

CS 312: Algorithms

Homework 4

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Instructions

Complete all problems and submit by the beginning of class on Thursday, Feb 21. You may work together with other students, but *your written work must be your own*. I highly encourage you to attempt the problems first on your own, especially the simpler ones.

Please make sure to:

- Write your name on your submission
- Write the name of all students with whom you collaborated
- Cite any sources you used other than the textbook or course notes.

Problems

1. (10 points) Chapter 4, Exercise 3
 - (a) (2 points) Create an example where you select a specific value for W , and make up weights for a sequence of n items that requires at least three trucks. Show which items are assigned to each truck.
 - (b) (3 points) Develop some notation and state the result a bit more formally, so you know exactly what you are trying to prove. This will look a little bit like the first few paragraphs of any of the sections titled “Analyzing the Algorithm” in the book (e.g., p. 119). In particular, you should probably formalize which items are assigned to the first k trucks by both the greedy solution and the optimal solution.
 - (c) (5 points) Prove the result.
2. (10 points) Chapter 4, Exercise 6.
 - (a) (2 points) Work out a small example to help you develop the algorithm. Work with the example to propose a greedy rule and see if it gives the correct answer. Refine the example if necessary to see if you can break your greedy rule. Write down the final example.
 - (b) (2 points) State the algorithm, and show the answer it gives on your example.
 - (c) (5 points) Prove that your algorithm is correct (Hint: use an exchange argument).
 - (d) (1 point) Give the asymptotic running time of your algorithm in terms of the number of triathlon participants n .
3. (10 points) Chapter 4, Exercise 13. Approach this problem like the previous ones. Use examples to develop an algorithm. State the algorithm. Select a proof technique. Prove the algorithm is correct.
4. How much time did you spend on this homework?