1. (5.17) Under a Huffman encoding of n symbols with frequencies f_1, f_2, f_3, ... f_n, what is the longest a codeword could possibly be? Give an example set of frequencies that would produce this case.

2. (Google interview question) A thief wants to rob a neighborhood. The neighborhood consists of n houses arranged in a line. Each house i contains v_i dollars worth of valuables that the thief can steal. His goal is to select a sequence of houses that will maximize his profit. He is subject to the constraints that:

   (a) He cannot steal from two adjacent houses or he will be caught.

   (b) He only has time to steal from t houses.

   (c) House k belongs to the local sheriff. The thief doesn't want to steal from any house that is within 5 houses of the sheriff.

   (d) Some houses have alarm systems or guard dogs, making the houses much riskier to steal from. If he decides to steal from one of these houses, it must be the last house he visits. (The thief doesn't have to steal from the houses in order. For example, if house j has an alarm system, the thief could steal from all the houses greater than j and then go back to house j at the end.

   (e) His getaway car can only carry w pounds of loot, and the valuables from house i weigh w_i.

   (f) He assigns a penalty to houses based on the weight of their items. That is, the "true value" of any particular house is $v_i - w_i^2$.

   Write a dynamic programming algorithm to help the thief determine how much money he can make.