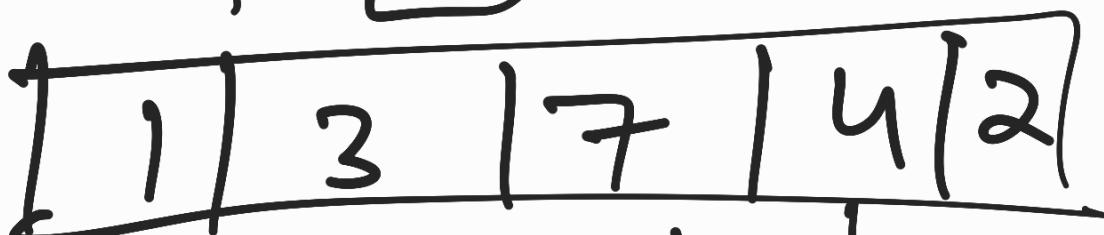
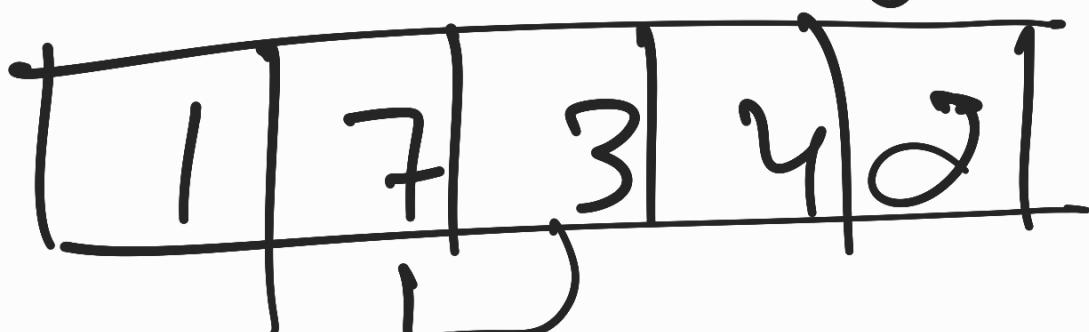
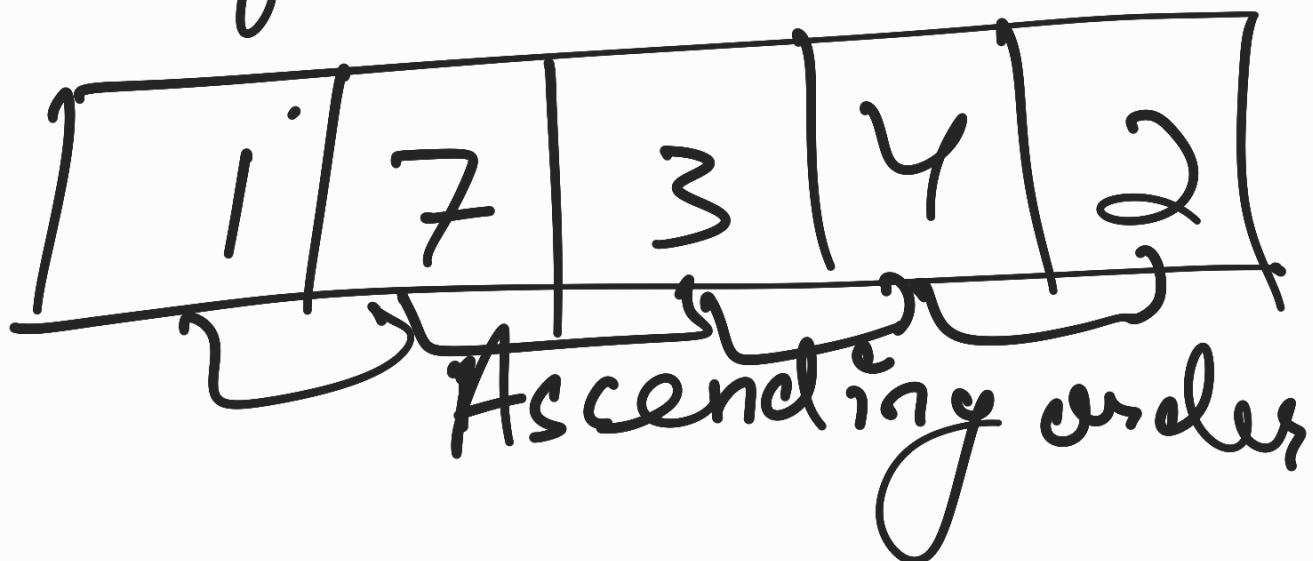


⇒ Pascal Triangle

Recap ⇒ SORTING

⇒ Bubble Sort (Swapping)

Sort the greatest element at first.



If ($\text{arr}[i+1] < \text{arr}[i]$)

1	1	3	1	4	7	1	2
---	---	---	---	---	---	---	---

1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 10

1	1	3	1	4	2	7
---	---	---	---	---	---	---

Descending Order

1	7	3	4	2
---	---	---	---	---

If (arr[i] < arr[i+1])

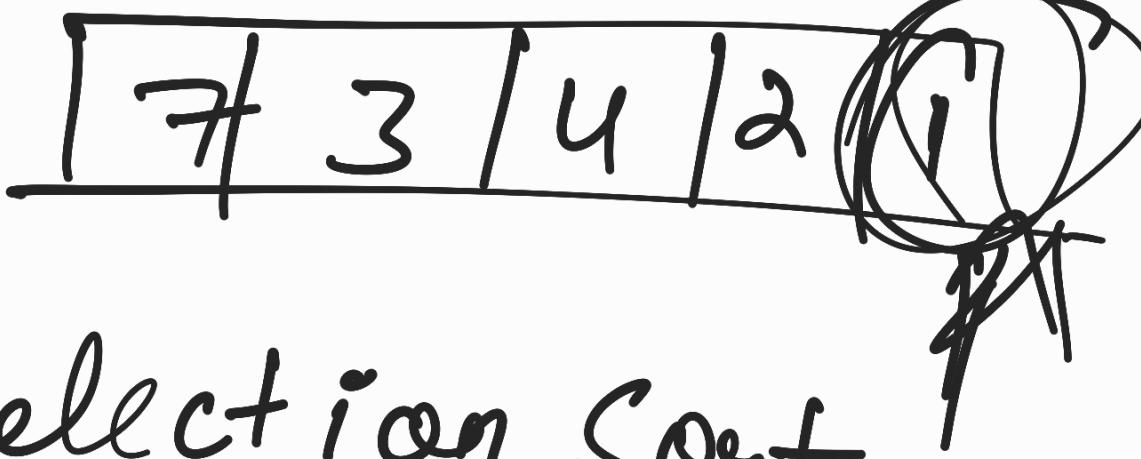
7	1	1	3	4	2
---	---	---	---	---	---

↓

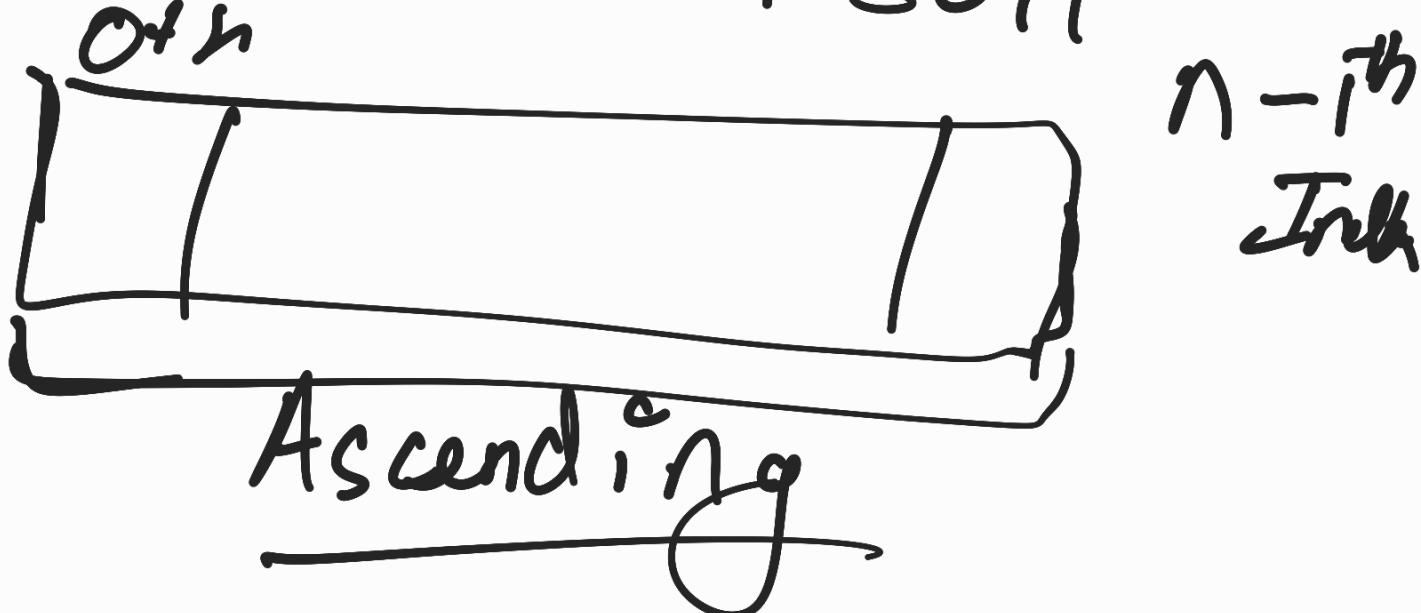
7	3	1	1	4	2
---	---	---	---	---	---

7	3	1	1	2
---	---	---	---	---

↓

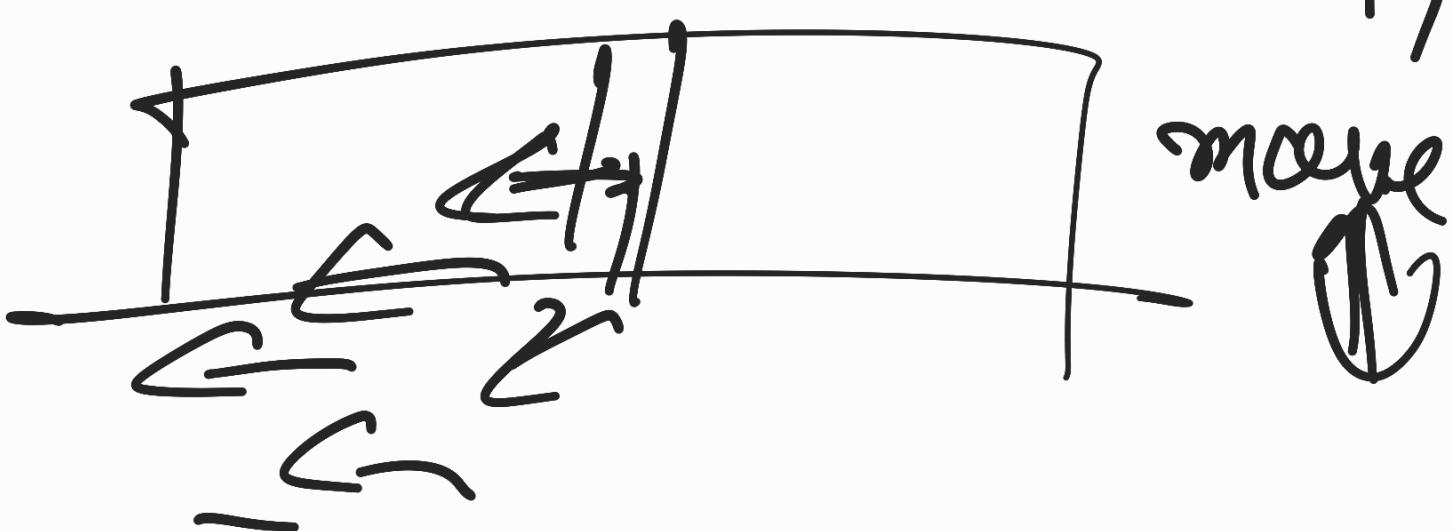


⇒ Selection Sort



Descending small

⇒ Insertion Sort selection small



⇒ Pascal Triangle

1

1

1

1

2

1

1 3 3 1

⇒ 1 ~~3~~ 6 4 1

→ 5 10 10 5 1

→

1 1

1	3	4	7	10	12
---	---	---	---	----	----

$$k = 10 \quad n = 6 \quad \text{mid} = 0 + (5-0)/2 \\ \text{right} = 5 \quad \Rightarrow 2$$

1	3	4	7	10	12
---	---	---	---	----	----

$$\text{arr}[\text{mid}] < k \quad \text{left} = \text{mid} + 1 \Rightarrow 3$$

1	3	4	7	10	12
---	---	---	---	----	----

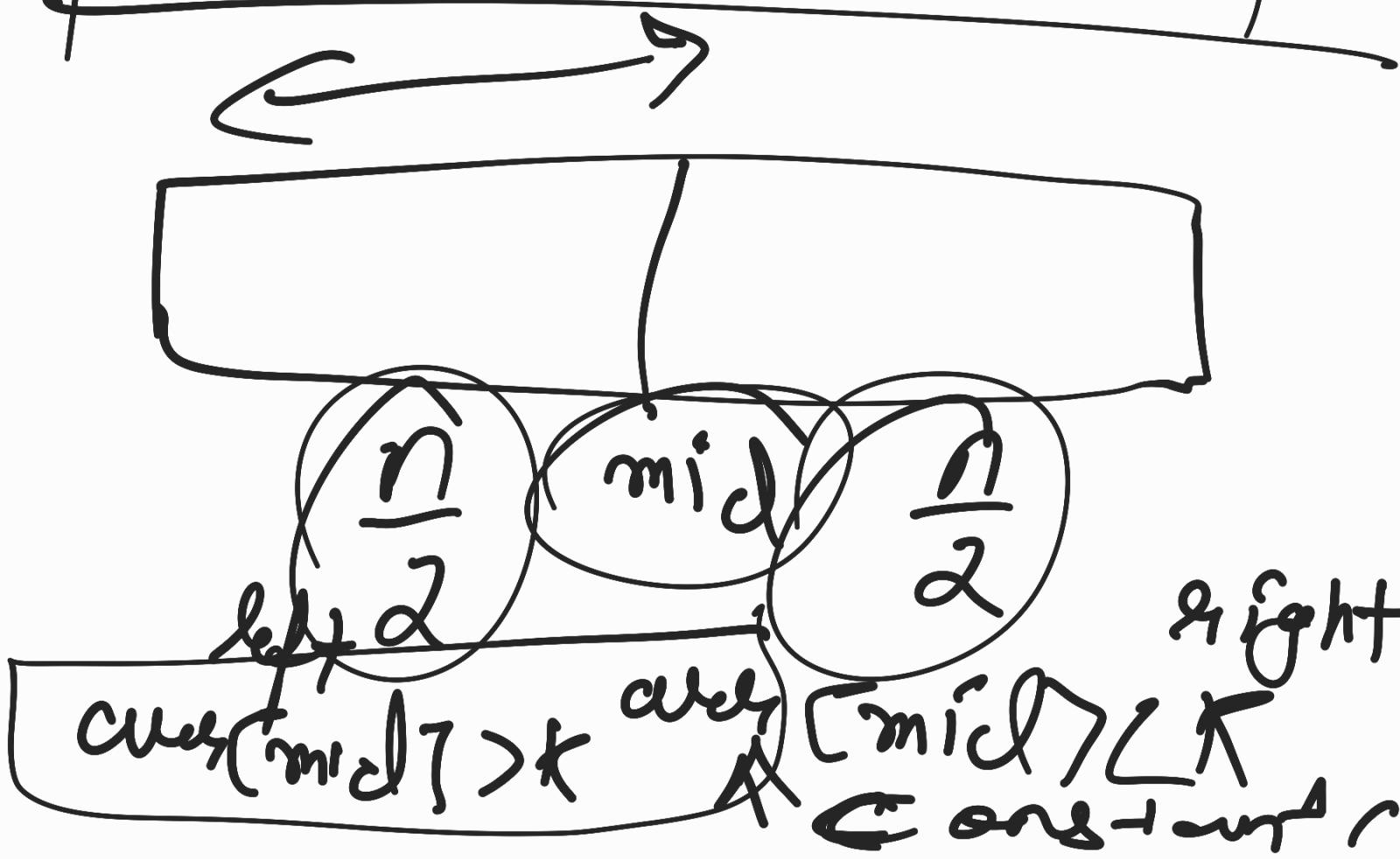
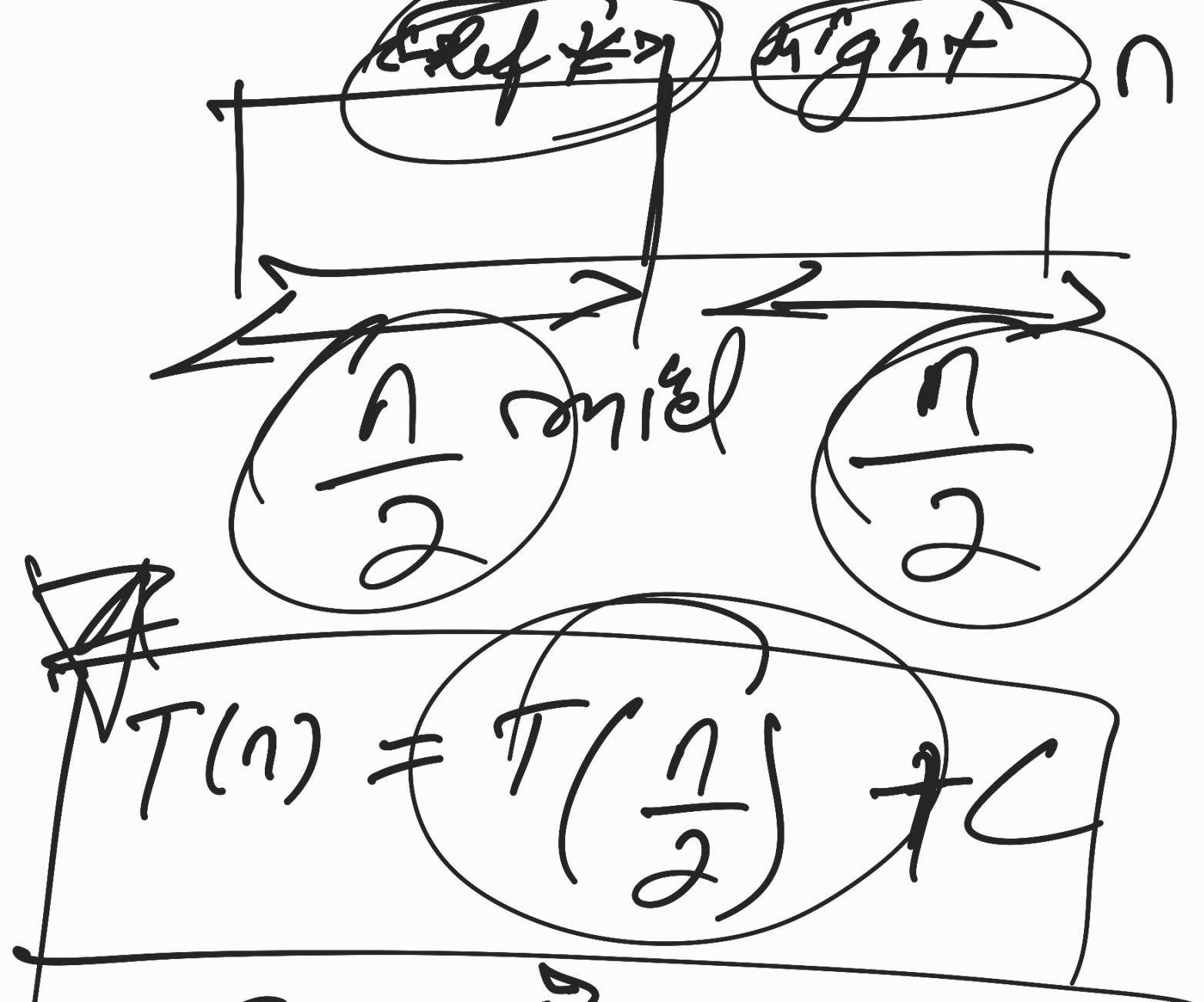
left: 3 right: 5

$$\text{mid} = 3 + (5-3)/2$$

$$\Rightarrow 3 + 1 \Rightarrow 4$$

$$\text{arr}[\text{mid}] = 5$$

(1) left < right mid



$$T\left(\frac{n}{2}\right) = T\left(\frac{\frac{n}{2}}{2}\right) + C$$

$$T\left(\frac{n}{2}\right) = T\left(\frac{n}{2}\right) + C$$

$$T(n) = T\left(\frac{n}{4}\right) + C + C$$

$$T(n) = T\left(\frac{n}{4}\right) + KC$$

$$T(1) = 1, \quad T(q) =$$

$$T(n) = T\left(\frac{n}{8}\right) + 3C$$

$$\left[\frac{n}{2^k} = 1 \right]$$

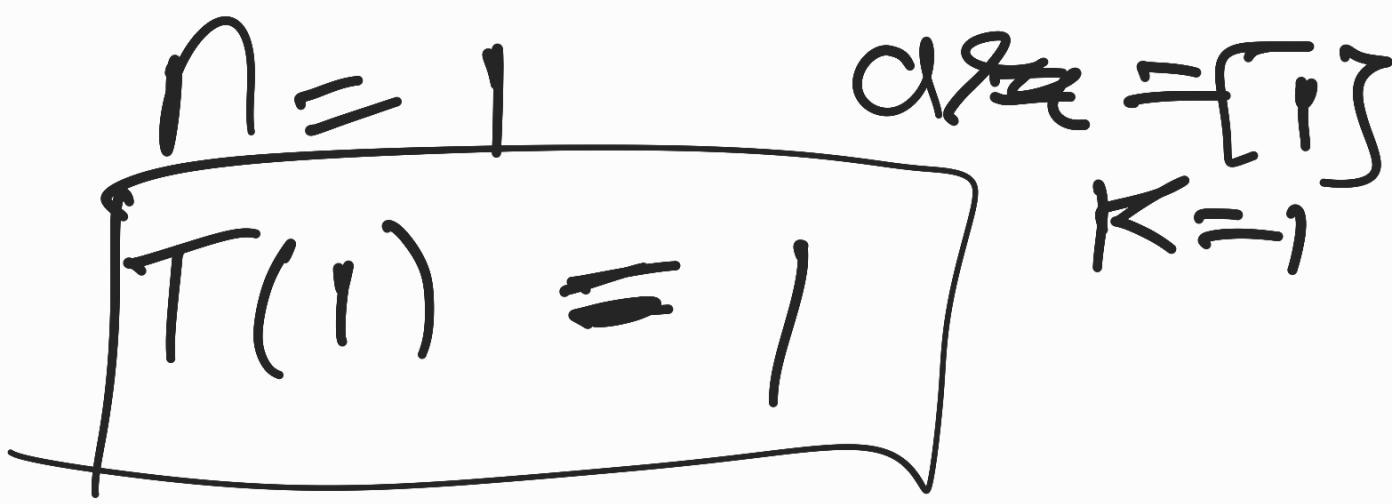
$$\left[n = 2^k \right]$$

$$\left[K = \log_2 n \right]$$

Time ~~O(log n)~~

$$T(n) = c$$

$n \rightarrow$ size of message



$$T(n) = T\left(\frac{n}{2}\right) + C_1$$

$$T\left(\frac{n}{2}\right) = T\left(\frac{n}{4}\right) + C_2$$

$$T\left(\frac{n}{4}\right) = T\left(\frac{n}{8}\right) + C_3$$

$$T\left(\frac{n}{8}\right) = T\left(\frac{n}{16}\right) + C_4$$

$$T(n) = T\left(\frac{n}{16}\right) + 4C$$

$$T(n) = T\left(\frac{n}{2^k}\right) + K$$

$$\bar{T}(n) = T\left(\frac{n}{2}\right) + C$$

$$T(n) = T\left(\frac{n}{4}\right) + K = 2$$

$$T(n) = T\left(\frac{n}{8}\right) + 3C$$

$$T(n) = T\left(\frac{n}{2^k}\right) + K$$

$$\bar{T}(1) = 1$$

$$\frac{1}{2^K} = 1$$

$$n = 2^K$$
$$K = \log_2 n$$

$$T(n) = T\left(\frac{n}{2^K}\right) + C$$

$$T(n) = T(1) + \log_2 n$$

$$T(n) = C \log n$$

$$T(n) = O(\log n)$$