

C307 Data Representation

Unit-2, Part B_1 **Array Basics**

By:



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Elementary Data Structures

- Arrays (1D, 2D, 3D, etc.)

Arrays

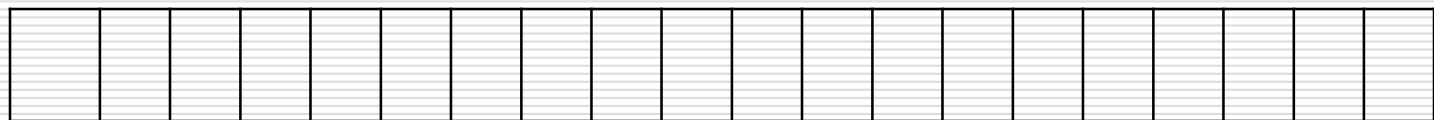
- ❑ A homogeneous aggregate of data elements.
- ❑ A collection of objects of the same type.
- ❑ A collection of similar variables which are identified under the same name.

- ❑ **Creating an Array of 20 integers:**

- `int test_scores = new int[20];`

or

- `int[] test_scores = new int[20];`



0 1 2 3 4 19

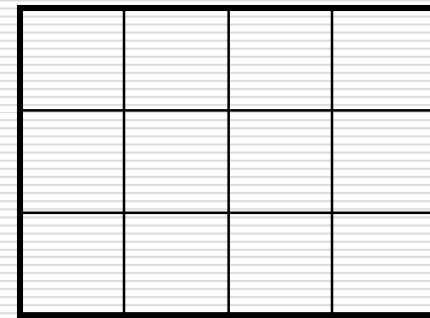
Multi-Dimensional Arrays:

❑ Arrays can have more than one dimension

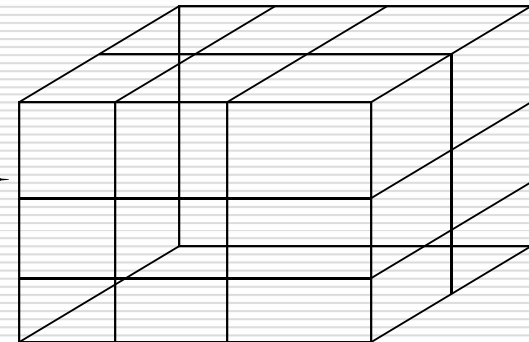
❑ Like a table of values

❑ Or a Cube of values.

2-D



3-D



1D Array

```
public static void Array1D_1() {  
  
    System.out.println("-----");  
    System.out.println("1D Array: Declaring ");  
  
    // double myArray[];  
    // myArray = new double[5];  
    //or  
    double[] myArray = new double[5];  
  
    System.out.println("1D Array: Initializing ");  
    for (int i = 0; i < myArray.length; i++) {  
        myArray[i] = -1.5;  
    }  
  
    System.out.println("1D Array: Printing ");  
    for (int i = 0; i < myArray.length; i++) {  
        System.out.println("Array[" + i + "] = " + myArray[i]);  
    }  
  
    Random rand = new Random();  
  
    System.out.println("1D Array: Initializing with Random data ");  
    for (int i = 0; i < myArray.length; i++) {  
        myArray[i] = rand.nextDouble();  
    }  
  
    System.out.println("1D Array: Printing ");  
    for (int i = 0; i < myArray.length; i++) {  
        System.out.println("Array[" + i + "] = " + myArray[i]);  
    }  
}
```

```
-----  
1D Array: Declaring  
1D Array: Initializing  
1D Array: Printing  
Array[0] = -1.5  
Array[1] = -1.5  
Array[2] = -1.5  
Array[3] = -1.5  
Array[4] = -1.5  
1D Array: Initializing with Random data  
1D Array: Printing  
Array[0] = 0.47689711939304436  
Array[1] = 0.15504961845845144  
Array[2] = 0.22258216880677772  
Array[3] = 0.3188563957346726  
Array[4] = 0.12311187570256021  
BUILD SUCCESSFUL (total time: 0 seconds)
```

2D Array (Multiplication Table)

```
public static void Array2D_1() {  
    System.out.println("-----");  
    System.out.println("----- Creating a Multiplication Table -----");  
    System.out.println("2D Array: Declaring an 11x11 integer array ");  
    int[][] my2DArray = new int[11][11];  
  
    System.out.println("2D Array: Initializing Multiplication Table");  
    for (int i = 1; i < my2DArray.length; i++) {  
        for (int j = 1; j < my2DArray[0].length; j++) {  
            my2DArray[i][j] = i * j;  
        }  
    }  
}
```

```
    System.out.println("2D Array: Printing Multiplication Table");  
    for (int i = 1; i < my2DArray.length; i++) {  
        for (int j = 1; j < my2DArray[0].length; j++) {  
            System.out.print(my2DArray[i][j] + "\t");  
        }  
        System.out.println();  
    }  
}
```

```
----- Creating a Multiplication Table -----  
2D Array: Declaring an 11x11 integer array  
2D Array: Initializing Multiplication Table  
2D Array: Printing Multiplication Table  
1      2      3      4      5      6      7      8      9      10  
2      4      6      8      10     12     14     16     18     20  
3      6      9      12     15     18     21     24     27     30  
4      8      12     16     20     24     28     32     36     40  
5      10     15     20     25     30     35     40     45     50  
6      12     18     24     30     36     42     48     54     60  
7      14     21     28     35     42     49     56     63     70  
8      16     24     32     40     48     56     64     72     80  
9      18     27     36     45     54     63     72     81     90  
10     20     30     40     50     60     70     80     90     100
```

2D Array (Random Table)

```
public static void Array2D_Random() {
    System.out.println("-----");
    // create instance of Random class
    Random rand = new Random();
    System.out.println("----- Table of Random Integers: -----");
    // 2D array

    System.out.println("2D Array: Declaring a 5x5 int array ");
    int[][] my2DArray = new int[5][5];

    System.out.println("2D Array: Initializing with Random Integers ");

    for (int i = 0; i < my2DArray.length; i++) {
        for (int j = 0; j < my2DArray[0].length; j++) {
            my2DArray[i][j] = rand.nextInt(100); // Generate random integers in range 0 to 99
        }
    }

    System.out.println("2D Array: Printing the 5x5 int array ");
    for (int i = 0; i < my2DArray.length; i++) {
        for (int j = 0; j < my2DArray[0].length; j++) {
            System.out.print(my2DArray[i][j] + "\t");
        }
        System.out.println();
    }
}
```

```
----- Table of Random Integers: -----
2D Array: Declaring a 5x5 int array
2D Array: Initializing with Random Integers
2D Array: Printing the 5x5 int array
98      92      21      2      25
67      35      67      69      31
91      88      20      30      94
76      62      71      38      89
22      31      6      89      28
BUILD SUCCESSFUL (total time: 0 seconds)
```

3D Array

```
public static void Array3D_1() {
    System.out.println("-----");
    System.out.println("3D Array: Creating a 4 x (3x5) ");
    System.out.println("Think of it as 4 frames each being a (3x5) array ");

    int[][][] my3DArray = new int[4][3][5];

    System.out.println("3D Array: Initializing the 3D array");
    for (int i = 0; i < my3DArray.length; i++) {
        System.out.println("Initializing Frame #:" + i);
        for (int j = 0; j < my3DArray[0].length; j++) {
            for (int k = 0; k < my3DArray[0][0].length; k++) {
                my3DArray[i][j][k] = i * j * k;
            }
        }
    }

    System.out.println("3D Array: Printing the 3D array");
    for (int i = 0; i < my3DArray.length; i++) {
        System.out.println("Printing Frame #:" + i);
        for (int j = 0; j < my3DArray[0].length; j++) {
            for (int k = 0; k < my3DArray[0][0].length; k++) {
                System.out.print(my3DArray[i][j][k] + "\t");
            }
        }
        System.out.println();
    }
}
```

```
-----
3D Array: Creating a 4 x (3x5)
Think of it as 4 frames each being a (3x5) array
3D Array: Initializing the 3D array
Initializing Frame #:0
Initializing Frame #:1
Initializing Frame #:2
Initializing Frame #:3
3D Array: Printing the 3D array
Printing Frame #:0
0      0      0      0      0
0      0      0      0      0
0      0      0      0      0

Printing Frame #:1
0      0      0      0      0
0      1      2      3      4
0      2      4      6      8

Printing Frame #:2
0      0      0      0      0
0      2      4      6      8
0      4      8      12     16

Printing Frame #:3
0      0      0      0      0
0      3      6      9      12
0      6      12     18     24
BUILD SUCCESSFUL (total time: 0 seconds)
```