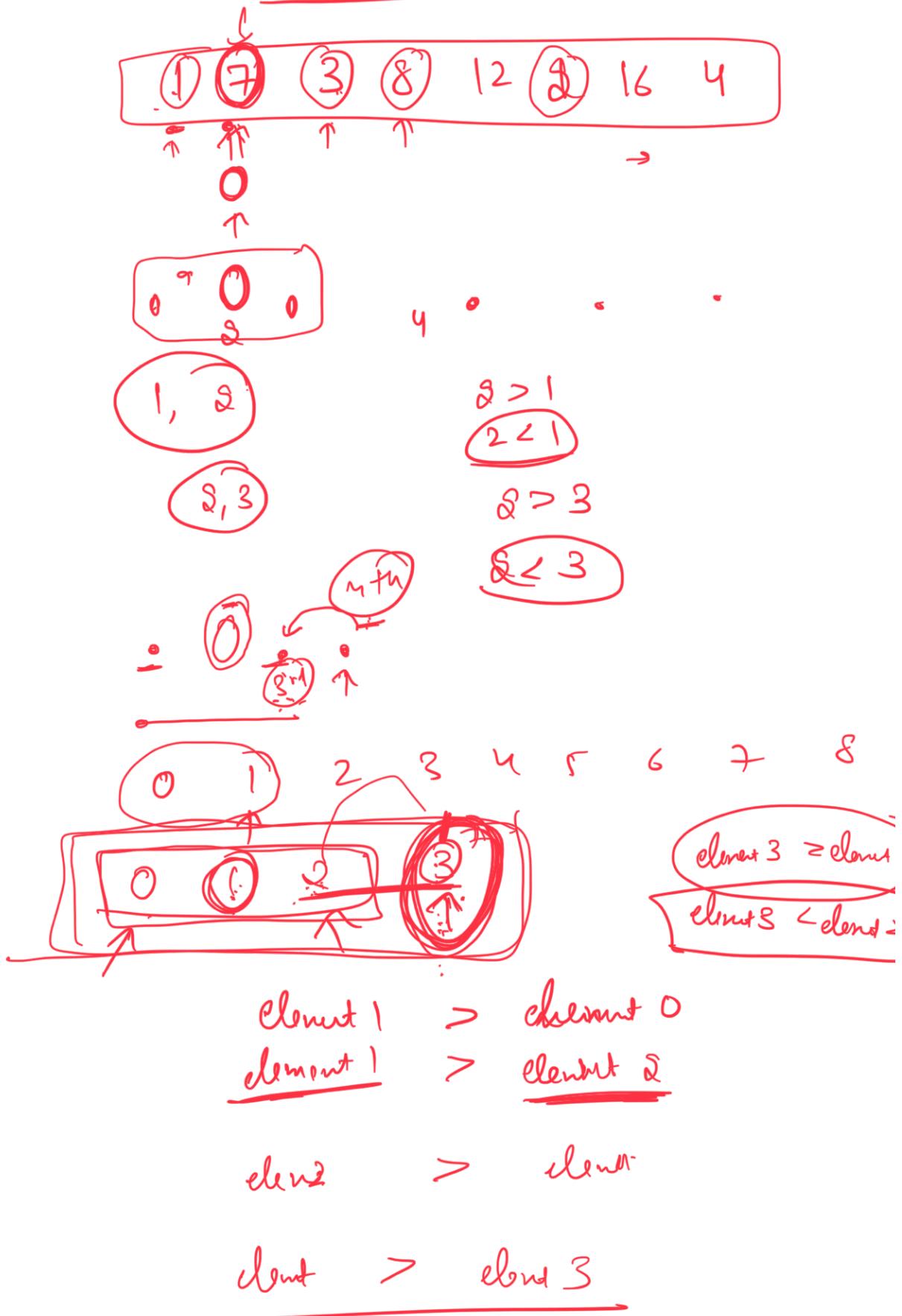


Problem Discussion



→ Bad Comparisons

Apartments

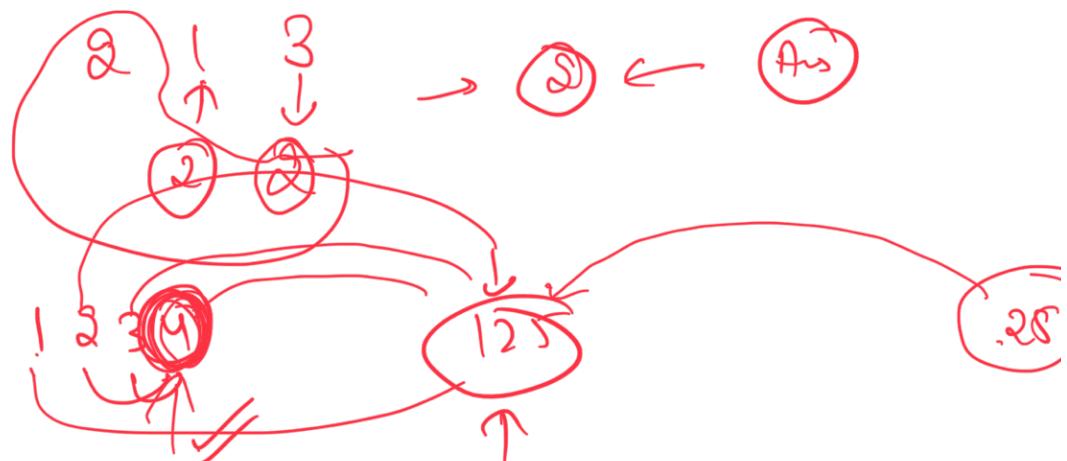
Sort C

Binary (0, 0)

0
↑

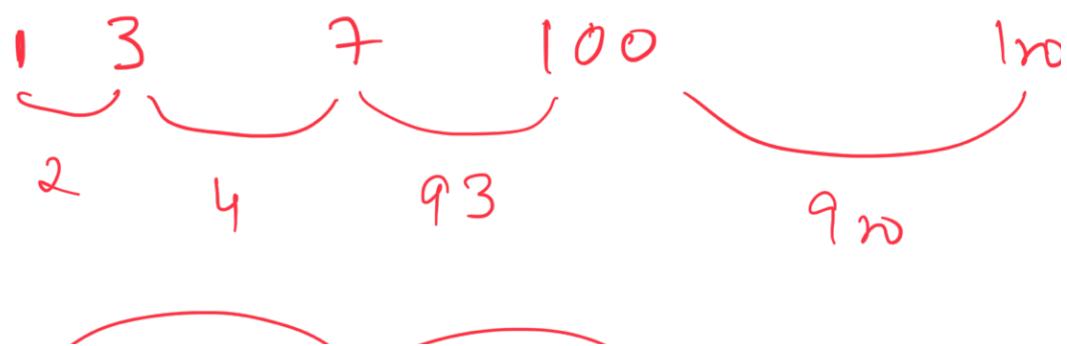
0 2 1 4 3

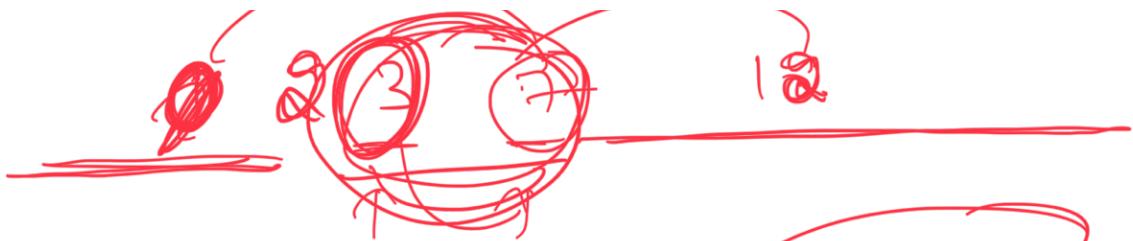
In-place any element of the array by 1
decrease any element of the array by 1



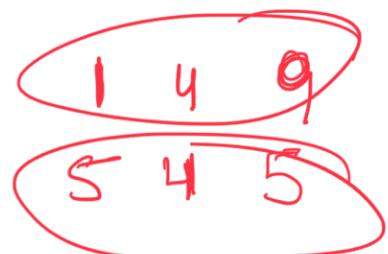
$$\rightarrow \underline{125 + 121 + 122 + 123 + 124} \quad ①$$

$$\rightarrow \underline{3 + 2 + 1 + 246} \quad ②$$





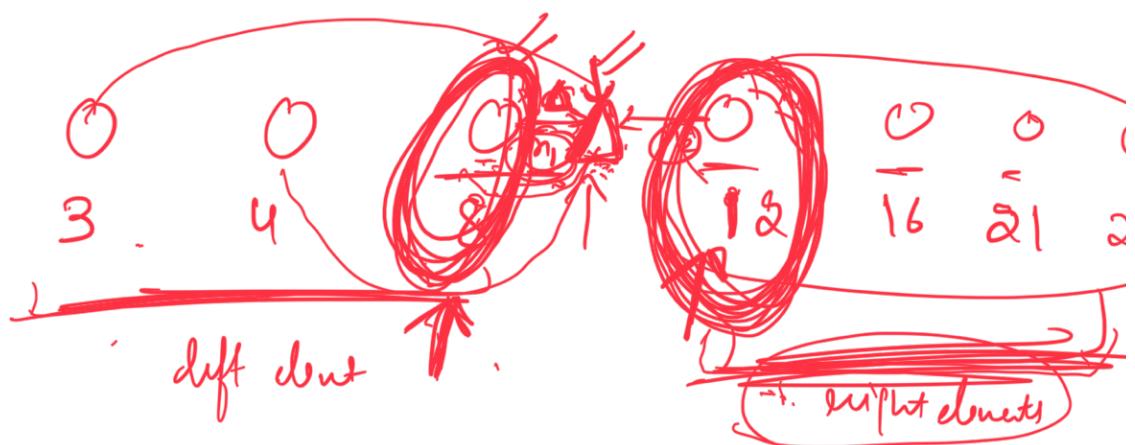
$2 + 4 + 7$



$6 + 4 + 3$

~~123~~

It is always better to pick the element that is parent



$\text{left ch} \times n_1 - \text{left Element } 11$

$(\text{left ch} - \text{right ch}) \times n_1$

$(\text{left ch} - \text{left ch}) \times n_2$



$$\text{left elmt } x n_1 - \frac{\text{exp bt elmt } n_1}{(\text{left elmt}) - \text{exp bt elmt}} x n_1 = > 0$$

$$^1 (\text{info elmt} - \text{left elmt}) x n_2$$



$$\begin{aligned} & \cancel{(10)} - \cancel{(7)} + \underline{(10) - 3} + \cancel{(10) - 11} \\ & \cancel{(12) - 10} + \cancel{(13) - 10} + \cancel{(14) - 10} \end{aligned}$$

$$10 \times (\text{left elmt} - \text{exp bt elmt})$$

~~left elmt~~

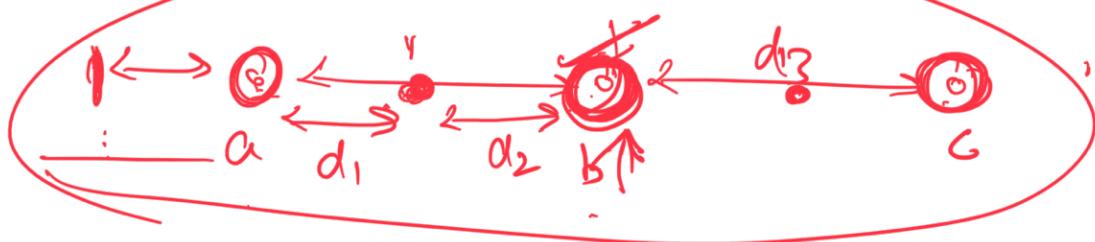
$$\frac{\text{suffix sum} - \cancel{\text{prefix sum}}}{\cancel{\text{suffix sum}}} = \text{suffix sum}$$

$$10 \times (\text{left elmt} - \text{exp bt elmt})$$

$$\cancel{\text{suffix sum}} - \text{prefix sum}$$

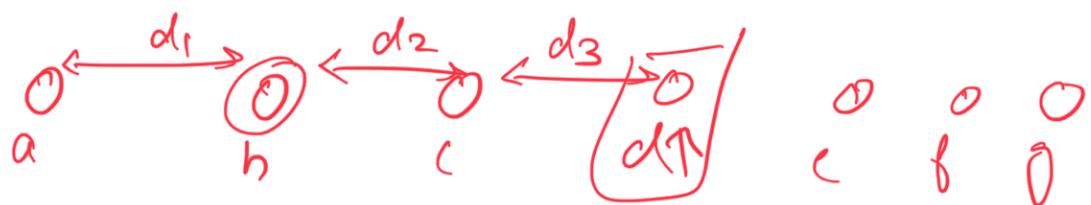
$a < b < c$

$\underline{(n-a)} + \underline{(n-b)} + \underline{(n-c)}$

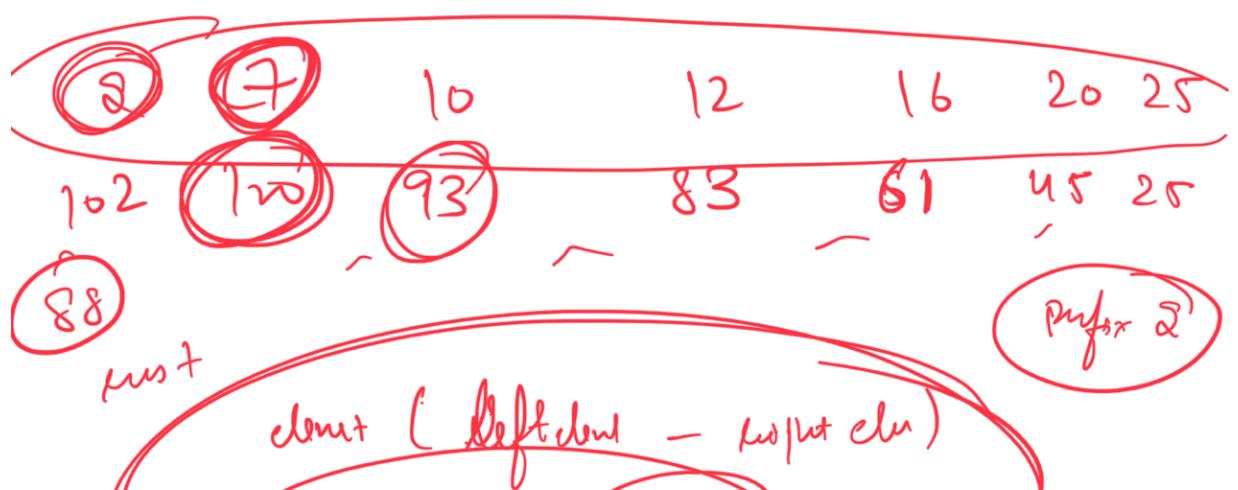
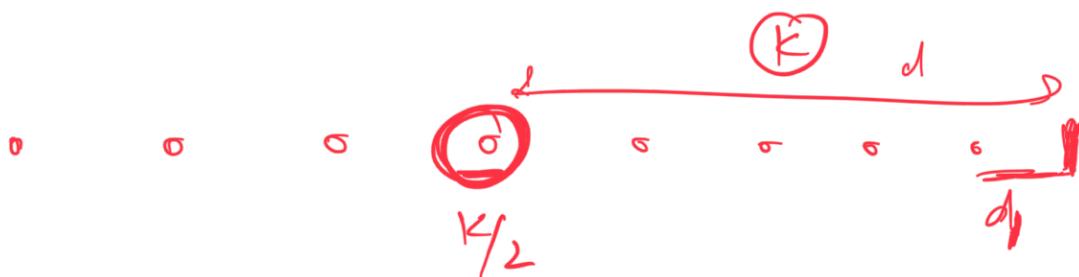


$$\underline{d_1 + d_2 + d_3 + d_4}$$

$$\underline{d_1 + d_2 + d_3}$$



$$\underline{(n-a) + (n-b) + (n-c) + (n-d) \dots}$$



~~(suffix - prefix)~~

left slot \neq ①

right slot = ⑤

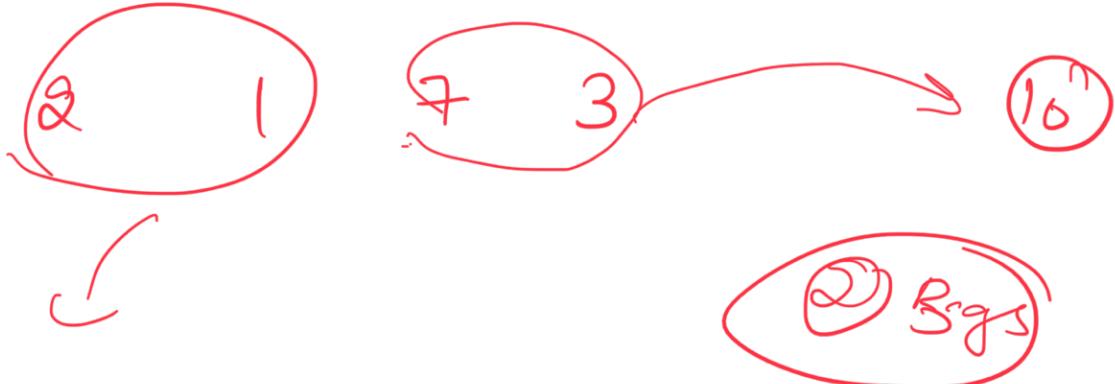
$$\begin{aligned} & - 6 \times 2 \\ & + 120 \\ & = 88 \end{aligned}$$

$-28 + 93 - 2$

\rightarrow Item¹ Stem² Stem³ Stem⁴ ... Stemⁿ

w₁ w₂ w₃ w₄ ... w_n

Bays \rightarrow Each Bay can contain 2 elements
 \rightarrow Capacity of Bay M

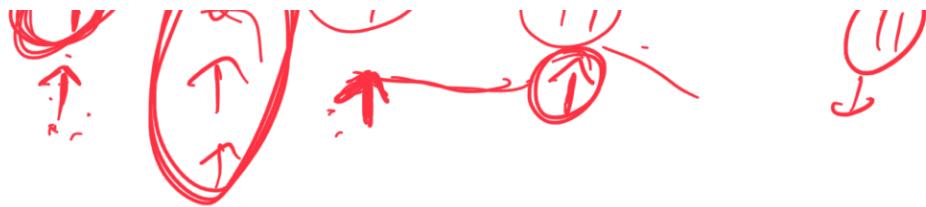


2 1 11 7

Sort the items

1 2 3 7 11





U

Bay +1

U

lift = input

$\text{fan}(m[1:n]) \in \text{fan}(\text{lift}) \leq M$

lift ++

input --

Boyer

else

input --

8j +1

ln

child

Can 2

Can 3

.....

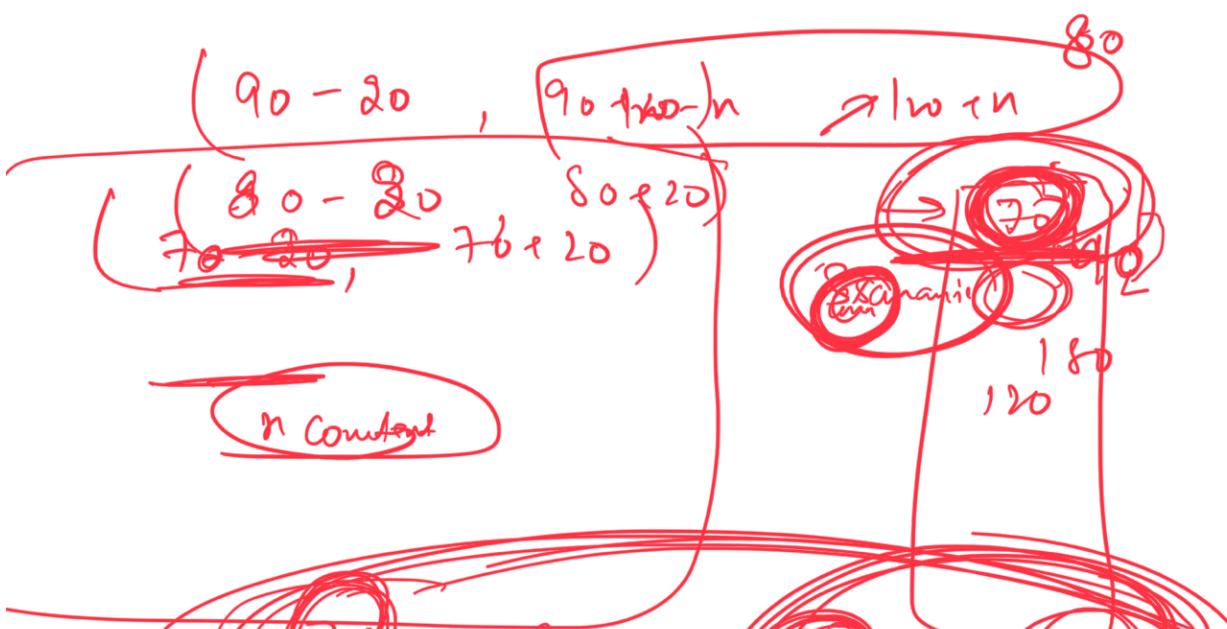
Can n

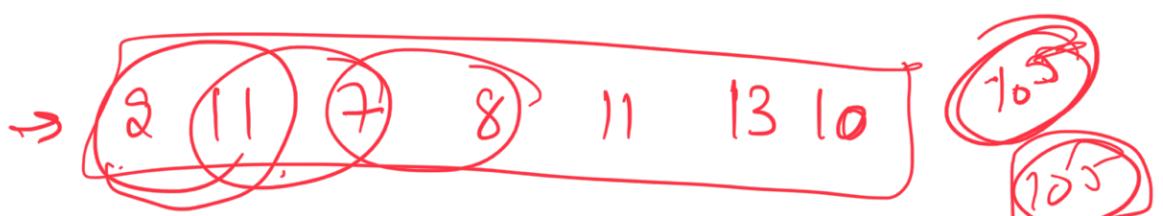
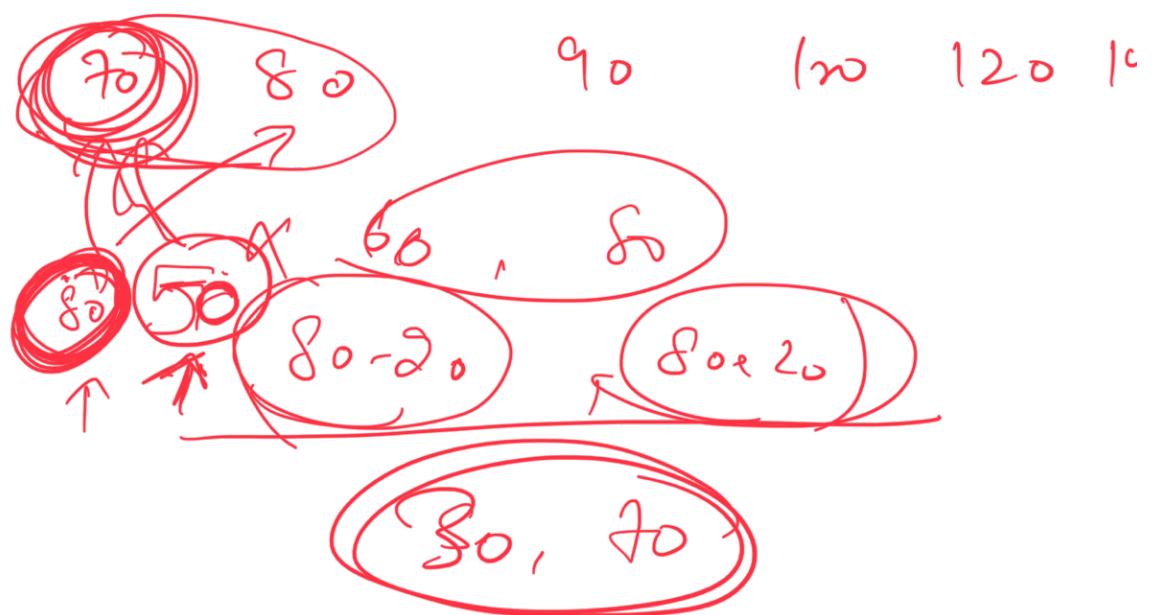
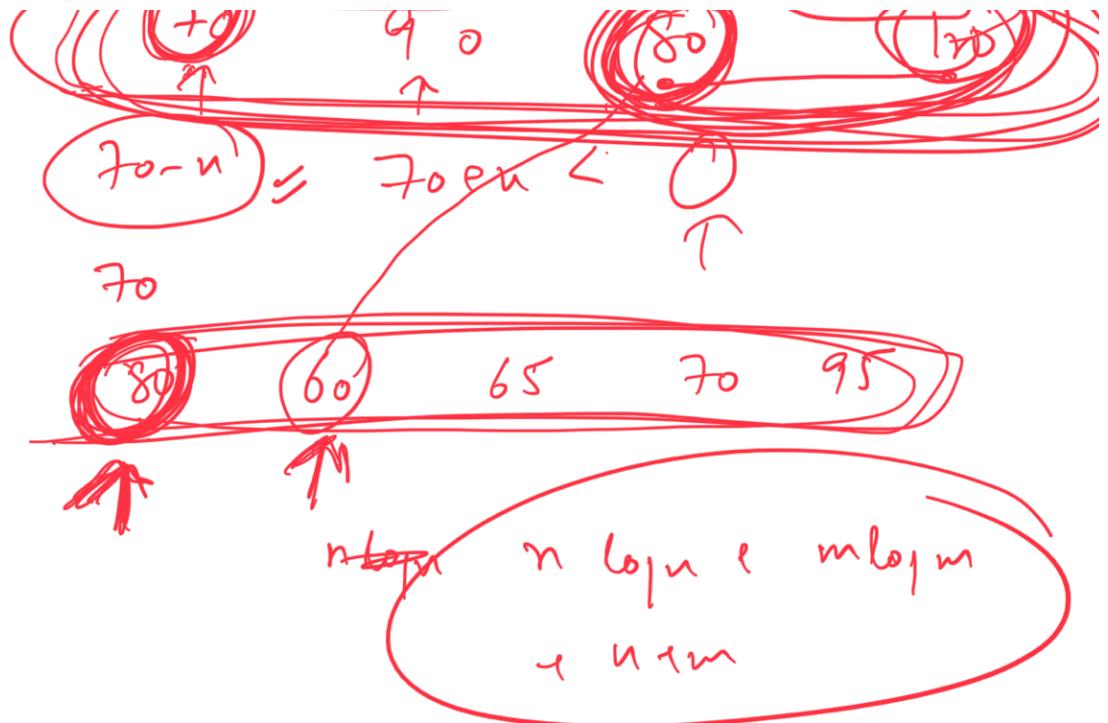
O
Apal
70

O
Apar
90

O
Apar M
50

O
28



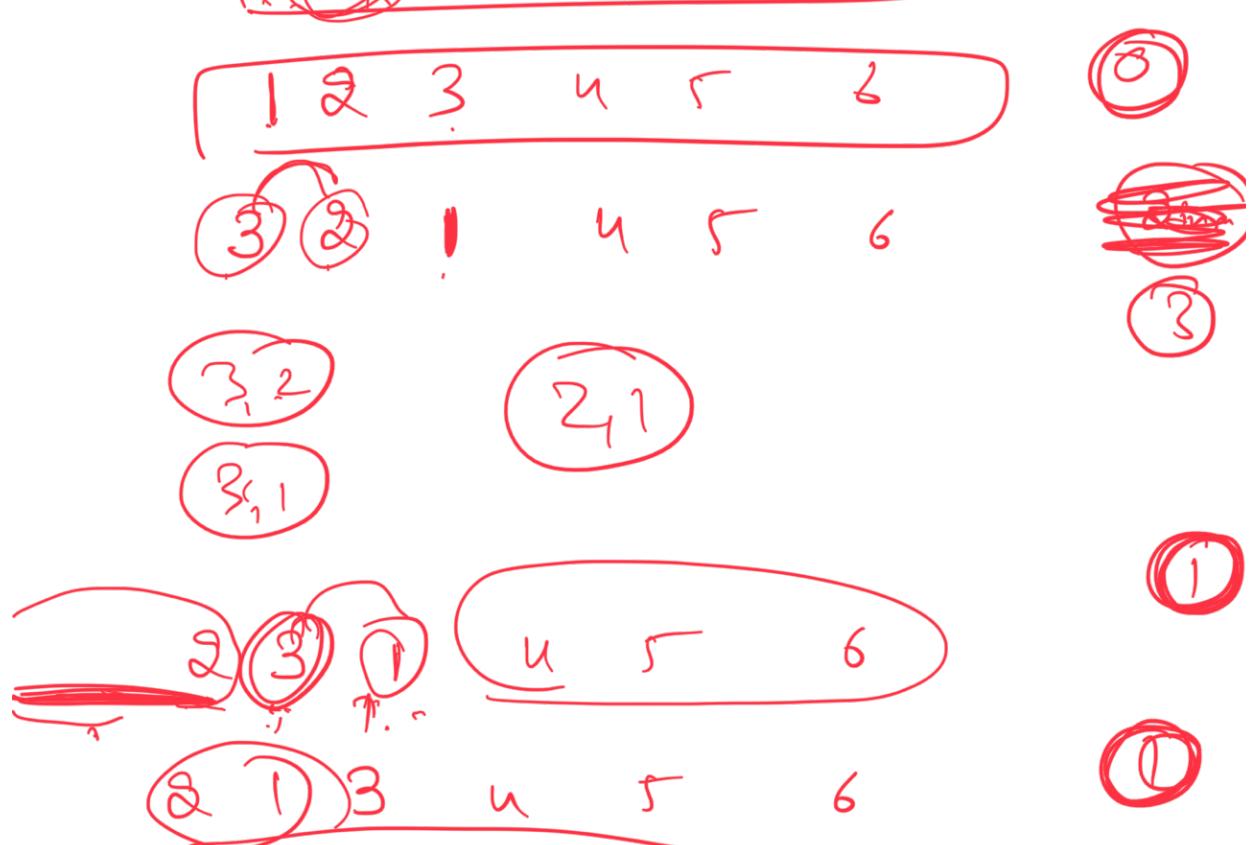
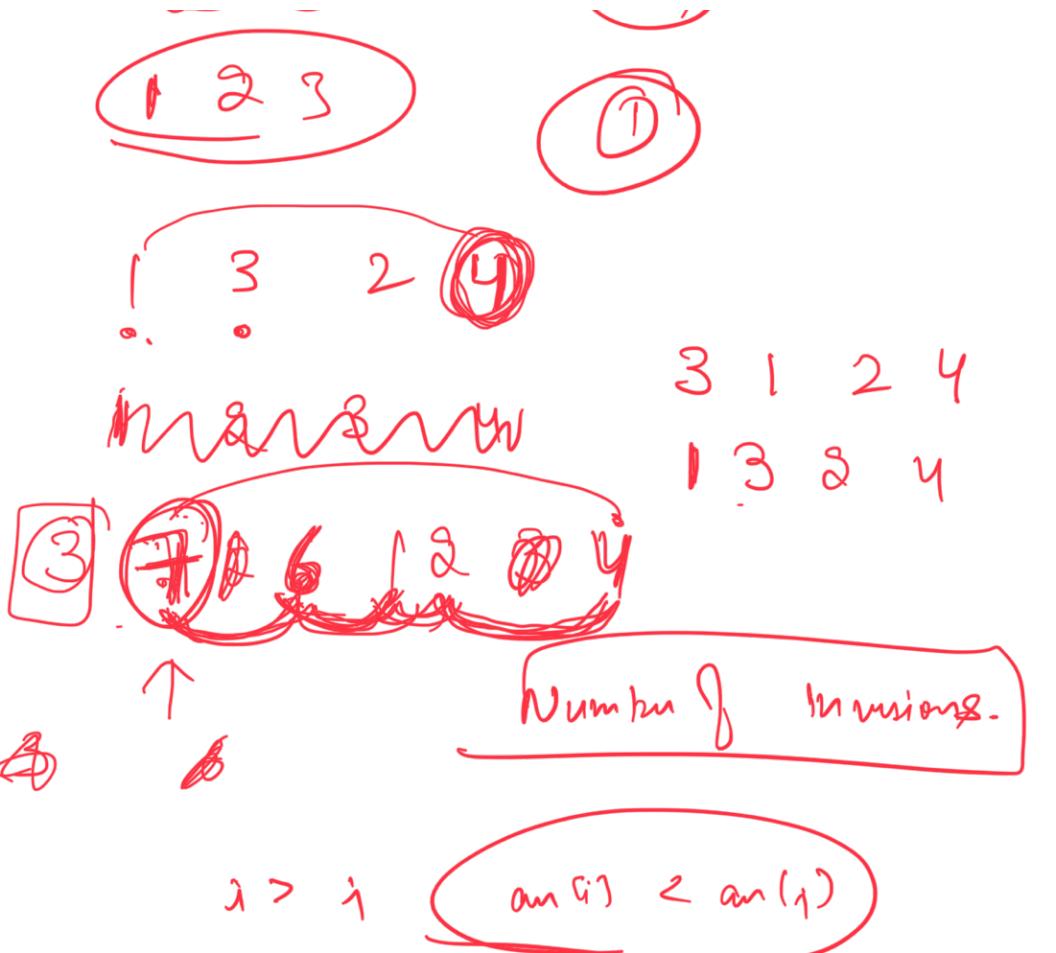


In how many minimum operations you can sort the array?

1 3 2

(8 steps)

$O(n^2)$



1 2 3 4 5 6 ①

Count the number of mutation

$$\underline{O(n \log n)}$$

nlogn

Array of n integers

1 to n

1 2 3 4 5 . . . n

$(0, 2) \leftarrow$

23

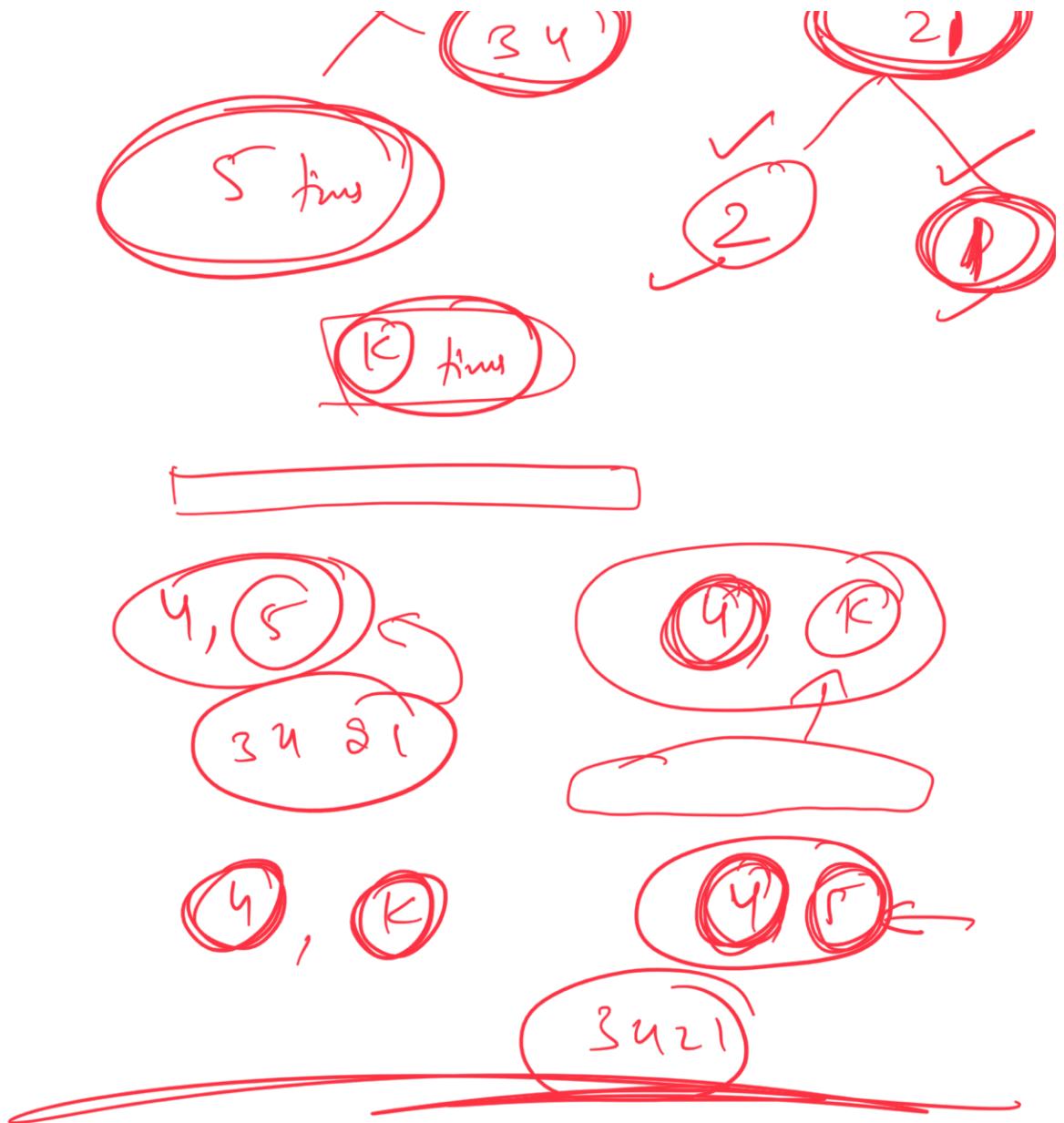
A hand-drawn diagram in red ink. On the left, three numbers are enclosed in circles: 0, 1, and 3. The number 3 is circled. On the right, three numbers are enclosed in circles: 2, 1, and 2. The number 2 is circled. Two red arrows point from the circled '1' and the circled '2' towards a large red 'X' on the far right.

A hand-drawn red arrow pointing to the right, indicating the direction of the next section.

~~8 + 3 =~~

34 21

3 4' 2 |



Bad Comparisons

Struct & Blend \leftarrow

Int a, b

*

Comp (element A, element B)

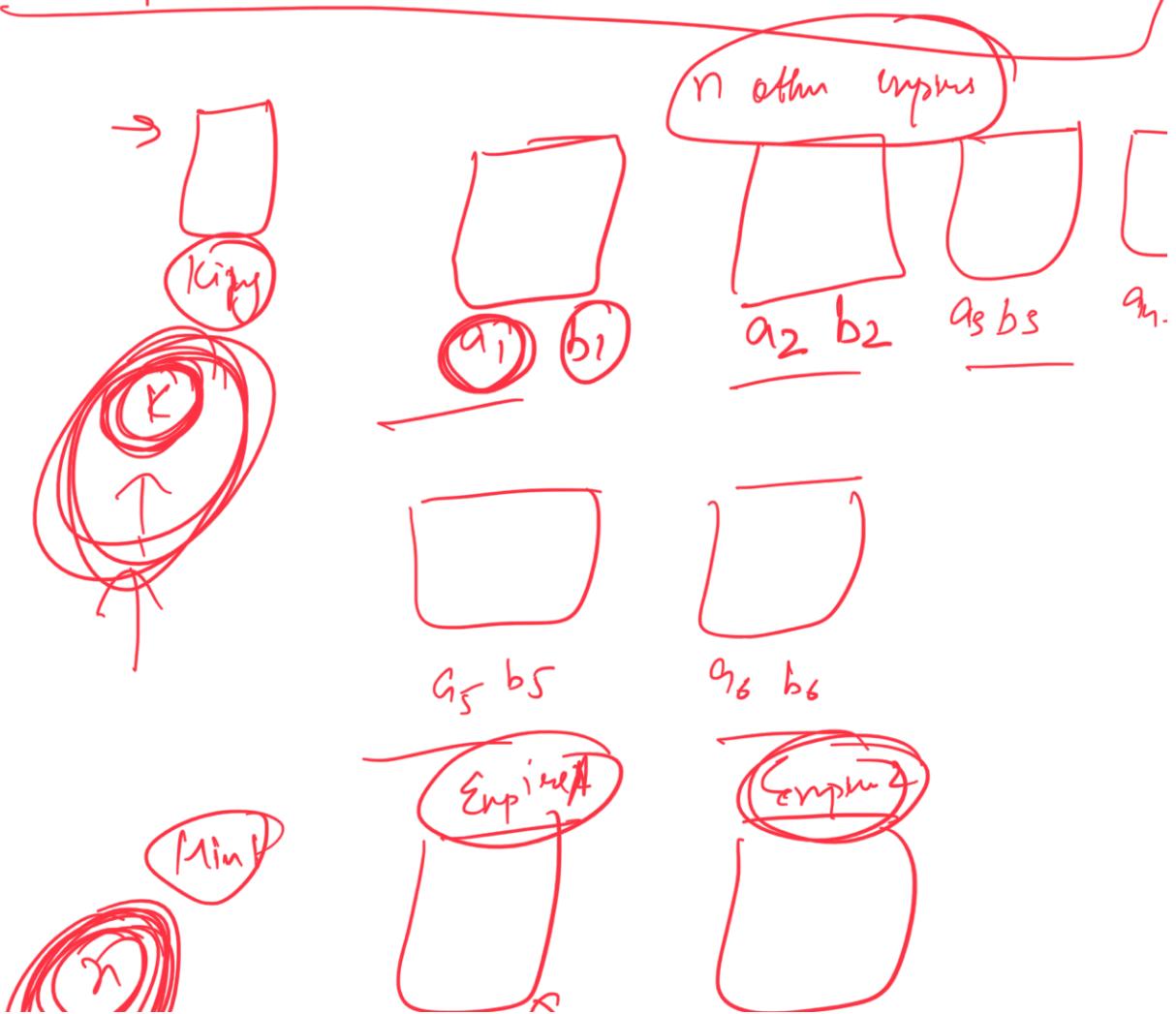
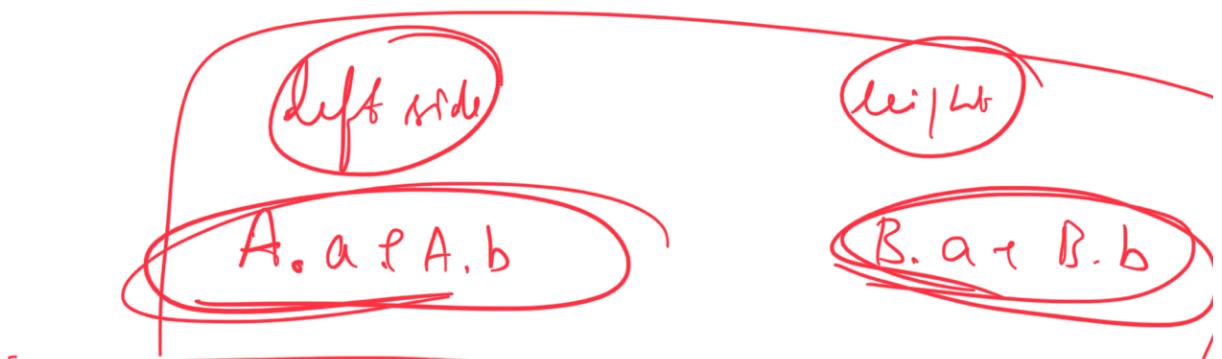
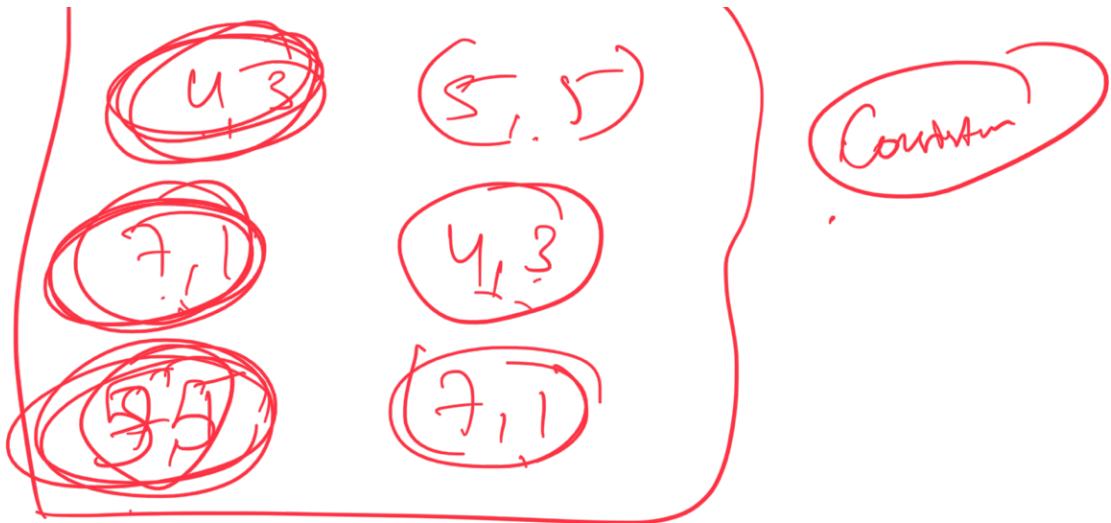
(A. a) < (B. b)

y

(4) 3),

(5) 5)

(6) 1)



a_1, b_1
 a_2, b_2
 Empirical, Empirical
 $\max(a_1, a_2 + b_1)$
 $n \geq a_1$
 $n - b_1 \geq a_2$
 $n \geq a_2 + b_1$
 $\max(a_1, a_2 + b_1)$
 $\max(a_2, a_1 + b_2)$
 $U_1 < U_2$
 So it converges
 Wann
 $\max(a_1, a_2 + b_2) \Rightarrow U_1$
 $\max(a_2, a_1 + b_1) \Rightarrow U_2$
 Condition
 $a_1 > a_2 + b_1$
 $a_1 > a_2$
 $a_1 - b_1 > a_2$ Empirical
 $a_2 - b_2 > a_1$ Empirical
 $a_1 + b_1 > a_1$
 $a_1 + b_1 > a_1$

~~(-1) $\sim 2 \sim 1$~~ ~~(-1) ~ 2~~

$$a_2 + b_1 < a_1 - b_2$$

$$a_2 - b_2 < a_1 - b_1$$

Emp 2

Cm 1

$$a_1 > a_2 + b_1$$

$$a_1 - b_1 > a_2$$

$$a_1 - b_1 > a_2 - b_2$$

$a_1 - b_1$

$$a_2 > a_1 + b_2$$

$$a_2 - b_2 > a_1$$

$$a_2 - b_2 > a_1 - b_1$$

→



(Me, opp)

(Me, opp_b)



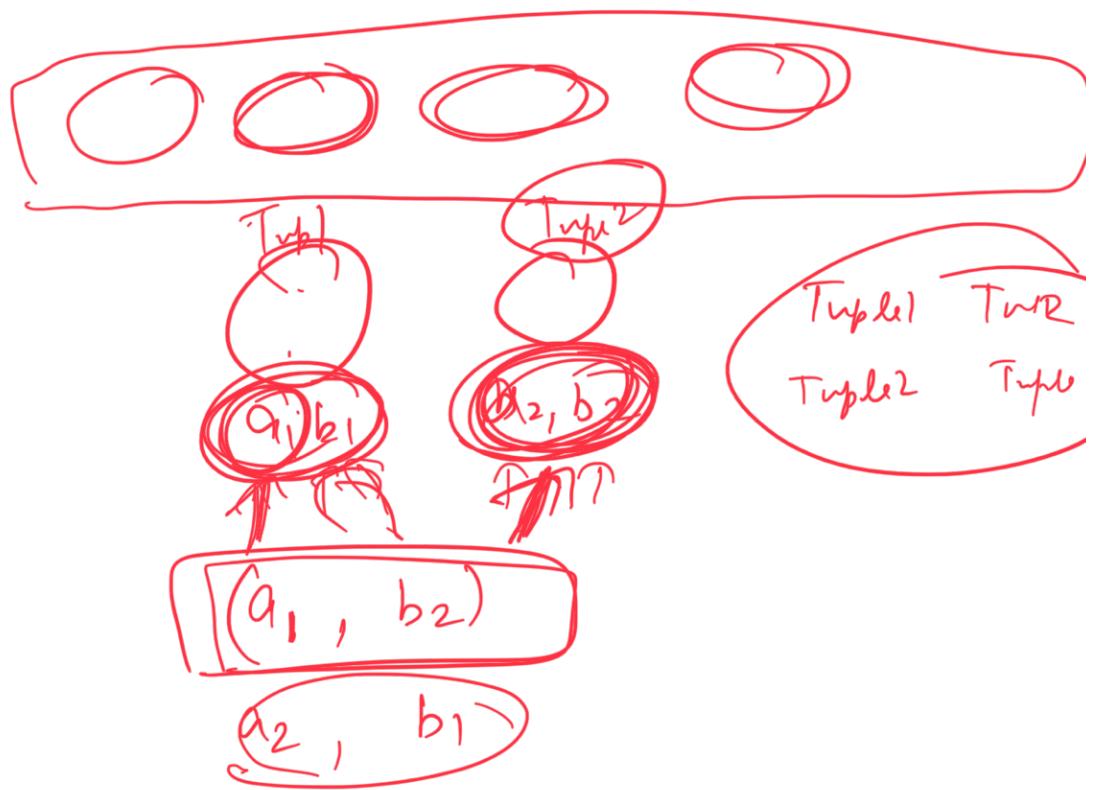
(S, 7)



③ ② → ⑦

10 → 10 ✓

8 2 = 10 ≈
7



$$(a_1, b_2) \rightarrow a_1 - b_2$$

$$(a_2, b_1) \rightarrow a_2 - b_1$$

$$a_1 - b_2 > a_2 - b_1$$

$$a_1 + b_1 > a_2 + b_2$$

(2, 3) (7, 10) (11, 12)

(1, 50)

2, 3
5

7, 10
17

11, 12
24

1, 50
51

1, 50

11, 12

7, 10

2, 3

0

8

Mage Snt
Ghost Mountain

15

1 knew

10 8

One Macan

10⁵
n²

10¹⁰

$10^2 \times 81\text{con}$

120x c

0 1 2
3 1 2

1 1 3 2
1 2 3 2
1 2 3 2
1 2 3 2

3 - 1 2
1 3 - 2
1 2 - 3

U I O Y

O