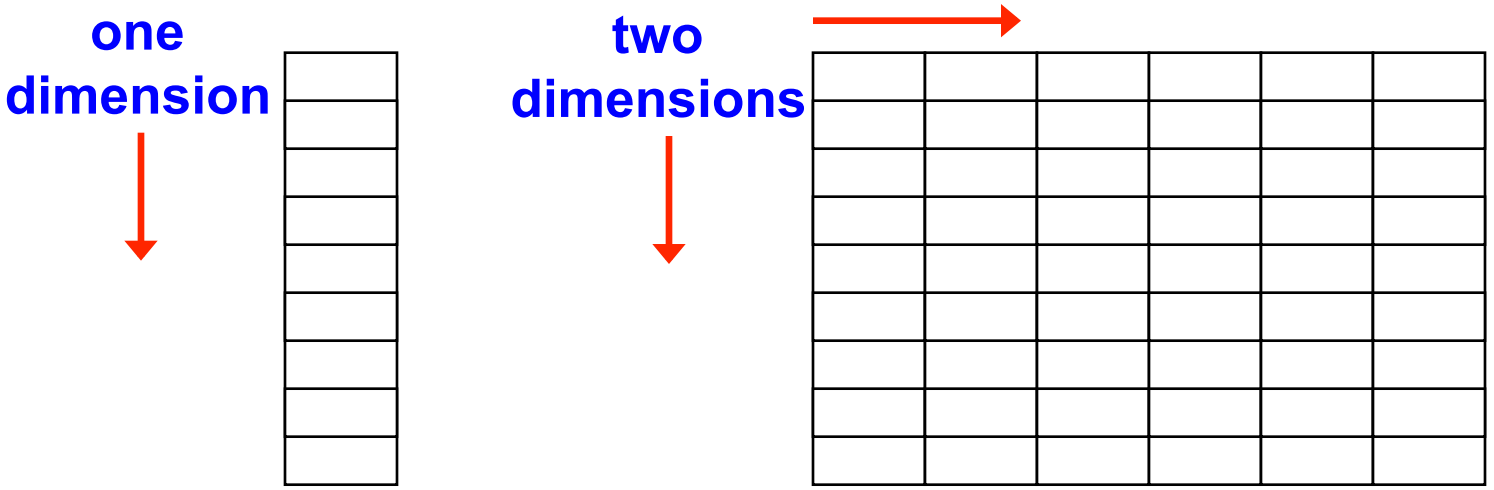
Two-Dimensional Arrays

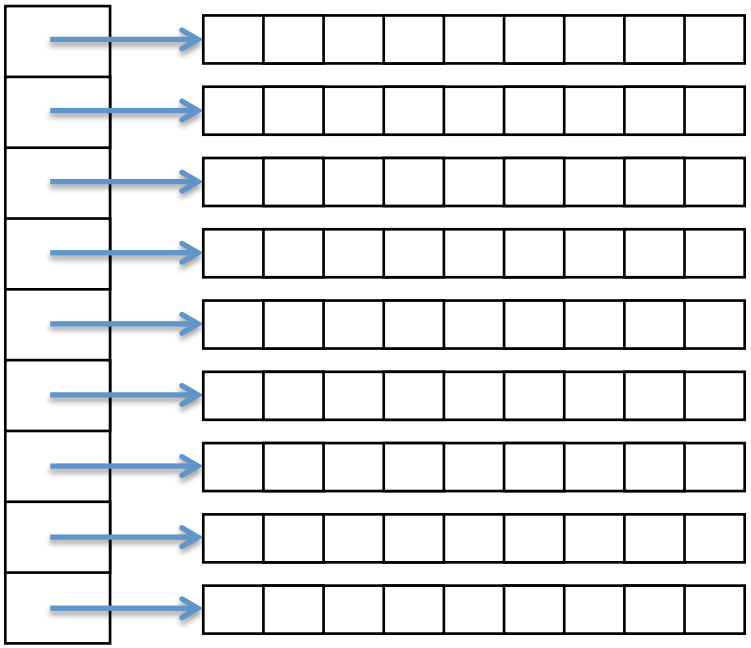
Two-Dimensional Arrays

- A *one-dimensional array* stores a list of elements
- A *two-dimensional array* can be thought of as a table of elements, with rows and columns



Two-Dimensional Arrays

- In Java, a two-dimensional array is an *array of arrays*



- A two-dimensional array is declared by specifying the size of each dimension separately:

```
int[][] matrix = new int[12][50];
```

Two-Dimensional Arrays

- Declaration:

```
int[][] matrix = new int[12][50];
```

- Referencing a single element:

```
value = matrix[3][6];
```

- The array stored in one row can be specified using one index

Expression	Type	Description
`matrix`	`int[][]`	2D array of integers, or array of integer arrays
`matrix[5]`	`int[]`	array of integers
`matrix[5][12]`	`int`	integer

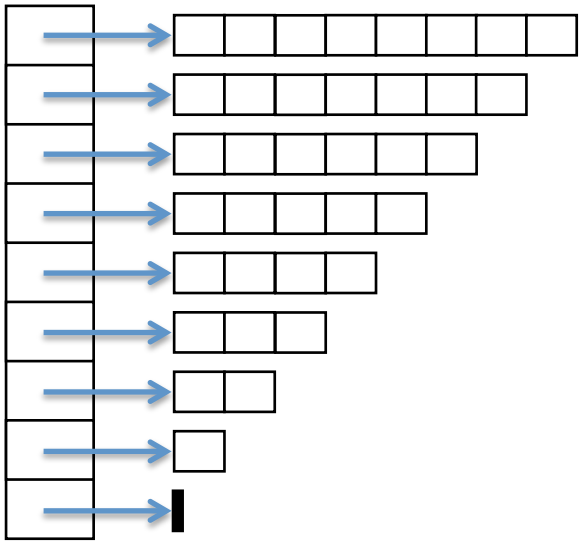
Looping Through a 2D Array

```
int M = 10, N = 5;
double[][] a = new double[M][N];
for (int i = 0; i < M; i++)
    for (int j = 0; j < N; j++)
        a[i][j] = 0;
```

```
int M = 10, N = 5;
double[][] a = new double[M][N];
for (int i = 0; i < a.length; i++)
    for (int j = 0; j < a[i].length; j++)
        a[i][j] = 0;
```

Ragged 2D Arrays

```
int M = 9;
double[][] a = new double[M][];
for (int i = 0; i < M; i++) {
    a[i] = new double[M-i];
    for (int j = 0; j < a[i].length; j++)
        a[i][j] = 0.0;
}
```



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Ragged 2D Arrays

```
int scores[][] = { {44, 55, 66, 77},
                   {36},
                   {87, 97},
                   {68, 78, 88} };
```

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