

### Problem Statement

[Suggest Edit](#)

You are given an array '*arr*' of '*n*' integers.

You have to divide the array into some subarrays such that each element is present in exactly one of the subarrays.

The length of each subarray should be at most '*k*'. After partitioning all the elements of each subarray will be changed to the maximum element present in that subarray.

Find the maximum possible sum of all the elements after partitioning.

arr = { 1 15 7 9 2 5 10 }

k = 3

Understanding question:

arr = { 1, 15, 7, 9, 2, 5, 10 }      k = 3

We have to part the array in sub-array such that every sub-array has size less than k and the every sub-array max. element will be replace by 10 in other element of next sub-array.

for eg:

1	15	7	9	2	5	10
15	15	15	9	9	9	10

• We have to return the maximum sum of the all sub-array after replacement

$$\begin{array}{c}
 \text{eg:} \\
 \underbrace{1, 15, 7, 9}_{\text{array}} \quad \xrightarrow{4} \quad \text{K} \quad \xrightarrow{5} \\
 \text{15} \times 3 + 9 \times 5 + 10 = \\
 \text{K} < 5
 \end{array}$$

We use front partition algorithm.

$$\begin{array}{c}
 \text{left} \\
 \underline{1} \quad | \quad 15 \quad 7 \quad 9 \quad 2 \quad 5 \quad 10 \\
 \text{1}
 \end{array}$$

$f(i) \rightarrow f(0) \rightarrow$  Give me the maximum sum of sub-array starting with index  $i$   
 if  $(i == n)$  return 0,

$\text{len} = 0, \text{maxi} = \text{INT\_MIN},$  to handle if  $i+k$  exceed  $n$   
for ( $j = i, j < \min(\underline{n}, i+k); j++$ ) len

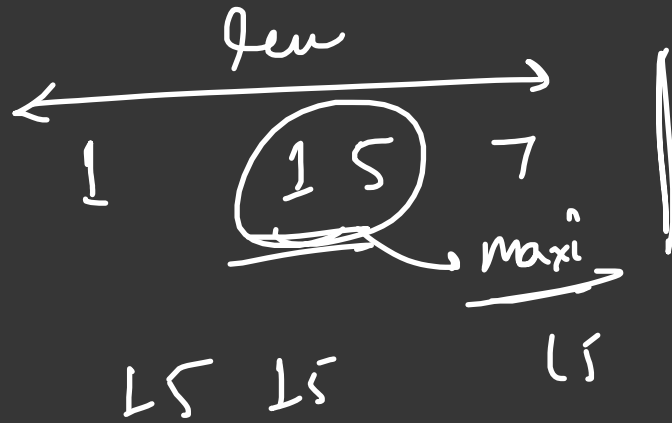
$\text{len}++;$

$\text{maxi} = \max(\text{maxi}, \text{arr}[j]),$  Give the maximum sum from index  $j+1$ .  
 $\text{sum} = (\underline{\text{len} \times \text{maxi}}) + \underline{f(j+1)};$

$\underline{\text{maxSum} = \max(\text{sum}, \text{maxSum});} \rightarrow \text{max } \underline{\text{sum}}$

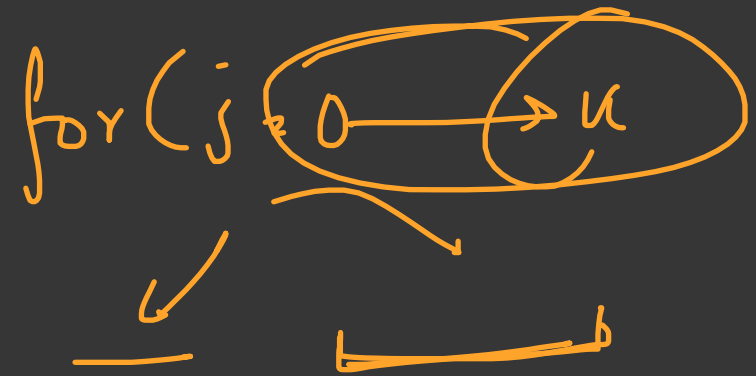
return  $\text{maxSum};$

Why len x maxi?



maxi x len

$$15 \times 3 = \underline{\underline{45}}$$



T.C.: Recursion  $\rightarrow$  Exponential (Overlapping Subproblem)  
Memorization  $\rightarrow$   $dp[n]$   $O(n \times k)$