1. What do you mean by an Array?

An **array** is a data structure that allows storing multiple values of the same type under a single variable name. It provides a fixed-size, sequential collection of elements, which are stored in contiguous memory locations.

Example:

java
Copy code
```java
int[] numbers = {1, 2, 3, 4, 5};
```

---

2. How to create an Array?

In Java, an array can be created using the following syntax:

java
Copy code
```java
// Declaration and initialization in one step
int[] arr = {10, 20, 30, 40};

// Declaration first, then memory allocation
int[] arr2 = new int[5];  // Creates an array of size 5
arr2[0] = 100;  // Assigning values later
```

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3. Can we change the size of an array at runtime?

No, the size of an array in Java **cannot be changed at runtime**. Once an array is declared with a specific size, it remains fixed. However, we can use collections like `ArrayList` for a dynamic array-like structure.

Example of `ArrayList` (Resizable Array):

java
Copy code
```java
import java.util.ArrayList;
public class DynamicArrayExample {
    public static void main(String[] args) {
```

```
        ArrayList<Integer> list = new ArrayList<>();
        list.add(10);
        list.add(20);
        list.add(30);
        System.out.println(list);  // Output: [10, 20, 30]
    }
}
```

---

4. Can you declare an array without assigning the size?

Yes, but only if you initialize the array at the time of declaration.

✔ Valid:

java
Copy code
```
int[] arr = {1, 2, 3, 4}; // Compiler infers size from elements
```

❌ Invalid:

java
Copy code
```
int[] arr;
arr = new int[]; // ERROR: Size must be specified
```

✔ Correct Way:

java
Copy code
```
int[] arr;
arr = new int[5];  // Now size is assigned
```

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5. What is the default value of an Array?

In Java, arrays are initialized with default values based on their data types:

Data Type	Default Value

`int`	`0`
`double`	`0.0`
`boolean`	`false`
`char`	`\u0000` (null character)
`String` (or any object)	`null`

Example:

java
Copy code
```
public class DefaultArrayValues {
    public static void main(String[] args) {
        int[] arr = new int[5]; // Size 5, values default to 0
        System.out.println(arr[0]);  // Output: 0
    }
}
```

---

6. What is a 1D Array with an Example?

A **1D array** is a single-dimensional array, where elements are stored linearly in a single row.

Example:

java
Copy code
```
public class OneDArrayExample {
    public static void main(String[] args) {
        int[] numbers = {10, 20, 30, 40, 50};

        // Printing array elements
        for (int i = 0; i < numbers.length; i++) {
            System.out.println(numbers[i]);
        }
    }
```

```
}
```

Output:

Copy code

```
10
20
30
40
50
```

---

7. Write a Program on a 2D Array

A **2D array** is an array of arrays, where elements are arranged in rows and columns.

Example: Creating and Printing a 2D Array

java

Copy code

```
public class TwoDArrayExample {
    public static void main(String[] args) {
        // Declare and initialize a 2D array (3 rows, 3 columns)
        int[][] matrix = {
            {1, 2, 3},
            {4, 5, 6},
            {7, 8, 9}
        };

        // Print the 2D array
        for (int i = 0; i < matrix.length; i++) { // Loop through rows
            for (int j = 0; j < matrix[i].length; j++) { // Loop
through columns
                System.out.print(matrix[i][j] + " ");
            }
            System.out.println(); // Move to the next line after each
row
        }
    }
}
```

Output:

Copy code

```
1 2 3
4 5 6
7 8 9
```