Practice Questions ahead of the Final Exam

The section leaders were again kind enough to write some practice questions for you to work as you prepare for the exam. We'll supply answers in a few days. These questions will be the most valuable if you first study, then sit down and answer the questions in an exam-like setting (quiet location, no computer). If you look at the answers first, you are more likely to say, "Oh, I knew that," even if you really didn't.

1. Binary Trees.

   (a) Build(Draw) this tree using its postorder and inorder traversal.

       Inorder Traversal: 24378

       Postorder Traversal: 23487

   (b) List the values held by leaf nodes.

   (c) List the value held by the root node

   (d) List the height of this tree

   (e) List the sibling(s) of the node containing 2

2. More Binary Trees.

   (a) Build(Draw) this tree using its preorder and inorder traversal.

       Preorder Traversal: 9543

       Inorder Traversal: 3459

   (b) What is the degree of the node containing 3?

   (c) What s the level of the node containing 5?

3. Big-O. For the following code snippets, determine the complexity at which they run:

   (a)
   ```
   for (i = 0; i < N; i++) {
       <sequence of statements>
   }
   ```

   (b)
   ```
   for (i = 0; i < N; i++) {
       for (j = i+1; j < N; j++) {
           <sequence of statements>
       }
   }
   ```

   (c)
   ```
   for (i = 0; i < N; i = 2*i) {
       <sequence of statements>
   }
   ```

   (d) f(k), where f is a function that inserts an element k at the front of a linked list

   (e) g(k), where g is a function that inserts an element k at the end of a linked list that does not have a tail reference.

(Continued . . .)

4. For each of these two lists, show the order of the list elements after each pass of Selection Sort.

   (a) 7 4 6 9 2 3 1

   (b) 9 8 7 6 5 4 3 2 1

5. Consider your answer to (b) of the previous question. You should notice that it continues after the list is already sorted. What does this tell us about the best case run time and the worse case run time of this sort?

6. For each of these three lists, show the order of the list elements after each pass of Insertion Sort, and count the number of key comparisons and data movements (copies) that the algorithm performed.

   (a) 7 4 6 8 2 3

   (b) 8 7 6 5 4 3

   (c) 1 2 3 4 5 6

7. Tree Sort.

   (a) Draw the Binary Search Trees created by inserting the following lists of items, in the order given.

      i. 5 3 2 4 8 7 9

      ii. 1 2 3 4 5 6 7

   (b) Which of the trees in part (a) required the most work to build, and why?

8. Quicksort.

   (a) If Quicksort is used to sort the list 5 8 7 4 2 3, how many calls to Quicksort will be made, if the last item in list is always used as the pivot?

   (b) Quicksort works by solving two half-problems instead of one large problem. What is the name given to this technique?

   (c) When choosing pivots for Quicksort, which ones give the worst-case performance?

9. In class McCann showed the Access Control table Java uses. What is that table's content?

```
                 Class    Package    Subclass    World
              +-------+---------+----------+-------+
      public  |       |         |          |       |
              +-------+---------+----------+-------+
   protected  |       |         |          |       |
              +-------+---------+----------+-------+
        -     |       |         |          |       |
              +-------+---------+----------+-------+
     private  |       |         |          |       |
              +-------+---------+----------+-------+
```

Remember: The final exam is comprehensive; these questions only cover material discussed after the second midterm. Study the material from the first 12 weeks of the semester, too!

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