CS: Pod of Delight

Week 7: CS314H Midterm

First of all

First of all

- Tetris!

- How is project going?

- Pair programming?

Second of all

- Discrete Midterm!

- How did it go?

- First Turing midterm

Third of all

- Did you have a good weekend?

- Don't forget to have fun!

Fourth of all

- Data Structures Midterm

CS314H Midterm

- What to expect?

- What are you learning in class?

Things to know

- Be familiar with all the projects you've done

  - If you didn't do it, at least read the karma

  - Understand algorithms/concepts that you used

Things to know

- Data structures

  - HashMaps, HashTrees, Linked Lists, Binary trees, heaps, tries

Things to be familiar with

- Object oriented programming

  - Encapsulation, inheritance, polymorphism

  - Interfaces, abstract classes, final, private, public

  - Overloading

  - Dynamic binding

  - Autoboxing

  - Covariance

  - Generics

  - Parametrized generics

Dynamic Binding Example

- class x; class y extends x; class z extends y;

- class Pub { foo(x); }

- class Book extends Pub { foo(x); foo(y); foo(z); }

- Pub p = new Book();

- What method gets called with: p.foo(z)?

  - Book.foo(x)

Interfaces, Abstract Classes

- What is difference?

  - Interfaces are only contracts!

    - But can have default implementation (Java 8+)

  - Abstract classes can implement methods with state

  - Multiple inheritance

- Which can be instantiated?

  - Neither!

Covariance Example

- class Shape; class Circle extends Shape; class Square extends Shape;

- Shape[] arr = new Circle[5];

- Is this legal: arr[0] = new Square(); ?

  - No! runtime error! arrays are covariant

Things to be familiar with

- Search algorithms

  - Binary search, linear searching

- Sorting algorithms

  - Quicksort, mergesort, bubble sort, insertion sort, selection sort, integer sort, radix sort

  - Their complexities

Data Structures and Complexities

Data Structure	Search	Insert/Delete
Array	n	1
Linked List	n	1/n
Hash table/map	1	1
Tree	logn	logn
BinHeap	1 (max/min) or logn	logn

Algorithms and Complexities

Algorithm	Best	Average	Worst
Quicksort	nlogn	nlogn	n^2
Mergesort	nlogn	nlogn	nlogn
Bubble sort	n	n^2	n^2
Insertion	n	n^2	n^2
Selection	n^2	n^2	n^2

Things to know

- Complexity Analysis

  - Big-Oh - upper bound (grows no faster)

  - Big-Omega - lower bound (grows no slower)

  - Big-Theta - exact bound

  - Little-Oh - stricter upper bound (strictly slower)

Most important!

- Be relaxed!

- Do not overstudy, no point in memorizing everything, stressing/eating out

- Get lots of sleep the night before

- Think of it as a fun puzzle session :)

- Ask a clarification question if something seems wrong

Good luck!