

## QUESTION #14

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### LONGEST INCREASING SUBSEQUENCE

To find the length of the longest subsequence of a given sequence, such that all elements of the subsequence are sorted in increasing order.

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DYNAMIC  
PROGRAMMING

## Solution

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### APPROACH 1 - USING ARRAY

Let  $a[n]$  = array for which longest subsequence has to be found.

1. Traverse the array and find longest subsequence for all the elements and store in a 2D array.
  - 1.1. for each  $a[i]$ ,  
traverse array  $a$  and find the number sequence in ascending order.
2. Print the subsequence with the largest length.

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Nerving Into  
Data Structures

## Solution

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### APPROACH 1 - RECURSION

1. Let  $\text{arr}[0 \text{ to } n-1]$  = array and  $L(i)$  = length of the LIS ending at index  $i$  such that  $\text{arr}[i]$  is the last element of the LIS.
2.  $L(i)$  can be recursively written as:  
if (  $0 < j < i$  and  $\text{arr}[j] < \text{arr}[i]$  ),  
     $L(i) = 1 + \max( L(j) )$ .  
if ( no such  $j$  exists ),  
     $L(i) = 1$ .
3. To find the LIS for a given array,  
    return  $\max(L(i))$  where  $0 < i < n$ .

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