

## Q Longest Increasing Subsequence

Given an integer array, find the length of longest strictly increasing subsequence.

A subsequence is a sequence that can be derived from an array by deleting some or no elements without changing the ordering of elements.

Eg: [0, 3, 1, 6, 2, 2, 7]  
 $\xrightarrow{\text{sub}}$  [3, 6, 2, 7]

Eg: [10, 9, 2, 5, 3, 7, 101, 18]

ans  $\rightarrow$  (4)

[2, 3, 7, 101]

Eg: [0, 1, 0, 3, 2, 3]

ans  $\rightarrow$  (4)

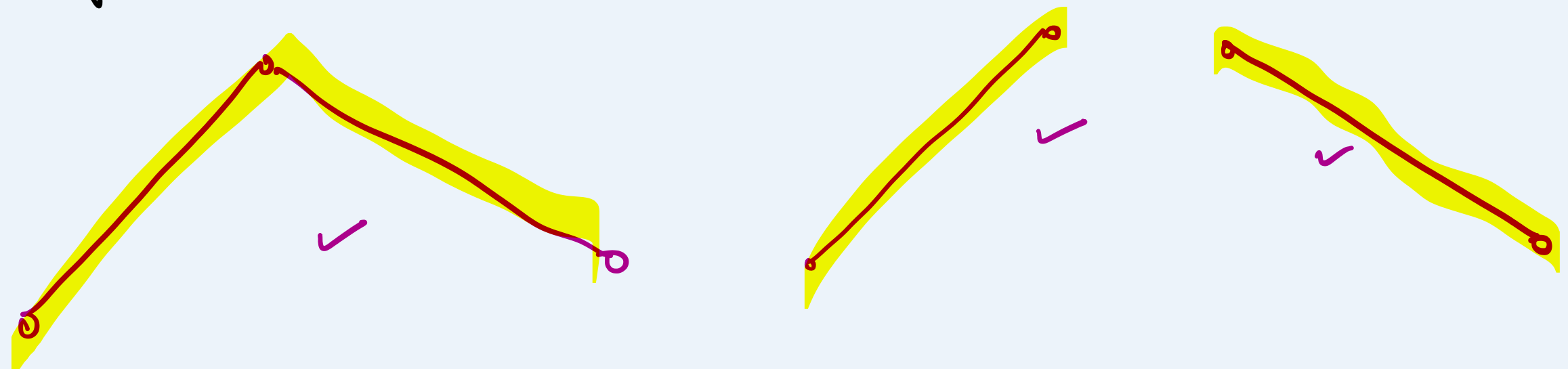
LIS from (0  $\rightarrow$  i) including i<sup>th</sup> ele.

10	22	9	33	21	50	41	60	80	3
1	2	1	3	2	4	4	5	6	1
10	10 22	9	10 22 33	10 21	10 22 33 50	10 22 33 41	10 22 33 41 50	10 22 33 41 50 80	3

$$dp(i) = \max(dp(j) + 1)$$

for all  $j$  where  $nums[j] < nums[i]$  &  $j < i$

## Q Longest Bitonic Subsequence



Eg: 1, 11, 2, 10, 4, 5, 2, 1

ans  $\rightarrow$  (6)  $\rightarrow$  [1, 2, 10, 4, 2, 1]

Eg: 12, 11, 40, 5, 3, 1

ans  $\rightarrow$  (5) [12, 11, 5, 3, 1]

10	22	9	33	21	50	41	60	80	3
1	2	1	3	2	4	4	5	6	1
3	3	2	3	2	3	2	2	2	1
10	22	9	33	21	50	41	60	80	3
1	2	1	3	2	4	4	5	6	1
3	4	2	5	3	6	6	6	7	1

10 22 33 50 60 80 1

## Q Coin change combinations

$n = 7$   
 coins = [2, 3, 5]

1	0	1	1	1	0	2	2
0	1	2	3	4	5	6	7
.		.2	.3	.22	.23 .5	.222 .33	.223 .232 .25

## Q Coin change permutations

5 = 2 + 1 + 1  
 $\hookrightarrow$  1 + 2 + 1  
 $\hookrightarrow$  1 + 1 + 2

coins = [2, 3, 5]

n = 7

ans  $\rightarrow$  (5)

7 = 2 + 5  
 = 5 + 2  
 = 2 + 3 + 2  
 = 3 + 2 + 2  
 = 2 + 2 + 3

1	0	1	1	1	3	2	5	...
0	1	2	3	4	5	6	7	8 9 10
.		.2	.3	.22	.5 .23 .32	.33 .25 .222 .232 .252 .322		

n = 10  
 $\hookrightarrow$  [2, 3, 5, 6]