Q: Given a binary array. Sort it!

A: [0, 1, 1, 0, 0, 1, 0]

→ [0, 0, 0, 0, 1, 1, 1]

Q.sort (N log N)

find cnt0

find cnt1.

place 0's & then 1's

cnt0 → 4

cnt1 → 3

0 0 0 0 1 1 1 ✓

O(N)

Q Given an array.

Sort the array.

$0 <= A[i] <= 4$

A: [4, 1, 2, 1, 1, 3, 4,]

→ cnt0, cnt1, cnt2, cnt3, cnt4

X 0 3 1 1 2

x 1 1 1 2 3 4 4

✓ HM<int, int> freq: ⟶ freq HM

HM
<2, 1>
<1, 3>
<3, 1>
<4, 2>

f(i:0 ⟶ 4)

| 1 | 1 | 2 | 3 | 4 | 4 |

i:0 ⟶ 0
1 ⟶ 3 (+1 +1 +1)
2 ⟶ 1 (+1)
3 ⟶ 1 (+1)
4 ⟶ 2 (+1)

N

```
HashMap<int, int> freq;
f(i:0 ⟶ N-1) {                    → O(N)
    freq[A[i]]++;
}
K=0
f(i:0; i<=4; i++) {               A [ ]  K
    fr = freq[i];                 } → 5
    f(j=0; j<fr; j++) {           } → N
        A[K] = i;
        K++;
    }
}
```

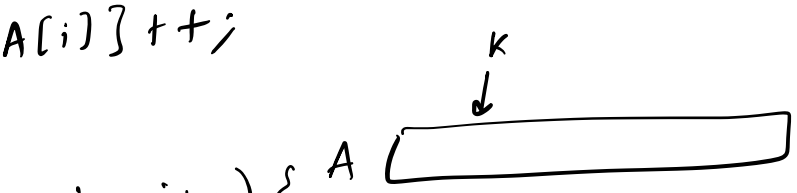
N + N+5

~ O(N)

Q Given an array. $a <= A[i] <= b$

Sort the array.

```
HashMap<int, int> freq;
for(i:0 ---> N-1) {                    -> O(N)
    freq[A[i]]++;
}
K=0
for(i: a; i<=b; i++){                  -> (b-a+1)
    fr = freq[i];
    for(j = 0; j < fr; j++) {          -> N
        A[K] = i;
        K++;
    }
}
```



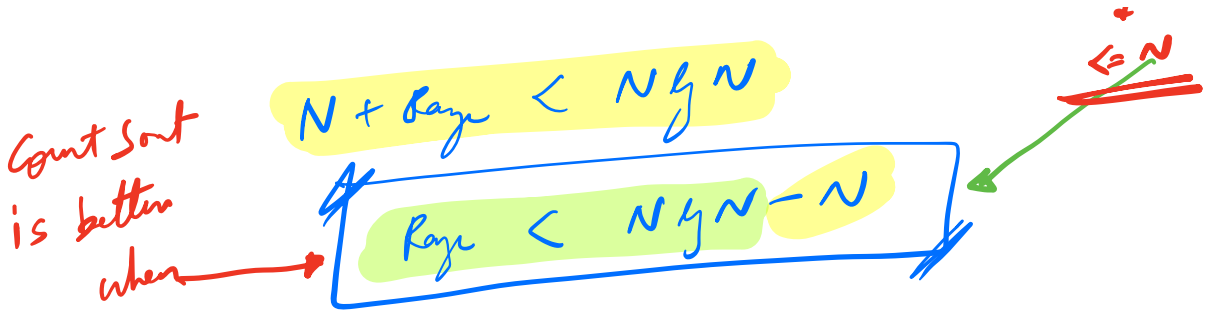
$N + N + b - a + 1$

$O(N + b - a)$

COUNT SORT -> TC: $O(N + Range)$

$Range = (b - a)$

SC: O(Distinct)



$0 <= A[i] <= 10^9$

$1 <= N <= 10^5$

$N \lg N$

$10^5 \cdot \lg(10^5)$

$10^5 \cdot 17$

1.7×10^6 ops

$N + R$

$10^5 + 10^9$

$\sim 10^9$ ops

Given a string $S_i \in \{a - z\}$

$R \rightarrow 26$

$N <= 10^6$

$N \lg N$

$2 \cdot 10^7$

$TC = (N + 26)$

$O(N)$

$10^6 + 26$

10^6

(*) RADIX SORT

MSD LSD

923
950
012
001
100
150
650
688
452
399
659

0	1	2	3	4	5	6	7	8	9
950	001	012	923					688	399
100		452							659
150									
650									

✓

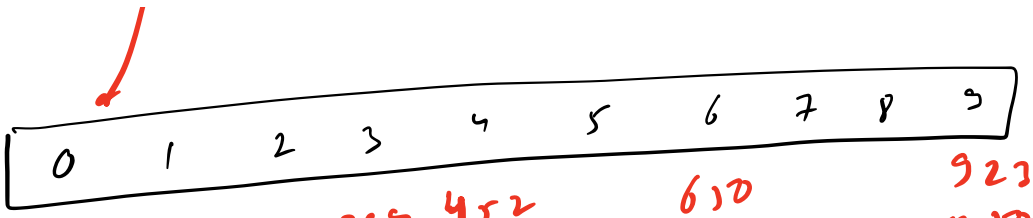
950, 100, 150, 650, 001, 012, 452, 923, 688, 399, 659

0	1	2	3	4	5	6	7	8	9
100	012	923			950			688	399
001					150				
					650				
					452				
					659				

✓

100 001 012 923 950 150 650 452 659 688 399

~ 5% 10 → 5



001, 012, 100, 150, 359, 452, 650, 659, 688, 923, 950

# of digits of Max(A)

X

(N + ~~10~~)

$N \log_2 N$

n → # of digits → $\log_{10}(n)$

TC = $O(N \times \log_{10} Max(A))$

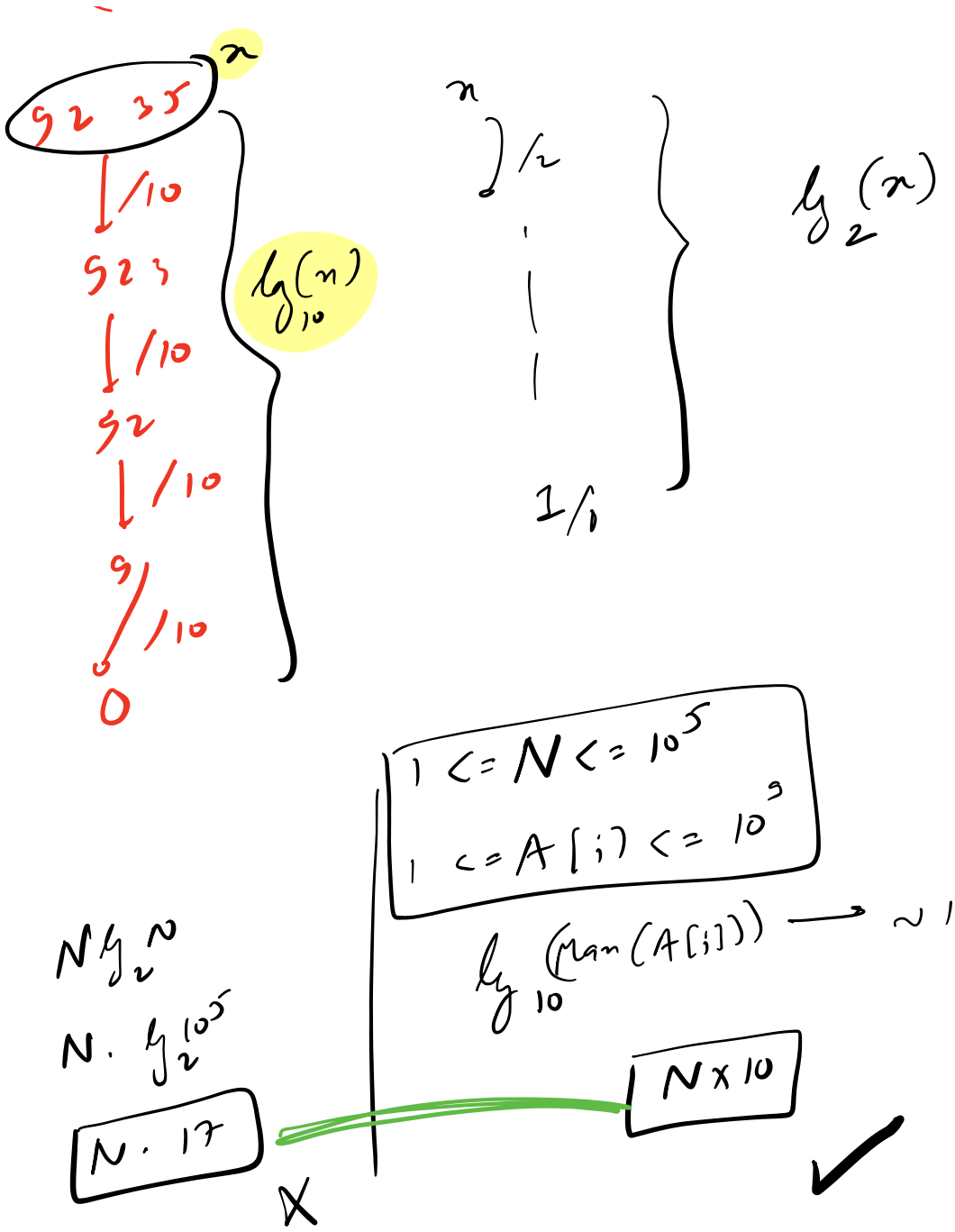
SC = $O(N)$

I $(9235 / 10^0) \% 10 \rightarrow 5$

II $(9235 / 10^1) \% 10 \rightarrow 3$

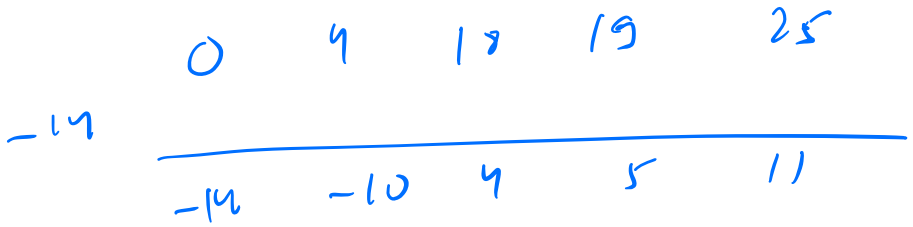
III $(9235 / 10^2) \% 10 \rightarrow 2$

IV $(9235 / 10^3) \% 10 \rightarrow 9$

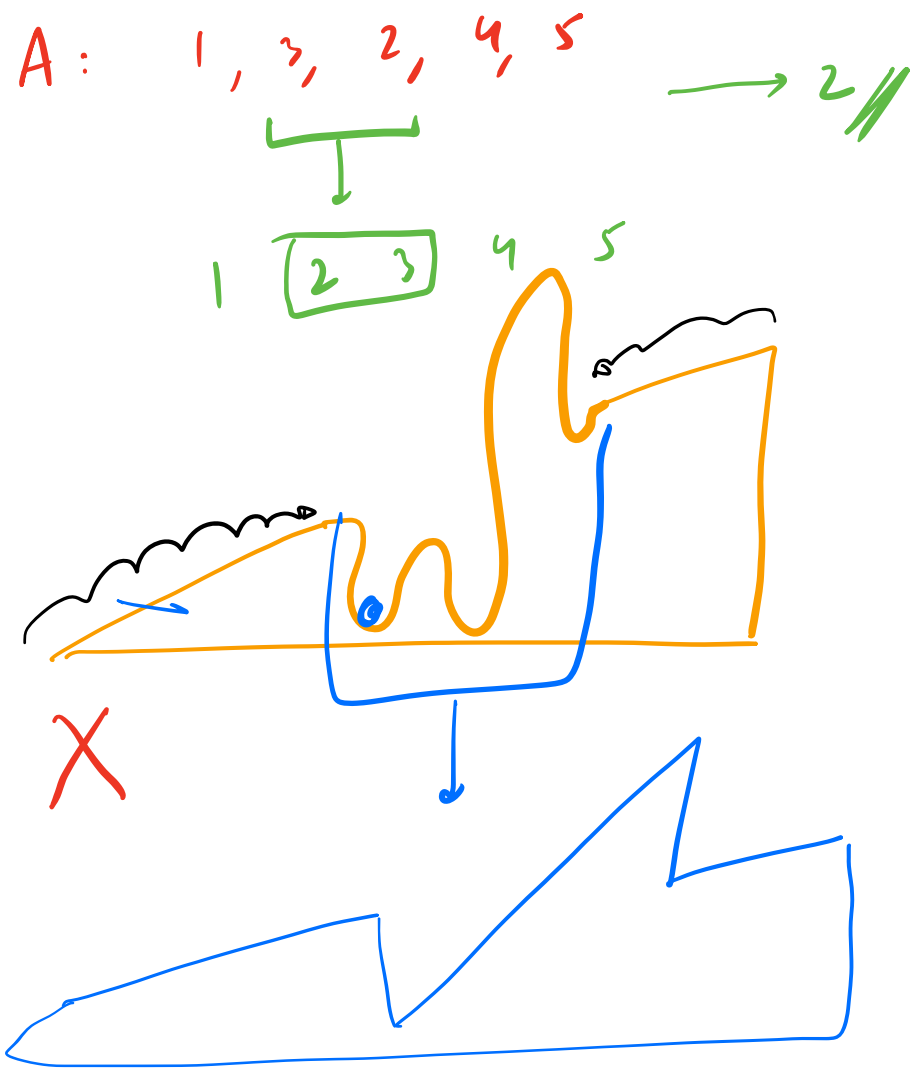


Handling -ve no's:

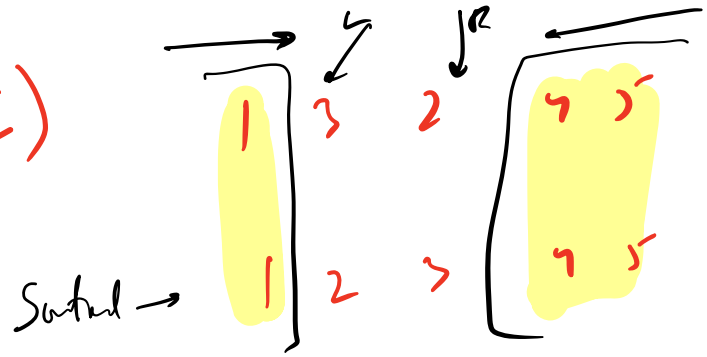
-10	-14	4	5	11
+14	+14	+14	+14	+14
4	0	18	19	25



Q Given an array. Find the minimum sized S.A. s.t if you sort it, then whole array is sorted (INC order)



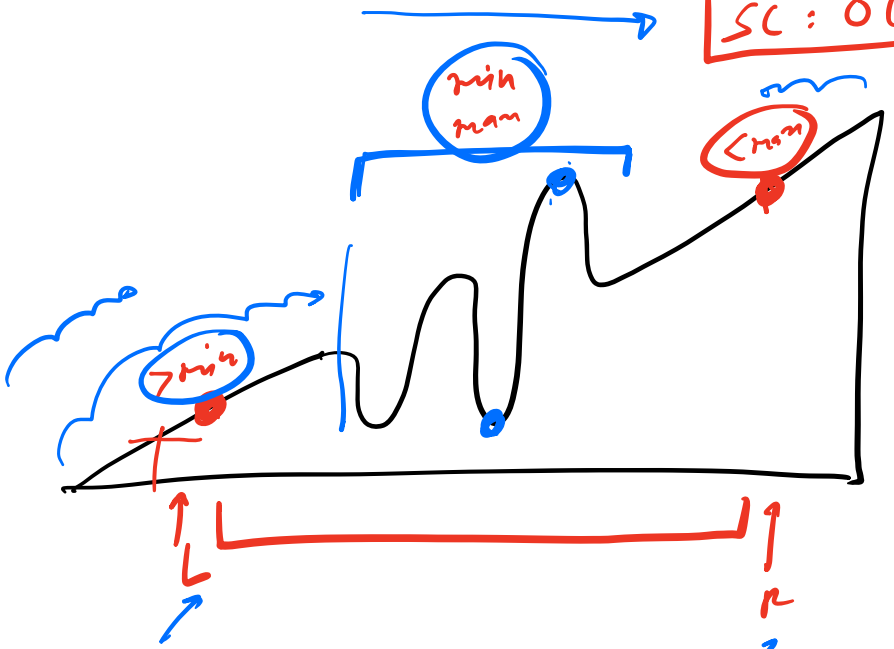
I)



TC: NlgN

SC: O(N)

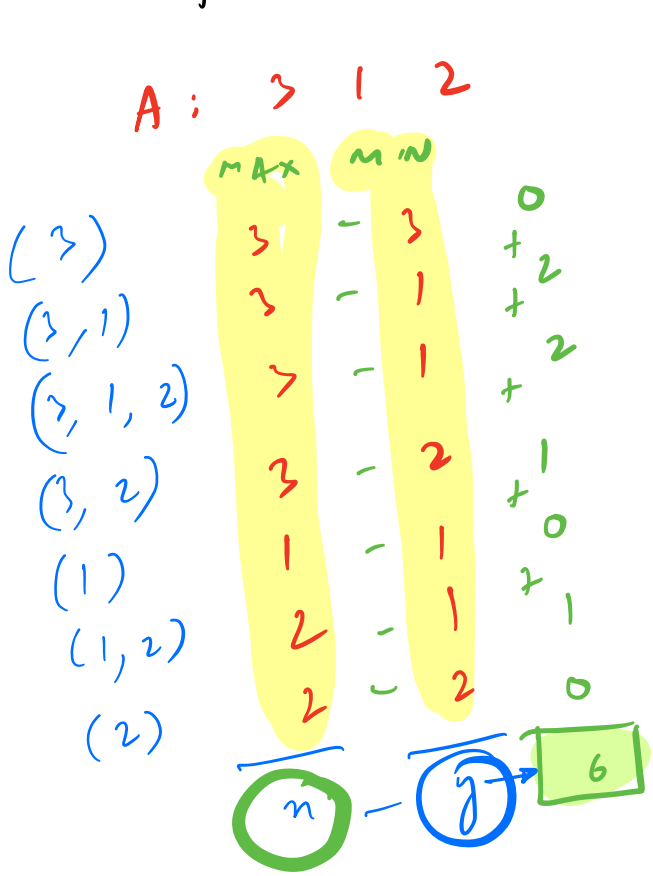
II)

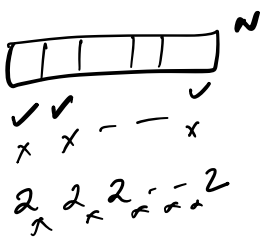


TC = O(N)

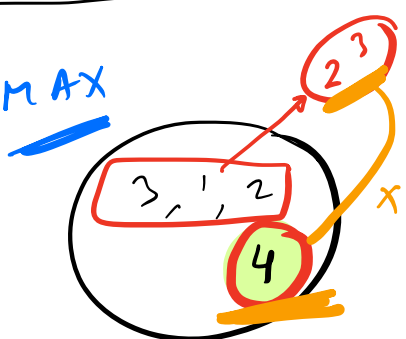
SC = O(1) ✓

Q Given an Array.
find all possible non-empty subsequences of the array, then for every subsequence find the diff b/w the smallest & the largest element.
find the sum of such differences !

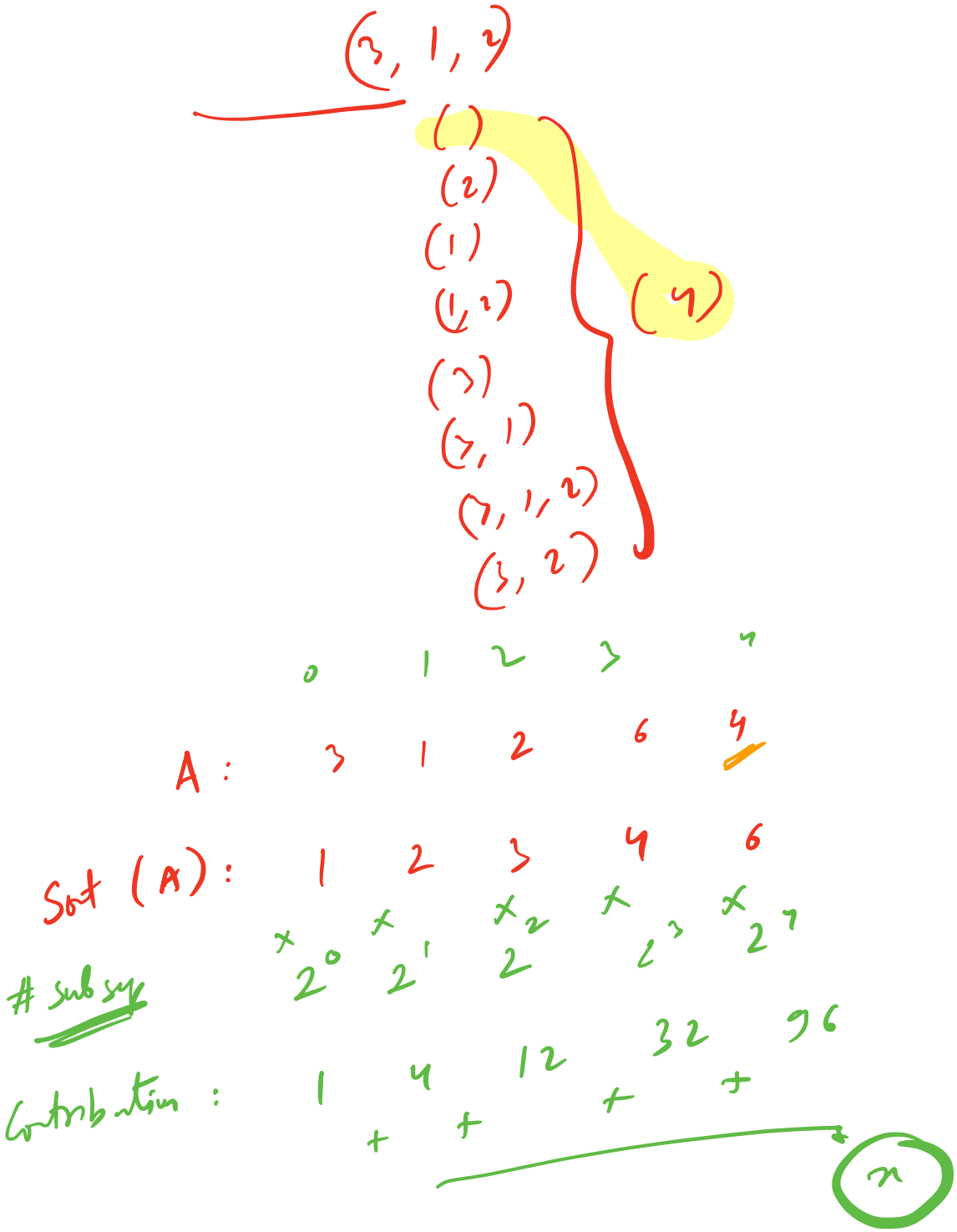




$1 <= N <= 10^5$

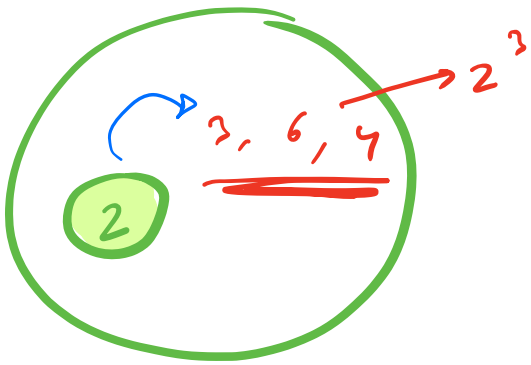


A : 3 1 2 6 4


(3, 1, 2)
( )
(2)
(1)
(1,2)
(3)
(3,1)
(3,1,2)
(3,2)
(4)
0 1 2 3 4
A: 3 1 2 6 4
Sort (A): 1 2 3 4 6
subsq
x 2^0 x 2^1 x 2^2 x 2^3 x 2^4
Contribution: 1 4 12 32 96
+ + + +
n

MIN

A : 3 1 2 6 4



Sort(A) : 1 2 3 4 6

#SA : $2^4 \times 2^3 \times 2^2 \times 2^1 \times 2^0$

$16 + 16 + 12 + 8 + 6 \longrightarrow y$

ANS = $n - y$

TC = O(N log N)

SC = O(1)

Merge Sort !