Java Assignment on Arrays

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1. Definition of Array

An array in Java is a collection of elements of the same data type stored in a contiguous memory location. It is used to store multiple values in a single variable, instead of declaring separate variables for each value. Arrays are objects in Java, and their elements are accessed using indices (starting from 0).

2. Types of Arrays

1. One-Dimensional Array (1D): A linear array.

2. Two-Dimensional Array (2D): An array of arrays, like a matrix.

3. Multidimensional Array: Arrays with more than two dimensions.

3. Array Declaration and Initialization

1D Array

int[] arr = new int[5]; // Declaration

arr[0] = 10; // Initialization

## Or directly:

int[] arr = {10, 20, 30, 40, 50};

2D Array

int[][] matrix = { {1, 2}, {3, 4} };

4. Array Traversal using Loops

## Using For Loop:

for (int i = 0; i < arr.length; i++) {

System.out.println(arr[i]);

}

## Using Enhanced For Loop:

for (int num : arr) {

System.out.println(num);

}

5. Common Array Operations

a. Sum of Elements

int[] numbers = {10, 20, 30};

int sum = 0;

for (int num : numbers) {

sum += num;

}

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

b. Finding Maximum Element

int[] arr = {4, 7, 1, 9};

int max = arr[0];

for (int i = 1; i < arr.length; i++) {

if (arr[i] > max) {

max = arr[i];

}

}

System.out.println("Maximum = " + max);

c. Reversing an Array

int[] arr = {1, 2, 3, 4};

for (int i = arr.length - 1; i >= 0; i--) {

System.out.print(arr[i] + " ");

}

6. Example Programs

a. 1D Array – Print Marks

public class ArrayExample {

public static void main(String[] args) {

int[] marks = {85, 90, 78, 92, 88};

System.out.println("Marks of Students:");

for (int i = 0; i < marks.length; i++) {

System.out.println("Student " + (i + 1) + ": " + marks[i]);

}

}

}

b. 2D Array – Matrix Addition

public class MatrixAddition {

public static void main(String[] args) {

int[][] a = { {1, 2}, {3, 4} };

int[][] b = { {5, 6}, {7, 8} };

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

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("Matrix Sum:");

for (int[] row : sum) {

for (int val : row) {

System.out.print(val + " ");

}

System.out.println();

}

}

}

7. Real-life Use Cases of Arrays

- Storing student marks in a school system

- Managing a list of products in an inventory

- Game development (like 2D board games)

- Storing customer names and IDs

8. Usefulness

Arrays are useful for storing multiple data items of the same type. For example, in a voting application, an array can be used to store the number of votes each candidate received. Arrays reduce the complexity of code by allowing the use of loops for iteration instead of writing multiple variables.

End of Assignment