Arrays of Objects
Arrays in Objects
Lecture 16

Readings
This Week: Review!
(Reminder: Readings are absolutely vital for learning this stuff!)

Labs and Tutorials
No labs/tutorials this week, during week of midterm.

Midterms – Save the Dates!
- Midterm #2 is 6-7pm on March 11 (Wednesday) in Woodward IRC 2
- Midterm coverage is through Ch 7.

Learning Goals
By the end of class today you will be able to...
- Write programs with multi-dimensional arrays, arrays of objects, and arrays inside objects.

Common Beginner’s Mistake
- Several students have shown me code like:
  
  ```java
  for (int i=0; i < i+blockSize; i++) {
      ...
  }
  ```
- What does that do?
Common Beginner's Mistake
- Several students have shown me code like:
  ```java
  for (int i=0; i < i+blockSize; i++) {
      ...
  }
  ```
- What does that do?
  - It loops forever!
  - The entire loop test gets re-evaluated each time.
  - Leading a donkey with a carrot on a fishing pole

Last Time: Organizing Data
- Is there a better way to store this data?

<table>
<thead>
<tr>
<th>studentNames</th>
<th>labMarks</th>
<th>labTotals</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Alan&quot;</td>
<td>4 4 4 4 4</td>
<td>40</td>
</tr>
<tr>
<td>&quot;Wolfgang&quot;</td>
<td>4 4 4 4 4</td>
<td>40</td>
</tr>
<tr>
<td>&quot;Puff Daddy&quot;</td>
<td>2 1 0 0 0</td>
<td>3</td>
</tr>
</tbody>
</table>

Last Time: Parallel Arrays
- "Parallel arrays" are common, but usually not the best way to do things.

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<thead>
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<td>2 1 0 0 0</td>
<td>3</td>
</tr>
</tbody>
</table>

Last Time: Arrays of Objects
- Usually, it's better to create an array of objects instead.

<table>
<thead>
<tr>
<th>CPSC111Student</th>
<th>name</th>
<th>labMarks</th>
<th>labTotal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Alan&quot;</td>
<td>4 4 4 4 4</td>
<td>16</td>
</tr>
</tbody>
</table>

Organizing Data
- Create a CPSC111Student class!
  - Constructors
  - Methods to get and set name
  - Methods to get and set lab scores.
  - Method to compute total lab score.
  - Etc.

  For simplicity, let's just worry about the student's name and lab scores…

Leftover from Last Time: Exercise
- Write code to print the names of all students with the highest total lab score.
- (You'll need to add an array of student names.)
Organizing Data

- Create a CPSC111Student class!
  - Constructors
    - Create a new student, specify number of labs.
    - Create a new student, specify name and number of labs.
  - Methods to get and set name
  - Methods to get and set lab scores.
  - Method to compute total lab score.
  - Etc.

For simplicity, let's just worry about the student's name and lab scores…

getTotalLabScore() Version 1

- We can add up the lab scores each time called.
- This can be wasteful if getTotalLabScore is called often – the same work gets re-done repeatedly.
getTotalLabScore() Version 2
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- No wasted computation when getTotalLabScore() called.

getTotalLabScore() Version 3
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- We add a new method computeTotalLabScore() that computes totalLabScore.

getTotalLabScore() Version 4
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- The object keeps track of whether totalLabScore is up-to-date. When getTotalLabScore() is called, it calls computeTotalLabScore() only if needed.

getTotalLabScore() Version 2
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- No wasted computation when getTotalLabScore() called.

getTotalLabScore() Version 3
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- We add a new method computeTotalLabScore() that computes totalLabScore.
- Gives correct results, but only if user always remembers to call computeTotalLabScore().
  Bad Design: Violates data protection!

getTotalLabScore() Version 4
- We can put the result in a variable totalLabScore.
- getTotalLabScore() just returns that value.
- The object keeps track of whether totalLabScore is up-to-date. When getTotalLabScore() is called, it calls computeTotalLabScore() only if needed.