LOOPS AND ARRAYS IN JAVA

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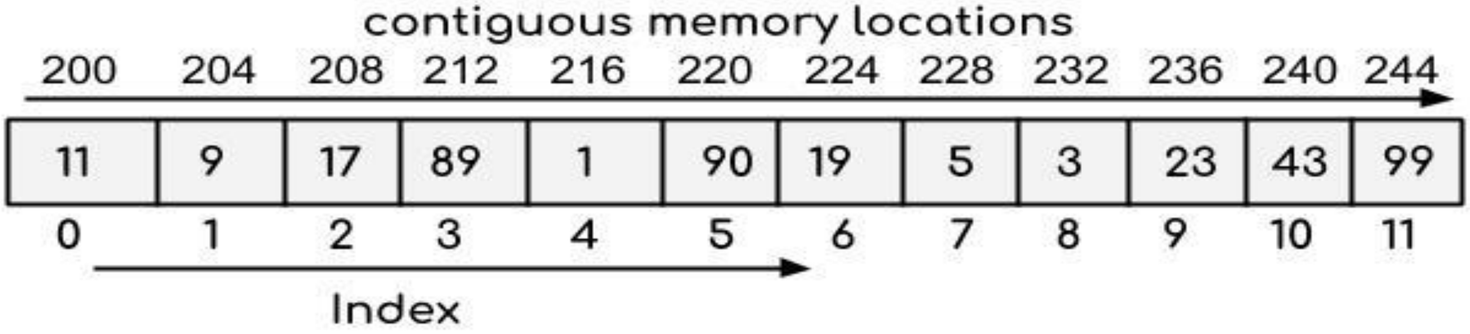
Outline

- What is an array?
- Example of Array
- Array Declaration, Instantiation, Initialization
- Length of an Array
- Default Values
- Loops
- Few words about Strings
- Two-dimensional Arrays
- Ragged Arrays

What is an array?

- A group or collection of like-typed variables that are referred to by a common name
- Can have one or more dimensions
- Element is accessed by index
- Contiguous memory allocation

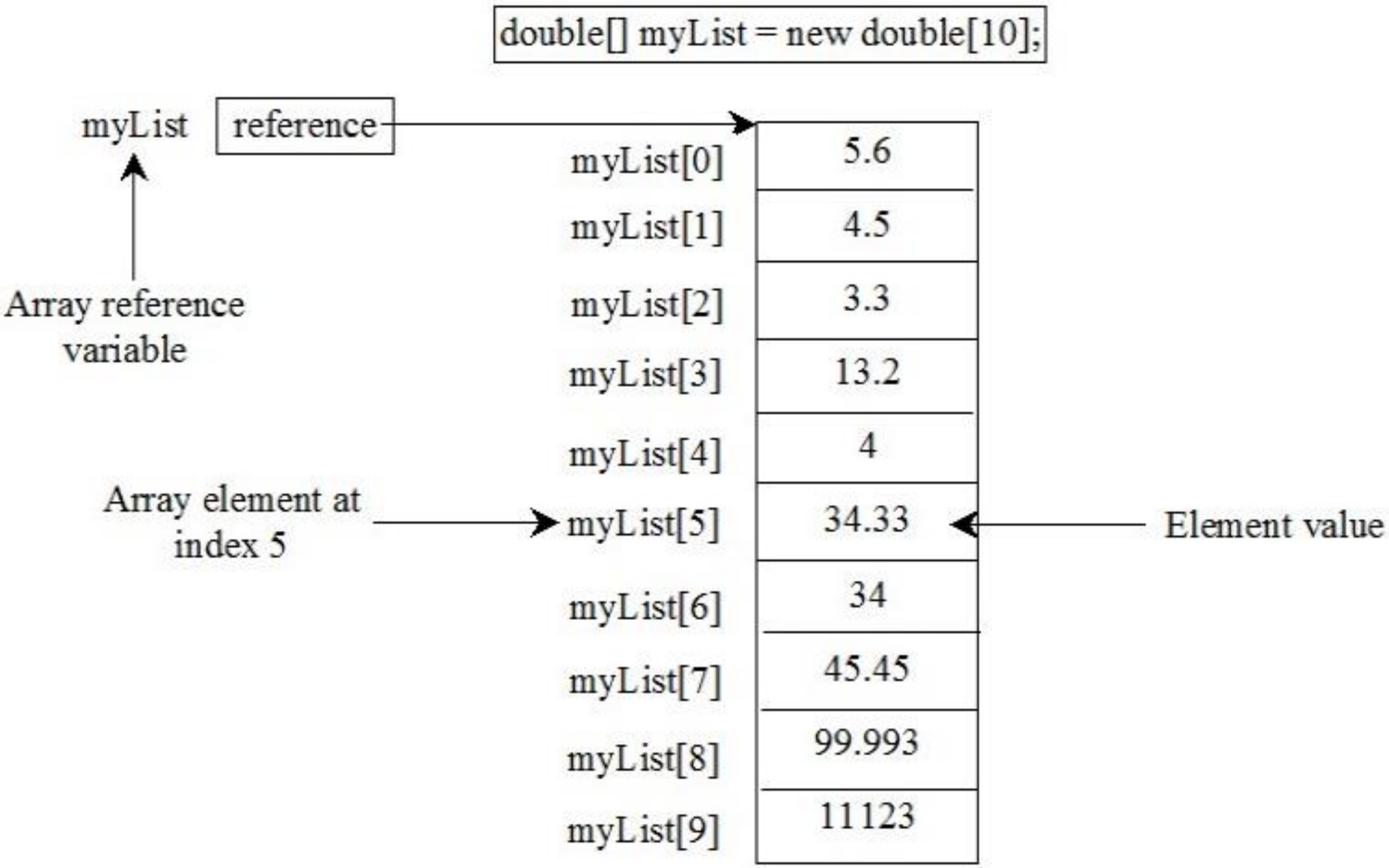


contiguous memory locations

200	204	208	212	216	220	224	228	232	236	240	244
11	9	17	89	1	90	19	5	3	23	43	99
0	1	2	3	4	5	6	7	8	9	10	11

Index

Example of Array



```
double[] myList = new double[10];
```

myList reference

Array reference variable

myList[0]	5.6
myList[1]	4.5
myList[2]	3.3
myList[3]	13.2
myList[4]	4
myList[5]	34.33
myList[6]	34
myList[7]	45.45
myList[8]	99.993
myList[9]	11123

Array element at index 5

Element value

Array Declaration

- Declaration:
  - Datatype[] arrayRefVar; //Preferable
  - Datatype []arrayRefVar;
  - Datatype arrayRefVar[]; //Allowed, but not preferred
  - EX:

    int[] totalMarks;
- Instantiation:

  arrayRefVar = new datatype [arraySize];

  EX:

  totalMarks=new int[5]; //declaration and instantiation

Array Instantiation and Initialization

- Only the declaration of the array is not sufficient
- To store values in the array, it is required to initialize it after declaration

1. Without assigning values:

```
int[] iArray = new int[5];
System.out.println(iArray[2]);    //0
for (i=0; i<5;i+++)
      System.out.println(iArray[i]);
```

2. After the declaration of the array:

```
int[] numbers;
numbers = new int[]{22,33,44,55,66};
```

Array Initialization

3. Initialize and assign values together:

```
 int[] numbers = {22,33,44,55,66};   //Shorthand notation
```

4. Assign values using index:

```
int[] iArray = new int[5];
iArray[0]=10;
iArray[1]=20;

…
```

Caution: In shorthand notation, declare, create and initialize array all in one statement, otherwise error !!

Length of an Array

- Once an array is created, its size is fixed. It cannot be changed.
- To find size:

arrayRefVar.length

EX:

totalMarks.length returns 5

Default Values

- Default values of array elements are:
  - Numeric primitive data types: 0
  - Character data types: ‘\u0000’
  - Boolean data types: false

Loops

- For-each Loop for Java Array
  - the Java array can be printed using for-each loop also
  - it prints the array elements one by one
  - it holds an array element in a variable

Syntax:

```
for(elementType ele:arrayRefVar){
        //body of the loop
}
```

Loops…

Example of for each loop:

```
class TestArray1{
        public static void main(String args[]){
                int iArray[]={10, 20, 30, 40, 50};
                        //printing array using for-each loop
                for(int ele : iArray)
                        System.out.println( ele );
                for(int j=0;j<5;j++)
                         System.out.println(iArray[ j ]);
        }
}
```

Few words about Strings

- String
  - Not primitive data type
  - Not an array of characters
  - It is an object
  - Characters of the string can’t be accessed using index

```
String str = “Welcome”;
System.out.println(str[1]); //Error
```

Two-dimensional Arrays

- // Declare array ref var
  - dataType[][] refVar;
- // Create array and assign its reference to variable
  - refVar = new dataType[10][10];
- // Combine declaration and creation in one statement
  - dataType[][] refVar = new dataType[10][10];
- // Alternative syntax
  - dataType refVar[][] = new dataType[10][10];

Two-dimensional Arrays…

```
int[][] matrix = new int[10][10];
for(int i=0 ; i < matrix.length ; i++)
        for(int j=0 ; j < matrix[ i ].length ; i++)
                matrix[ i ][ j ] = matrix[ i ][ j ] + 100;
```

- Questions:

```
int[][] matrix = new int[3][5];
matrix.length  ?
matrix[0].length ?
matrix[2].length ?
```

Ragged Arrays

- Each row in a two-dimensional array is itself an array. So, the rows can have different lengths. Such an array is known as a ragged array.
- EX:

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

matrix.length is 5
matrix[0].length is 5
matrix[1].length is 4
matrix[2].length is 3
matrix[3].length is 2
matrix[4].length is 1

Ragged Arrays…

- Another declaration

```
int[][] matrix = new int[3][];
matrix[0] = new int[3];
matrix[1] = new int[4];
matrix[2] = new int[2];
```

EX:

```
for(i=0; i<3; i++)
     for(j=0; j<matrix.length; j++)
            matrix[ i ][ j ] = i + j;
```