Homework 3

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Question 1

a) For $i = 1$ and $j = n$, $L[i,j]$ would refer to the length of the longest palindromic subsequence in A.

b) $$L[i,j] = \begin{cases} 0 & if\ i > j \\ 1 & if\ i = j \\ L[i+1, j-1] + 2 & if\ i < j,\ a_i = a_j \\ \max(L[i+1,j], L[i,j-1]) & if\ i < j,\ a_i \neq a_j \end{cases}$$

c) It would be $O(n^2)$ because this is a dynamic programing problem and when the given input length is n, there would be $n * n$ subproblems.

Question 2

a) For $i = n$ and $j = w$, $P[i,j]$ would refer to the maximum value that can be packed into our knapsack of capacity W.

b) $$P[i,j] = \begin{cases} 0 & if\ i = 0 \\ P[i-1,j] & if\ i > 0, j < w_i \\ \max(P[i-1,j], P[i-1, j-w_i] + v_i) & if\ i > 0, j \geq w_i \end{cases}$$

c) It would be $O(n * w)$ because the parameters are the numbers of items n with capacity w. Also, each operation takes $O(1)$.

Question 3

a) Objects should be picked based on their value / weight ratio that called v_i/w_i. All objects should be sorted by their v_i/w_i and iterated through each other. Also, a pick list can be used for objects whose weights do not exceed capacity.

b) To minimize the value that can be packed into remaining capacity, the problem of maximizing is encountered.