

CMPSCI 187, Spring 2015 Discussion #12: A Lower Bound for Sorting: Response Sheet

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Names: _____

Each *pair* of students should hand in one response sheet.

Question 1: List the $4! = 24$ possible orders of four elements $a, b, c,$ and d .

Question 2: Describe (in English) how you could list all the possible orders of $n + 1$ elements, if you had a list of all the possible orders of n elements. Given this idea, describe (in English) a recursive algorithm to list the orders of n elements. What is the base case of this recursion?

Question 3: Draw a binary tree where the internal nodes are comparisons of two elements from $\{a, b, c\}$, each internal node has two children for the two possible outcomes of the comparison, and the leaves are the $3! = 6$ orderings of the three elements.

Question 4: Repeat Question 3 for four elements. Your tree should have depth as small as possible while still having a leaf for each of the $4! = 24$ possible orders. You may be able to describe parts of the tree using symmetry rather than drawing out every node.