

CS 180 Homework 5

Due Wed 5/22 at 11:59 pm

For all algorithm questions please provide a proof of correctness and time complexity analysis in bullet point form.

1. Given a sorted integer array, find all pairs with a given sum k in it using only $O(1)$ extra space.

a. Example:

arr = [1, 2, 2, 2, 4, 5, 5, 5, 7]

k=6

Output: (1, 5) and (2, 4)

2. Exercise 3 on Page 314
3. Exercise 5 Page 316
4. Exercise 10 on page 321
5. Imagine you have a piece of fabric that is n inches long. You also have a list of prices for fabric strips of various lengths, where each price corresponds to a length shorter than n . Your task is to determine the maximum revenue you can generate by cutting the fabric into smaller strips and selling them.

Example:

Length	1	2	3	4	5	6	7	8
Price	1	5	8	9	10	17	17	20

Total length is 8 and the price of different lengths are given as above. The maximum obtainable amount is 22 (by dividing into two of 2 and 6 ounces).

6. Consider a row of n coins of values $v_1 \dots v_n$, where n is even. We play a game against an opponent by alternating turns (you can both see all coins at all times). In each turn, a player selects either the first or last coin from the row, removes it from the row permanently, and receives the value of the coin.

We define the guaranteed winning value for a strategy as the amount of money we can win using that strategy, no matter what actions the opponent takes. Determine the maximum guaranteed winning value we can achieve, for the player that starts the game.

- Example 1: [5, 3, 7, 3]: we pick 5, the opponent must pick one of the 3s. lastly, we pick 7. This approach guarantees 12 no matter what strategy the opponent uses.
- Example 2: [8, 15, 3, 2]: we can maximize the guaranteed value by picking 2 first. The opponent has to pick 8 or 3, and we pick 15 afterwards.