Experiment Number : 04 **Date: 4.02.2026**

ARRAYS

Aim:

To understand and implement array operations in Java.

PRE LAB EXERCISE

QUESTIONS

- ✓ What is an array?

  An array is a collection of multiple values of the same data type stored in one variable name, and each value is accessed using an index number.

  Example:

  int marks[5] = {80, 85, 90, 75, 88};

- ✓ Why are arrays used?

  Store **many values using one variable name**

  Make programs **shorter and cleaner**

  Allow **easy access** to data using index numbers

  Help in **looping** through data (using for, while)

  Are useful for **lists** like marks, salaries, prices, temperatures, etc.

- ✓ What is the difference between array and variable?

Variable	**Array**
Stores **only one value**	Stores **multiple values**
Uses **single memory location**	Uses **multiple memory locations**
Cannot store a list	Can store a list of values
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] + " ");
    }
}
```

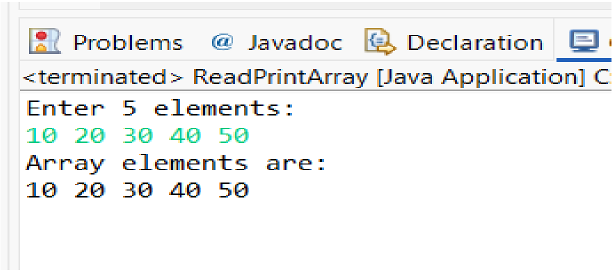
OUTPUT:

Input:

```
10 20 30 40 50
```

Output:

```
Array elements are:
10 20 30 40 50
```



```
<terminated> ReadPrintArray [Java Application] C
Enter 5 elements:
10 20 30 40 50
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);

    }

}
```

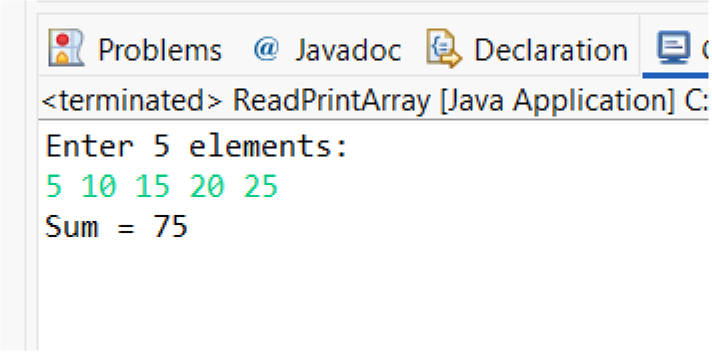
OUTPUT:

Input:

```
5 10 15 20 25
```

Output:

```
Sum = 75
```



```
<terminated> ReadPrintArray [Java Application] C:
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);
    }
}
```

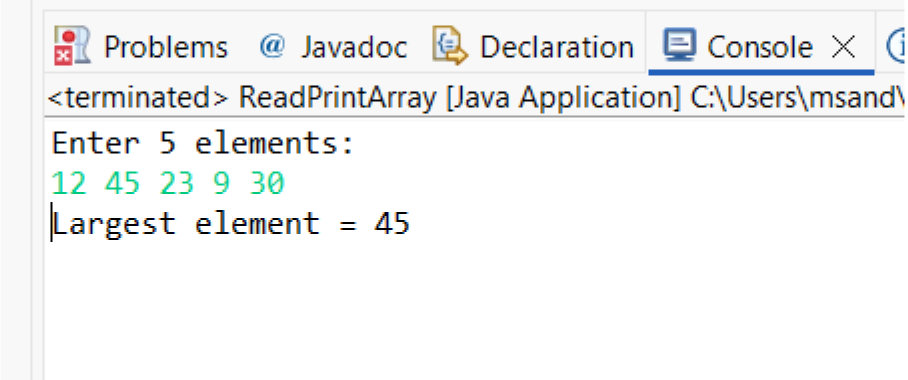
OUTPUT:

Input:

12 45 23 9 30

Output:

Largest element = 45



```
<terminated> ReadPrintArray [Java Application] C:\Users\msand\
Enter 5 elements:
12 45 23 9 30
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] + " ");
    }
}
```

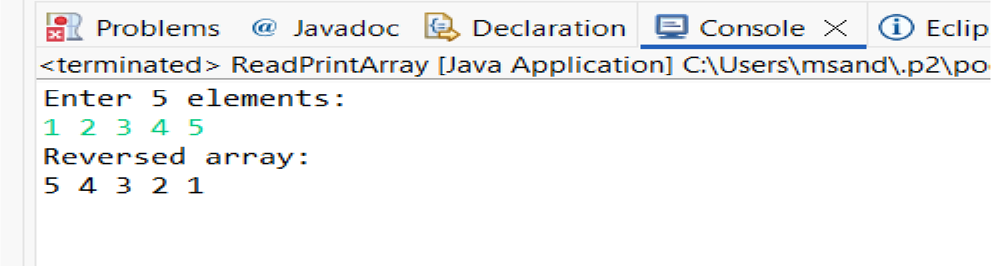
OUTPUT:

Input:
1 2 3 4 5

Output:

Reversed array:

5 4 3 2 1



```
<terminated> ReadPrintArray [Java Application] C:\Users\msand\.p2\po
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);
    }
}
```

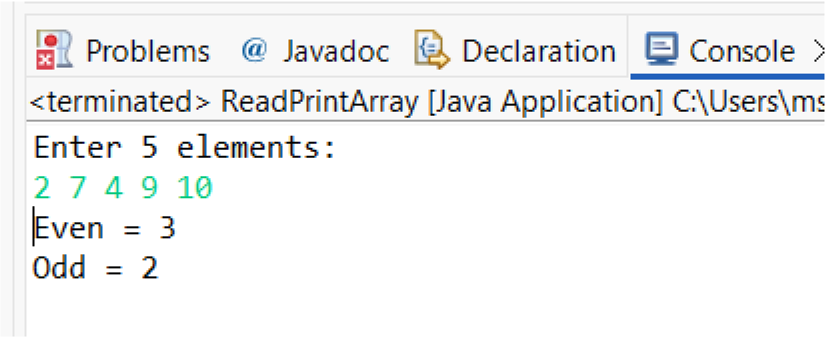
OUTPUT:

Input:
2 7 4 9 10

Output:

Even = 3

Odd = 2



```
<terminated> ReadPrintArray [Java Application] C:\Users\ms
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] + " ");
    }
}
```

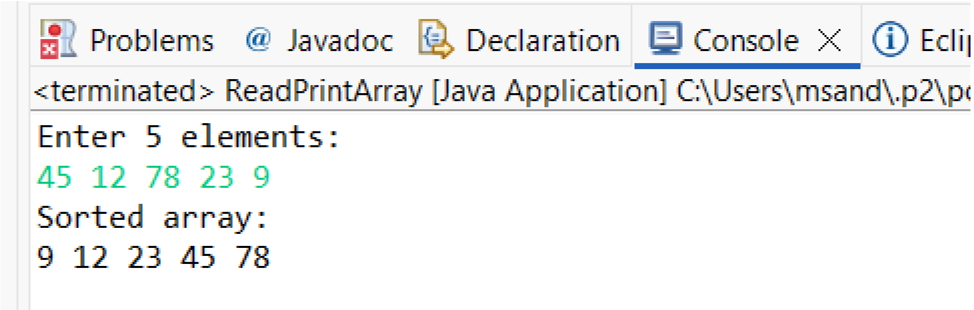
OUTPUT:

Input:
45 12 78 23 9

Output:

Sorted array:

9 12 23 45 78



```
<terminated> ReadPrintArray [Java Application] C:\Users\msand\.p2\p
Enter 5 elements:
45 12 78 23 9
Sorted array:
9 12 23 45 78
```

7. Program to Find Second Largest Element

Code:

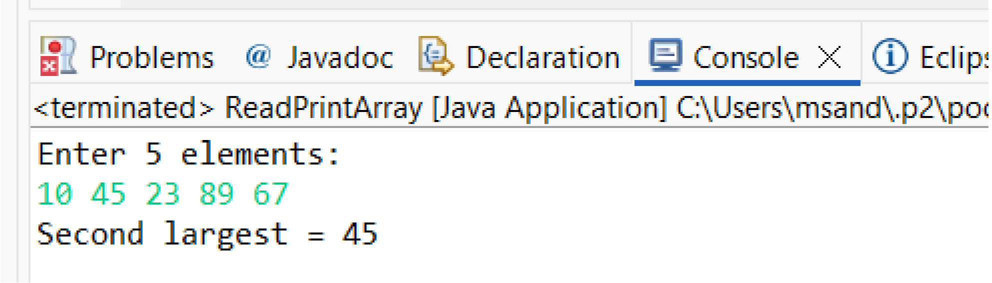
```
import java.util.Scanner;
public class SecondLargest {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[5];

        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



```
<terminated> ReadPrintArray [Java Application] C:\Users\msand\.p2\poc
Enter 5 elements:
10 45 23 89 67
Second largest = 45
```

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:

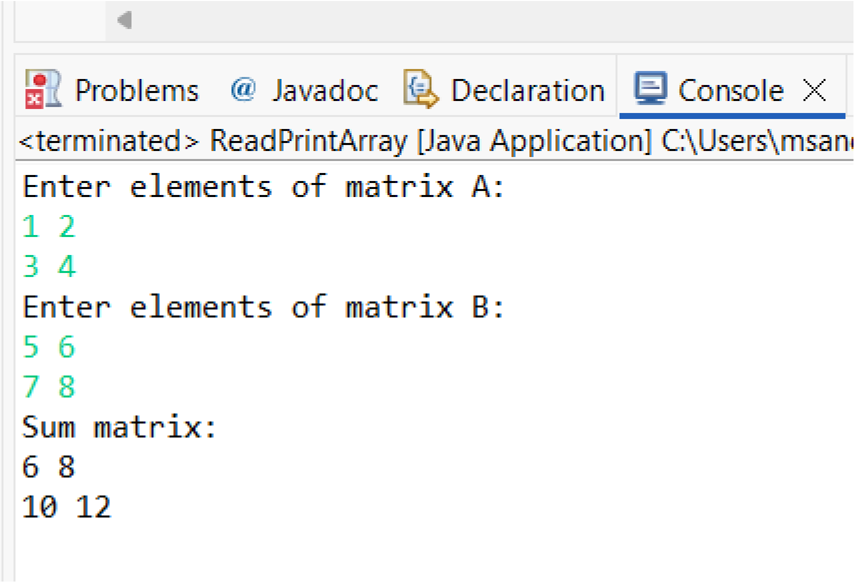
5 6

7 8

Sum matrix:

6 8

10 12



```
<terminated> ReadPrintArray [Java Application] C:\Users\msan
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?

Array indexing starts from **0** because:

- The index represents the **offset from the base address** in memory.
- The first element is at **offset 0** from the starting address.

Formula used by the system:

Address of element = Base address + (index × size of data type)

If index starts from 0:

- First element → Base + (0 × size) = Base address

This makes:

Memory calculation faster

Hardware and compiler design simpler

That’s why most languages (C, C++, Java, Python) use **0-based indexing**.

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

If we try to access an array element outside its declared size, it results in an error or undefined behavior. In languages like Java, it throws a runtime error, while in languages like C or C++, it may cause incorrect output or program crash

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

Static arrays are allocated memory at compile time and their size is fixed throughout the program. Dynamic arrays are allocated memory at runtime and their size can be changed during program execution, making them more flexible

- ✓ Why is searching faster in arrays compared to linked lists?

Searching is faster in arrays because elements are stored in contiguous memory locations and can be accessed directly using index values. In linked lists, each element must be accessed sequentially, which takes more time.

- ✓ What is the difference between contiguous and non-contiguous memory allocation?

Contiguous Memory	**Non-Contiguous Memory**
Memory is stored **in sequence**	Memory is stored **in different locations**
Faster access	Slower access
No pointers needed	Uses pointers

Contiguous Memory	**Non-Contiguous Memory**
Used by **arrays**	Used by **linked lists**
Less flexible	More flexible

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		