

Section #6: Lesson Plan

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This section is about data structures (aka collections). The goal is to give them good conceptual and coding practice with the four collections they've seen. For context, they're also working on ImageShop this week, which is all about image matrix manipulation, so they'll hopefully value those problems. In addition, they just got the midterm back, so a pep talk, and clarification that we as course staff see the midterm primarily as a diagnostic, may be in order. This is also a great opportunity to pitch the graphics contest as a way for students to demonstrate their knowledge outside of an exam setting! Encourage them to be creative ☺

Key Concepts

- **Arrays**
 - Can store primitives and objects, use angle bracket [] notation
- **ArrayLists**
 - Can only store objects. Ordered and resizable.
- **HashMaps**
 - Can only store objects. Unordered key-value pairs, resizable.
- **Matrices** as the most common combination of collections: an array of arrays!
 - Of particular note is the importance of writing **getRows()** and **getCols()** methods to avoid syntactic confusion with number of rows and number of columns in a matrix.
- Getter and setter methods for all of the above
- Iterating over contents for all of the above

Lecture Recap

Here's quick summaries of the relevant lectures for this week's section. Please check out the slides in full if you haven't been in lecture.

14. Arrays

Ordered lists that store one type; indexing; iterating; accessing & modifying

15. ArrayLists

Adding resizability and getter/setter methods to the idea of arrays

16. Matrices

2D arrays; used for images (matrix of numbers); pointillism example

17. HashMaps

Key-value pairings that sacrifice ordering for superfast lookup time

18. Collections

Putting these together to hold all kinds of data in useful ways

19. Interactors (they'll only have just seen these Wednesday, and they aren't in section)

Array Problems (1, 2, 3)

Either problem 1 or 3 will give good practice with arrays. It's worth hammering home why arrays are good for these problems. Problem 1 can get tricky both because it starts counting at 2 instead of 0 and because it's the index, not the contents, of the array that indicates the number of interest. This one is very much helped by walking through it on the board, crossing out numbers.

Matrix (2D Array) Problems (4, 5, 6)

Problems 4 and 5 are high-priority and worth particular focus this week because they're so similar to what students will be doing with image matrix manipulation in ImageShop. If you haven't looked over that assignment, it would be helpful to do so before section so you set them up for the assignment or walk them through points of confusion. It's particularly valuable here to make sure they understand why and how we find the number of rows and number of columns in a matrix.

HashMap Problems (7, 8)

Either one of these problems should give good review of HashMaps. Problem 7 is similar to the How Unique name collection question from last week's handout, so if you did that last week in section this can be a good one to help hammer home how different data structures lend themselves to different tasks.