

# 1043 Partition Array of maximum sum

arr = [1, 4, 1, 5, 7, 3, 6, 1, 9, 9, 3]

$K=4$   
 $\text{memo}[i] \Rightarrow$  optimal sum for  $\text{arr}[0:i]$

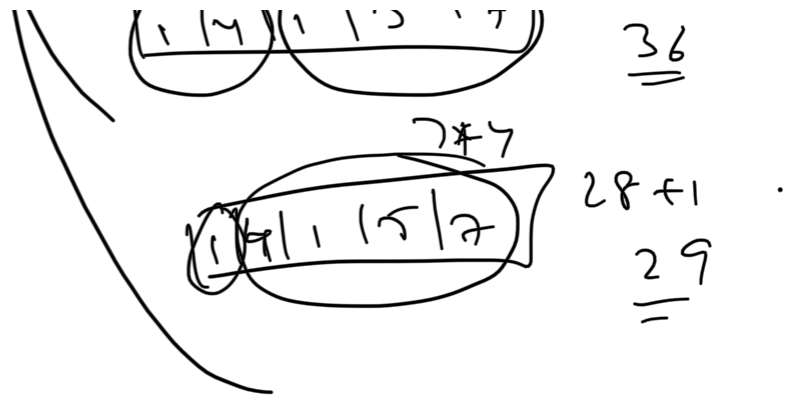
$$\text{memo}[0] = \text{arr}[0]$$

$$\text{memo}[1] = \max(\text{arr}[0], \text{arr}[1]) * 2$$

$$\text{memo}[2] = \max(\text{arr}[0], \text{arr}[1], \text{arr}[2]) * 3$$

$$\text{memo}[3] = \max(\text{arr}[0], \text{arr}[1], \text{arr}[2], \text{arr}[3]) * 4$$

$$\text{memo}[5] = \text{MAX} \left( \begin{array}{l} \text{5*4} + 7 \quad \underline{27} \\ \text{4*3} + \text{7*2} \quad \underline{12+14=26} \\ \text{4*2} + \text{7*3} \quad \underline{28+8} \end{array} \right)$$



$$\text{Memo}[5] = \max(27, 26, 36, 29) = 36$$

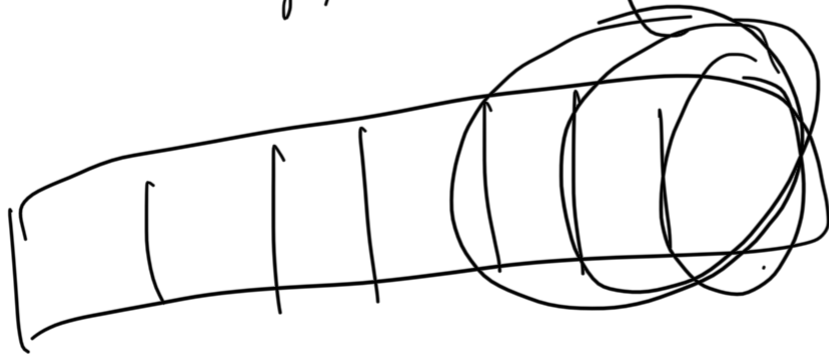
In general

$$\text{memo} = [-1] * \text{len}(\text{arr})$$

$$\text{memo}[0] = \text{arr}[0]$$

Initialize first  $k$  items

for  $y$  in  $(1, K)$  :

$$\text{memo}(y) = \max(\text{arr}[1:y]) * (y+1)$$


last element added could be  
 alone, group of 2, group of 3, ...  
 group of  $K$

$$\text{memo}[i] = \max_{1 \leq z \leq K} \left( \max(\text{arr}[i-z:i]) * \text{memo}[i-z] \right)$$