

1. (EOC EX6.2) You are going on a long trip. You start on the road at mile post 0. Along the way there are n hotels, at mile posts $a_1 < a_2 < \dots < a_n$, where each a_i is measured from the starting point. The only places you are allowed to stop are at these hotels, but you can choose which of the hotels you stop at. You must stop at the final hotel (at distance a_n), which is your destination.

You'd ideally like to travel 200 miles a day, but this may not be possible (depending on the spacing of the hotels). If you travel x miles during a day, the *penalty* for that day is $(200-x)^2$. You want to plan your trip so as to **minimize the total penalty**-that is, the sum, over all travel days, of the daily penalties.

Give an efficient algorithm that determines the optimal sequence of hotels at which to stop. **In your answer describe the notation you are using and the basis, reason that your algorithm will give the solution of this problem.**

(hint: review the concepts in section 6.1 to find Shortest path in a directed graph. Set the weight of edge to the penalty. Shortest path minimizes the total penalty).

2. (EOC EX5.14) Suppose the symbols a, b, c, d, e occur with frequency $1/2, 1/4, 1/8, 1/16, 1/16$ respectively.
 - a. What is the Huffman encoding of the alphabet?
 - b. If this file is applied to a file consisting of 1,000,000 characters with the given frequencies, what is the length of the encoded file in bits?