

— Range update query $O(1)$ time.
— Difference Array.



370. Range Addition Premium

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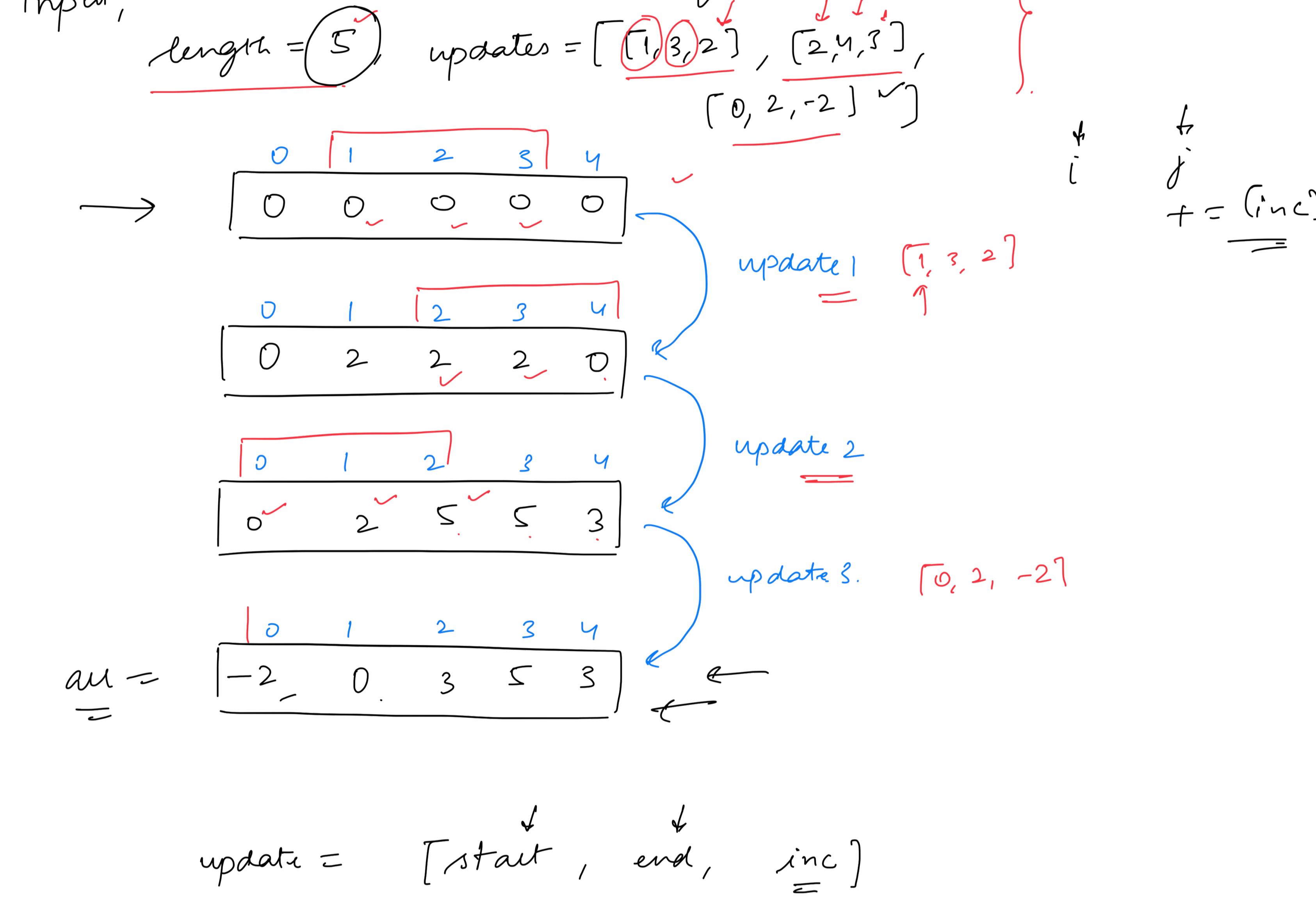
You are given an integer length and an array updates where $\text{updates}[i] = [\text{startIdx}_i, \text{endIdx}_i, \text{inc}_i]$.

You have an array arr of length length with all zeros, and you have some operation to apply on arr . In the i^{th} operation, you should increment all the elements $\text{arr}[\text{startIdx}_i], \text{arr}[\text{startIdx}_i + 1], \dots, \text{arr}[\text{endIdx}_i]$ by inc_i .

Return arr after applying all the updates.

Constraints:

- $1 \leq \text{length} \leq 10^5$
- $0 \leq \text{updates.length} \leq 10^4$
- $0 \leq \text{startIdx}_i \leq \text{endIdx}_i < \text{length}$
- $-1000 \leq \text{inc}_i \leq 1000$



Approach 1 — Naive approach $\sim O(n^2)$

for each query $[\text{start} \dots \text{end}]$
do inc.

$T = O(N^2) / \text{query.}$

Overall, $\begin{cases} T = O(m \cdot n) \\ S = O(1) \end{cases}$

(m) queries. $\sim O(n)$
 n length. \sim

Approach 2 — Difference Array Technique
(Range update query $O(1)$ time.)

(Prefix sum)

— read query — at the end. ?
— order of queries is irrelevant. ?

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

Step 1:
for each query —
perform,
 $\text{arr}[i] += \text{inc}$.
 $\text{arr}[j+1] -= \text{inc}$.
 $(j+1 < n)$

Step 2:
final array -
 $\text{arr}[i] += \text{arr}[i-1] \quad \forall i \in [1, n]$

given, $\text{length} = 5$, $\text{updates} = [[1, 3, 2], [2, 4, 3], [0, 2, -2]]$

$\text{arr} = [-2, 0, 3, 5, 3]$

$O(1) / \text{query.} \sim$