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ARRAYS IN JAVA

Java Programming

ARRAY-Introduction

- An *array* is a container object that contains homogeneous elements.
- This means that all the elements in the array are of the same data type
- The elements of an array are stored in a contiguous memory location.
- The length of an array is established when the array is created. After creation, its length is fixed.

Main Features of an Array

- **Dynamic allocation:** In arrays, the memory is created dynamically, which reduces the amount of storage required for the code.
- **Elements stored under a single name:** All the elements are stored under one name. This name is used any time we use an array.
- **Occupies contiguous location:** The elements in the arrays are stored at adjacent positions. This makes it easy for the user to find the locations of its elements.

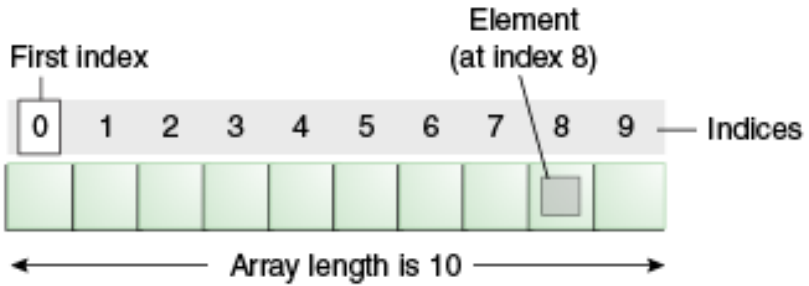
Advantages & Disadvantages of Arrays

Advantages

- Java arrays enable you to access any element randomly with the help of indexes
- It is easy to store and manipulate large data sets

Disadvantages

- The size of the array cannot be increased or decreased once it is declared—arrays have a fixed size
- Java cannot store heterogeneous data. It can only store a single type of primitives



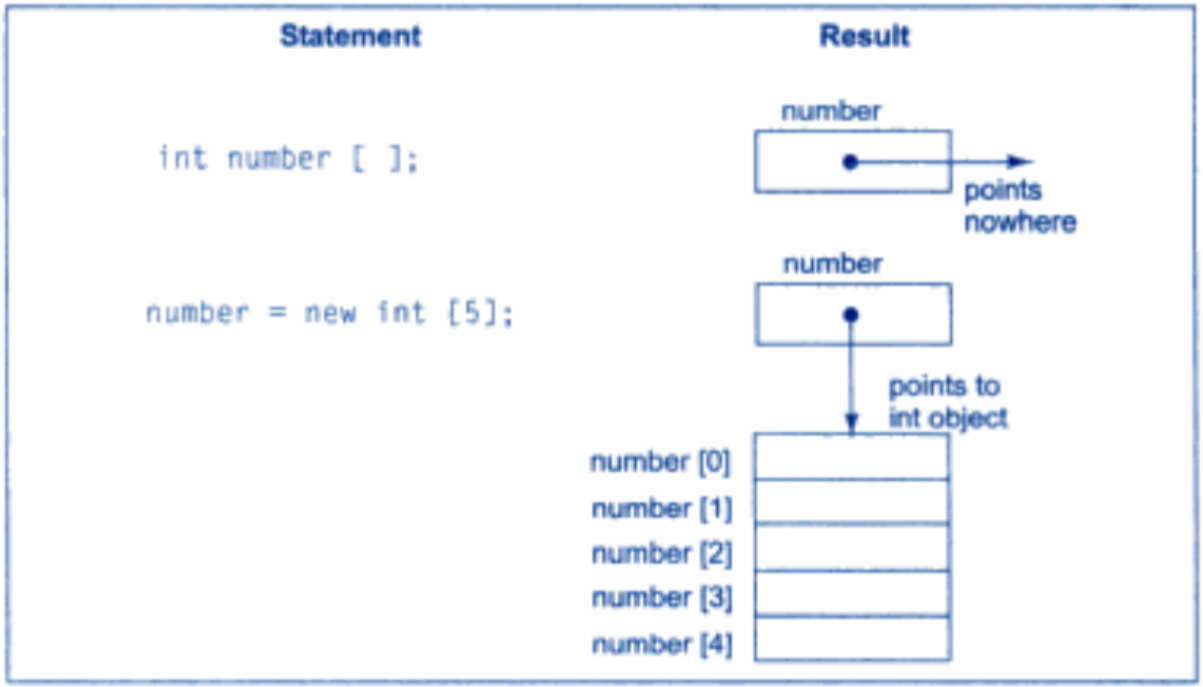
An array of 10 elements.

Each item in an array is called an *element*, and each element is accessed by its numerical *index*.

As shown in the above illustration, numbering begins with 0.

The 9th element, for example, would therefore be accessed at index 8

Memory representation of 1-D Array



Types of Arrays

Broadly categorized in 2 types:

- One-Dimensional Arrays(1-D)
- Multi-Dimensional Arrays(n-D)

Define/Declare 1-D Array in Java

- Arrays in Java are easy to define and declare. First, we have to define the array. The syntax for it is:

```
type var-name[];
OR
type[] var-name;
```

- Here, the type is int, String, double, or long
- Var-name is the variable name of the array.

Initialize Arrays in Java

```
//declare and initialize and array
int[] age = {12, 4, 5, 2, 5};
// declare an array
int[] age = new int[5];
// initialize array
age[0] = 12; age[1] = 4; age[2] = 5;
```

Looping Through Array Elements

```
class Main {
public static void main(String[] args) {
int[] age = {12, 4, 5}; // create an array
System.out.println("Using for Loop:");
for(int i = 0; i < age.length; i++) {
   System.out.println(age[i]); } } }
```

Using the for-each Loop

```
class Main {
public static void main(String[] args) {
int[] age = {12, 4, 5}; // create an array
System.out.println("Using for-each Loop:");
for(int a : age) {
    System.out.println(a); } } }
```

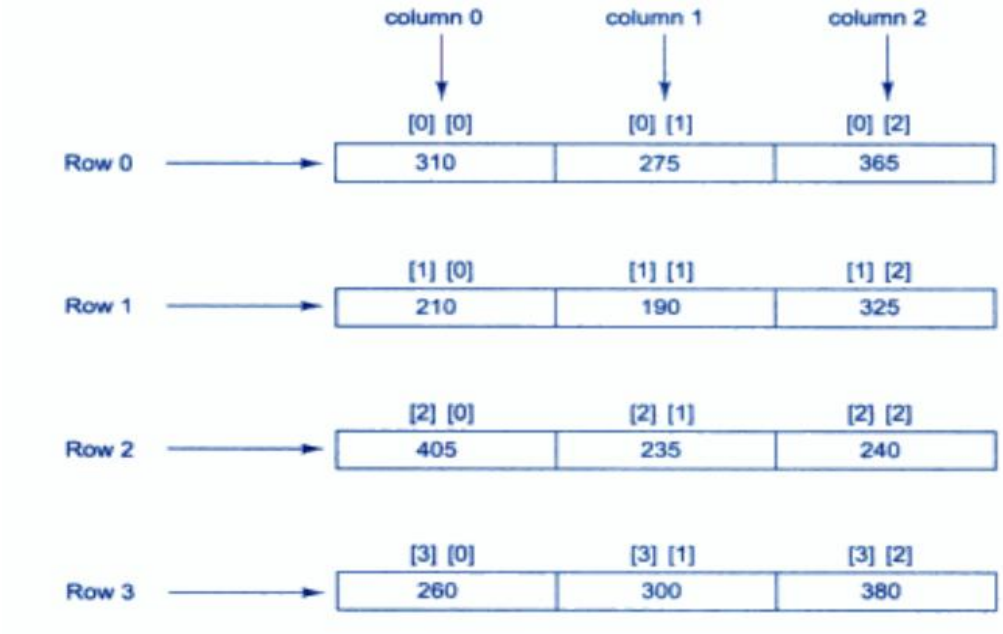
Passing Array to a Method in Java

```
class FindMin{
static void min(int arr[]){
int min=arr[0];
for(int i=1;i<arr.length;i++)

 if(min>arr[i])
  min=arr[i];
System.out.println(min);
}

public static void main(String args[]){
int a[]={33,3,4,5};
//declaring and initializing an array
min(a);//passing array to method
}}
```

Multidimensional Arrays

- A multidimensional array is an array of arrays. That is, each element of a multidimensional array is an array itself.
- In such case, data is stored in row and column based index (also known as matrix form).
- **int**[][] arr=**new int**[3][3];//3 row and 3 column

Memory representation of 2-D Array



ArrayList in Java

- The ArrayList class is a resizable array, which can be found in the java.util package.

Syntax:

```
import java.util.ArrayList; // import the ArrayList class
ArrayList<String> cars = new ArrayList<String>();
// Create an ArrayList object
```

ArrayList: Methods

Method	Description	Syntax
get()	To access an element in the ArrayList, use the get() method and refer to the index number.	cars.get(0);
set()	To modify an element, use the set() method and refer to the index number.	cars.set(0, "Opel");
remove()	To remove an element, use the remove() method and refer to the index number.	cars.remove(0);
clear()	To remove all the elements in the ArrayList, use the clear() method.	cars.clear();
size()	To find out how many elements an ArrayList have, use the size() method.	cars.size();

Add Items to ArrayList

```
import java.util.ArrayList;
public class Main {
 public static void main(String[]
    args) { ArrayList<String> cars
    = new ArrayList<String>();
    cars.add("Volvo");
    cars.add("BMW");
    cars.add("Ford");
    cars.add("Mazda");
System.out.println(cars);
 System.out.println(cars.size());
 System.out.println(cars.get(2));
 System.out.println(cars.set(2,"Maruti"));
 System.out.println(cars.get(2));
 System.out.println(cars.remove(2));
 System.out.println(cars);
 cars.clear();
 System.out.println(cars);
```

Difference between Arrays & Arraylist

Array	ArrayList
Arrays are of fixed length.	ArrayList is of variable length.
You can't change the size of the array once you create it.	Size of the ArrayList grows and shrinks as you add or remove the elements.
Array does not support generics.	ArrayList supports generics.
You can use arrays to store both primitive types as well as reference types.	You can store only reference types in an ArrayList.

Java program to enter and remove list element through keyboard.

```
import java.util.*;
class ArrayListAndListIterator{
public static void main(String[]args){
List l = new ArrayList();
Scanner input=new Scanner(System.in);
System.out.println("Enter 5 elements: ");
for(int i=0;i<5;i++){
String st=input.next();
l.add(st); }
System.out.println("Enter element to remove: ");
String st=input.next(); l.remove(st);
ListIterator listIterator = l.listIterator();
    System.out.println("Elements are: ");
while (listIterator.hasNext()) {
    System.out.println(listIterator.next())
    ;
} } }
```

Assignment Questions

- Sum of all elements in an array
- Find Minimum & maximum element
- Transpose of a matrix
- Add diagonal elements of a matrix.
- Add of 2 Matrices in Java
- Multiply 2 Matrices in Java