Difference Matrix :-

(Everything is zero base indexing)

Given "arr" of size "n".
Let us define "diff" of size n

Initializing diff :- $i \in [0, n-1]$

$$diff[i] = \begin{cases} arr[0] & \text{if } i=0 \\ arr[i] - arr[i-1] & \text{otherwise} \end{cases}$$

* Note that we can restore "arr" from diff.
i.e for unique arr ther exist unique diff and vice versa.

algo to Restore :-

```
arr[0] = diff[0]
for i from 1 to n-1 :-
    arr[i] = diff[i] + arr[i-1]
```

* update operation. (zero base)
# l & r

let arr be $a_0, a_1, a_2, \ldots a_l \ldots a_r \ldots a_{n-1}$ initially
after updation $a_0, a_1, a_2, \ldots a_l + n \ldots a_r + n \ldots a_{n-1}$

The difference matrix before updation would be let
$d_0, d_1, d_2, \ldots, d_l \ldots, d_r \ldots d_{n-1}$
from the definition.

let the new difference array be $u_0, u_1, u_2, \ldots u_l \ldots, u_r \ldots u_{n-1}$

d_0	d_1	...	d_l	...	d_x	...	d_{n-1}
a_0	$a_1 - a_0$		$a_l - a_{l-1}$		$a_x - a_{x-1}$		$a_{n-1} - a_{n-2}$

u_0	u_1	...	u_l	u_{l+1}	...	u_x	u_{x+1}	...
a_0	$a_1 - a_0$		$a_{l+x} - a_{l-1}$	$a_{l+1} - a_l$		d_x	$a_{x+1} - a_{x-1}$	

$$u_i = \begin{cases} d_i + x & \text{if } i = l \\ d_i - x & \text{else if } i = x+1 \ \& \ x \neq n-1 \\ d_i & \text{else} \end{cases}$$

from u we can get update matrix.
Similarly for any number of updates this holds.