

Hand in your solutions electronically using CMS and submit a paper copy in class. Write your name and NetID on the first page.

Remember that when a problem asks you to design an algorithm, you must also prove the algorithm's correctness and analyze its running time. The running time must be bounded by a polynomial function of the input size, unless specified otherwise.

1. [10 points] Problem 6.8 from the text.
2. [10 points] Problem 4.4 from the text.
3. [15 points] A *Matryoshka box* is a set of rectangular boxes that are nested with their faces aligned parallel. Rigorously, a Matryoshka box of cardinality k is a set of boxes b_1, \dots, b_k where b_i contains b_j for all $i < j$. We say a box b_1 contains b_2 if it is possible to rotate b_2 so that the length of each side of b_1 is strictly greater than the corresponding side of b_2 . For example, a box with side lengths $(10, 11, 12)$ contains a box with side lengths $(11, 10, 9)$, but not $(1, 11, 11)$. Our goal is to choose a Matryoshka box with the maximum cardinality from a given set of boxes. Given n boxes and the lengths of their three sides, design an efficient algorithm that finds a maximum-cardinality Matryoshka box.