Difference Array Concepts & Qns

Video-7

Motivation :-

Use these ~50 days of year 2025 wisely.

Aleast choose any 4 topics which you find difficult. Give each topic 15 10 days. Relax and enjoy remaining days 15 of this year and prepare yourself 15

strong for the next...

2536. Increment Submatrices by One

Medium | Topics | Companies | Hint

You are given a positive integer `n`, indicating that we initially have an `n x n` **0-indexed** integer matrix `mat` filled with zeroes.

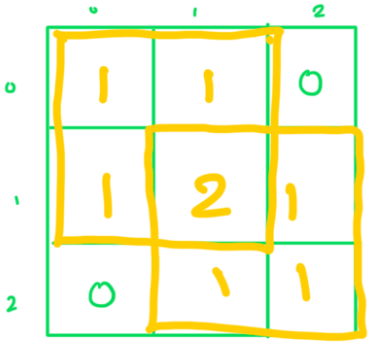
You are also given a 2D integer array `query`. For each `query[i] = [row1_i, col1_i, row2_i, col2_i]`, you should do the following operation:

- Add `1` to **every element** in the submatrix with the **top left** corner `(row1_i, col1_i)` and the **bottom right** corner `(row2_i, col2_i)`. That is, add `1` to `mat[x][y]` for all `row1_i <= x <= row2_i` and `col1_i <= y <= col2_i`.

Return *the matrix* `mat` *after performing every query.*

Example:- n = 3 , queries = [[1,1,2,2],[0,0,1,1]]

Output:



Thought Process :-

	0	1	2	3
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0

2-D

queries = [(1,1,2,2), (0,0,1,1)]

Step-1

(l, r) ⇒

diff[l] += 1

if(r+1 < n){

diff[r+1] -= 1

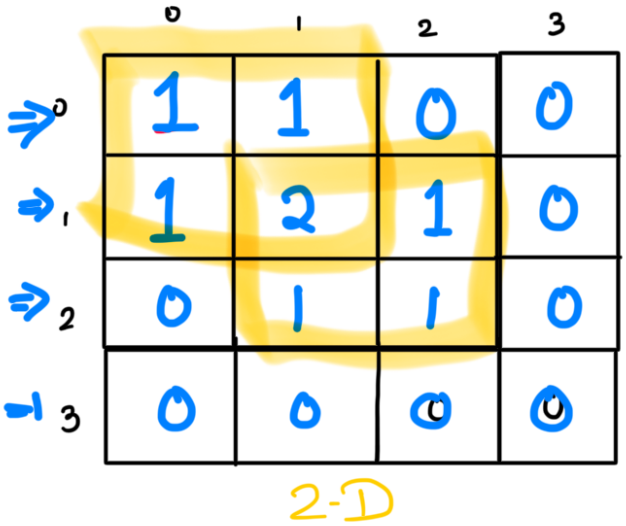
	0	1	2	3
diff	0	0	0	0

1-D

query = [(0,2), (1,2), (2,3)]

Step-2 → Find Curr Sum of diff.

"DAT" in 2D-Array



queries = [(1,1,2,2), (0,0,1,1)]

r1 = 0
c1 = 0
l

r2 = 1
c2 = 1
r

```
for ( i = r1 ; i <= r2 ; i++ ) {
    diff[i][c1] += 1;
    if (c2+1 < n) {
        diff[i][c2+1] -= 1;
    }
}
```

Copy Paste ⇒ DAT
(1-D Array)

Diff N Code:

```
vector<vector<int>> diff(n, vector<int>(n,0));

for (query : queries) {   → O(q * n)

    r1 = query[0]
    c1 = qu[1]
    r2 = qu[2]
    c2 = q-[3]

step-1 :-
    for (int i = r1 ; i<=r2; i++) {
        diff[i][c1] += 1
        if (c2+1<n) {
            diff[i][c2+1] -= 1
        }
    }

step :2 :  Find Cumulative sum :-

    for (i = 0 ; i<n ; i++) {
        for(j = 1; j<n; j++) {
Cum sum -   diff[i][j] += diff[i][j-1];
        }
```

$O(n^2)$

}

return diff;

T.C = O(q*n + n*n);

S.C = O(1).