CS 2 Exam #1 Review

Date: 2/6/24 (Thursday)
Place: CB1-121
Time: 3:00 – 4:30 pm

Outline of material covered so far:

I. Java Tools: Built in Sorting, Data Structures
- **a. How to use Arrays.sort, Collections.sort**
- **b. ArrayDeque**
- **c. PriorityQueue**
- **d. HashSet**
- **e. TreeSet**
- **f. HashMap**
- **g. TreeMap**

II. Backtracking
- **a. Just Recursion**
- **b. Stop traversing a path when it's doomed to fail**
- **c. Basically, "try all reasonable possibilities"**
- **d. K-divisibility**
- **e. Eight Queens**
- **f. Magic Squares**
- **g. Tentaizu**
- **h. Paintings**

III. Disjoint Sets
- **a. Array representation**
- **b. FindSet Operation**
- **c. Union Operation**
- **d. Path Compression**
- **e. Use in tracking components, component sizes**
- **f. Severing connections can be building them in reverse.**

IV. 2-4 Trees

- **a. 2-4 Tree Node Property, Leaf Node property**
- **b. Insert**
- **c. Delete**
- **d. Tracing only**

V. Red-Black Trees

- **a. R-B node properties**
- **b. Insert**
- **c. Delete**
- **d. Equivalence with 2-4 Trees**
- **e. Tracing only**

VI. Skip Lists

- **a. Use of probability**
- **b. Link structure**
- **c. Insert**
- **d. Delete**

VII. Programming Assignment Details (Posted Solutions)

- **a. SGA**
  - **i. Use of Hash Map**
  - **ii. Frequency array of starting letters**
  - **iii. Long for large numbers**
- **b. Hexagram**
  - **i. Calculation of Row Sum Before Recursion**
  - **ii. Implementation of adding rows.**
  - **iii. Implementation of knowing when a row is filled.**

Format of exam:

You will have some short answer questions, some tracing questions, some coding (Java API, backtracking) and perhaps some problem solving based on what we've done. Any necessary Java API documentation will be given on the exam.

How to study:

1) Look over the notes, paying attention to all the code shown in class. Make sure you understand how it all works.

2) Look over your programming assignments, making sure you remember how you solved certain problems.

3) Look over past exams on my archive.

4) Code up short examples related to backtracking, or trace through data structures, checking results with posted programs or websites that provide traces.