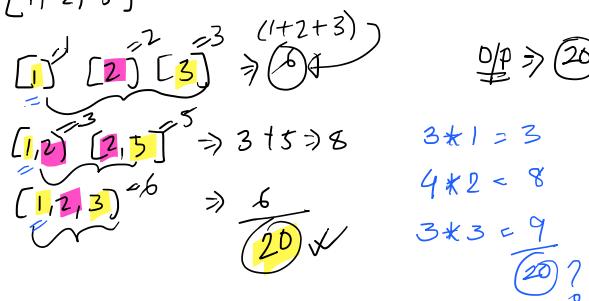


Calculate sum of all the sub-arrays of an arr of size n

$\exists [1, 2, 3]$



$\therefore \Rightarrow 20$

$$3 * 1 = 3$$

$$4 * 2 = 8$$

$$3 * 3 = 9$$

$20?$

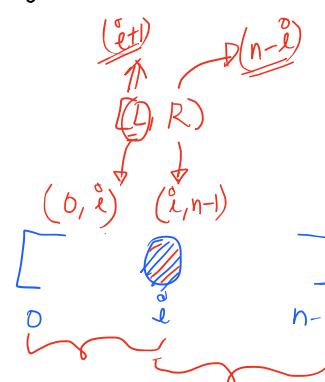
$\underline{[L, R]}$

$\underline{[L, R]}$

$\downarrow R-L+1$

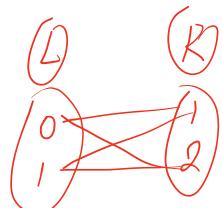
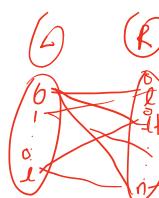
$$[0, n] \Rightarrow \underline{\underline{0-0+1}} \Rightarrow \underline{\underline{(0+1)}}$$

$$[i, n-1] \Rightarrow \underline{n-i+1} \Rightarrow \underline{(n-i)}$$



$\exists [2, 6, 1]$

$$\begin{aligned} [2] & (6) (1) \Rightarrow 9 \\ [2, 6] & (6, 1) \Rightarrow 15 \\ [2, 6, 1] & \Rightarrow 9 \end{aligned}$$



$$\begin{aligned} (0, 1) & \Rightarrow [1, 2] \\ (0, 2) & \Rightarrow [1, 2, 5] \\ (1, 1) & \Rightarrow [2] \\ (1, 2) & \Rightarrow [2, 3] \end{aligned}$$

MH

$\text{totalSum} = 0$

$\text{for } (i=0; i < n; i++) \{$

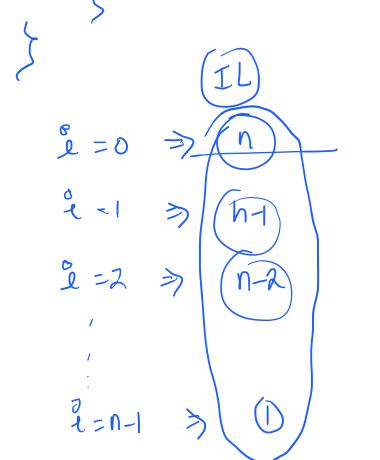
$\text{curSum} = 0$

$\text{for } (j=i; j < n; j++) \{$

$\text{curSum} += \text{arr}[j]$

$\text{totalSum} += \text{curSum};$

| $[1, 2, 3]$ | | $i \setminus j$ | tots | curSum |
|--------------|--------------|-----------------|---------------|--------------|
| 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 4 | 1 |
| 1 | 2 | 2 | 10 | 3 |
| 1 | 1 | 1 | 12 | 2 |
| 2 | 2 | 1 | 15 | 5 |
| 2 | 2 | 2 | 20 | 3 |



$$\frac{n(n+1)}{2} \Rightarrow O(n^2)$$

$$\Rightarrow \frac{n^2}{2} + \cancel{O(n^2)} \Rightarrow O(\cancel{n^2}) \Rightarrow$$

$$\begin{array}{l}
 \stackrel{\text{M-2}}{=} [2, 1, 6, 1] \Rightarrow (0-0+1) \\
 \quad \quad \quad \downarrow \\
 (0+) * (3-0) * 2 \Rightarrow 1 * 3 * (2) \Rightarrow 6 \\
 (1+) * (3-1) * 6 \Rightarrow 2 * 2 * 6 \Rightarrow 24 \\
 (2+) * (3-2) * 1 \Rightarrow 3 * 1 * 1 \Rightarrow 3
 \end{array}$$

totalSum < 0

for ($i = 0$; $i < n$; $i++$) {

totalSum += (i+1) * (n-i) * arr[i];

Y

$$\Rightarrow TC = O(n)$$

$$Sc=0(1)$$

Given an arr of size ' N ', and ' L ' and ' R '
 Find sub-arr^{sum} b/w ' L ' and ' R '. ($L \leq R$) ($0 \leq L, R, < N$)

$$\text{eg } [1, 2, 1, 3, 4], \quad L=2, \quad R=4 \quad [N \simeq 10^5]$$

0/P: (8) x

$\sum_{i=L}^R arr[i]$
 for ($i = L$; $i \leq R$; $i++$) {
 sum += arr[i];
 }
 st sum;
—————

$$Q_2 \text{ 'Q' querien. } Q(2,4) \ni \textcircled{5} \checkmark \quad [Q \approx 10^6]$$

$$Q(1,2) \rightarrow ③ \checkmark$$

M-1

for $f \leftarrow 0 \dots Q$

L, R, f —————

$\sum_{i=0}^Q$ $o_i \dots 1 \quad R$?

}

} $O(Q \cdot N)$ $\Rightarrow 10^6 \cdot 10^5 \Rightarrow 10^{11}$ ✓

100 sec ↴

for $i \leftarrow 1 \dots n$
 $\text{sum} += \text{aext}[i]$

print(sum)

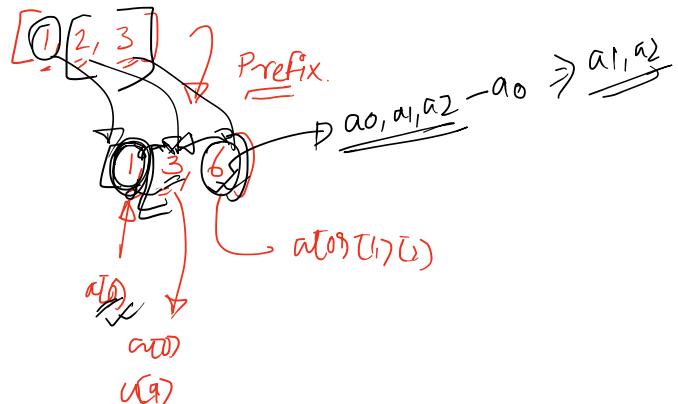
$1 \text{ sec} \approx 10^9 \text{ instou}$

— ↗

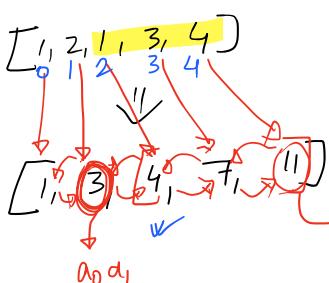
m=2



$Q(1, 2)$



eg



$L=2, R=4$

$a_0 a_1 a_2 a_3 a_4 - a_0 a_1$

$\Rightarrow [a_2 a_3 a_4] \times$

$$L = \frac{\text{presum}[R] - \text{presum}[L-1]}{\downarrow}$$

$$\frac{(a_0 a_1 \dots a_{L-1}) a_L a_{L+1} a_R}{\underline{(a_0 a_1 \dots a_{L-1})} \quad \underline{(a_L a_{L+1} \dots a_R)}} \checkmark$$

$L=0?$ ↗ $Q(0, 2)$

if $L=0$
 $\text{prefixsum}(R)$
else
 $\text{prefixsum}(R) - \text{prefixsum}[L-1]$

$\text{prefixsum} = T(n)$

$\text{presum} = a[0:n]$

for $i \leftarrow 1 \dots n-1$

$\text{prefixsum}[i] = \text{prefixsum}[i-1] + \text{aext}[i]$

$\mathcal{O}(n)$

for $q \leftarrow 1 \dots Q$

