Chapter 7
Two-dimensional Arrays

- Reading: pp. 418-425
- Good Problems to Work: p. 426 [7.19, 7.20, 7.21, 7.23, 7.25]
2D Arrays

- Consider double scores[3][4]

- Notice:
  1. Number of rows = 3 with subscripts going from 0 to 2
  2. Number of columns = 4 with subscripts going from 0 to 3
  3. Number of elements = 3 * 4 = 12

<table>
<thead>
<tr>
<th></th>
<th>Column 0</th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 0</td>
<td>[0][0]</td>
<td>[0][1]</td>
<td>[0][2]</td>
<td>[0][3]</td>
</tr>
<tr>
<td>Row 1</td>
<td>[1][0]</td>
<td>[1][1]</td>
<td>[1][2]</td>
<td>[1][3]</td>
</tr>
<tr>
<td>Row 2</td>
<td>[2][0]</td>
<td>[2][1]</td>
<td>[2][2]</td>
<td>[2][3]</td>
</tr>
</tbody>
</table>

2D Array Initialization

- 2D arrays can be initialized just as 1D arrays

```java
int values[3][2] = {{1, 2}, {3, 4}, {5, 6}};
```

- Write a program segment to find the sum of all of the values in the array
Practice

- Using the array below, print the following assuming the array already contains data:
  1. the average score for each assignment

    Assignment #1 - Average Score: xx
    Assignment #2 - Average Score: xx

```c
const int NUM_OF_STUDENTS = 24;
const int NUM_OF_ASSIGNMENTS = 6;
int testScores[NUM_OF_STUDENTS][NUM_OF_ASSIGNMENTS];
```

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Practice

- Using the array below, print the following assuming the array already contains data:
  1. the average score for each student

    Student #1 - Average Score: xx
    Student #2 - Average Score: xx

```c
const int NUM_OF_STUDENTS = 24;
const int NUM_OF_ASSIGNMENTS = 6;
int testScores[NUM_OF_STUDENTS][NUM_OF_ASSIGNMENTS];
```

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Passing 2D Arrays to Functions

2D arrays can be passed to functions just as 1D arrays BUT the number of columns must contain a size declarator.

```c
void printValues (const int values[][2],
                 int rows, int columns);
```

Notice the array is still passed by reference but protected with `const`.

Practice

Using the array below, write function prototypes for each of the following:
1. return the average score for a particular assignment
2. return the average score for a particular student

```c
const int NUM_OF_STUDENTS = 24;
const int NUM_OF_ASSIGNMENTS = 6;
int testScores[NUM_OF_STUDENTS][NUM_OF_ASSIGNMENTS];
```