Arrays, Part 3: multidimensional arrays

CSC 1051 – Data Structures and Algorithms I

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Course website:
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Arrays, Part 3: Multidimensional 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

- To be precise, 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:
  ```java
  int[][] table = new int[12][50];
  ```
- A array element is referenced using two index values:
  ```java
  value = table[3][6]
  ```
- The array stored in one row can be specified using one index

Course Grade

courseGrade[][] = new double[3][10];

2D Array Overview:
Two-Dimensional Arrays

<table>
<thead>
<tr>
<th>Expression</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>table</td>
<td>int[][]</td>
<td>2D array of integers, or array of integer arrays</td>
</tr>
<tr>
<td>table[5]</td>
<td>int[]</td>
<td>array of integers</td>
</tr>
<tr>
<td>table[5][12]</td>
<td>int</td>
<td>integer</td>
</tr>
</tbody>
</table>

- See TwoDArray.java
- See SodaSurvey.java

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Output

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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<td>49</td>
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</tbody>
</table>

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public class SodaSurvey
{
    // Demonstrates the use of a two-dimensional array.
    public static void main(String[] args)
    {
        int[][] scores = { {3, 4, 5, 2, 1, 4, 3, 2, 4, 4},
                           {2, 4, 3, 4, 3, 2, 1, 2, 2, 2},
                           {3, 5, 4, 5, 5, 3, 2, 3, 5, 3},
                           {1, 1, 1, 1, 2, 3, 2, 4, 4, 4} };
        final int SODAS = scores.length;
        final int PEOPLE = scores[0].length;
        int[] sodaSum = new int[SODAS];
        int[] personSum = new int[PEOPLE];
        System.out.println("scores.length: "+SODAS); System.out.println("people.length: "+PEOPLE);
        continue
    }
}
Arrays, Part 3: multidimensional arrays

Multidimensional Arrays

- An array can have many dimensions – if it has more than one dimension, it is called a *multidimensional array.*
- Each dimension subdivides the previous one into the specified number of elements.
- Each dimension has its own length constant.
- Because each dimension is an array of array references, the arrays within one dimension can be of different lengths.
  - these are sometimes called *ragged arrays.*