Class 11

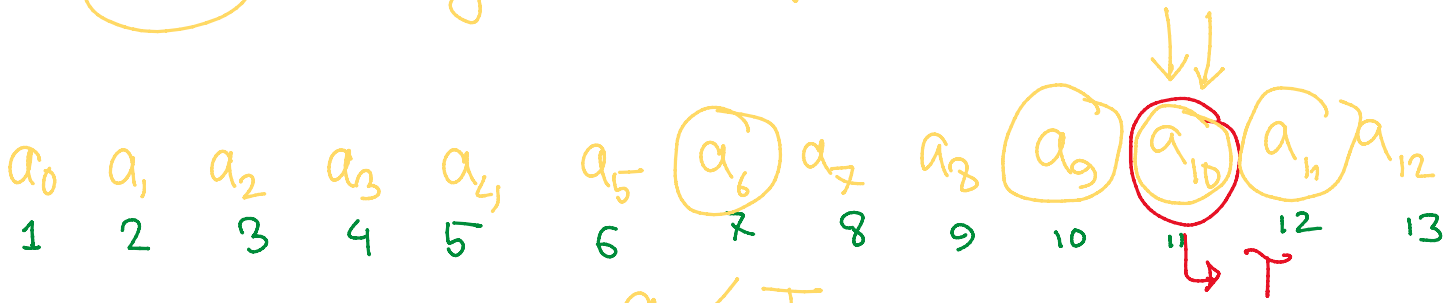
Sunday, November 22, 2020 9:45 PM

Binary Search

1 5 6 8 13 110 282

110 ← target

O(N) ← Time ← Linear Search



target = T = 11 $a_6 < T$ $12 > 11$

$$N \to \frac{N}{2} \to \frac{N}{4} \to \frac{N}{8} \to \frac{N}{16} \to \cdots\cdots \to \frac{N}{2^k}$$

$\frac{N}{2^k}$ → 1

$$\frac{N}{2^k} = 1$$

$$\Rightarrow N = 2^k$$

$$\Rightarrow \log_2 N = \log_2 2^k = k \cdot \log_2 2 = k$$

$$\therefore k = \log_2 N$$

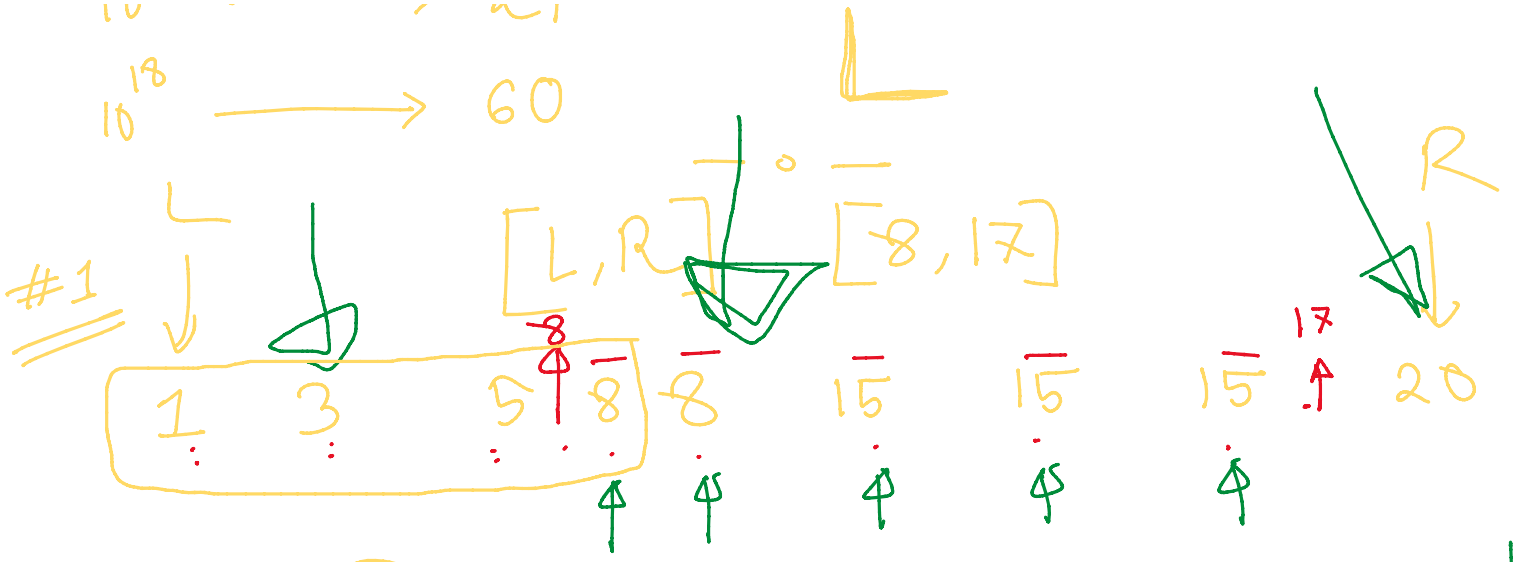
$N = 10^7$

$O(N) \longrightarrow O(\log_2 N)$

$10^7 \longrightarrow 24$

10^8

$10^{18} \longrightarrow 60$



(15)

$a_i \leq T \rightarrow$ upper_bound

$a_i < T \rightarrow$ lower_bound

1 4 6 8 10

A, B

upper(B) − lower(A)

$O(Q \log_2 N)$

$O(5 \times 10^4 \times \log_2(10^5))$

$O(5 \times 10^4 \times 20)$ $\quad 100 \times 10^4 = 10^6$

$5 \times 10^6 < 2 \times 10^8$