CPSC 320 Problem Set 8 20 November 2009
W. Evans Due: 27 November 2009 at the start of class.

The grading policy for this homework is as follows: If you leave a question blank, you receive 1 point for that question. If you answer a question, the question will be graded on a scale from 0 to 5. This homework has two questions.
You do not need to rewrite the question or copy down pseudo-code that was presented in class.

1. **Knapsack problem** A thief carrying a knapsack enters a store. The knapsack can hold at most W pounds. There are n items the thief can steal. Item i (for $i = 1, 2, \ldots, n$) has weight w_i (a positive integer) and value v_i. Describe a dynamic programming algorithm to find the most valuable combination of items the thief can fit in his knapsack. The algorithm should run in time $O(nW)$.

   Hint: The common subproblems could have the form "Choose the most valuable set of items of weight at most X from items $1, 2, \ldots, i$."

2. (from Exercise 6.7 in Algorithms by Dasgupta, Papadimtriou, and Vazirani) A subsequence is *palindromic* if it is the same whether read from left to right or right to left. For instance the sequence

   $$A, C, G, T, G, T, C, A, A, A, A, T, C, G$$

   has many palindromic subsequences, including A, C, G, C, A and A, A, A, A, A (on the other hand, A, C, T is *not* palindromic). Devise an algorithm that takes a sequence $X[1 \ldots n]$ and returns the length of the longest palindromic subsequence of X. Its running time should be $O(n^2)$.