

**CS 280 – Discrete Structures**  
**HW 12 – Grading Guide**

**Section 8.1**

16. (5 marks)

Full credit for the correct answers (50000, 40001)

Full credit for stating that 50001 people receive chain letters *if* the assumption that the “root” person receives a chain letter was made (and stated)

1 mark taken off for off-by-1 errors (for instance, if the answer stated that 40000 people did not send it out)

24. (5 marks)

Full credit for any explanation which sufficiently shows why the total number of leaves must be larger than  $m^{h-1}$

2 marks taken off for incorrect interpretation of the phrase “full and balanced tree”

Note that a full and balanced  $m$ -ary tree is one with leaves at levels  $h$  and  $h-1$ , and each node either has zero or  $m$  children. It is *not* a complete  $m$ -ary tree of level  $h$  with  $m^h$  leaves. Thus even though  $m^h > m^{h-1}$ , it is not a correct or sufficient explanation as to why the total number of leaves must be larger than  $m^{h-1}$ .

**Section 8.2**

6. (5 marks)

Full credit for any satisfactory answer which finds the counterfeit coin in 2 weightings

2 marks taken off for any satisfactory answer which finds the counterfeit coin in more than 2 weightings.

10. (5 marks)

Full credit for any satisfactory answer which finds the counterfeit coin in 3 weightings

2 marks taken off for any satisfactory answer which finds the counterfeit coin in more than 3 weightings.

2 marks taken off for any answer which finds the counterfeit coin but does not find out whether it is heavier or lighter, since this reduces the problem to question 6.

**Section 8.3**

**Problem 8:**

2 points for each part, total 6 points.

For each part, -1 for 1 error and -2 for more than one error. If the student placed 2 letters in spots opposite to where they should be, this was counted as one error. If a student mixed up names, for example, did preorder for postorder, they lost total of 2 points for this question provided their actual solutions were correct.

A common mistake was that in the inorder traversal, students wrote the last 2 letters as “l, p” rather than “p, l”. They lost 1 point for this. Be careful even towards the end of the solution.

**Problem 16:**

Total points 3. When there were errors, we tried to break up the graph into 3 parts and awarded 1 point for each correct part.

**Problem 30:**

Total points 4. Although the base case was trivial, it was expected, and 1 point was deducted if missing. If the inductive hypothesis was missing, 1 point was deducted. Some people tried to do a proof that was in some sense a reverse of the proof given in the solution, i.e. instead of removing a node and applying their IH, they started from the root and added a node and tried to apply their IH. This resulted in many students losing 2 points because they didn't prove some aspects of this insertion such as how the position of insertion may affect the overall graph structure.

**Problem 32:**

Total points 2. This being a fairly simple question, almost any mistake resulted in a deduction of 2 points.

Grading Guide for Section 8.4

**Problem 8.4.2** (5 points) 1 point per iteration, 1 point deducted for sorting in descending order. 2-3 points deducted if bubble sort is not clearly used and other nontrivial errors.

**Problem 8.4.4** (5 points) -1/2 point for each incorrect list, up to 2 points. -1 point if the list are not broken down to single element lists. -1 point if the list being sorted is different from the provided list. 3 points in total for the merging steps. -1 point for each incorrectly merged list.

**Problem 8.4.6** (4 points) 2 points per part, all or none.

**Problem 8.4.8** (6 points) 1.5 points per part. If the best case scenario is considered (i.e. Assumptions are made about the data in the lists) and is explicitly stated, then 1 point deducted per part. For part (b) although the formula gives 4 as the answer, atleast 5 comparisons are required. If 4 is stated as an answer, 0.5 points deducted.