INV CNT

[2, 3, 8, 6, 1]

ans → 5

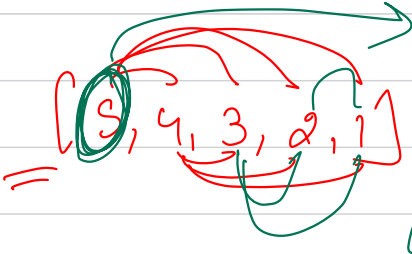
valid inversions: (2,1), (3,1), (8,6), (8,1), (6,1)

$n \leq 2 \times 10^5$

i < j

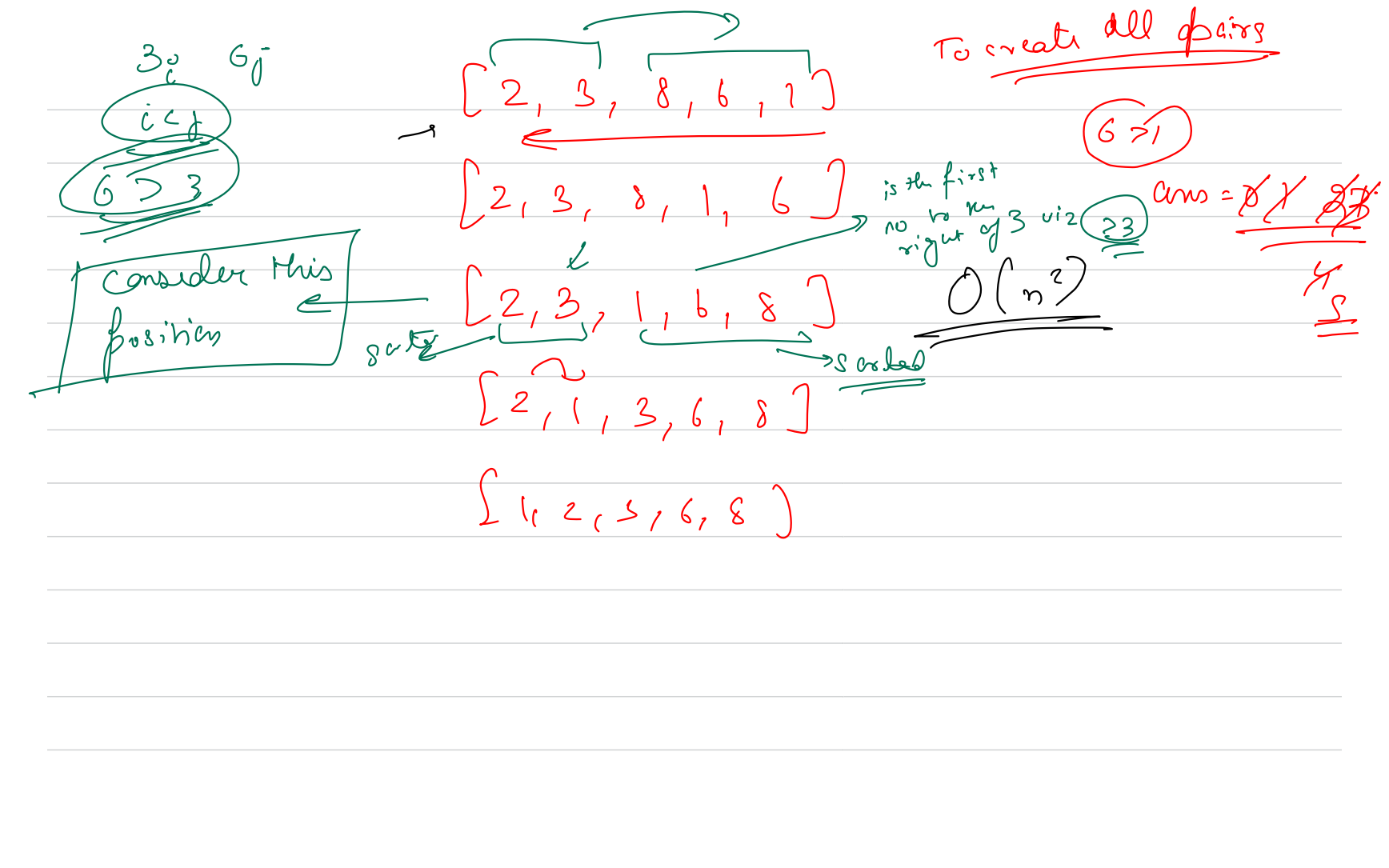
a[i] > a[j]

if you make all possible pairs, then the pair with elements (a[i], a[j]) where i < j & a[i] > a[j] is a valid inversion

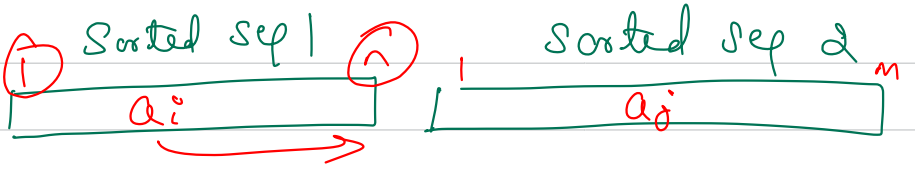


reverse sorted arr

[1, 2, 3, 4] → no INV counts


3 i
6 j
i < j
6 > 3
Consider this position
[2, 3, 8, 6, 1]
[2, 3, 8, 1, 6]
i
[2, 3, 1, 6, 8]
sort
Sorted
[2, 1, 3, 6, 8]
[1, 2, 3, 6, 8]
is the first no to the right of 3 viz
≥3
O(n²)
To create all pairs
6 > 1
Ans = 0 1 2 3 4 5

merge



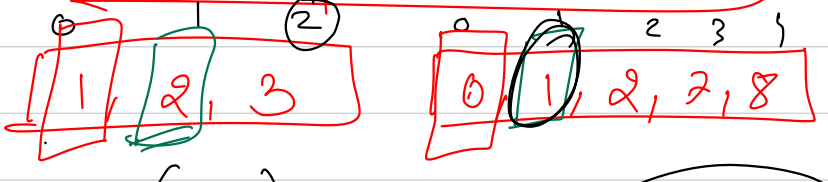
$a_i > a_j$

$\forall k \rightarrow i \le k \le n$

$a_k > a_j$

$n - i + 1$

$i > 0$

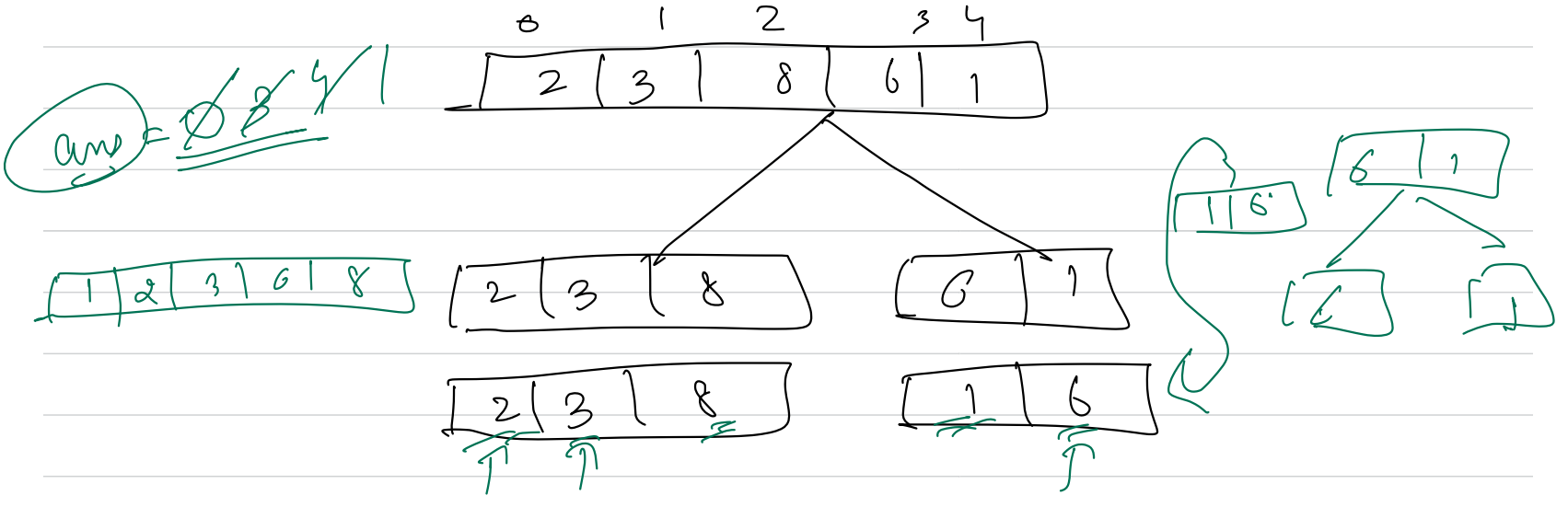


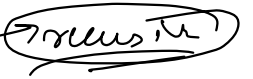
2 > 1
3 > 1

(2, 1)
(3, 1)

2 - i + 1

For each element of the 2nd sorted seq, how many inversion pairs it can make with first seq?





Total inv ⟶ inv cnt from left + inv count from right

+ inv cnt from merge operation

Q:) There are two sorted lists of different sizes.

Find the median of the elements from both the lists

↳ Ex [1, 3] → n

median → 2

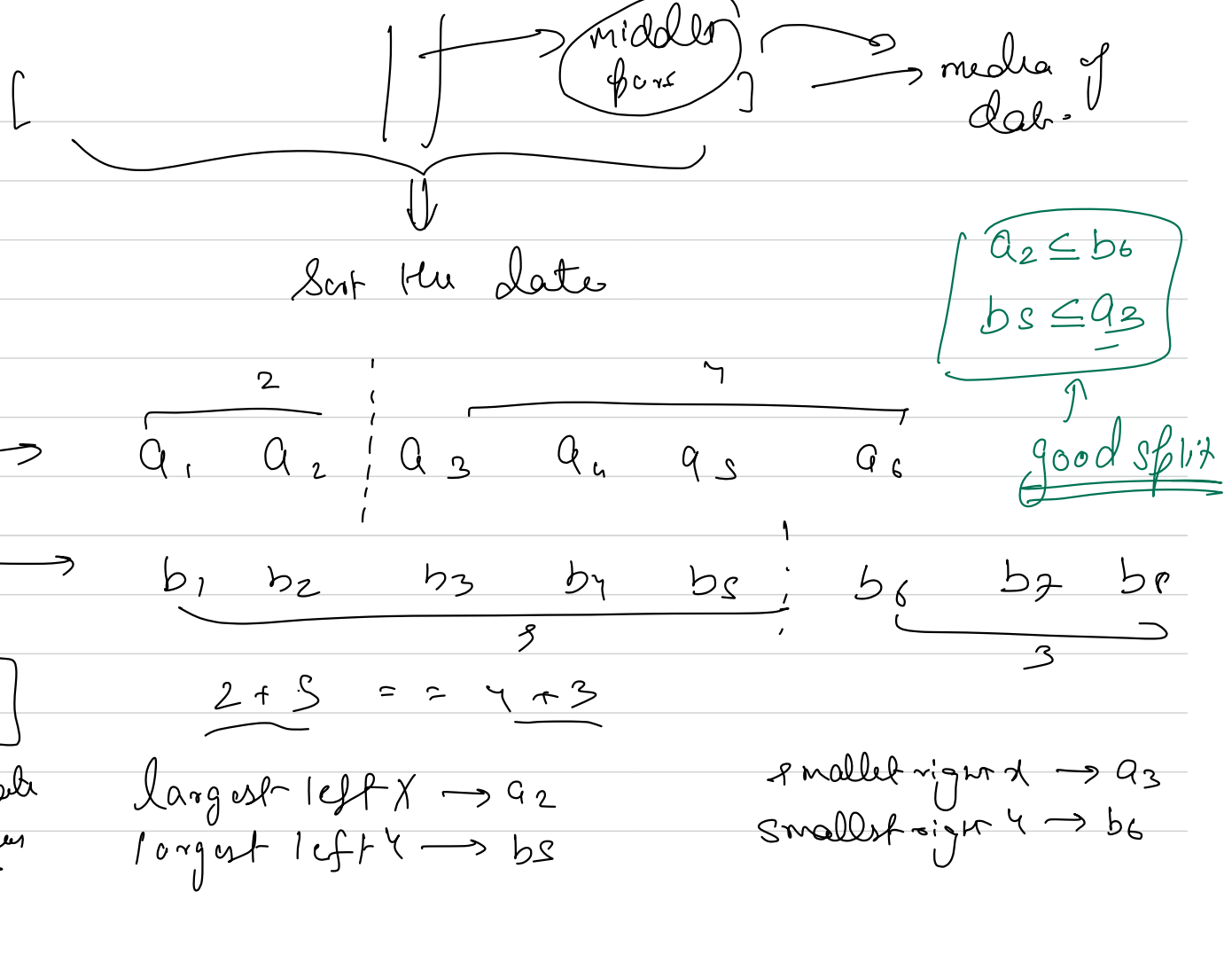
[2] → m

Ex → [1, 12, 15, 26, 38]

[2, 13, 17, 30, 45]

ans 16

Try to do this in less than $O(n)$ & less than $O(m)$ & less than $O(n+m)$

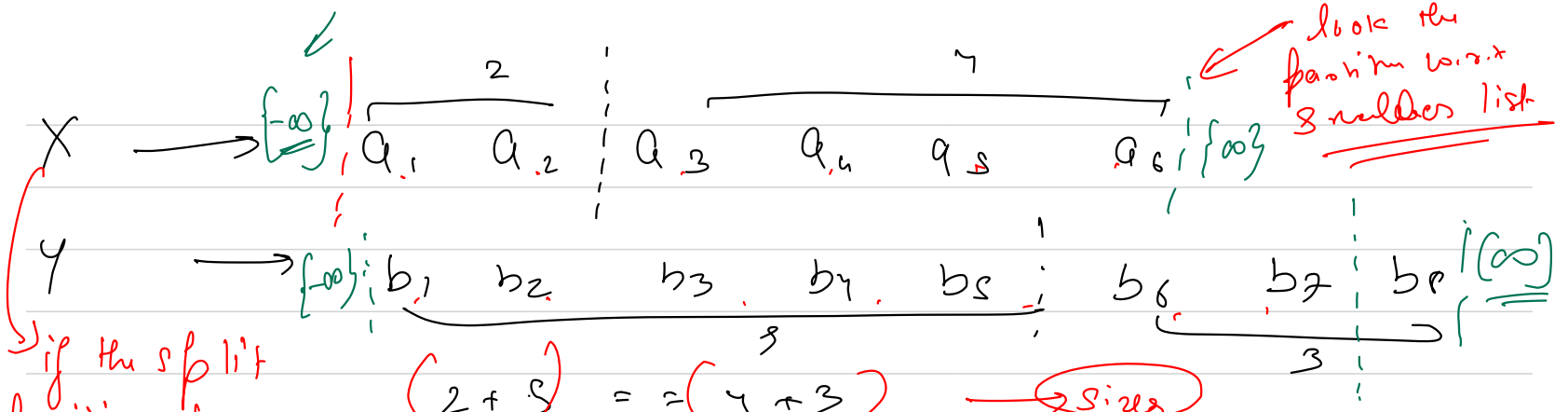

middle pairs
median of data
Sort the data
$a_2 \le b_6$
$b_5 \le a_3$
good split
X → a_1 a_2 | a_3 a_4 a_5 a_6
Y → b_1 b_2 b_3 b_4 b_5 | b_6 b_7 b_8
2
4
5
3
2 + 5 = = 4 + 3
a_2, b_5, a_3, b_6
may be candidate to calc median
largest left X → a_2
largest left Y → b_5
smallest right X → a_3
smallest right Y → b_6

$a_2 \leq b_6$

$b_5 \leq a_3$

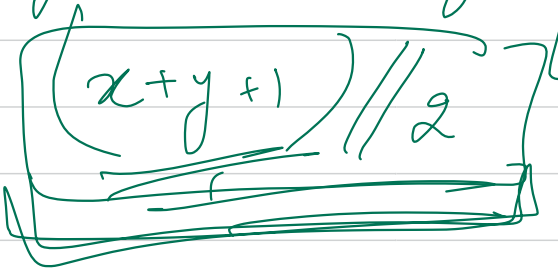
if this doesn't holds true we change the split

We already know $a_2 \leq a_3$ and $b_5 \leq b_6$ but if $a_2 \leq b_6$ and $b_5 \leq a_3$ then every thing on left side is less than or equal to every thing on right & this is the best split


look the position with smaller list
X
Y
$-\infty$
a_1 a_2 a_3 a_4 a_5 a_6
∞
b_1 b_2 b_3 b_4 b_5 b_6 b_7 b_8
2
4
5
3
if the split position changes in X it will also change in Y
$(2+5) == (4+3)$
sizes
largest left X → a_2
largest left Y → b_5
smallest right X → a_3
smallest right Y → b_6
$a_2 \le b_6$
$b_5 \le a_3$
what can go wrong → $a_2 > b_5$
go to left
$b_5 > a_3$
go to right

→ X → no of elents → x

Y → no of elents → y



partitionX

partitionY = (x+y+1)//2 − partitionX

partitionX + partitionY = (x+y+1)//2

Find a good split → BS