Dynamic Programming - III

Complete Course on Algorithms

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In Q.S the sorting of n- numbers 300 largest ele selected as pivot using $\Theta(n^2)$ TC algo. then what is the TC of Q.S in Best case?

(a) $\Theta(n \log n)$ (b) $\Theta(n^2)$ (c) $\Theta(n^3)$ (d) $\Theta(n)$

$$T(n) = \underbrace{n^2 + n}_{\text{P.S}\quad\text{P.A}} + T(n-300) + T(300-1)$$

$$= n^2 + T(n-300) \Longrightarrow \frac{n}{300} * n^2 \Longrightarrow \Theta(n^3)$$

[EC]

middle ele $\Longrightarrow$ $\frac{n}{2}$ ele

median ele $\Longrightarrow$ $\frac{n}{2}$ Smallest ele

$\Downarrow$

~~n^2~~ $\theta(n) \Longrightarrow$ median of 5 algo [HW]

$T(n) = \underbrace{n + n}_{\text{P.S}\quad\text{P.A}} + T(n/2) + T(n/2) \Longrightarrow 2T(n/2) + \underbrace{2n}_{\uparrow 2n} \Rightarrow \underline{\underline{2n \xi^n}}$

$\downarrow$

$O(n \log n)$ [EC]

Counting no. of. inversions

i/p: An array of n-elements

o/p: Count no. of inversions

$i < j$

$a[i] > a[j]$

m.s

nlogn

ex

a

1	2	3	4	5	6	7	8	9	10	11	12
80	15	10	1	75	92	160	16	3	88	28	14

$5 < 8$

$a[5] > a[8]$

80 ⇒ 15, 10, 1, 75, 16, 3, 28, 14 ⇒ 8

15 ⇒ 10, 1, 3, 14 ⇒ 4

75 ⇒ 16, 3, 28, 14 ⇒ 4

10 ⇒ 1, 3 ⇒ 2

92 ⇒ 16, 3, 88, 28, 14 ⇒ 5

8 + 4 + 2 + 5 + 4 + 5 + 2 + 1 + 2 ⇒ 33

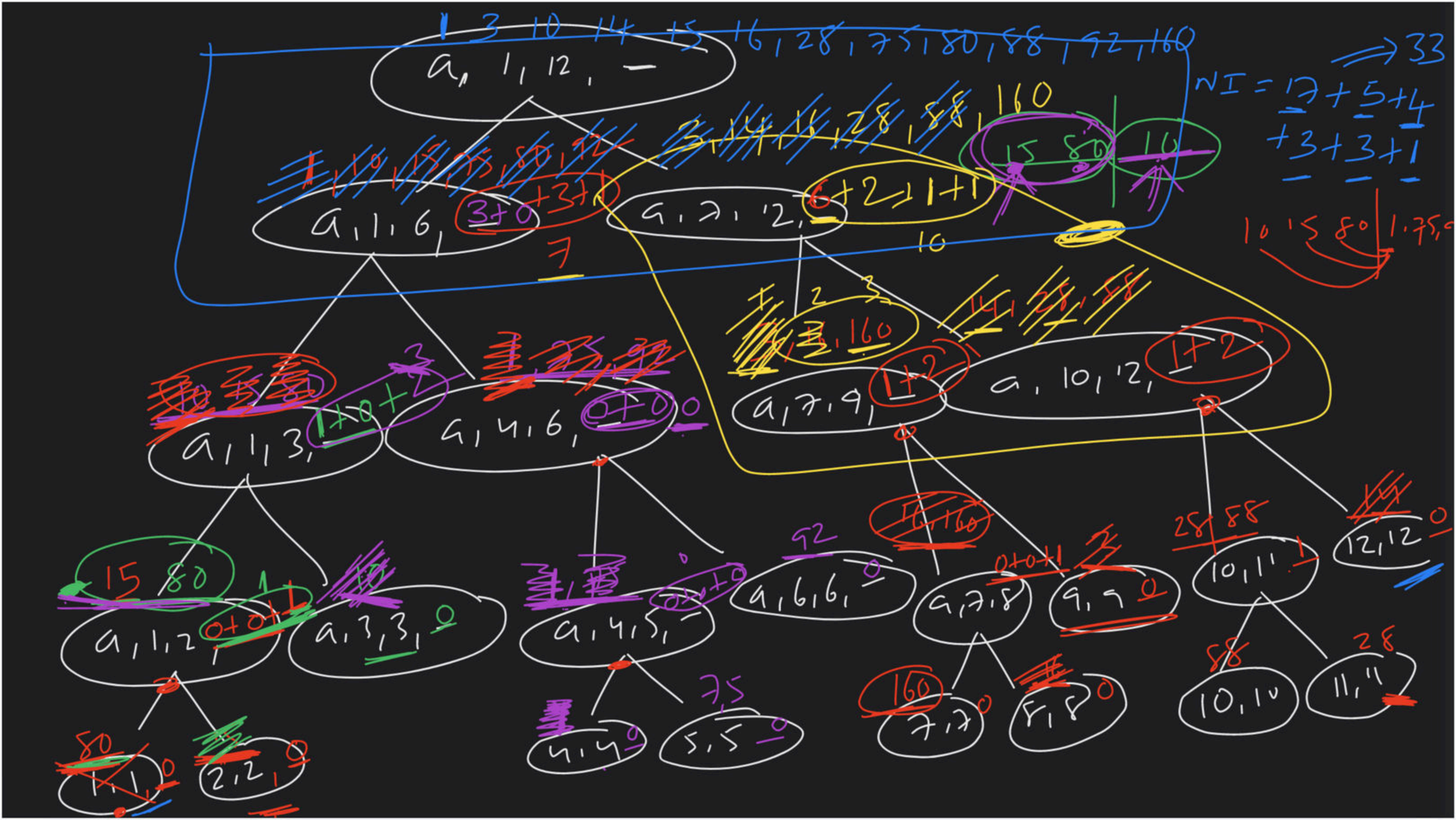
160 ⇒ 5

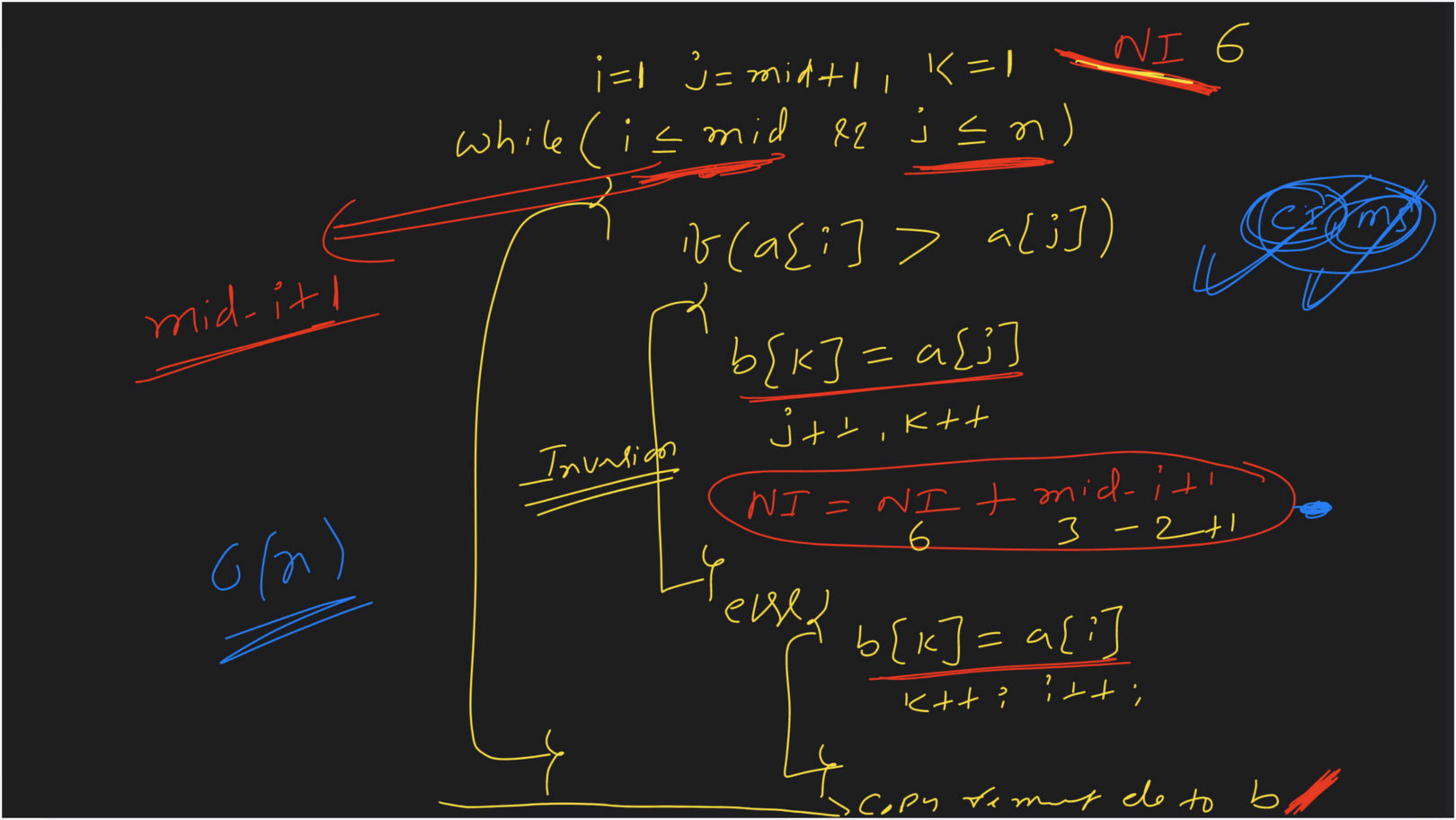
3 ⇒ 0

88 ⇒ 2

28 ⇒ 1

16 ⇒ 3, 14 ⇒ 2


a, 1, 12, –
a, 1, 6,
a, 7, 12,
a, 1, 3,
a, 4, 6,
a, 7, 9,
a, 10, 12,
a, 1, 2,
a, 3, 3,
a, 4, 5,
a, 6, 6,
a, 7, 8
9, 9
10, 11
12, 12
1, 1
2, 2
4, 4
5, 5
7, 7
8, 8
10, 10
11, 11
NI = 17 + 5 + 4 + 3 + 3 + 1 ⟹ 33


i=1 j=mid+1, k=1
NI 6
while(i ≤ mid && j ≤ n)
mid-i+1
if(a[i] > a[j])
b[k] = a[j]
j++, k++
Inversion
NI = NI + mid-i+1
6 3 -2+1
O(n)
else{
b[k] = a[i]
k++; i++;
Copy remaining to b

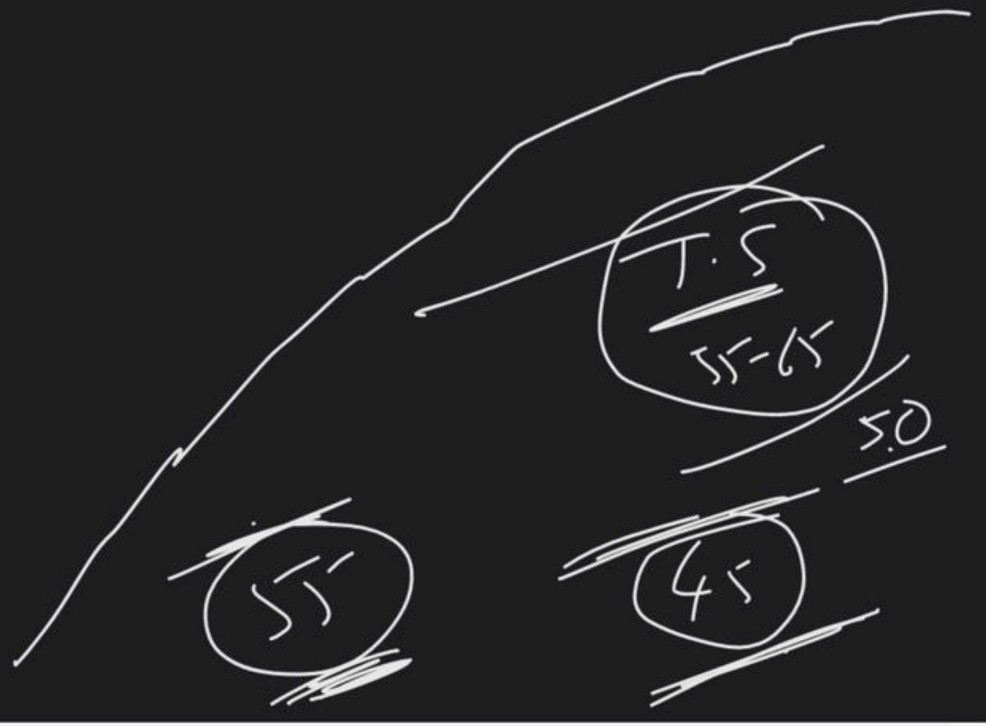
Thanks All

Dedication

$$T(n) = c + n + T(n/2) + T(n/2)$$

$$= 2T(n/2) + n$$

$$= \Theta(n \log n)$$


T·S
55-65
5.0
55
45