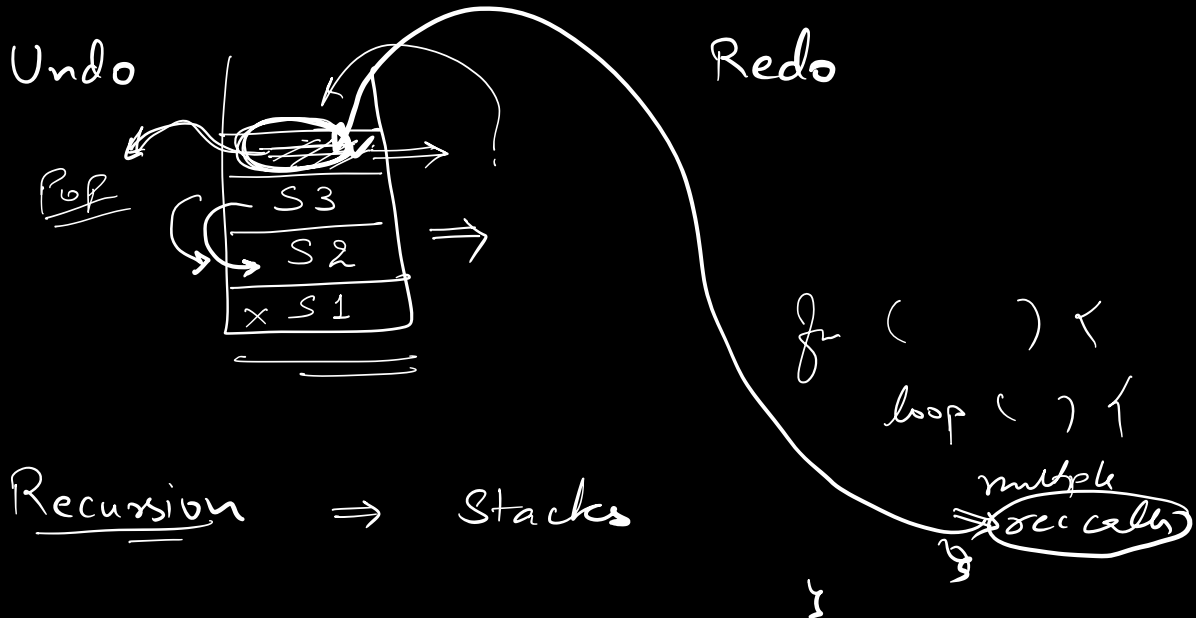


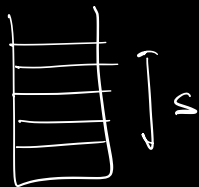
Stacks \Rightarrow LIFO (Last In First Out)



Recursion \Rightarrow Stacks

Stack Operations

- 1) Push \Rightarrow Insert on Top $\Rightarrow O(1)$
- 2) Pop \Rightarrow Remove from top $\Rightarrow O(1)$
- 3) Peek / Top \Rightarrow Return top element of stack.
- 4) Is Empty() \Rightarrow Boolean \Rightarrow True if stack is empty.
 $O(1)$



Q Given a string

Remove all duplicate adjacent characters from the given string.

I/P \Rightarrow " a ~~z x z~~ y " = " a ~~z z~~ y "
 O/P \Rightarrow ay

O/P \Rightarrow ay

\Rightarrow We can only remove pairs.

$$\overline{az \cancel{xx} zy} \Rightarrow az \check{xx} zy$$

Solⁿ

(1) Route from

$$S \Rightarrow \underline{az \kappa \kappa^2 y}$$
$$S' = a$$



a ~~zz~~ y

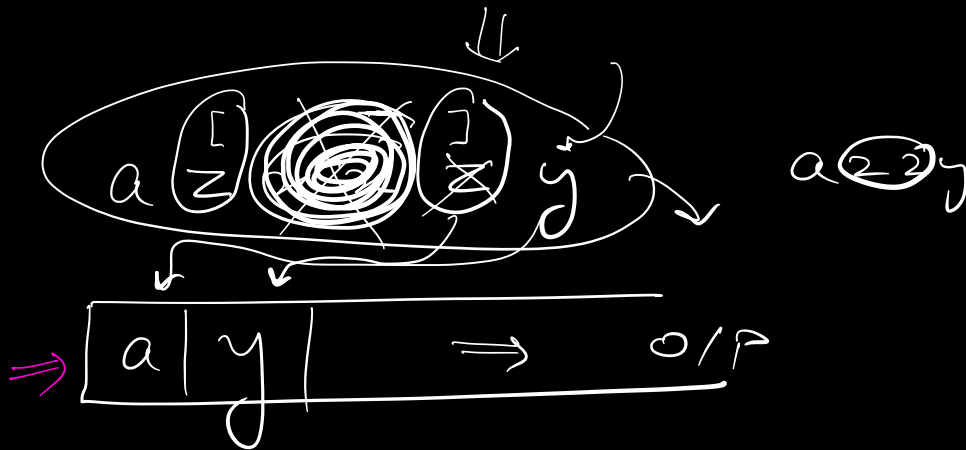
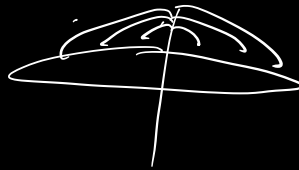
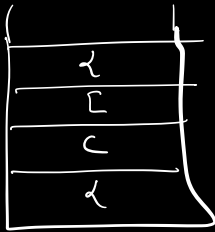
a y

$$\begin{array}{r} N \\ \downarrow \quad \text{---} \underline{2} \\ N-2 \\ \downarrow \quad \text{---} \underline{2} \\ N-4 \end{array}$$

+

$$T.C. = O(n^2) \quad (N)(\frac{N}{2}) = \underline{\underline{O(n^2)}}$$

$$\{ ([()] ()) \}$$



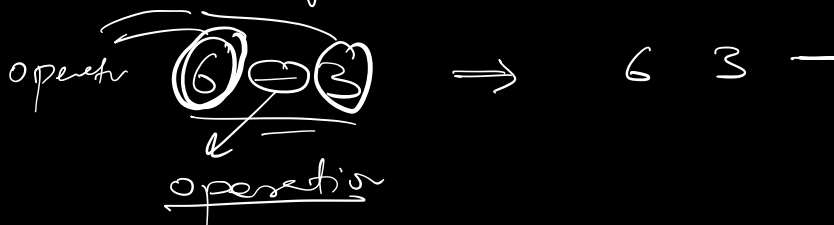
$$T.C. = O(N)$$

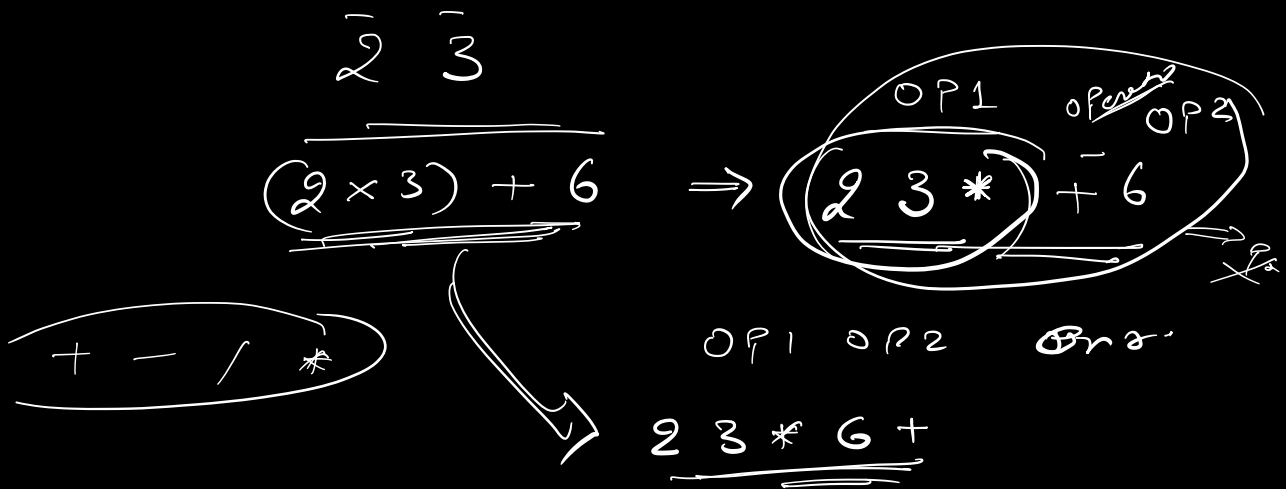
$$S.C. = \underline{\underline{O(N)}}$$

Q-2

Evaluate an expression

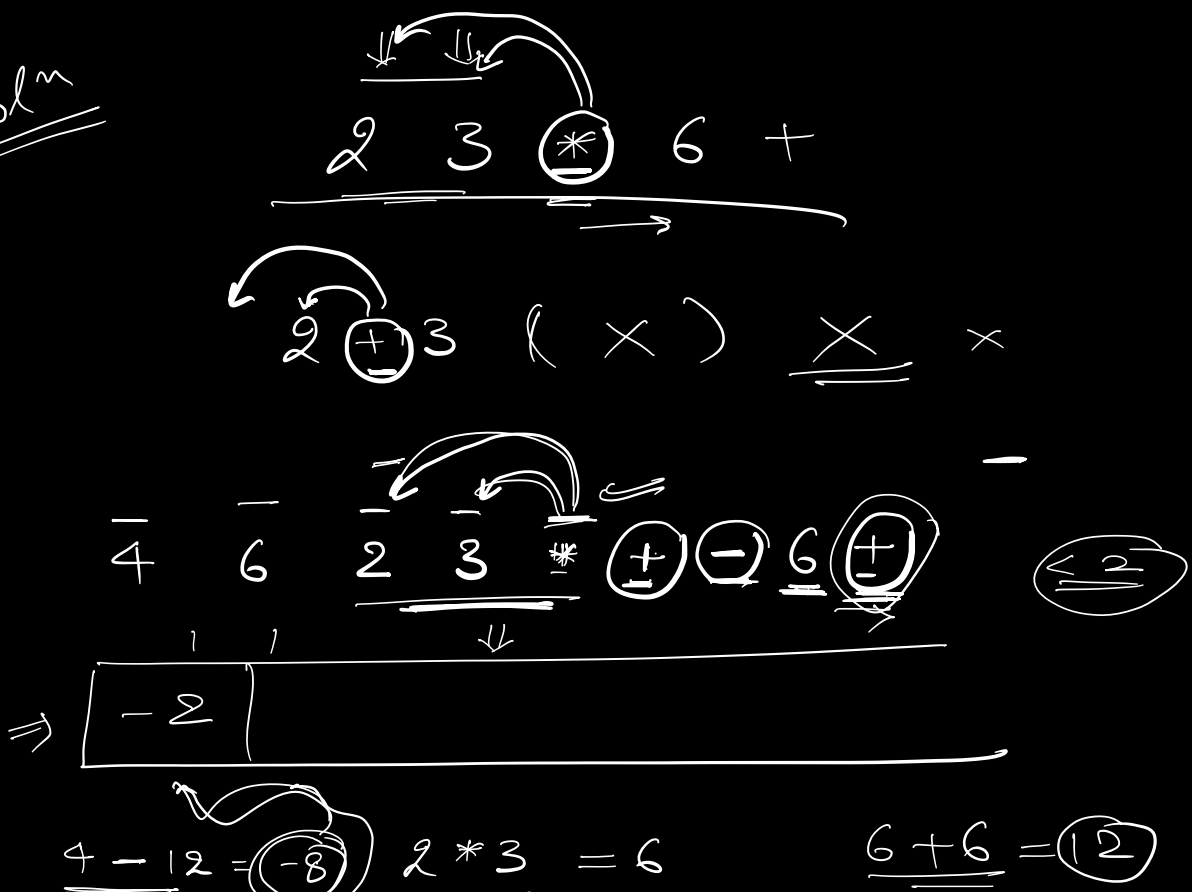
Postfix expression





\Rightarrow Given a postfix expression.
Evaluate it

Solⁿ

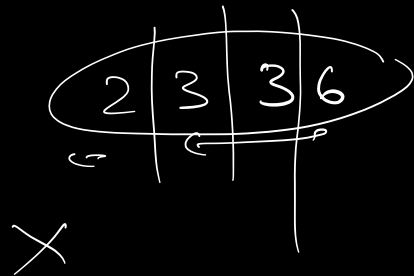
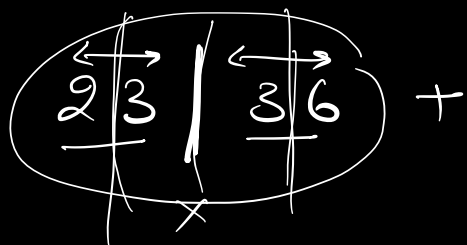


$$\overline{(-8)} + 2 = \overline{-2}$$

$$\begin{array}{r} -8 + 6 \\ \hline = -2 \end{array} \quad \begin{array}{r} 2 \quad 3 \quad - \\ \hline 3 - 2 \end{array}$$

$$\begin{array}{ccccccccc} 4 & 6 & 2 & 3 & * & + & - & 6 & + \\ & & \uparrow & & & & & & \\ \hline & & & & & & & & \\ (4 - (6 + (2 \times 3))) + 6 \end{array}$$

$$\begin{array}{l} T.C. = \underline{\underline{O(N)}} \\ S.C. = \underline{\underline{O(N)}} \end{array}$$



$1) P \Rightarrow$

<u>1</u>	<u>3</u>	<u>5</u>	<u>2</u>	<u>9</u>	<u>6</u>	<u>4</u>	<u>12</u>	<u>16</u>	<u>9</u>	<u>10</u>

NSE \Rightarrow

-1	1	3	1	2	2	2	4	12	4	9
----	---	---	---	---	---	---	---	----	---	---

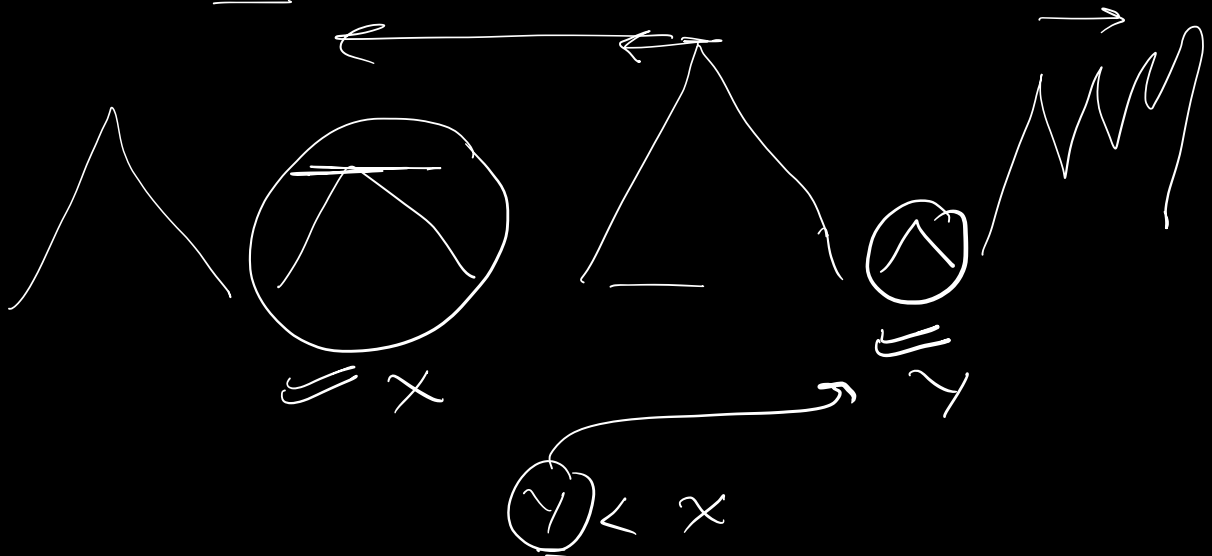
Solⁿ

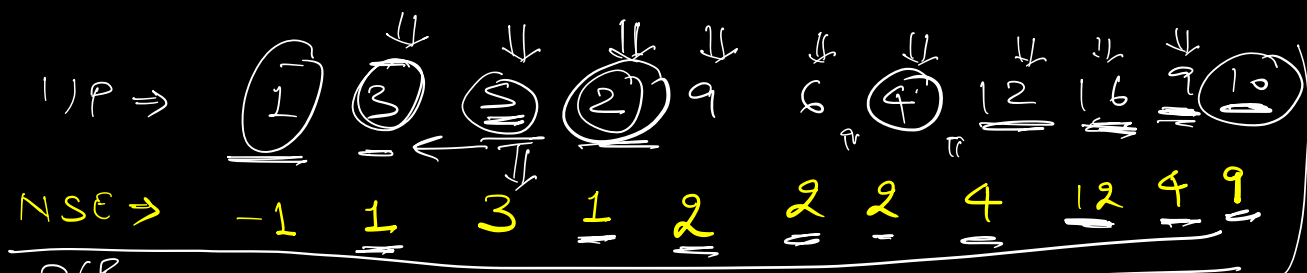
1) Brute force

for each element, travel to words
the left & find the 1st element
smaller than the current element

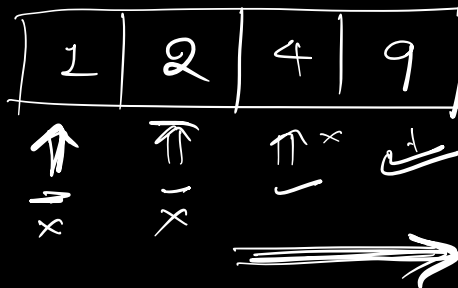
T.C. = $O(n^2)$

2) Observations





O/P



①

N

$$N = \underline{O(N)}$$

Max & Min

\Rightarrow Given an array A of distinct elements.

for every subarray in the array find the sum of



$$N \Rightarrow \underline{N_{C_2}} = \underline{O(n^2)}$$

$A = \begin{pmatrix} 2 & 5 & 3 \\ 2 & 1 & 2 \\ 2 & 3 & 5 \end{pmatrix}$

$\frac{n(n-1)}{2} + 2$

$\begin{pmatrix} 2 & 5 & 3 \\ 2 & 1 & 2 \\ 2 & 3 & 5 \end{pmatrix}$

$\begin{pmatrix} 2 & 5 & 3 \\ 2 & 1 & 2 \\ 2 & 3 & 5 \end{pmatrix}$

$- (2) \times 3$

$5 \times 4 - 5 \times 1$

Contribution

Max

Min

8

③ x
 $6x$

$$\underline{5 \times 4} - 5 \times 1$$

Solⁿ

✓ Subarray

Find (next E run)

51

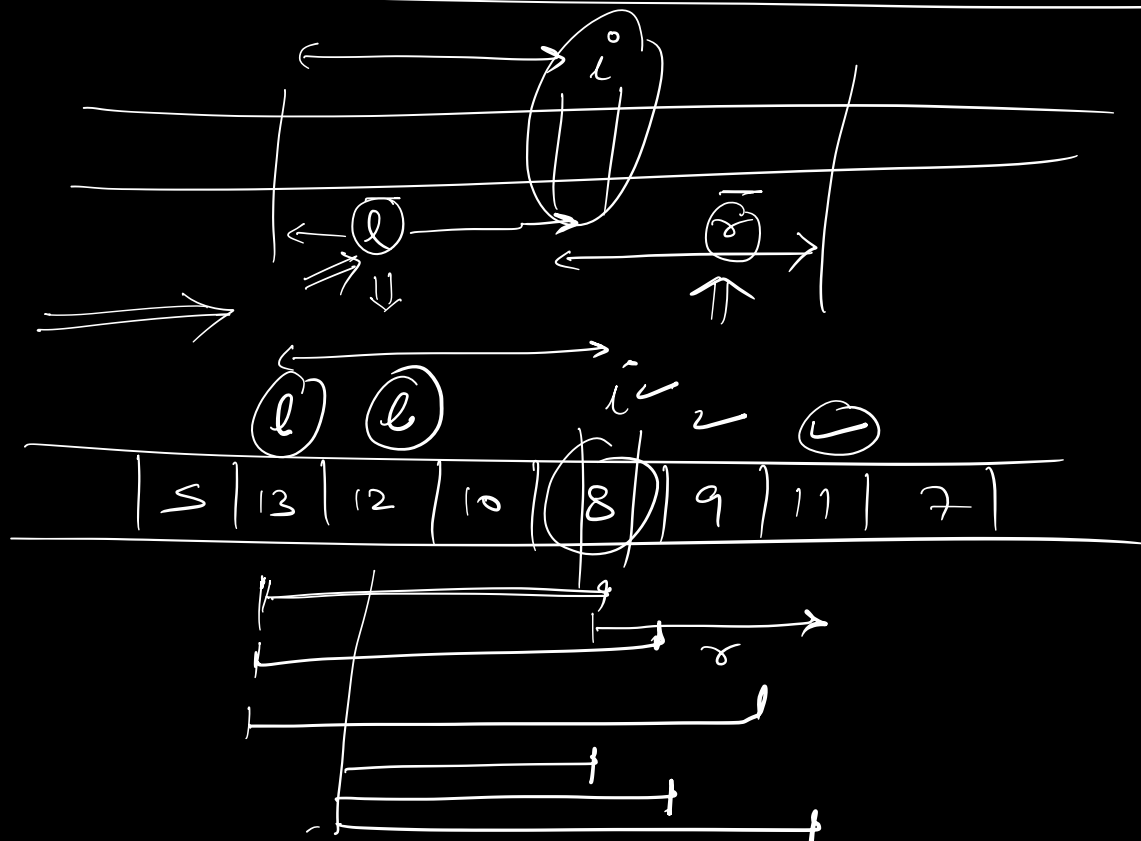
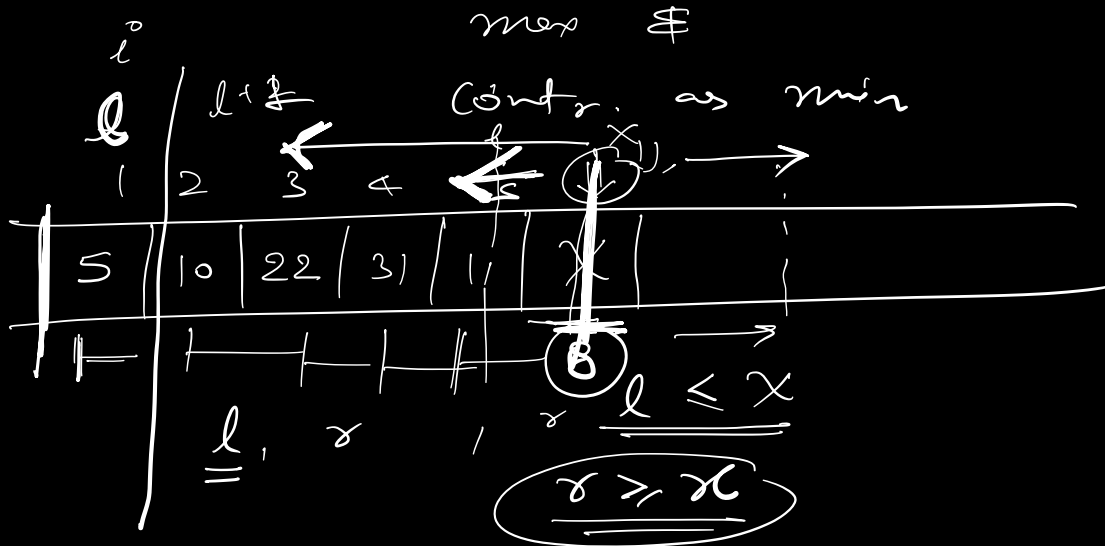
$O(N)$

$O(N^3)$

$$\text{for } \underline{(i = 0; i < N; i++)} \{$$
$$\text{for } (j = i+1; j < N; j++) \{$$

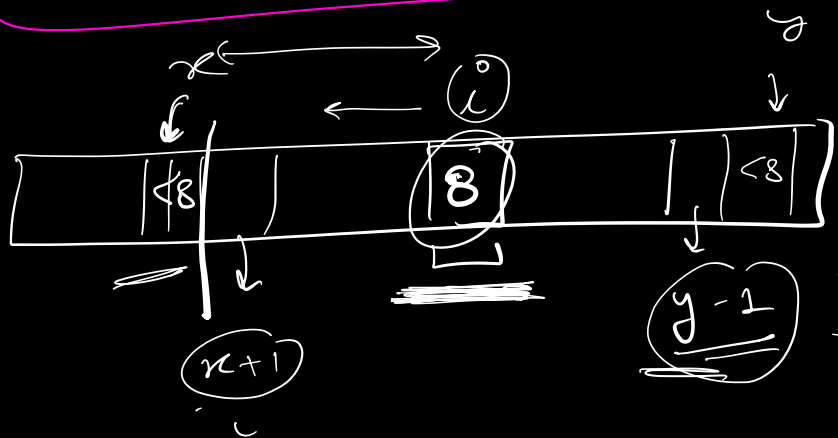
2) Contribution

Elements, calculate contribution \rightarrow



$$= \underline{\underline{l \times r}}$$

$$\begin{aligned} \text{T.C.} &= O(N) \\ \text{S.C.} &= \underline{\underline{O(1)}} \end{aligned}$$



$$\underline{\underline{j-i+1}}$$

$$\begin{aligned} i - (i+1) + 1 \\ = \underline{\underline{i-i}} = \underline{\underline{0}} \end{aligned}$$

$$\begin{aligned} (j-1) - i + 1 \\ \underline{\underline{j-i}} = \underline{\underline{0}} \end{aligned}$$

$$= l \times r$$

$$= \underline{\underline{(i-i)}} (\underline{\underline{j-i}})$$

$$\begin{aligned} &0 \quad 1 \quad 2 \end{aligned}$$

$$\begin{array}{ccc}
 \begin{array}{c} \nearrow \\ \textcircled{2} \\ \searrow \end{array} & \xrightarrow{\quad} & \begin{array}{c} 3 \\ - \\ 3 \end{array} \\
 \begin{array}{c} -1 \\ \textcircled{x=-1} \\ \textcircled{-1} \end{array} & \begin{array}{c} \textcircled{c-2} \\ \textcircled{-2} \end{array} & = \underline{\underline{\textcircled{1} \times 3 \quad 3^{-0} = 3}}
 \end{array}$$

$$y - u = \textcircled{1} = \textcircled{2}$$