + "!");
    }
}
```



Q.4

Write a Java program that takes Name, Roll No and marks of 5 subjects as input and gives a formatted output as:

Name: ABCD

Roll No. : 1

Average: 84

Also display the grade (e.g. A, B, C…etc) using the average.

Ans.

```
package inheritance;

import java.util.Scanner;

public class StudentDetails {
```

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

        System.out.print("Enter Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Roll No.: ");
        int rollNo = scanner.nextInt();

        System.out.print("Enter marks for 5 subjects (separated by spaces): ");
        int marks1 = scanner.nextInt();
        int marks2 = scanner.nextInt();
        int marks3 = scanner.nextInt();
        int marks4 = scanner.nextInt();
        int marks5 = scanner.nextInt();

        scanner.close();

        int totalMarks = marks1 + marks2 + marks3 + marks4 + marks5;
        double average = totalMarks / 5.0;

        System.out.println("Name: " + name);
        System.out.println("Roll No.: " + rollNo);
        System.out.println("Average: " + (int) average);

        if (average >= 90) {
            System.out.println("Grade: A");
        } else if (average >= 80) {
            System.out.println("Grade: B");
        } else if (average >= 70) {
            System.out.println("Grade: C");
        } else if (average >= 60) {
            System.out.println("Grade: D");
        } else {
            System.out.println("Grade: F");
        }
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA
Enter Name: lakhman
Enter Roll No.: 30
Enter marks for 5 subjects (separated by spaces): 80 90 96 89 97
Name: lakhman
Roll No.: 30
Average: 90
Grade: A

Process finished with exit code 0
```

Q.5

Calculate and return the sum of all the even numbers present in the numbers array passed to the method calculateSumOfEvenNumbers. Implement the logic inside calculateSumOfEvenNumbers() method.

Test the functionalities using the main() method of the Tester class.

Test the functionalities using the main() method of the Tester class.

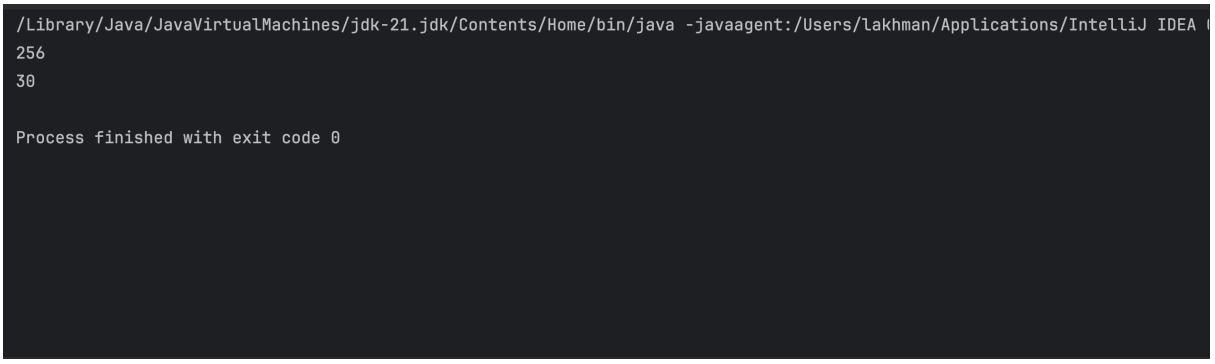
Sample Input and Output:

Sample Input	Sample Output
{68,79,86,99,23,2,41,100}	256
{1,2,3,4,5,6,7,8,9,10}	30

Ans.

```
package inheritance;

public class Tester {
    public static void main(String[] args) {
        int[] numbers1 = {68, 79, 86, 99, 23, 2, 41, 100};
        int[] numbers2 = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};

        int sum1 = calculateSumOfEvenNumbers(numbers1);
        int sum2 = calculateSumOfEvenNumbers(numbers2);

        System.out.println(sum1);
        System.out.println(sum2);
    }
```

```
    public static int calculateSumOfEvenNumbers(int[] numbers) {
        int sum = 0;

        for (int number : numbers) {
            if (number % 2 == 0) {
                sum += number;
            }
        }

        return sum;
    }
}
```



Q.6

1. Write a program to perform matrix addition and matrix multiplication on two given matrices. Use for-each form of for loop to display the matrices.

Ans.

```
public class MatrixOperations {
    public static void main(String[] args) {
        int[][] matrix1 = {
            {1, 2, 3},
            {4, 5, 6},
            {7, 8, 9}
        };

        int[][] matrix2 = {
            {9, 8, 7},
```

```
        {6, 5, 4},
        {3, 2, 1}
    };

    System.out.println("Matrix 1:");
    displayMatrix(matrix1);

    System.out.println("\nMatrix 2:");
    displayMatrix(matrix2);

    System.out.println("\nMatrix Addition:");
    int[][] sumMatrix = addMatrices(matrix1, matrix2);
    displayMatrix(sumMatrix);

    System.out.println("\nMatrix Multiplication:");
    int[][] productMatrix = multiplyMatrices(matrix1, matrix2);
    displayMatrix(productMatrix);
}

public static void displayMatrix(int[][] matrix) {
    for (int[] row : matrix) {
        for (int element : row) {
            System.out.print(element + " ");
        }
        System.out.println();
    }
}

public static int[][] addMatrices(int[][] matrix1, int[][] matrix2) {
    int rows = matrix1.length;
    int columns = matrix1[0].length;
    int[][] resultMatrix = new int[rows][columns];

    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < columns; j++) {
            resultMatrix[i][j] = matrix1[i][j] + matrix2[i][j];
        }
    }
```

```
        return resultMatrix;
    }

    public static int[][] multiplyMatrices(int[][] matrix1, int[][] matrix2) {
        int rows1 = matrix1.length;
        int columns1 = matrix1[0].length;
        int columns2 = matrix2[0].length;
        int[][] resultMatrix = new int[rows1][columns2];

        for (int i = 0; i < rows1; i++) {
            for (int j = 0; j < columns2; j++) {
                for (int k = 0; k < columns1; k++) {
                    resultMatrix[i][j] += matrix1[i][k] * matrix2[k][j];
                }
            }
        }

        return resultMatrix;
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA
Matrix 1:
1 2 3
4 5 6
7 8 9

Matrix 2:
9 8 7
6 5 4
3 2 1

Matrix Addition:
10 10 10
10 10 10
10 10 10

Matrix Multiplication:
30 24 18
84 69 54
138 114 90

Process finished with exit code 0
```

Q.7

Practice Problems:

- Given an integer numRows, return the first numRows of Pascal's triangle using a jagged array. In Pascal's triangle, each number is the sum of the two numbers directly above it.

Sample Input and Output:

Sample Input	Sample Output
numRows = 5	[[1],[1,1],[1,2,1],[1,3,3,1],[1,4,6,4,1]]
numRows = 1	[[1]]

Ans.

```
public class PascalsTriangle {
    public static void main(String[] args) {
        int numRows = 5;
        int[][] pascalsTriangle = generatePascalsTriangle(numRows);

        for (int[] row : pascalsTriangle) {
            for (int num : row) {
                System.out.print(num + " ");
            }
            System.out.println();
        }
    }

    public static int[][] generatePascalsTriangle(int numRows) {
        if (numRows <= 0) {
            return new int[0][0];
        }

        int[][] triangle = new int[numRows][];
        for (int i = 0; i < numRows; i++) {
            triangle[i] = new int[i + 1];
            triangle[i][0] = 1;

            for (int j = 1; j < i; j++) {
```

```
                triangle[i][j] = triangle[i - 1][j - 1] + triangle[i - 1][j];
            }

            triangle[i][i] = 1;
        }

        return triangle;
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

Process finished with exit code 0
```

Q.8

- Write a Java program to convert the integer entered by the user into a roman numeral. Roman numerals are represented by seven different symbols: I, V, X, L, C, D and M.

Symbol	Value
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

Ans.

```
import java.util.Scanner;

public class IntegerToRoman {
```

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

        System.out.print("Enter an integer: ");
        int num = scanner.nextInt();

        scanner.close();

        if (num < 1 || num > 3999) {
            System.out.println("Please enter an integer between 1 and 3999.");
        } else {
            String romanNumeral = intToRoman(num);
            System.out.println("Roman numeral: " + romanNumeral);
        }
    }

    public static String intToRoman(int num) {
        int[] values = {1000, 900, 500, 400, 100, 90, 50, 40, 10, 9, 5, 4, 1};
        String[] symbols = {"M", "CM", "D", "CD", "C", "XC", "L", "XL", "X", "IX", "V", "IV",
"I"};

        StringBuilder result = new StringBuilder();

        for (int i = 0; i < values.length; i++) {
            while (num >= values[i]) {
                num -= values[i];
                result.append(symbols[i]);
            }
        }

        return result.toString();
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA (
Enter an integer: 200
Roman numeral: CC

Process finished with exit code 0
```

Q.9

- A group of MIT friends decide to run the Boston Marathon. Their names and times (in minutes) are below: Name Time (minutes) Elena 341 Thomas 273 Hamilton 278 Suzie 329 Phil 445 Matt 402 Alex 388 Emma 275 John 243 James 334 Jane 412 Emily 393 Daniel 299 Neda 343 Aaron 317 Kate 265 Find the fastest runner. Print the name and his/her time (in minutes).

Optional: Find the second fastest runner. Print the name and his/her time (in minutes).

Ans.

```
package inheritance;

public class BostonMarathon {
    public static void main(String[] args) {
        String[] names = {"Elena", "Thomas", "Hamilton", "Suzie", "Phil", "Matt", "Alex", "Emma", "John", "James", "Jane", "Emily", "Daniel", "Neda", "Aaron", "Kate"};
        int[] times = {341, 273, 278, 329, 445, 402, 388, 275, 243, 334, 412, 393, 299, 343, 317, 265};

        String fastestRunner = findFastestRunner(names, times);
        System.out.println(fastestRunner);

        String secondFastestRunner = findSecondFastestRunner(names, times);
        System.out.println(secondFastestRunner);
    }

    public static String findFastestRunner(String[] names, int[] times) {
        String fastestRunner = "";
        int fastestTime = Integer.MAX_VALUE;
```

```
        for (int i = 0; i < times.length; i++) {
            if (times[i] < fastestTime) {
                fastestTime = times[i];
                fastestRunner = names[i];
            }
        }

        return "Fastest Runner: " + fastestRunner + ", Time: " + fastestTime + "
minutes";
    }

    public static String findSecondFastestRunner(String[] names, int[] times) {
        String fastestRunner = "";
        int fastestTime = Integer.MAX_VALUE;
        String secondFastestRunner = "";
        int secondFastestTime = Integer.MAX_VALUE;

        for (int i = 0; i < times.length; i++) {
            if (times[i] < fastestTime) {
                secondFastestTime = fastestTime;
                secondFastestRunner = fastestRunner;

                fastestTime = times[i];
                fastestRunner = names[i];
            } else if (times[i] < secondFastestTime) {
                secondFastestTime = times[i];
                secondFastestRunner = names[i];
            }
        }

        return "Second Fastest Runner: " + secondFastestRunner + ", Time: " +
secondFastestTime + " minutes";
    }
}
```

```
/Library/Java/JavaVirtualMachines/jdk-21.jdk/Contents/Home/bin/java -javaagent:/Users/lakhman/Applications/IntelliJ IDEA
Fastest Runner: John, Time: 243 minutes
Second Fastest Runner: Kate, Time: 265 minutes

Process finished with exit code 0
```