

CSE 6331 HOMEWORK 5 (REDUX)

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1. Consider the **first approach** to the longest common subsequence problem, where we solved the problem using the forward approach. Now, solve it using the backward approach. Your answer must include: the definition of $L(i, j)$, the definition of $\varphi(k, j)$, the recurrence, boundary conditions, and the goal.

We view (x_1, x_2, \dots, x_k) , the sequence of subproblems as a subsequence of A . Using the backward approach, our options for x_k are a_1, \dots, a_n . Let $L(i, j)$ denote the length of the longest common subsequence of $A_i = (a_1, \dots, a_i)$ and $B_j = (b_1, \dots, b_j)$. Let $\varphi(k, j)$ be the index of the last character in B_j that is equal to a_k , or 0 if no such character. Our recurrence is:

$$L(i, j) = \begin{cases} 1 + \max_{1 \leq k \leq i, \varphi(k, j) \geq 1} \{ L(k-1, \varphi(k, j)-1) \} \\ 0 \end{cases} \quad \text{if the set for the max is empty} \quad (1)$$

Boundary condition: $L(0, j) = L(i, 0) = 0$ for all i, j . Running time: $\Theta(n^3)$.