CORE JAVA

MANUAL V8.3

MODULE CODE:

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Module 4: Array, Enumeration and Collections

Chapter 3

Objective: After completing this lesson you will be able to : * Learn about array pass by reference * Learn about the array of objects	**Materials Required:** 1. Computer 2. Internet access
Theory Duration: 60 minutes	**Practical Duration:** 60 minutes
Total Duration: 120 minutes	

Chapter 3

3.1 Array pass by reference

Arrays are considered as objects in Java and can be passed into methods like other objects. Since arrays are predefined objects, they can pass by reference.

But Java arrays are passed by value in Java by default. A value is a reference to an array. Array objects are passed as arguments.

On passing an array to another method, a programmer is actually copying the reference to that specific array. It is important to understand that -

* Changes to the array content made through the reference will also be reflected in the original array. For instance, if you pass an array by reference and edit its contents, the original array's content will get the same changes.
* However, editing a reference to direct to a new array cannot affect the reference present within the original method

Take a look at the Java pass by reference program given below.

```
public class PassingByReference
{
  public static void display(int y[])
  {
    System.out.println(y[0]);
    y[0] = 200;
  }
  public static void main(String args[])
  {
    int x[] = { 20, 30, 40 };
    System.out.println(x[0]);

    display(x);
    System.out.println(x[0]);
```

```
 }
}
```

Output:

```
20
20
200
```

3.2 Array of Objects

What is an array of objects in Java?

In Java, an array of objects stores objects. The elements of object arrays store the reference variable location of objects. These arrays can store the instances of different classes like Integer, String and Character.

Since object is the root class of all classes in Java. An array is suitable for storing multiple values of objects. Keep in mind that an array of objects can only store references to objects, and not the objects themselves.

Syntax:

```
Class obj[]= new Class[array_length]
```

Declaring an array of objects in Java

There are two ways of declaring an array of objects in Java.

i) Stating the object class name (Object) followed by [] brackets. It is followed by the array declaration.

```
Object[] objectArray;
```

ii) The other method is similar but the [] brackets have to be put after the array declaration.

```
Object objectArray[];
```

Example of Array of Objects

```
public class Program {
    public static void main(String[] args) {

        Object[] elements = new Object[4];
         elements[0] = 'elephant';
         elements[1] = 60;
         elements[2] = new StringBuilder('xyz');
         elements[3] = 3.4;

        for (Object e : elements) {
                System.out.println(e);
         }
    }
}
```

Output

```
elephant
60
xyz
3.4
```

Declaring an array of objects in Java

Take a look at this programme to store students objects in array and sort them on basis of their roll numbers –

```
import java.util.*;
import java.lang.*;
import java.io.*;

// The class represents students
class Student
{
   int rollno;
   String name, address;

 // Constructor
   public Student(int rollno, String name,
                  String address)
   {
      this.rollno = rollno;
      this.name = name;
      this.address = address;
   }

 // Prints student details in main()
   public String toString()
   {
      return this.rollno + ' ' + this.name +
                  ' ' + this.address;
   }
}

class Sortbyroll implements Comparator<Student>
{
 // For ascending order roll number sort

   public int compare(Student a, Student b)
   {
      return a.rollno - b.rollno;
   }
}
```

```
// Driver class
class Main
{
   public static void main (String[] args)
   {
      Student [] arr = {new Student(100, 'B', 'kolkata'),
                        new Student(120, 'A', 'delhi'),
                        new Student(120, 'C', 'mumbai')};

      System.out.println('Unsorted');
      for (int i=0; i<arr.length; i++)
         System.out.println(arr[i]);

      Arrays.sort(arr, new Sortbyroll());

      System.out.println('\nSorted by rollno');
      for (int i=0; i<arr.length; i++)
         System.out.println(arr[i]);
   }
}
```

Output:

Unsorted

100 b kolkata

120 a delhi

120 c mumbai

Sorted by rollno

100 b kolkata

120 c mumbai

120 a delhi

The limitations of arrays –

* Programmers must know the number of array elements beforehand.
* An array has a fixed size and the size cannot be modified after creation.
* Array elements are stored in consecutive memory locations. It makes insertion and deletion challenging.
* Memory allocation is difficult as allocating more or less memory space leads to issues.

Practical (60 minutes)

See the example programme for Java array of objects below. Write the same programme to create an object of arrays with the elements 'dog', '70', new StringBuilder('bcd') and the integer 6. Show the resulting output. Repeat the same with the elements 'cat', '22', new StringBuilder('abc') and the integer 9.

```
public class Program {
   public static void main(String[] args) {
      Object[] elements = new Object[4];
     elements[0] = 'elephant';
     elements[1] = 60;
     elements[2] = new StringBuilder('xyz');
     elements[3] = 3.4;
      for (Object e : elements) {
         System.out.println(e);
     }
   }
}
```

Instructions: The progress of students will be assessed with the exercises mentioned below.

MCQ (10 minutes)

1. Arrays are considered as _____ in Java

a) classes

b) subjects

c) objects

d) None of the mentioned

2. Arrays can pass by reference as they are _____ objects.

a) object

b) insertion

c) list

d) None of the mentioned

3. A value is a _____ to an array

a) query

b) reference

c) inference

d) None of the mentioned

4. If a programmer is passing an array to another method, he is copying the _____ to the array

a) equivalent value

b) reference

c) constructor

d) None of the mentioned

5. Changes to an array reference are reflected in the _____ array.

a) fresh

b) original

c) new

d) None of the mentioned

6. An array of _____ in Java is used for storing objects.

a) subclasses

b) objects

c) floats

d) None of the mentioned

7. Object[] objectArray is a way of _____ a Java object array.

a) unboxing

b) declaring

c) clearing

d) None of the mentioned

8. Object array elements store the reference _____ location of objects.

a) variable

b) integer

c) constructor

d) None of the mentioned

9. What is the root class of classes in Java?

a) subclass

b) object

c) integer

d) float

10. An array of objects stores references ___ objects.

a) without

b) with

c) to

d) None of the mentioned