Java Arrays: what is index concept in array? How to create and initialize an array? Types of arrays with examples.
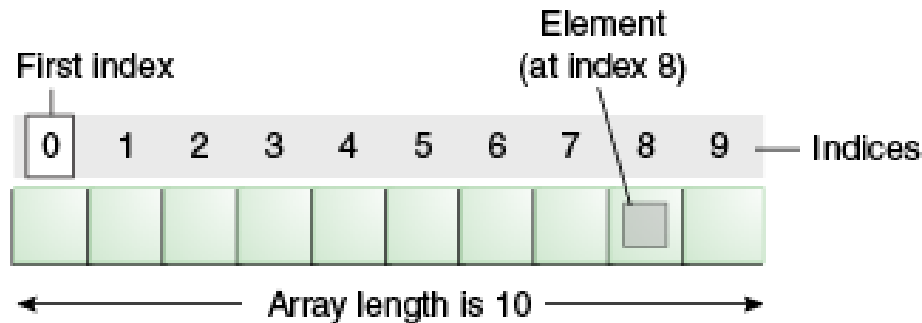
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Java Arrays

- Java array is an object which contains elements of a similar data type. Additionally, The elements of an array are stored in a contiguous memory location.

- It is a data structure where we store similar elements. We can store only a fixed set of elements in a Java array.

Indexing in array:

Array in Java is index-based, the first element of the array is stored at the 0th index, 2nd element is stored on 1st index and soon.

Element
(at index 8)

First index

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | — Indices

Array length is 10

Declaring and Creating an array

Array Declaration

To declare an array in Java, use the following syntax:

```
type[] arrayName;
```

Array Declaration Example:

Here's an example of declaring an integer array:

```
int[] numbers; // Declaring an integer array
```

This statement declares an array named "numbers" that will hold integers.

Create an Array

To create an array,you need to allocate memory for it using the new keyword:

```
numbers = new int[5]; //creating an array of 5 integers
```

This statement initializes the "numbers" array to hold 5 integers.The default value for element is 0.

Access an Element of an Array

We can access array elements using their index,which starts from 0:

```
numbers[0] = 10; // Setting the first element of the array
int firstElement = numbers[0]; // Accessing the first element
```

The 1st line sets the value of 1st element to 10 and 2nd line retrieves the value of 1st element.

Change an Array Element

To change an element,assign a new value to a specific index

```
numbers[0] = 20; //Changing the 1st element to 20
```

This Statement updates the value of 1st element from 10 to 20.

Array Length

We can get length of an array using length property.

```
int length = numbers.length;
```

This retrieves the no of elements in the "numbers" array,which is 5 in this case.

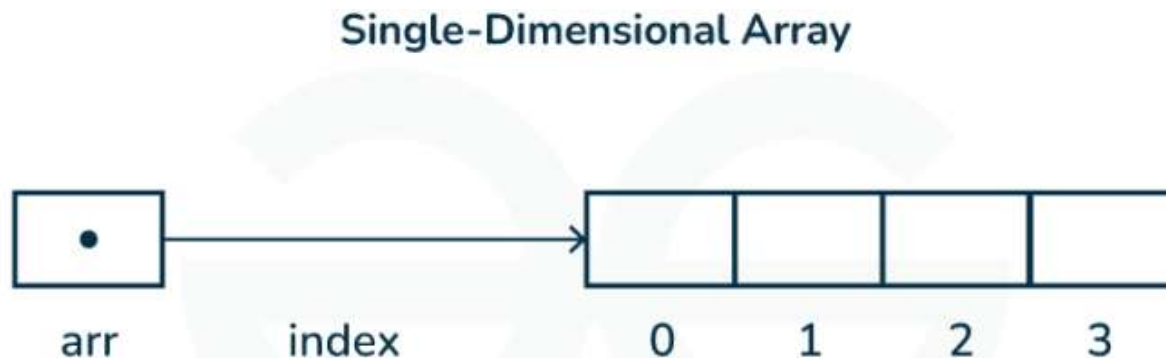# Types of Arrays

Single-Dimensional Arrays

These are the most common type of arrays, where elements are stored in a linear order.

Syntax to declare:

 dataType[] arr; (or) dataType []arr; (or) dataType arr[];

Example:

int[] singleDimArray = {1, 2, 3, 4, 5}; // A single-dimensional array

Single-Dimensional Array

arr   index   0   1   2   3

2. Multi-Dimensional Arrays

Multidimensional arrays are arrays of arrays with each element of the array holding the reference of other arrays. A multidimensional array is created by appending one set of square brackets ([]) per dimension.
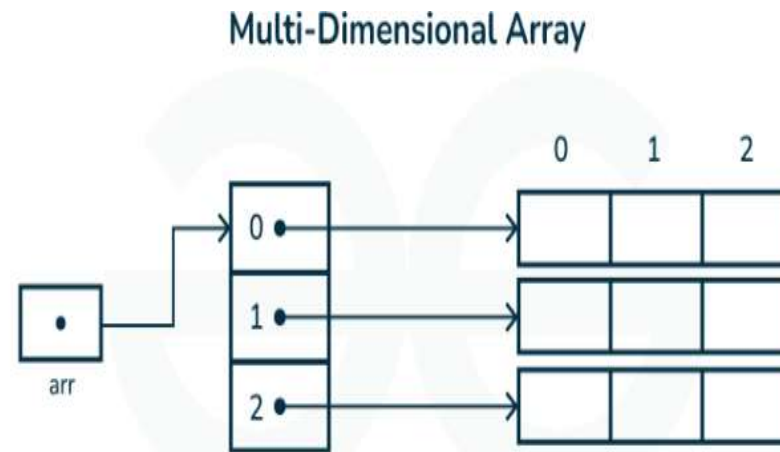
Syntax:

There are 2 methods to declare Java Multidimensional Arrays as mentioned below:

datatype [][] arrayrefvariable;
datatype arrayrefvariable[][];

Declaration:

int[][] intArray = new int[10][20]; //a 2D array or matrix
int[][][] intArray = new int[10][20][10]; //a 3D array

Multi-Dimensional Array

Single-Dimensional Array Example Program

```
class Student {
    public int roll_no;
    public String name;
    Student(int roll_no, String name)
    {
        this.roll_no = roll_no;
        this.name = name;
    }
}
public class SingleDim {
    public static void main(String[] args)
    {
        // declares an Array of Student
        Student[] arr;
        //allocating memory for 5 objects of type Student
        arr = new Student[5];

        // initialize the first elements of the array
        arr[0] = new Student(1, "aman");

        // initialize the second elements of the array
        arr[1] = new Student(2, "vaibhav");
        // so on...
        arr[2] = new Student(3, "shikar");
        arr[3] = new Student(4, "dharmesh");
        arr[4] = new Student(5, "mohit");

        // accessing the elements of the specified array
        for (int i = 0; i < arr.length; i++)
            System.out.println("Element at " + i + " : "
                        + arr[i].roll_no + " "
                        + arr[i].name);
    }
}
```

Output:

Element at 0 : 1 aman
Element at 1 : 2 vaibhav
Element at 2 : 3 shikar
Element at 3 : 4 dharmesh
Element at 4 : 5 mohit

Multidimensional array Example Program

//Java Program to illustrate the use of multidimensional array

class Testarray{

public static void main(String args[]){

//declaring and initializing 2D array

int arr[][]={{1,2,3},{2,4,5},{4,4,5}};

//printing 2D array

for(**int** i=0;i<3;i++){

 for(**int** j=0;j<3;j++){

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

 }

 System.out.println();

}

}}

Output:

```
3 2
4 5
4 4
5
```