

Algoritma dan Pemrograman

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13

Array 2 D

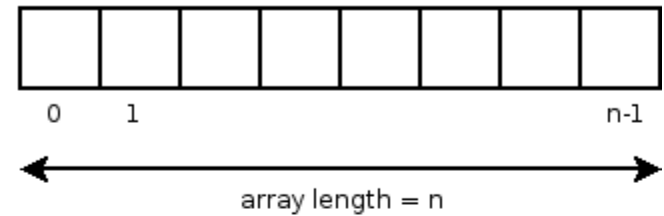
Introduction [1/5]

- The arrays you have been using so far have only held one column of data. But you can set up an array to hold more than one column. These are called multi-dimensional arrays.
- As an example, think of a spreadsheet with rows and columns. If you have 6 rows and 5 columns then your spreadsheet can hold 30 numbers. It might look like this:
- $6 * 5 = 30$

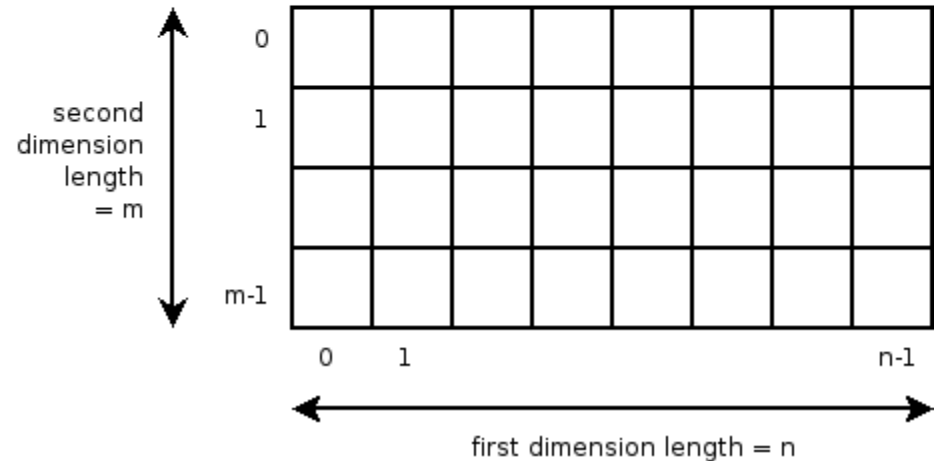
Introduction [2/5]

- Here is how one and two dimensional arrays are organized conceptually
- A two-dimensional array is like a grid (spreadsheet, table)

One-dimensional array

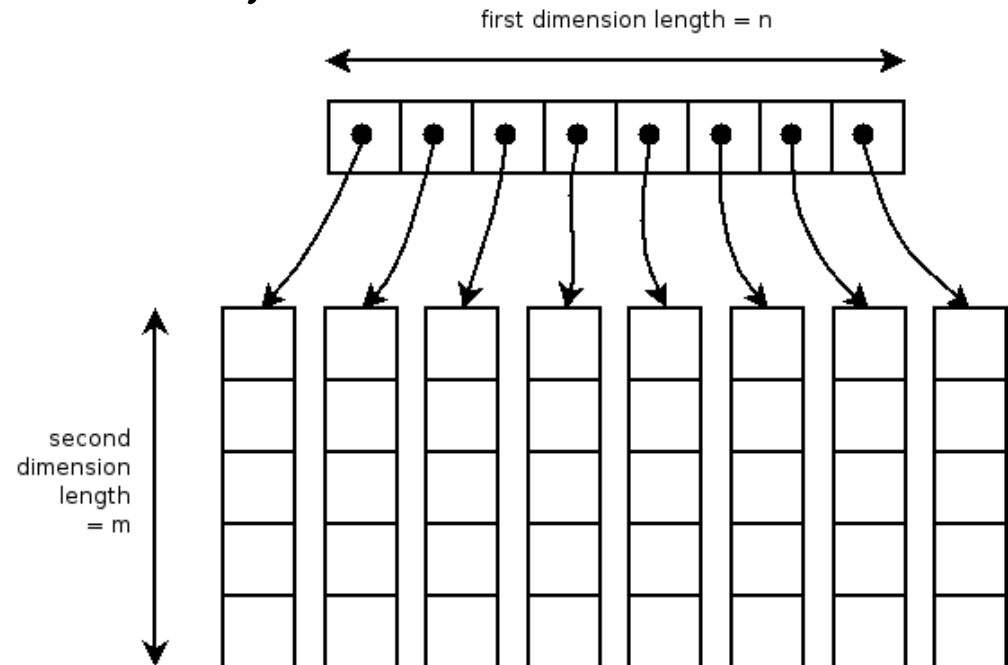


Two-dimensional array



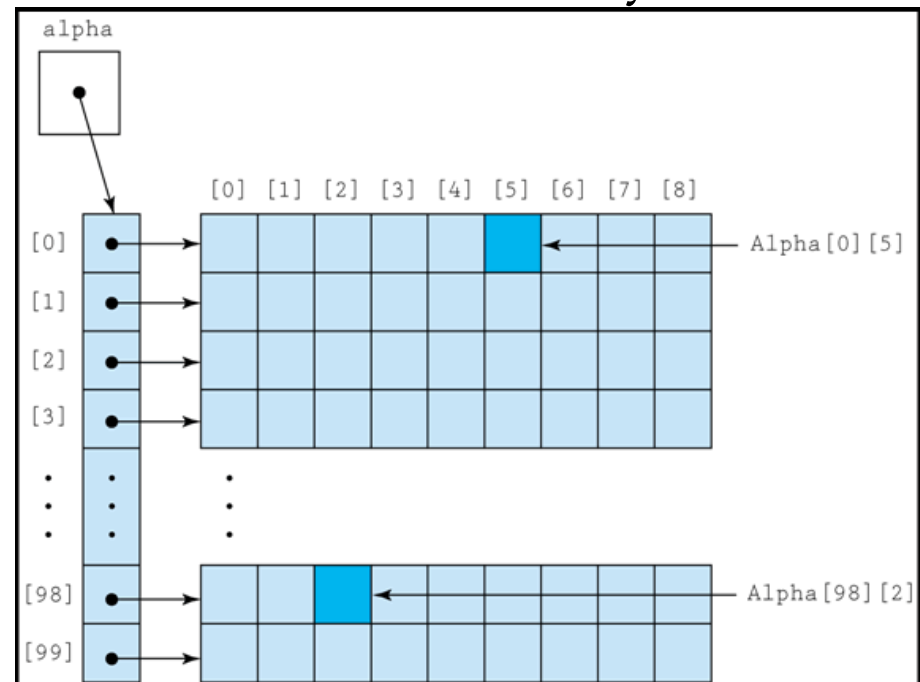
Introduction [3/5]

- Multidimensional arrays in Java are somewhat more complicated than one dimensional arrays. This is because multidimensional arrays are actually implemented as a collection of one-dimensional arrays.



Introduction [4/5]

- The first dimension of the array is actually a one dimensional array, each element of which is a lower-dimensional array. In this case, the first dimension of the array is an array whose elements point to the columns of the overall 2-d array.



Introduction [5/5]

- To declare a two-dimensional array, you simply list two sets of empty brackets, like this:
- **<data type>[] [] <arrayName>;**
- **<data type> <arrayName>[] [] ;**

Example

- We have a table consists of 6 rows and 5 columns

	A	B	C	D	E
0	10	12	43	11	22
1	20	45	56	1	33
2	30	67	32	14	44
3	40	12	87	14	55
4	50	86	66	13	66
5	60	53	44	12	11

- A multi dimensional array is one that can hold all the values above. You set them up like this:
- `int[][] aryNumbers = new int[6][5];`

- To hold values in a multi-dimensional array you have to take care to track the rows and columns.
- Here's some code to fill the first rows of numbers from our spreadsheet image:
- **// Initialization for the first rows**

```
twoD[0][0] = 10;
```

```
twoD[0][1] = 12;
```

```
twoD[0][2] = 43;
```

```
twoD[0][3] = 11;
```

```
twoD[0][4] = 22;
```



```
package package08;

public class Array2D {

    public static void main(String[] args) {

        int rows = 6;
        int cols = 5;

        int[ ][ ] twoD = new int[rows][cols];

        twoD[0][0] = 10;
        twoD[0][1] = 12;
        twoD[0][2] = 43;
        twoD[0][3] = 11;
        twoD[0][4] = 22;

        twoD[1][0] = 20;
        twoD[1][1] = 45;
        twoD[1][2] = 56;
        twoD[1][3] = 1;
        twoD[1][4] = 33;
    }
}
```

```
twoD[2][0] = 30;  
twoD[2][1] = 67;  
twoD[2][2] = 32;  
twoD[2][3] = 14;  
twoD[2][4] = 44;
```

```
twoD[3][0] = 40;  
twoD[3][1] = 12;  
twoD[3][2] = 87;  
twoD[3][3] = 14;  
twoD[3][4] = 55;
```

```
twoD[4][0] = 50;  
twoD[4][1] = 86;  
twoD[4][2] = 66;  
twoD[4][3] = 13;  
twoD[4][4] = 66;
```

```
twoD[5][0] = 60;  
twoD[5][1] = 53;  
twoD[5][2] = 44;  
twoD[5][3] = 12;  
twoD[5][4] = 11;
```

```
int i, j;
for (i=0; i < rows ; i++) {
    for (j=0; j < cols ; j++) {
        System.out.print( twoD[ i ][ j ] + "\t" );
    }
    System.out.println( "" );
}
}
```

<terminated> Array2D [Java Application] C:\Prog

10	12	43	11	22
20	45	56	1	33
30	67	32	14	44
40	12	87	14	55
50	86	66	13	66
60	53	44	12	11

Array Matrix

```
package package08;

public class ArrayMatrix {

    public static void main(String[] args) {

        int [][] Matrix = {
            {1,2,3,4},
            {2,3,4,5},
            {5,6,7,8},
            {6,7,8,5},
            {3,7,9,3}
        };

        for(int row=0; row<5; row++){
            for(int col=0; col<4; col++){
                System.out.print(Matrix[row][col]+"\\t ");
            }
            System.out.println();
        }
    } // main
} // class
```

- Result

<terminated> ArrayMatrix [Java Application]

1	2	3	4
2	3	4	5
5	6	7	8
6	7	8	5
3	7	9	3

Populating Array using for

```
package package08;

public class Array2DimRandom {

    public static void main(String[] args) {

        int[][] numbers = new int[11][11];

        for (int x = 1; x < 11; x++) {
            for (int y = 1; y < 11; y++) {
                numbers[x][y] = x*y;
                System.out.print(numbers[x][y] + "\t");
            }
            System.out.println();
        }
    } // main
} // class
```

- Result

```
<terminated> Array2DimRandom [Java Application] C:\Program Files (x86)\Java\jre7\bin\javaw.exe (1
```

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

Array of Array

```
package package08;

public class ArrayOfArrayMatrix {
    public static void main(String[] args) {
        int[][] aMatrix = new int[4][];

        // populate matrix
        for (int i = 0; i < aMatrix.length; i++) {
            aMatrix[i] = new int[5]; // create sub-array
            for (int j = 0; j < aMatrix[i].length; j++) {
                aMatrix[i][j] = i + j;
            }
        }

        // print matrix
        for (int i = 0; i < aMatrix.length; i++) {
            for (int j = 0; j < aMatrix[i].length; j++) {
                System.out.print(aMatrix[i][j] + " ");
            }
            System.out.println();
        }
    }
}
```

<terminated> ArrayOfArrayMatrix

0	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7