What is Multidimensional Array?

- An array is a systematic arrangement of similar objects
- Arrays can have more than one dimension, e.g. matrices
- The most used multidimensional arrays are the 2-dimensional

Matrix	COLUMNS			
ROWS	[0][0]	[0][1]	[0][2]	[0][3]
	[1][0]	[1][1]	[1][2]	[1][3]
	[2][0]	[2][1]	[2][2]	[2][3]
	[3][0]	[3][1]	[3][2]	[3][3]

Row Index

Column Index

Declaring and Creating Multidimensional Arrays

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- Declaring multidimensional arrays:

```
int[][] intMatrix;
float[][] floatMatrix;
String[][][] strCube;
```

- Creating a multidimensional array
  - Use **new** keyword
  - Must specify the size of at least one dimension

```
int[][] intMatrix = new int[3][];
float[][] floatMatrix = new float[8][2];
String[][][] stringCube = new String[5][5][5];
```

Initializing Multidimensional Arrays

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- Initializing a multidimensional array with values:

```
int[][] matrix = {
  {1, 2, 3, 4}, // row 0 values
  {5, 6, 7, 8}  // row 1 values
};
```

- Matrices are represented by a list of rows
  - Each row consists of a list of values

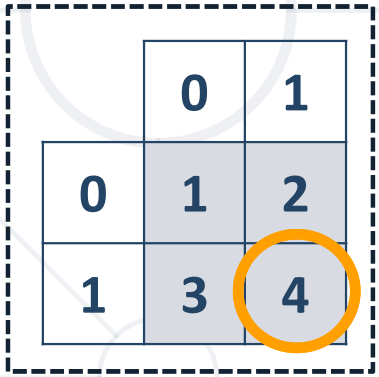
Accessing Elements

- Accessing N-dimensional array element:

```
nDimensionalArray[index1] … [indexn]
```

- Getting element value example:

```
int[][] array = {{1, 2}, {3, 4}};
int element = array[1][1]; // element11 = 4
```



- Setting element value example:

```
int[][] array = new int[3][4];
for (int row = 0; row < array.length; row++)
  for (int col = 0; col < array[0].length; col++)
    array[row][col] = row + col;
```

Reading a Matrix – Example

```
public static void main(String[] args) {
  Scanner scanner = new Scanner(System.in);
  int rows = Integer.parseInt(scanner.nextLine());
  int cols = Integer.parseInt(scanner.nextLine());

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

  for (int row = 0; row < rows; row++) {
    String[] inputTokens = scanner.nextLine().split(" ");
      for (int column = 0; column < cols; column++) {
        matrix[row][column] =
          Integer.parseInt(inputTokens[column]);
      }
  }
}
```