Experiment Number : 04 **Date: 05.02.2026**

ARRAYS

Aim:

To understand and implement array operations in Java.

PRE LAB EXERCISE

QUESTIONS

✓ What is an array?

An array is a collection of elements of the same data type stored in contiguous memory locations and accessed using a single name with an index.

✓ Why are arrays used?

Arrays are used to:

- Store multiple values of the same type in one structure
- Access data easily using index numbers
- Reduce the need for many separate variables
- Make programs more organized and efficient
- Simplify operations like sorting, searching, and iteration

✓ What is the difference between array and variable?

Variable	Array
Stores only one value at a time	Stores multiple values

Variable	Array
Has a single memory location	Uses multiple continuous memory locations
Accessed by name	Accessed by name with index (e.g., arr[0])
Example: int a = 10;	Example: int a[5] = {1,2,3,4,5};

IN LAB EXERCISE

Objective:

To perform array operations using simple programs.

PROGRAMS:

1. Program to Read and Print Array Elements

Code:

```
import java.util.Scanner;
public class ReadPrintArray {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        System.out.println("Array elements are:");
        for(int i = 0; i < 5; i++)
            System.out.print(arr[i] + " ");
    }
```

}

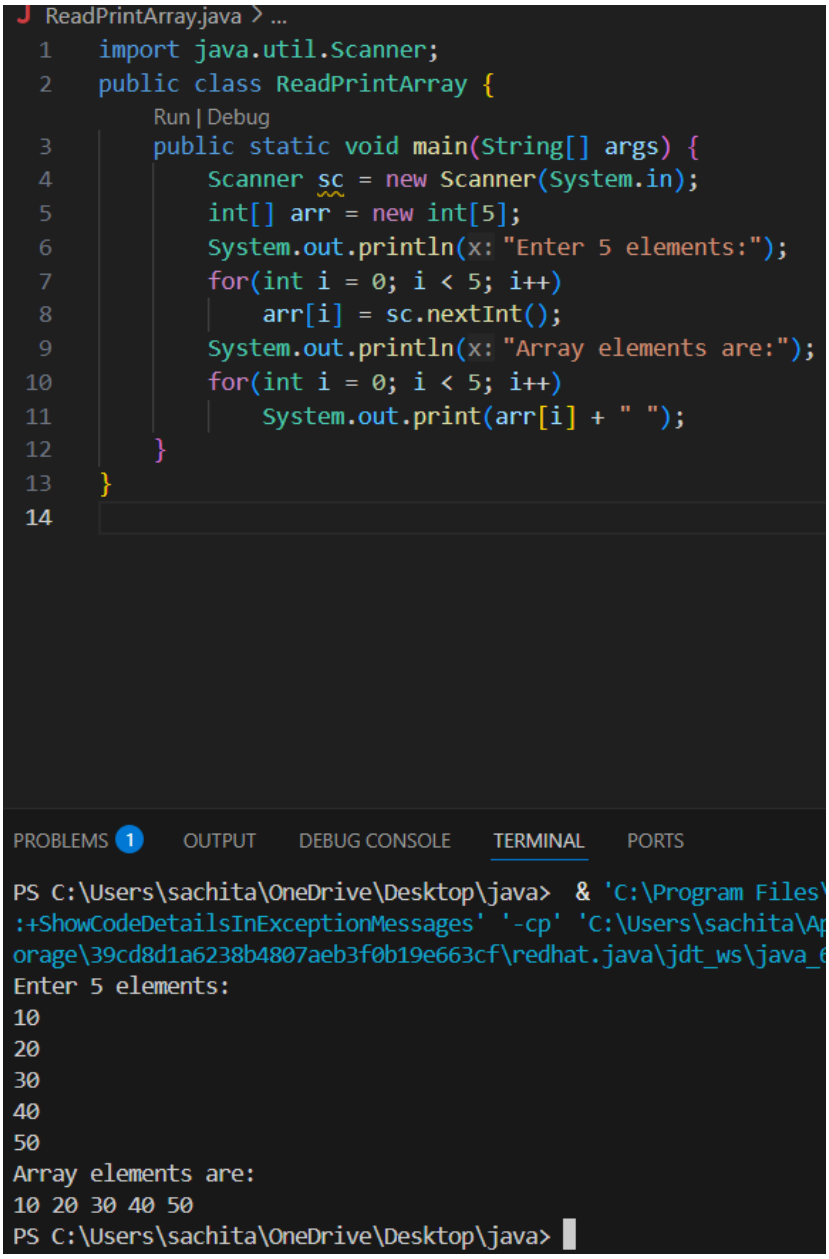
OUTPUT:

Input:
10 20 30 40 50

Output:

Array elements are:

10 20 30 40 50



2. Program to Find Sum of Array Elements

Code:

```
import java.util.Scanner;
public class SumArray {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
        int sum = 0;
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        for(int i = 0; i < 5; i++)
            sum += arr[i];
        System.out.println("Sum = " + sum);
    }
}
```

OUTPUT:

Input:
5 10 15 20 25

Output:

Sum = 75

```java
import java.util.Scanner;

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

        int[] arr = new int[5];
        int sum = 0;

        System.out.println(x: "Enter 5 elements:");

        for (int i = 0; i < 5; i++) {
            arr[i] = sc.nextInt();
        }

        for (int i = 0; i < 5; i++) {
            sum = sum + arr[i];
        }

        System.out.println("Sum = " + sum);

        sc.close();
```

```java
        sc.close();
    }
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\sachita\OneDrive\Desktop\java>
PS C:\Users\sachita\OneDrive\Desktop\java>  c
Program Files\Java\jdk-21.0.10\bin\java.exe'
ers\sachita\AppData\Roaming\Code\User\workspa
\jdt_ws\java_6a99f975\bin' 'SumArray'
Enter 5 elements:
5
10
15
20
25
Sum = 75
```

3. Program to Find Largest Element in an Array

Code:

```
import java.util.Scanner;
public class LargestElement {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        int max = arr[0];
        for(int i = 1; i < 5; i++)
            if(arr[i] > max)
                max = arr[i];
        System.out.println("Largest element = " + max);
    }
}
```

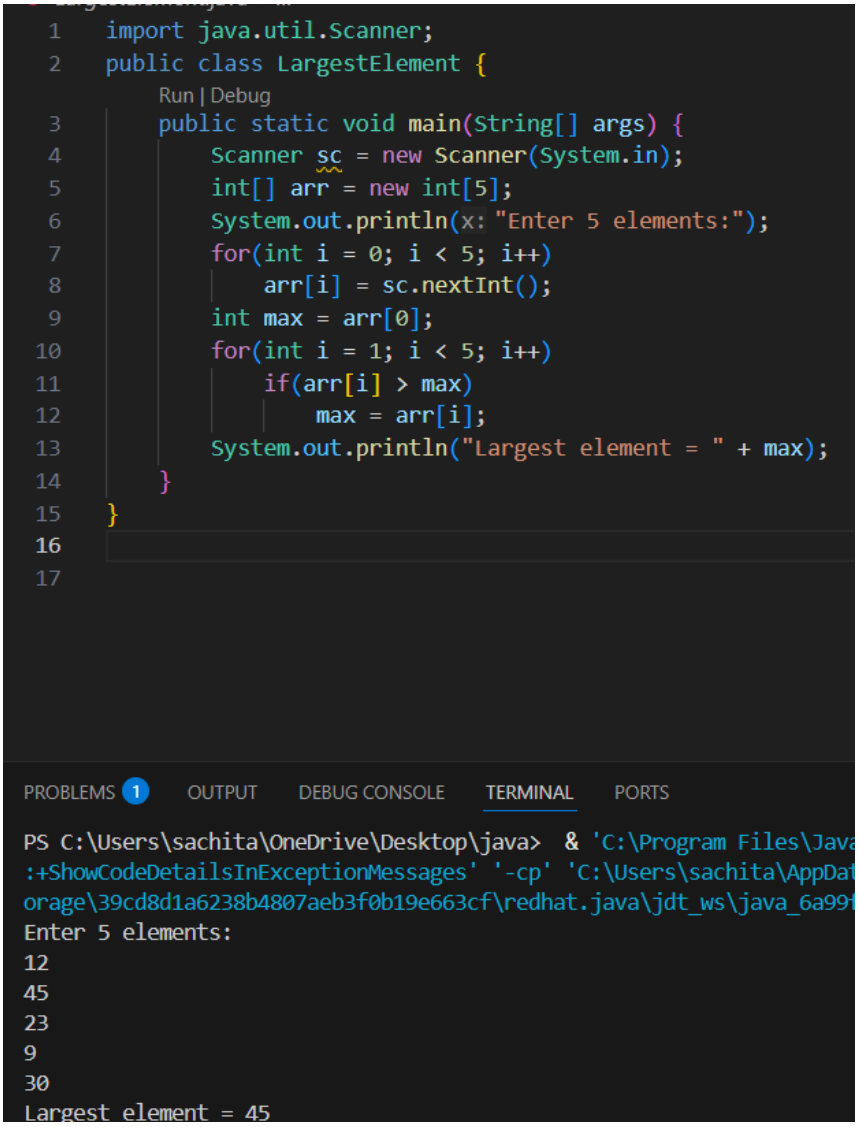
OUTPUT:

Input:

12 45 23 9 30

Output:

Largest element = 45



4. Program to Reverse an Array

Code:

```
import java.util.Scanner;


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

```
        int[] arr = new int[5];
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        System.out.println("Reversed array:");
        for(int i = 4; i >= 0; i--)
            System.out.print(arr[i] + " ");
    }
}
```

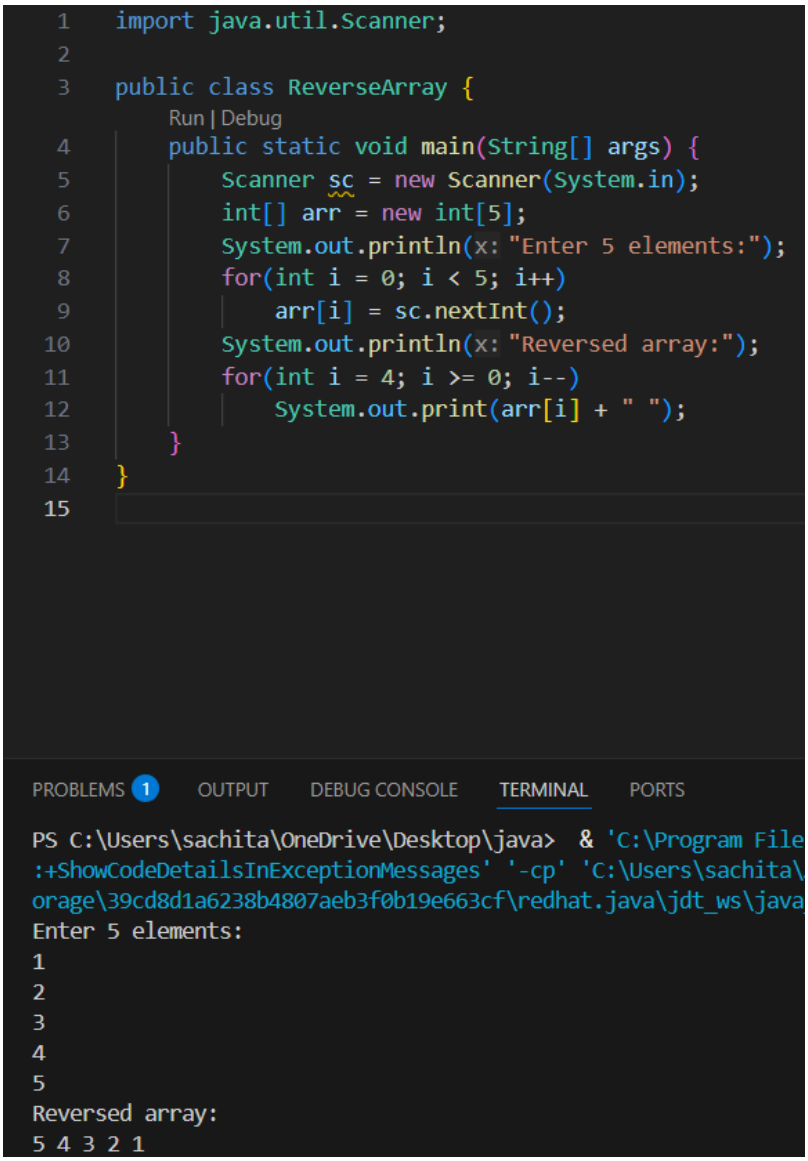
OUTPUT:

Input:
1 2 3 4 5

Output:

Reversed array:

5 4 3 2 1



```java
import java.util.Scanner;

public class ReverseArray {
    Run | Debug
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
        System.out.println(x: "Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        System.out.println(x: "Reversed array:");
        for(int i = 4; i >= 0; i--)
            System.out.print(arr[i] + " ");
    }
}
```

```
PROBLEMS 1  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

PS C:\Users\sachita\OneDrive\Desktop\java>  & 'C:\Program File
:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\sachita\
orage\39cd8d1a6238b4807aeb3f0b19e663cf\redhat.java\jdt_ws\java
Enter 5 elements:
1
2
3
4
5
Reversed array:
5 4 3 2 1
```

5. Program to Count Even and Odd Numbers

Code:

```
import java.util.Scanner;
public class EvenOddCount {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
```

```
        int even = 0, odd = 0;
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        for(int i = 0; i < 5; i++) {
            if(arr[i] % 2 == 0)
                even++;
            else
                odd++;
        }

        System.out.println("Even = " + even);
        System.out.println("Odd = " + odd);
    }
}
```

OUTPUT:

Input:
2 7 4 9 10

Output:

Even = 3

Odd = 2

```java
import java.util.Scanner;

public class EvenOddCount {
    Run | Debug
    public static v
        Scanner sc

        int[] arr =
        int even =

        System.out.println(x: "Enter 5 elements:");

        for (int i = 0; i < 5; i++) {
            arr[i] = sc.nextInt();
        }

        for (int i = 0; i < 5; i++) {
            if (arr[i] % 2 == 0) {
                even++;
            } else {
                odd++;
            }
        }
```

```
void java.io.PrintStream.println(String x)

Prints a String and then terminates the line. This method behaves as though it invokes print(String) and then println().

• Parameters:
  ◦ x The String to be printed.

Source: Java 21.0.10 (module: java.base)
```

```java
        }

        System.out.println("Even = " + even);
        System.out.println("Odd = " + odd);

        sc.close();   // closes the Scanner to
    }
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

PS C:\Users\sachita\OneDrive\Desktop\java>  & 'C:\Program
:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\sac
orage\39cd8d1a6238b4807aeb3f0b19e663cf\redhat.java\jdt_ws
Enter 5 elements:
2
7
4
9
10
Even = 3
Odd = 2
```

6. Program to Sort Array in Ascending Order

Code:

```
import java.util.Scanner;
public class SortArray {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
        int temp;
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        for(int i = 0; i < 5; i++) {
            for(int j = i + 1; j < 5; j++) {
                if(arr[i] > arr[j]) {
                    temp = arr[i];
                    arr[i] = arr[j];
                    arr[j] = temp;
                }
            }
        }
        System.out.println("Sorted array:");
        for(int i = 0; i < 5; i++)
            System.out.print(arr[i] + " ");
    }
}
```

OUTPUT:

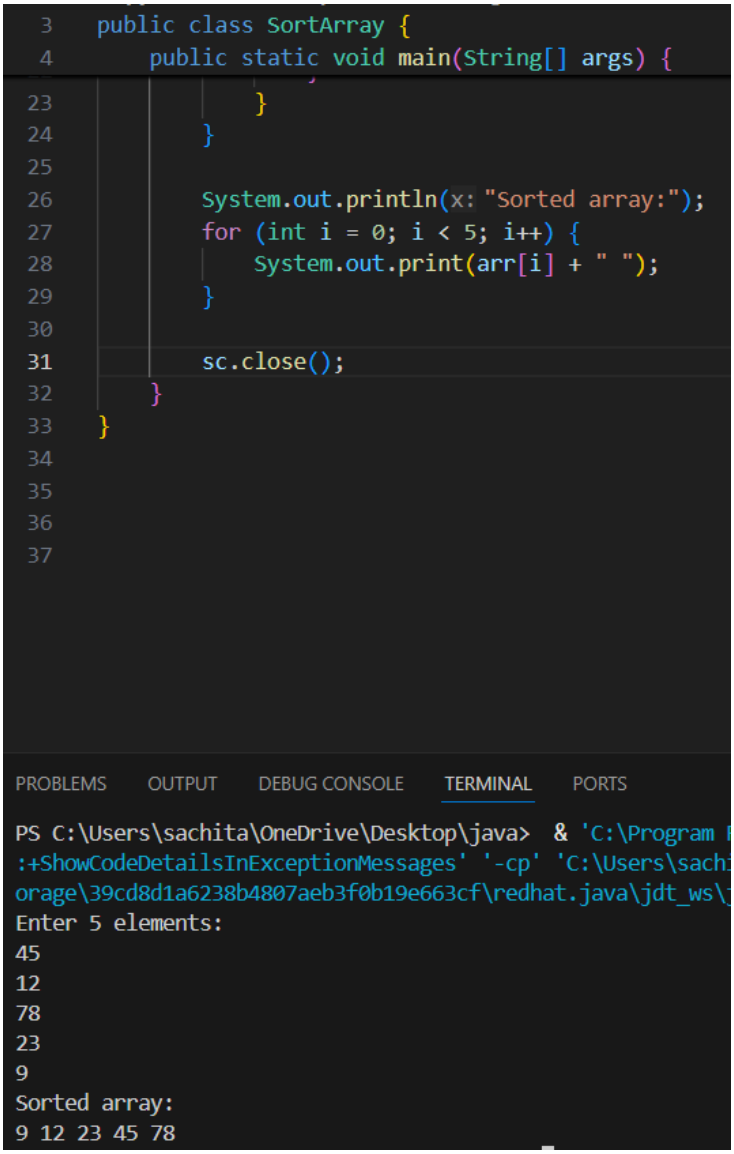
Input:
45 12 78 23 9

Output:

Sorted array:

9 12 23 45 78

```java
import java.util.Scanner;

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

        int[] arr = new int[5];
        int temp;

        System.out.println(x: "Enter 5 elements:");

        for (int i = 0; i < 5; i++) {
            arr[i] = sc.nextInt();
        }

        for (int i = 0; i < 5; i++) {
            for (int j = i + 1; j < 5; j++) {
                if (arr[i] > arr[j]) {
                    temp = arr[i];
                    arr[i] = arr[j];
                    arr[j] = temp;
                }
```



7. Program to Find Second Largest Element

Code:

```
import java.util.Scanner;
public class SecondLargest {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];
```

```
        System.out.println("Enter 5 elements:");
        for(int i = 0; i < 5; i++)
            arr[i] = sc.nextInt();
        int largest = arr[0];
        int second = arr[0];
        for(int i = 0; i < 5; i++) {
            if(arr[i] > largest) {
                second = largest;
                largest = arr[i];
            }
        }
        System.out.println("Second largest = " + second);
    }
}
```

OUTPUT:

Input:
10 45 23 89 67

Output:

Second largest = 67

```java
import java.util.Scanner;

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

        int[] arr = new int[5];

        System.out.println(x: "Enter 5 elements:");
        for (int i = 0; i < 5; i++) {
            arr[i] = sc.nextInt();
        }

        int largest = arr[0];
        int second = arr[0];

        for (int i = 1; i < 5; i++) {
            if (arr[i] > largest) {
                second = largest;
                largest = arr[i];
            }
            else if (arr[i] > second && arr[i] != largest) {
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```java
                second = arr[i];
            }
        }

        System.out.println("Second largest = " + second);

        sc.close();
    }
}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\sachita\OneDrive\Desktop\java>  & 'C:\Program Files\Java
:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\sachita\AppDat
orage\39cd8d1a6238b4807aeb3f0b19e663cf\redhat.java\jdt_ws\java_6a99f
Enter 5 elements:
10
45
23
89
67
Second largest = 67
```

8. Program for Matrix Addition (2D Array)

Code:

```
import java.util.Scanner;
public class MatrixAddition {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[][] a = new int[2][2];
        int[][] b = new int[2][2];
        int[][] sum = new int[2][2];
        System.out.println("Enter elements of matrix A:");
        for(int i = 0; i < 2; i++)
            for(int j = 0; j < 2; j++)
                a[i][j] = sc.nextInt();
        System.out.println("Enter elements of matrix B:");
        for(int i = 0; i < 2; i++)
            for(int j = 0; j < 2; j++)
                b[i][j] = sc.nextInt();
        for(int i = 0; i < 2; i++)
            for(int j = 0; j < 2; j++)
                sum[i][j] = a[i][j] + b[i][j];
        System.out.println("Sum matrix:");
        for(int i = 0; i < 2; i++) {
            for(int j = 0; j < 2; j++)
                System.out.print(sum[i][j] + " ");
            System.out.println();
        }
```

```
    }
}
```

OUTPUT:

Matrix A:

1 2

3 4

Matrix B:

5 6

7 8

Sum matrix:

6 8

10 12

```java
import java.util.Scanner;

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

        int[][] a = new int[2][2];
        int[][] b = new int[2][2];
        int[][] sum = new int[2][2];

        System.out.println(x: "Enter elements of matrix A:");
        for (int i = 0; i < 2; i++)
            for (int j = 0; j < 2; j++)
                a[i][j] = sc.nextInt();

        System.out.println(x: "Enter elements of matrix B:");
        for (int i = 0; i < 2; i++)
            for (int j = 0; j < 2; j++)
                b[i][j] = sc.nextInt();

        for (int i = 0; i < 2; i++)
            for (int j = 0; j < 2; j++)
```

```
            for (int j = 0; j < 2; j++)
                sum[i][j] = a[i][j] + b[i][j];

        System.out.println(x: "Sum matrix:");
        for (int i = 0; i < 2; i++) {
            for (int j = 0; j < 2; j++)
                System.out.print(sum[i][j] + " ");
            System.out.println();
        }

        sc.close();
    }
}
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\sachita\OneDrive\Desktop\java>  & 'C:\Program Fi
:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\sachit
orage\39cd8d1a6238b4807aeb3f0b19e663cf\redhat.java\jdt_ws\ja
Enter elements of matrix A:
1 2
3 4
Enter elements of matrix B:
5 6
7 8
Sum matrix:
6 8
10 12
```

POST LAB EXERCISE

✓ Why is array indexing usually started from zero instead of one?

- Arrays store elements in contiguous memory.
- The index represents the offset from the starting address.
- First element → offset 0 → base address + 0.
- This makes address calculation simple and fast in programming languages.

✓ What happens if we try to access an array element outside its declared size?

It causes an error at runtime.

In Java: ArrayIndexOutOfBoundsException occurs.

In C/C++: may access garbage values or crash the program.

✓ How does memory allocation differ for static arrays and dynamic arrays?

Static Array	**Dynamic Array**
Size fixed at compile time	Size decided at runtime
Memory allocated before execution	Memory allocated during execution

Cannot be resized	Can be resized
Example: int arr[5];	Example: new int[n]; in Java

- ✓ Why is searching faster in arrays compared to linked lists?
- ✓ What is the difference between contiguous and non-
- ✓ contiguous memory allocation?

Result:

Thus the array operations were executed successfully.

ASSESSMENT

Description	Max Marks	Marks Awarded
Pre Lab Exercise	**5**	
In Lab Exercise	**10**	
Post Lab Exercise	**5**	
Viva	**10**	
Total	**30**	
	Faculty Signature	