#Segment Tree

Concepts & Qns...

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"No more fear of Segment Tree"

"Every topic will become easy once you start giving it time"

video - 2

Recap :-

- We understood about segment Tree ? what ? why ? When ?

- buildSegmentTree

- Example - Range Sum in an array

Update Query . . .

Query- (1, 2)
Q:: (3, 4)
update (1, 7)
. .

	0	1	2	3
nums =	3	~~1~~ 4	~~2~~ 1	7

(1, 2)

(1, 3) → 13 - 3
= 10

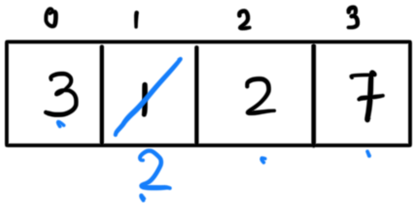
	0	1	2	3
PrefixSum =	3	~~4~~	~~6~~	~~13~~
		7	~~9~~ 8	~~16~~ 15

⇒ update (nums, 1, 4)
(1, 3) → 16 - 3
= 13
update (

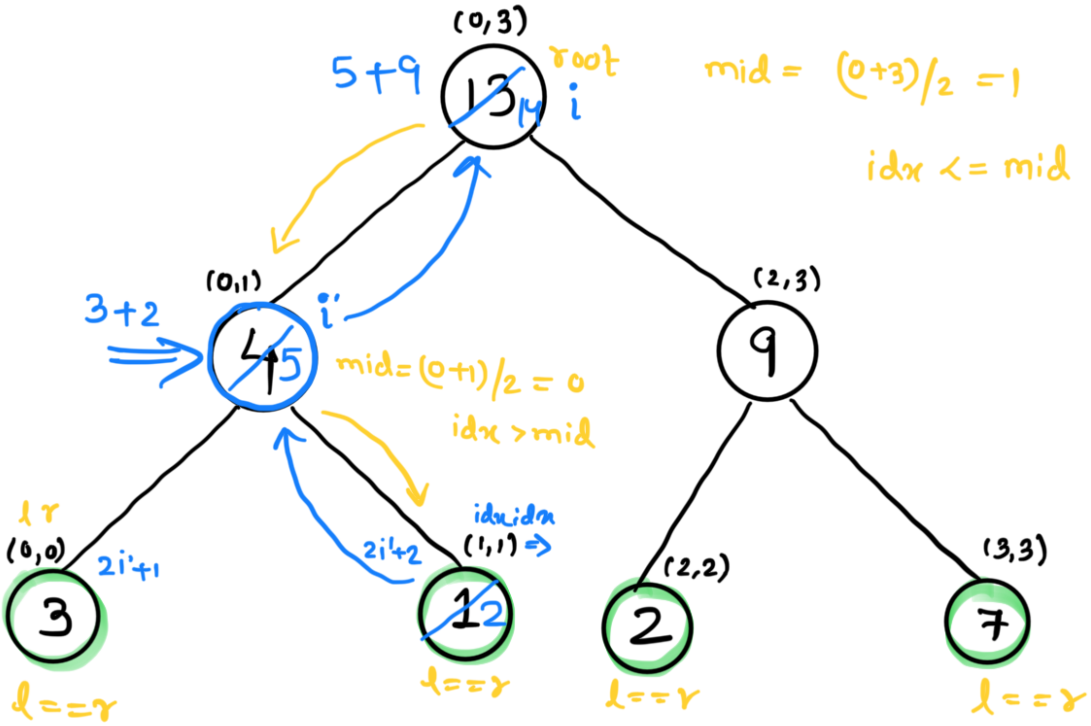
☹ ⇒ O(n) time to update the PrefixSum

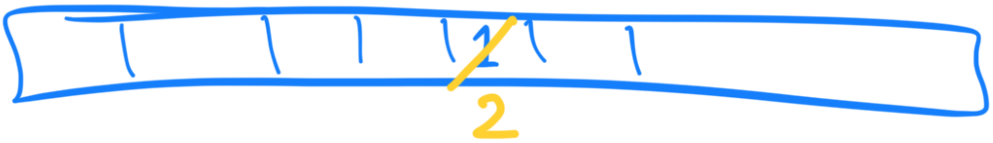
Let's see How segment Tree will Help us here . . .

✓ ✓



update(idx=1, val=2)





segTree[i] = segTree[2i+1] + segTree[2i+2];

Recursion Tree (Story) ⟹ Code

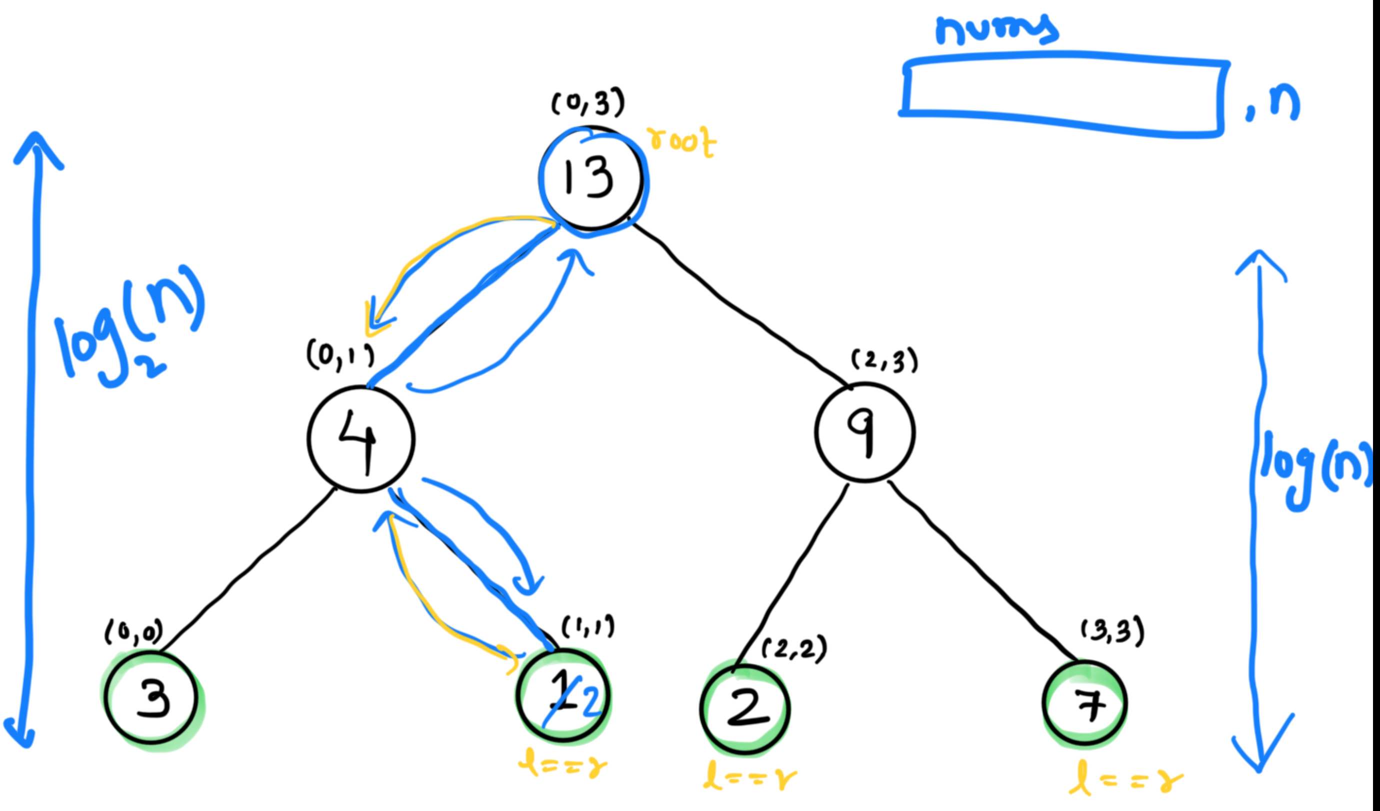
updateSegTree(idx, val, $\overset{0}{i}$, $\overset{0}{l}$, $\overset{3}{r}$)

```
void updateSegTree( idx, val, i, l, r) {
        if(l==r) { //Base case
             segTree[i] = val;
             return;
        }
        mid = (l+r)/2 ;

        if (idx <= mid) { //left child
          ✓ updateSegTree(idx, val, 2i+1, l, mid);
        } else { //right child
          ✓ updateSegTree(idx, val, 2i+2, mid+1, r) ;
        }

        segTree[i] = segTree[2i+1] + segTree[2i+2] ;
}
```

Time Complexity :-



Total nodes update # = log(n)

O(n) ——> log(n)

*Buildseg. *Update

Query (i, j) → sum

Query (i', j') → Sum