FAST

National University of Computer and Emerging Sciences Peshawar

Lecture # 07

Software Construction and Development (Java Programming)

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Arrays in Java

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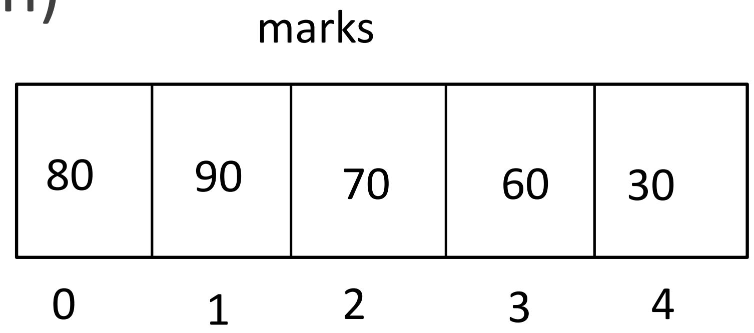
Array

- Same name which store multiple values
- It is a collection of similar type of elements that have contiguous memory location.

Array is:

1. Linear data structure (consecutive location)
2. Static data structure (fixed size)
3. Homogeneous data will be stored.



marks

80	90	70	60	30
0	1	2	3	4

Syntax of one dimensional array in C++

```
Datatype   arrayName[size];
```

Example:

```
int array[5];
```

Syntax of one dimensional array in Java

```
Datatype   arrayName[] = new Datatype[size];
```

Example:

```
int   marks[]   = new int[5];

                OR

int[]  marks = new int[5];

                OR

int marks[];     // declaration

marks = new int[5];    //initialization
```

Syntax of one dimensional array in Java

```
                OR
int   marks[] , i ;     // marks is array while i variable
marks = new   int[5];
i=5;
            OR
int[]  marks , i ;   // here marks and i both are arrays
marks = new int[5];
i  =   new int[8];
            OR
int marks[];      // declaration
marks = new marks[5];     //instantiation
```

Syntax of array declaration in java

```
Datatype[]   arrayName;

             OR

Datatype   []arrayName;

             OR

Datatype    arrayName[];
```

Syntax of array instantiation in java

```
arrayReferenceVariable    =   new datatype[size];
```

Declaration and instantiation at one time

```
 int   marks[]   = new int[5];
```

new--→ object instantiation in heap

Syntax of array instantiation in java

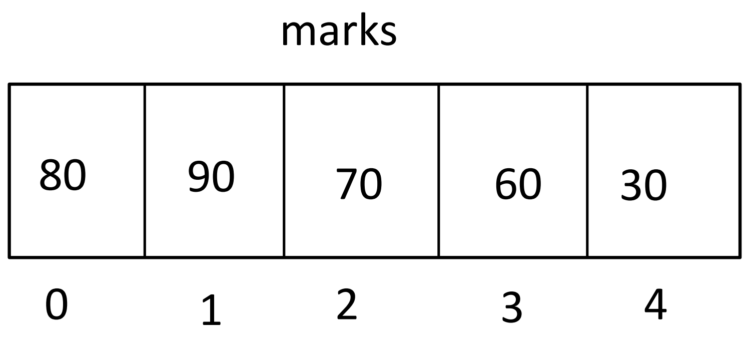
```
int array[]   =  new int[10];
```

OR

```
Integer array[]  =   new Integer[10]
```

Initialization of Array

```
int    marks[]  =    new int[5]      // 5 is array length or size


marks[0]  = 80 ;          // [0] is array index  and 80 is array element

marks[1]  = 90 ;

marks[2]  = 70 ;

marks[3]  = 60 ;

marks[4]  = 30 ;
```



marks

80	90	70	60	30
0	1	2	3	4

Declaration, instantiation and initialization of java array

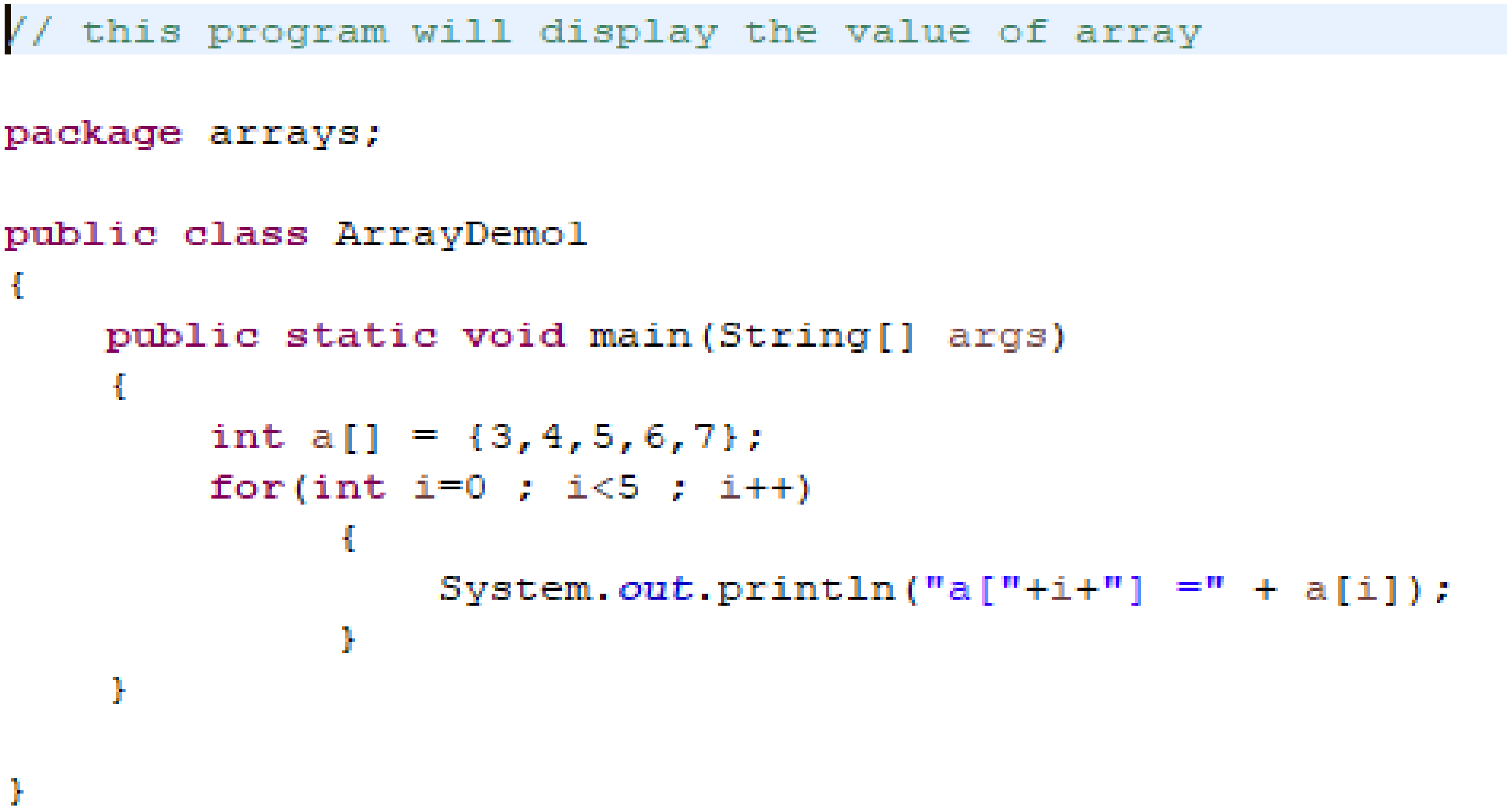
```
int marks[]    =  {80, 90, 70, 60, 30};
```

Declare array length constant

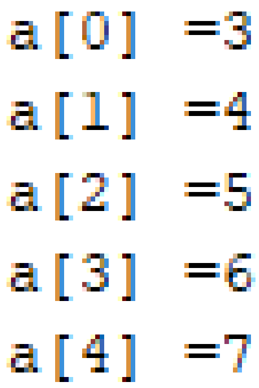
Example

```
final int ARRAY_LENGTH = 10 ;

int[]     array  = new int[ARRAY_LENGTH];
```

Program 1

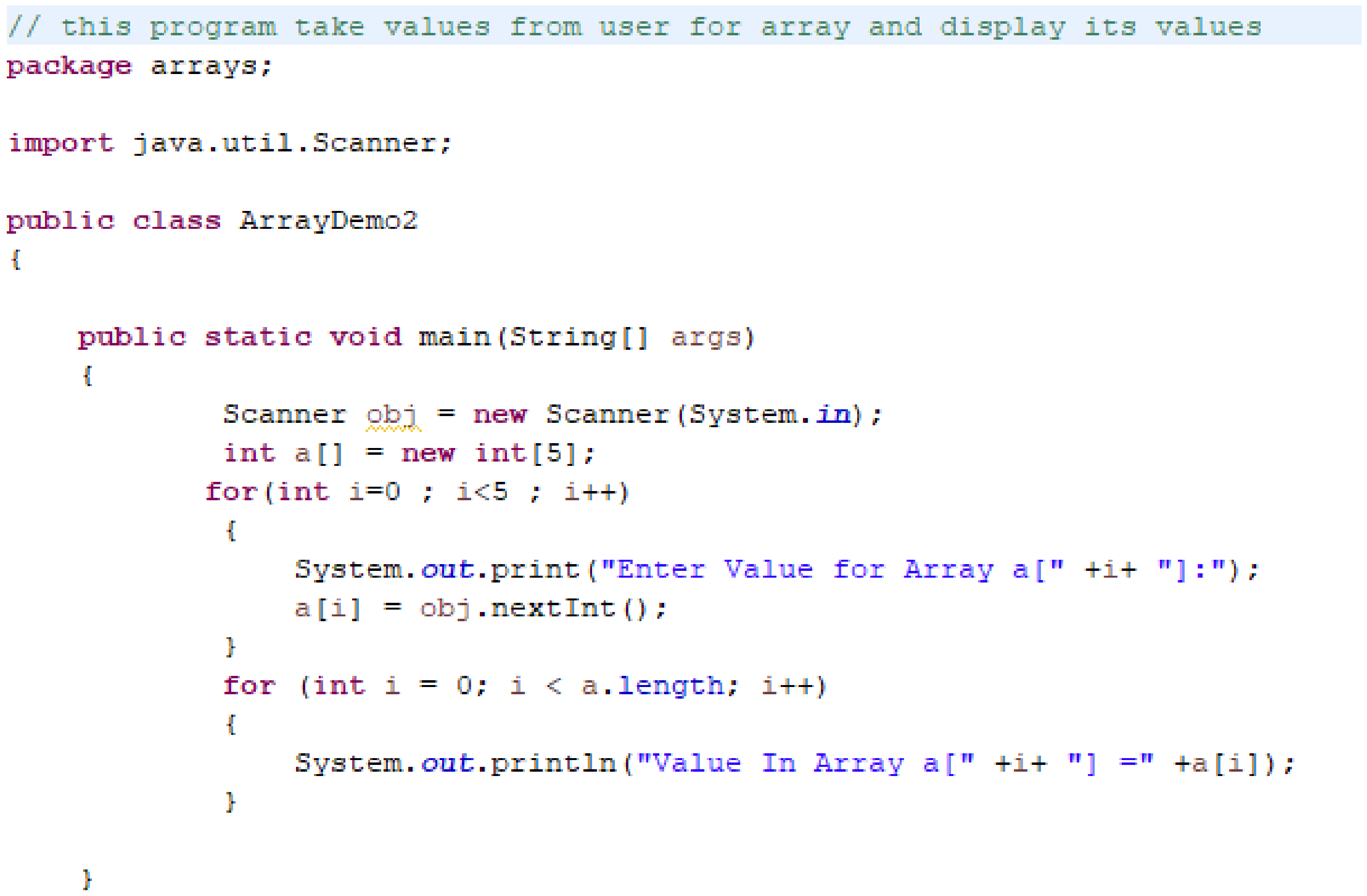


```
// this program will display the value of array

package arrays;

public class ArrayDemo1
{
    public static void main(String[] args)
    {
        int a[] = {3,4,5,6,7};
        for(int i=0 ; i<5 ; i++)
            {
                System.out.println("a["+i+"] =" + a[i]);
            }
    }

}
```

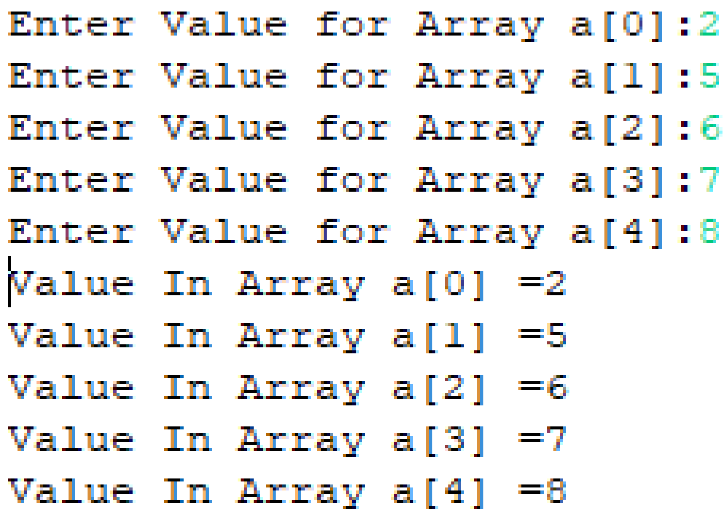


```
a[0] =3
a[1] =4
a[2] =5
a[3] =6
a[4] =7
```

Program 2 Runtime value in array from user



```
// this program take values from user for array and display its values
package arrays;

import java.util.Scanner;

public class ArrayDemo2
{

    public static void main(String[] args)
    {
            Scanner obj = new Scanner(System.in);
            int a[] = new int[5];
           for(int i=0 ; i<5 ; i++)
            {
                System.out.print("Enter Value for Array a[" +i+ "]:");
                a[i] = obj.nextInt();
            }
            for (int i = 0; i < a.length; i++)
            {
                System.out.println("Value In Array a[" +i+ "] =" +a[i]);
            }

    }
```



```
Enter Value for Array a[0]:2
Enter Value for Array a[1]:5
Enter Value for Array a[2]:6
Enter Value for Array a[3]:7
Enter Value for Array a[4]:8
Value In Array a[0] =2
Value In Array a[1] =5
Value In Array a[2] =6
Value In Array a[3] =7
Value In Array a[4] =8
```

Enhanced for loop (for-each loop)

- Works with array.
- Is used for traversing in array.
- It is easy to use than simple for loop because we do not need to increment or decrement counter variable.

Syntax

```
for (data type variable : arrayName)
{    statement(s);   }
```

Data type must be same as that of array data type.

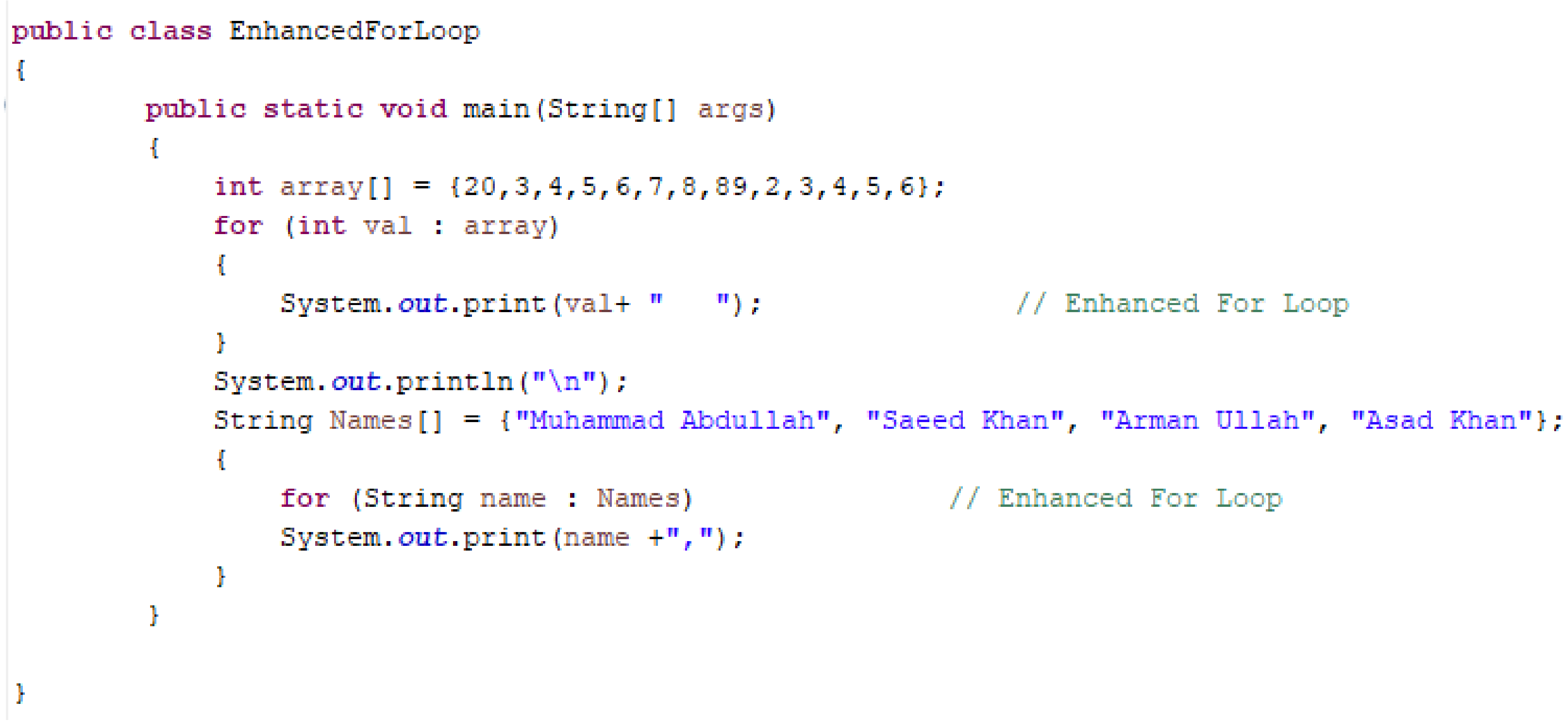
Enhanced for loop (for-each loop)

- Start from 1st element.
- End in last element.
- We cannot use it in reverse order.
- We cannot traverse element in middle of array.
- Only one step incrementation is possible.

Enhanced for loop example 1

```
class ForEachExample1{
 public static void main(String args[]){
//declaring an array
 int arr[]={12,13,14,44};
//traversing the array with for-each loop
 for(int i:arr){
     System.out.println(i+ “ ”);
   } }
}
```

Enhanced for loop example 2



```
public class EnhancedForLoop
{
        public static void main(String[] args)
        {
            int array[] = {20,3,4,5,6,7,8,89,2,3,4,5,6};
            for (int val : array)
            {
                System.out.print(val+ "   ");               // Enhanced For Loop
            }
            System.out.println("\n");
            String Names[] = {"Muhammad Abdullah", "Saeed Khan", "Arman Ullah", "Asad Khan"};
            {
                for (String name : Names)               // Enhanced For Loop
                System.out.print(name +",");
            }
        }

}
```

One dimensional array tasks

1. Write a java program that will add two single dimensional array elements. Take values from user at runtime.
2. Write a java program that will add two single dimensional arrays elements using random numbers.
3. Write a java program that will find maximum number in an array.
4. Write a java program that will find minimum number in a array.

Two dimensional arrays

- An array that is represented with two indices/subscripts is called 2D array.
- It is similar to matrix in maths.
- Logically it consist of rows and columns.
- 2D array is called an array of an arrays.

Two dimensional arrays…

Syntax of declaration

```
Datatype  arrayName[][]   = new datatype[R][C];   // R means number of rows and C means number of columns
```

Example:

```
int StudentMarks[][]  =     new int[4][3];
```

2D Array logical Representation

	0	1	2
0	**(0,0)** 70	**(0,1)** 80	**(0,2)** 90
1	**(1,0)** 10	**(1,1)** 20	**(1,2)** 30
2	**(2,0)** 5	**(2,1)** 10	**(2,2)** 15
3	**(3,0)** 50	**(3,1)** 60	**(3,2)** 70

Row major order

70 80 90	10 20 30	5 10 15	50 60 70

Column major order

70 10 5 50	80 20 10 60	90 30 15 70

Declaration of 2D Array

Datatype [][] arrayRefVar;

OR

Datatype   [][]arrayRefVar;

OR

Datatype   arrayRefVar[][];

OR

Datatype []arrayRefVar[];

Instantiation of 2D Array

```
int[][]   array  =  int[3][3];
```

Initialization of 2D Array

1st Method

```
int  studentMarks[][]  =  int[4][3];
studentName[0][0]  = 70;
studentName[0][1]  = 90;
studentName[0][2]  = 90;
studentName[1][0]  = 10;
studentName[1][1]  = 20;
studentName[1][2]  = 30;
studentName[2][0]  = 5;
studentName[2][1]  = 10;
studentName[2][2]  = 15;
```

Initialization of 2D Array

1st Method…

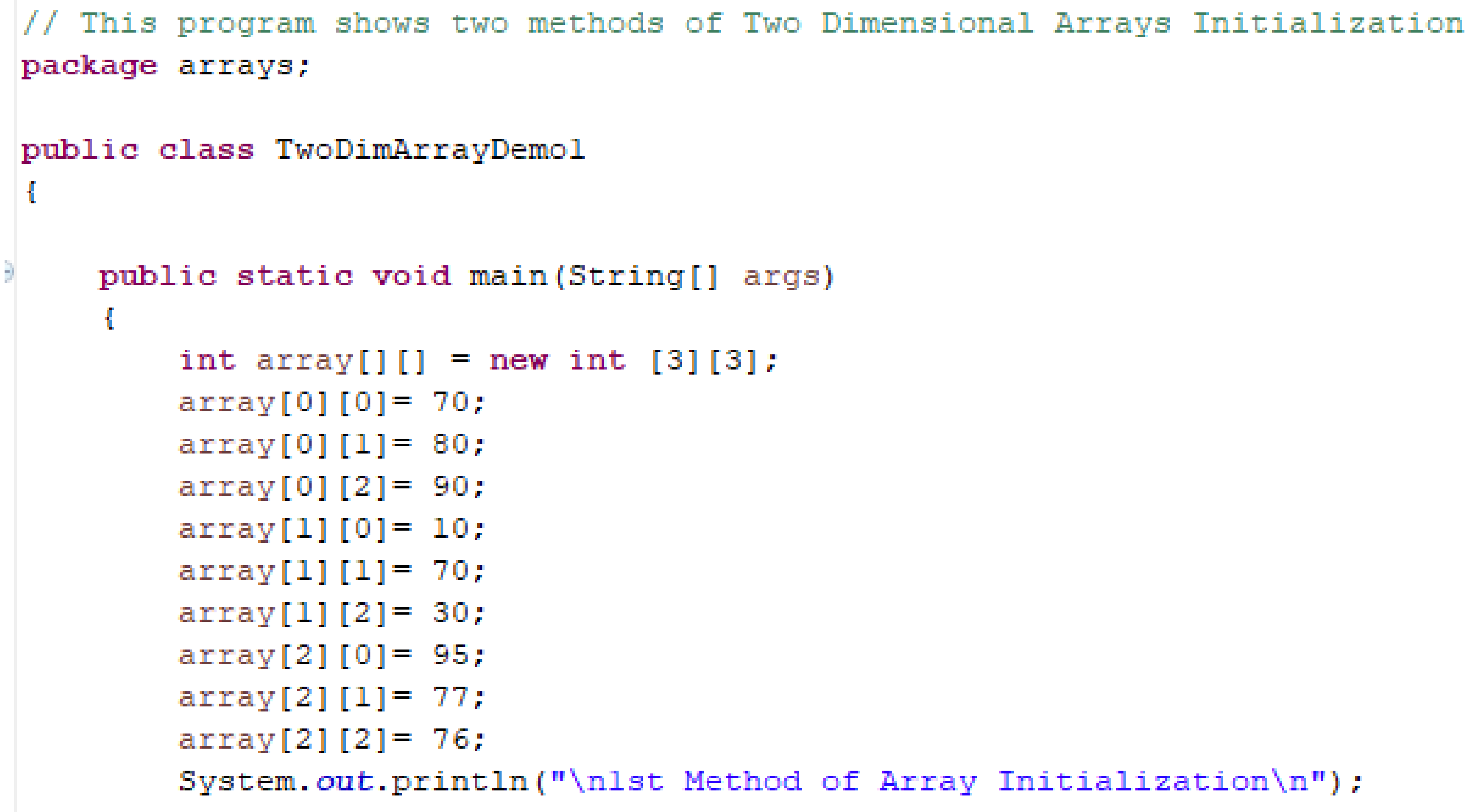
```
studentName[3][0]  = 50;

studentName[3][1]  = 60;

studentName[3][2]  = 70;
```

Initialization of 2D Array

2nd Method

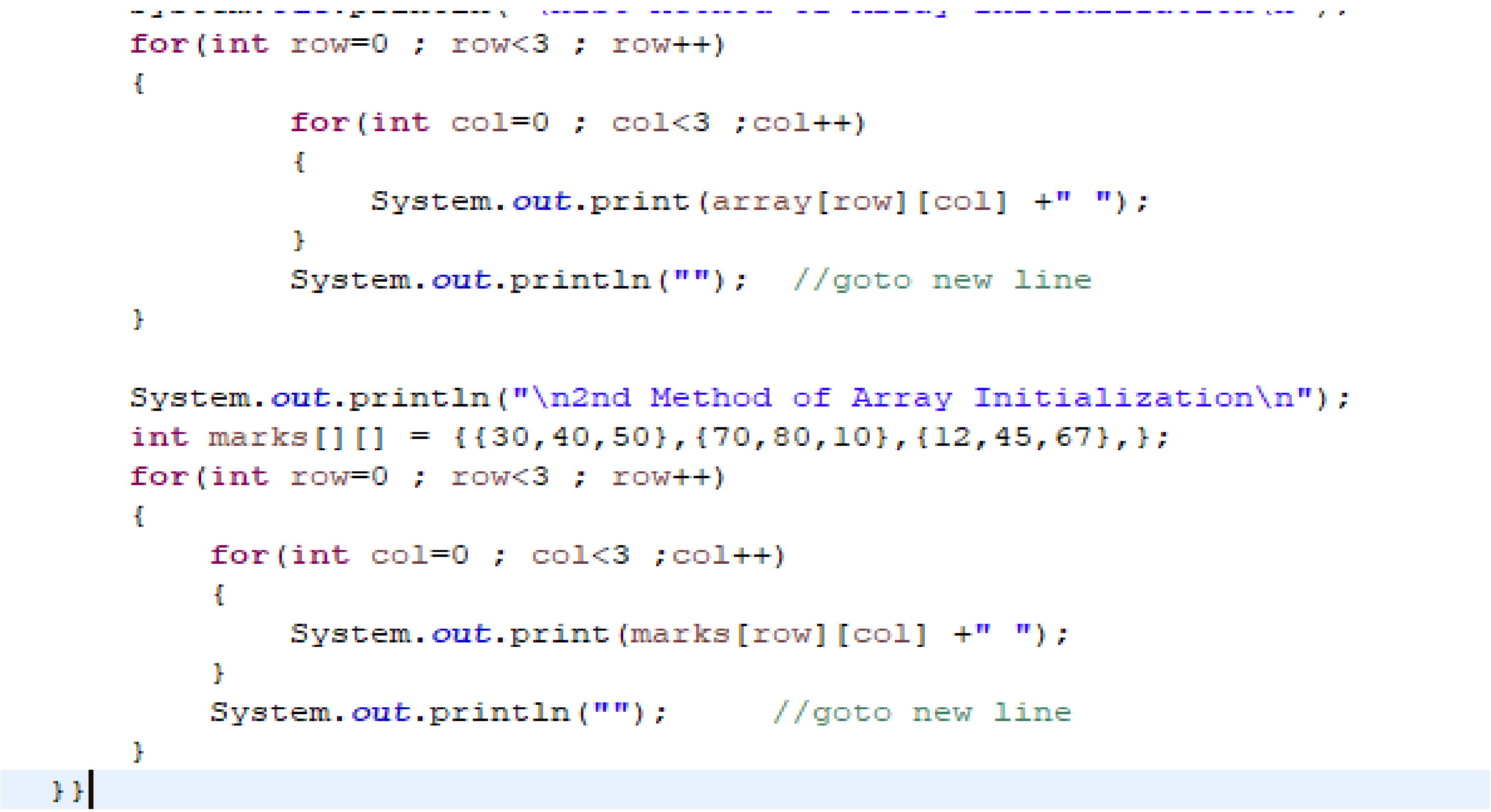
```
int  studentMarks[][]  = {   { 70, 80, 90 },
                             { 10, 20, 30 },
                             { 5, 10, 15  },
                             { 50, 60, 70 },
                           };
                      OR
int  studentMarks[][]  = {  { 70, 80, 90 },   { 10, 20, 30 },  { 5, 10, 15  }, { 50, 60, 70 } ,};
```

2D Array Program 1

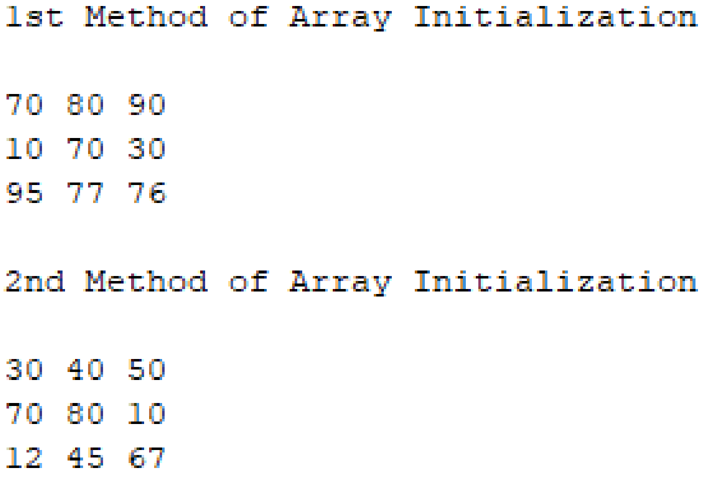


```
// This program shows two methods of Two Dimensional Arrays Initialization
package arrays;

public class TwoDimArrayDemo1
{

    public static void main(String[] args)
    {
        int array[][] = new int [3][3];
        array[0][0]= 70;
        array[0][1]= 80;
        array[0][2]= 90;
        array[1][0]= 10;
        array[1][1]= 70;
        array[1][2]= 30;
        array[2][0]= 95;
        array[2][1]= 77;
        array[2][2]= 76;
        System.out.println("\n1st Method of Array Initialization\n");
```

2D Array Program 1

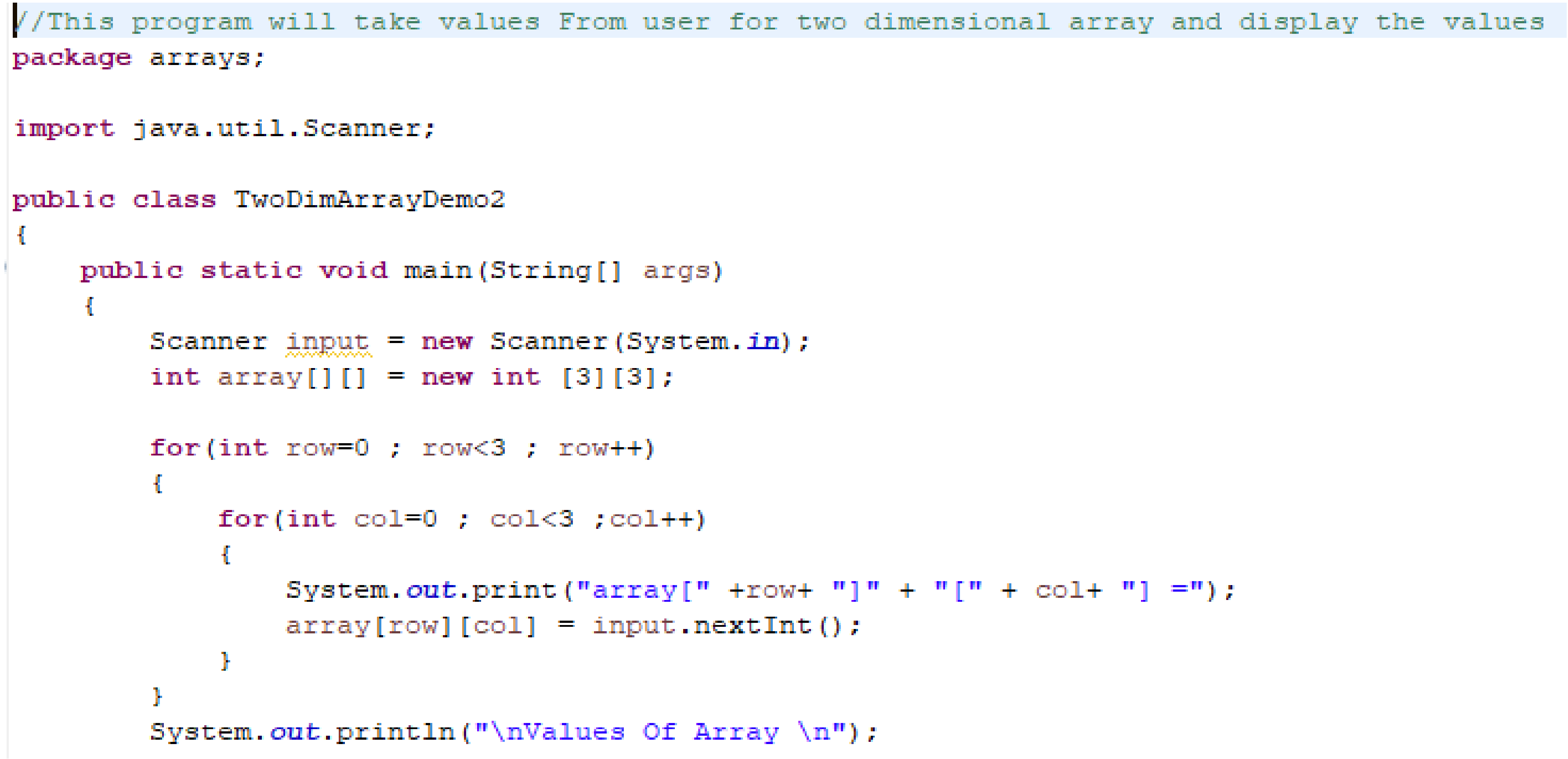


```
        for(int row=0 ; row<3 ; row++)
        {
                for(int col=0 ; col<3 ;col++)
                {
                    System.out.print(array[row][col] +" ");
                }
                System.out.println("");  //goto new line
        }

        System.out.println("\n2nd Method of Array Initialization\n");
        int marks[][] = {{30,40,50},{70,80,10},{12,45,67},};
        for(int row=0 ; row<3 ; row++)
        {
            for(int col=0 ; col<3 ;col++)
            {
                System.out.print(marks[row][col] +" ");
            }
            System.out.println("");     //goto new line
        }
    }}
```



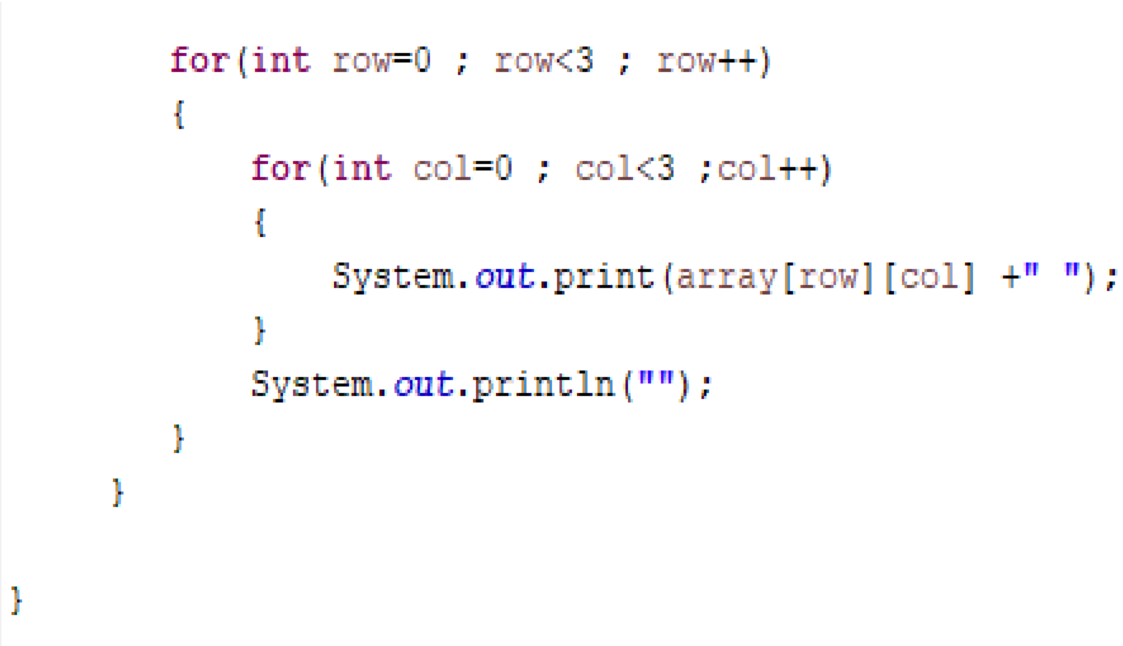
```
1st Method of Array Initialization

70 80 90
10 70 30
95 77 76

2nd Method of Array Initialization

30 40 50
70 80 10
12 45 67
```

2D Array Program 2

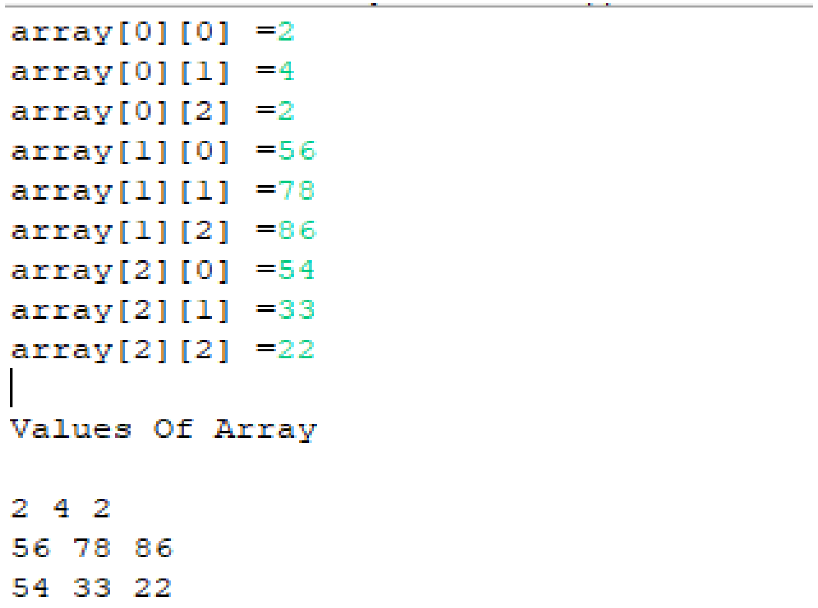


```
//This program will take values From user for two dimensional array and display the values
package arrays;

import java.util.Scanner;

public class TwoDimArrayDemo2
{
    public static void main(String[] args)
    {
        Scanner input = new Scanner(System.in);
        int array[][] = new int [3][3];

        for(int row=0 ; row<3 ; row++)
        {
            for(int col=0 ; col<3 ;col++)
            {
                System.out.print("array[" +row+ "]" + "[" + col+ "] =");
                array[row][col] = input.nextInt();
            }
        }
        System.out.println("\nValues Of Array \n");
```

2D Array Program 2



```
        for(int row=0 ; row<3 ; row++)
        {
            for(int col=0 ; col<3 ;col++)
            {
                System.out.print(array[row][col] +" ");
            }
            System.out.println("");
        }
     }

}
```



```
array[0][0] =2
array[0][1] =4
array[0][2] =2
array[1][0] =56
array[1][1] =78
array[1][2] =86
array[2][0] =54
array[2][1] =33
array[2][2] =22

Values Of Array

2 4 2
56 78 86
54 33 22
```

Two dimensional array tasks

1. Write a java program that will create 2D array using random numbers and then show these values.
2. Write a java program that will find maximum and minimum number in 2D array. Note array elements must be random values.
3. Write a java program that will add two 2D arrays elements. Take values from user at runtime. Note display values 1st, 2nd and their resultant array.

THANK YOU