CSE8B Discussion
Wednesday April 23, 2013
2D Arrays

See them as an array of arrays

```java
int[][] nums = new int[5][4];
```

What is the height? How could you get the width?

```java
nums.length = ?
```
2D Arrays

### NESTED LOOPS

```java
int height = 3;
int width = 4;
for (int row = 0; row < height; row++) {
  for (int col = 0; col < width; col++) {
    nums[row][col] = row*10+col;
  }
}
```

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nums[0][0]</td>
<td>nums[0][1]</td>
<td>nums[0][2]</td>
<td>nums[0][3]</td>
</tr>
<tr>
<td>Row 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nums[1][0]</td>
<td>nums[1][1]</td>
<td>nums[1][2]</td>
<td>nums[1][3]</td>
</tr>
<tr>
<td>Row 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

row index(row)  column index(col)
2D Arrays - Exercise

Write a method which receives a 2 dimensional array of chars as an argument and also receives an integer specifying the width of the array. The method returns a string formed with all the chars in the array concatenated.

A B   =>  "ABCD"
C D

public String concatenateChars(char[][] letters, int width) {
  String toReturn = new String();
  for (int row = 0; row < letters.length; row++) {
    for (int column = 0; column < width; column++)
    {
      toReturn += letters[row][column];
    }
  }
  return toReturn;
}
The `toString()` method is called automatically when the object is printed and it should return a string.

```java
> int num = 5;
> System.out.println(num)
5
> boolean check = false;
> System.out.println(check)
false
> ConnectFourBoard game = new ConnectFourBoard();
> System.out.println(game)
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
---------------
0 1 2 3 4 5 6
```

Without `toString()` method
```java
> System.out.println(game)
ConnectFourBoard@775dfb9d
```
toString()

In your PSA4, let's assume your board is 3 x 3. In order to print the board imagine it as follow:

The output of the toString() method should be:

"| | | |
| | | |
| | | |
-------
0 1 2"

> System.out.println("| | | |
| | | |
| | | |
-------
0 1 2")

> System.out.println("| | |X|
| |X|O|
-------
0 1 2")

game.toString() or just game
Board Visualization

How would you generate the toString() method?
**AddMove**

Start from the biggest number and keep decrementing until an empty space is found.

X -> AddMove(3)

O -> AddMove(5)
Exercise
Write a method which receives a string as an argument and a char and returns the position(index) where the char is first found in the string BUT from right to left.

i.e.  "PROGRAMMING", R  =>  return: 4
     "PROGRAMMING", G  =>  return: 10

Note: Do not use lastIndexOf()
CheckWinner Horizontal
Connect Four Board

Check Winner Vertical
ConnectFourBoard

hostGame Flowchart

1. Start
2. Clear Board
3. winsFor('X')
   - yes: Print Winner X
   - no:
4. winsFor('Y')
   - yes: Print Winner Y
   - no:
5. isFull
   - yes: Print Board, Print Tie
   - no:
6. allowsMove
   - yes:
     - Add Move
     - Change Player
   - no:
7. Print Board
8. Read Column
9. End
Dr. Java Debugger

1. Compile your code
2. Click in the line where you want to put your breakpoint.
3. On debugger menu, select "Toggle breakpoint on current line" (CTRL+B)
4. Enable debug mode, select "Debug mode" on the debugger menu.
5. Run your code
6. In the Watches section, type the Name of the variable or object you want to monitor.
7. Click "Step Over" button to execute the highlighted line.
8. Click "Step Into" to move the execution to inside a function.