Searching Session

⇒ To find something

⇒ List1 =   [2, 3, 4, 10, 1, 6]

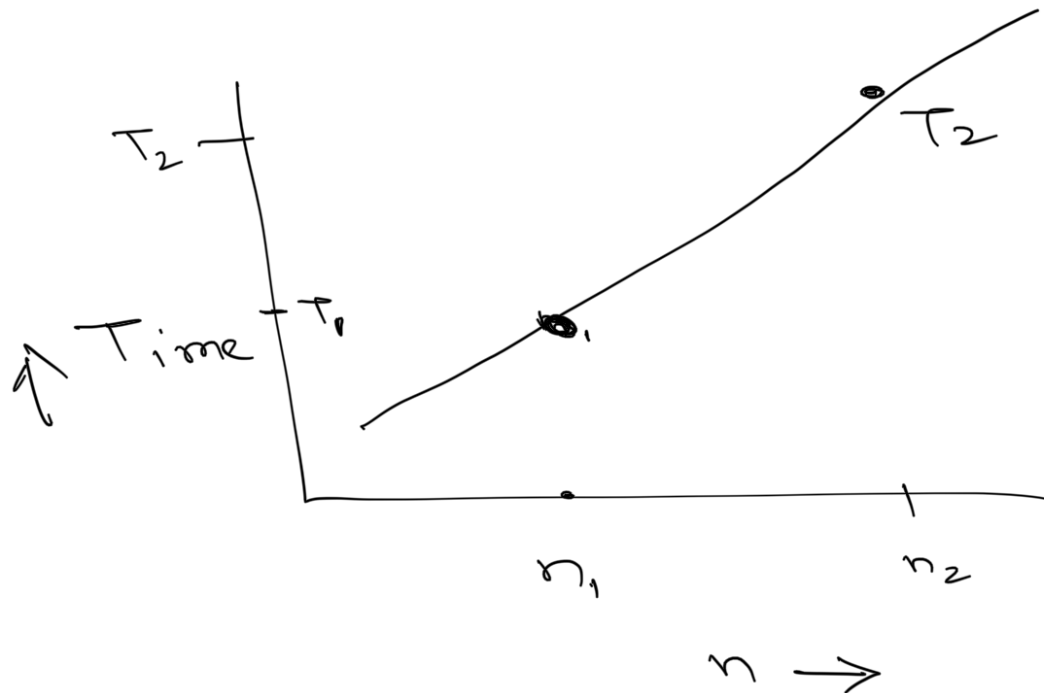Target ⇒ 5
  ↳
      F(List1, 5) ⇒ -1, Not

Target ⇒ 10
  ↳
      F(List1, 10) ⇒ 3

① Linear Search :
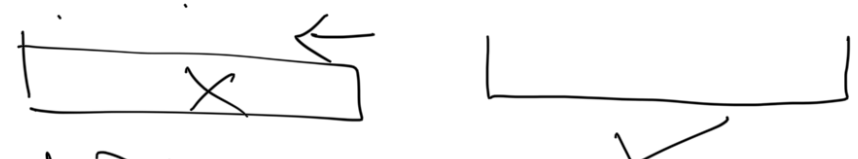
| 10 → | 20 Sec | → 1 element ⇒ 2 se |

100 → 200 secs → 200 sec

———— x ——— x ——— x

1) Binary Search :

⇒ B.S. only works on Sorted List/Tuple

St 0 ___ mid ___ mid+1 ___ 5 End

[1 , 2 , 3 , 4 , 5 , 6]

Target ⇒ 4

♡ mid = (0 + 5) // 2
⇒ 2

2) Start ⇒ mid +1

Start ⇒ 3

end ⇒ 5

$[1 , 2 , 3, 4 , 5 , 6]$

Start ←mid End
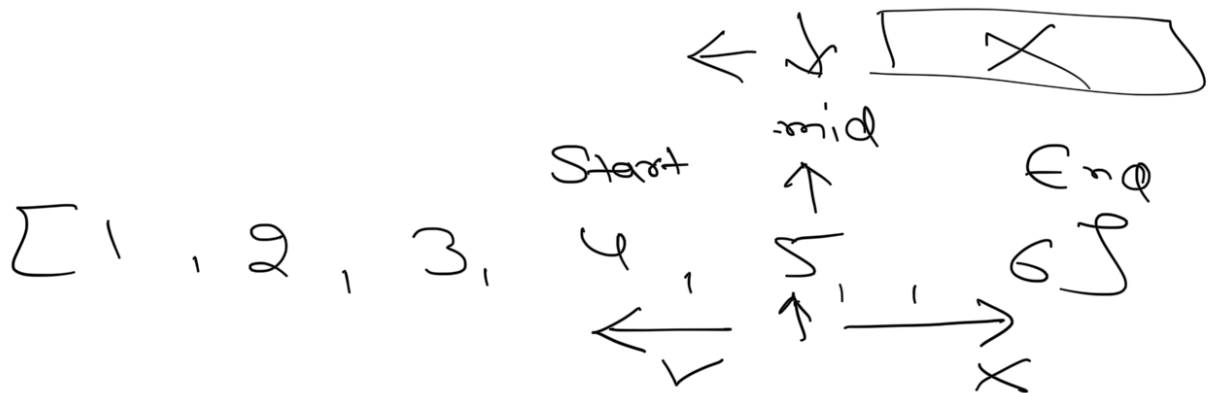
mid ⇒ $(3 + 5) // 2$

⇒ 4

Target ⇒ 4

Compare (Target, midpoint)

end ⇒ mid −1

end ⇒ 3

③ St ⇒ 3   end ⇒ 3
mid ⇒ $(3 + 3) // 2 ⇒ 3$

Compare (mid , Target)

4 == Targel

Start

$S = 0, \text{end} = \text{len} - 1$

$S \geq e$ → no → return -1

$S \geq \text{end}$

$\text{mid} = (S + e) // 2$

$e = m - 1$

$T < [m]$

$S = m + 1$

T to $[m]$

$T > [m]$

$T == [m]$

return m

$[m]$ value
m index

$$X$$

End

$$S \quad 1 \quad , \quad 2 \quad , \quad 3 \quad , \quad 4 \quad , \quad 5 \quad , \quad 6^{\,6}$$

mid $\qquad X \qquad e$

① $\boxed{T < [m]} \Rightarrow e = mid - 1$

② $T > [m]$

$$S \Rightarrow m + 1$$

③ $T == m$

return m

$$S \qquad mid \qquad end$$
$$[1, 2, 3, 4, 5, 7, 8-]$$
$$S$$
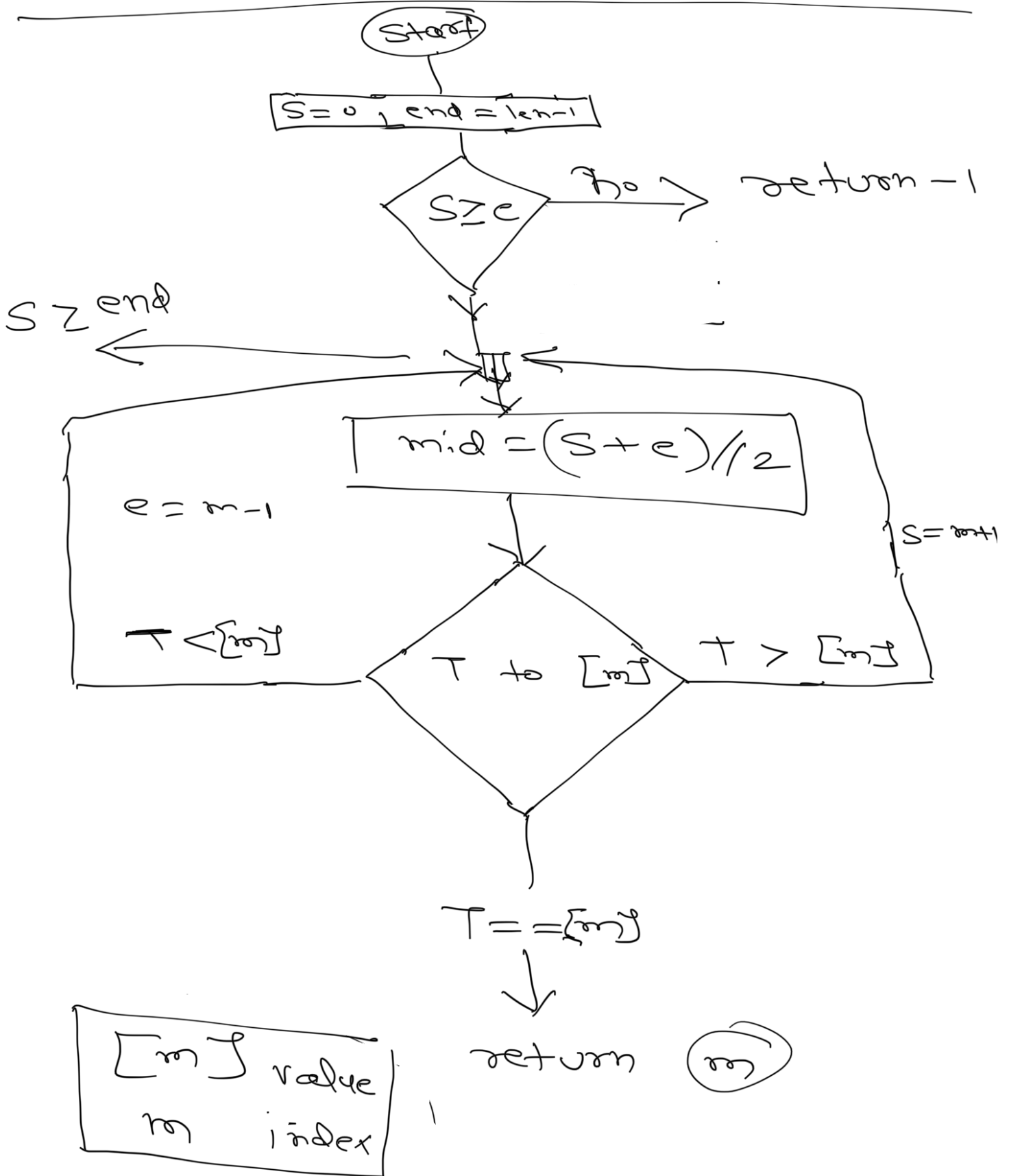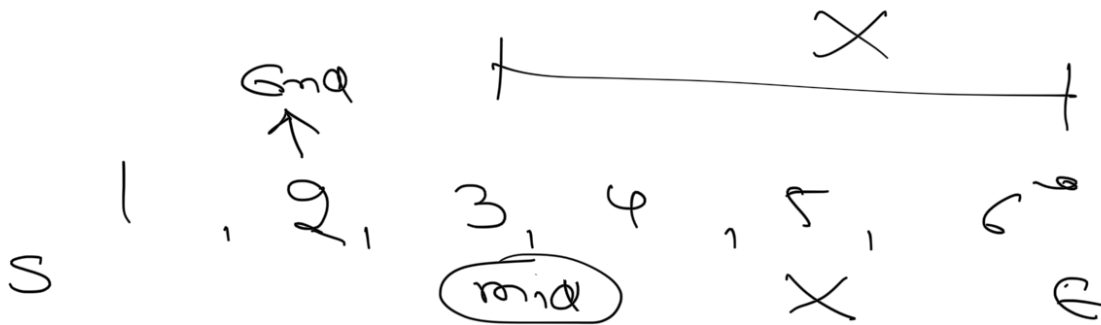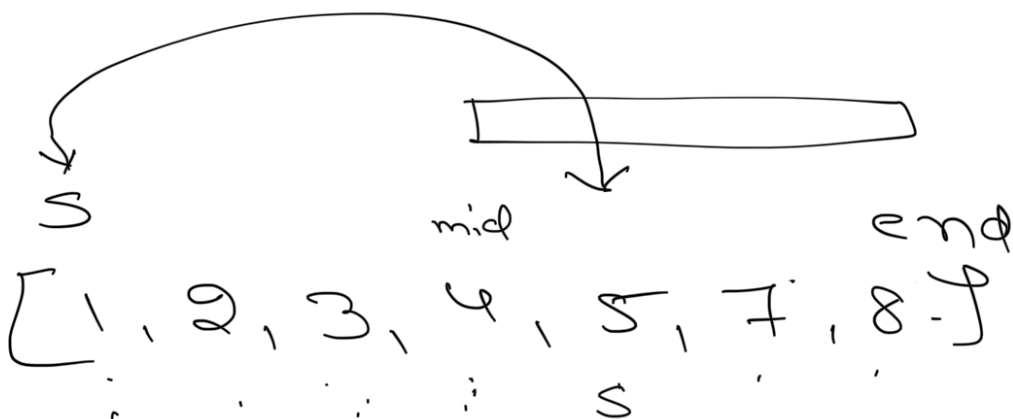
Target $= 7$ ✓

Target $\Rightarrow$ 6 $\checkmark$

(1) $\quad$ S = 0, $\quad$ end = len (list) - 1

$\quad\quad\quad\quad\quad\quad\quad$ 6

$\Rightarrow$ mid $\Rightarrow$ (0 + 6) // 2 $\Rightarrow$ 3

$\Rightarrow$ $\quad$ Target $\quad\quad$ [mid]

$\quad\quad\quad$ 7 $\quad > \quad$ 4

$\Rightarrow$ $\quad$ Start $\Rightarrow$ m + 1

$$[\ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 7 \quad 8 \quad 9\ ]$$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad$ $\uparrow$ $\quad\quad\quad$ $\uparrow$ mid $\quad\quad\quad$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad$ S $\quad\quad\quad\quad\quad\quad$ end

(2) $\quad$ $\Rightarrow$ mid $\Rightarrow$ (4 + 6) // 2 $\Rightarrow$ 5

$\Rightarrow$ $\quad$ Target $\quad\quad$ [mid]

$\quad\quad\quad$ 7 $\quad == \quad$ 7

$\quad\quad\quad\quad\quad\quad$ $\downarrow$

$\quad\quad\quad\quad$ return $\quad$ mid

$Ex \Rightarrow 6 \Leftarrow T$

$[1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 7 \quad 8]$

S: m   end
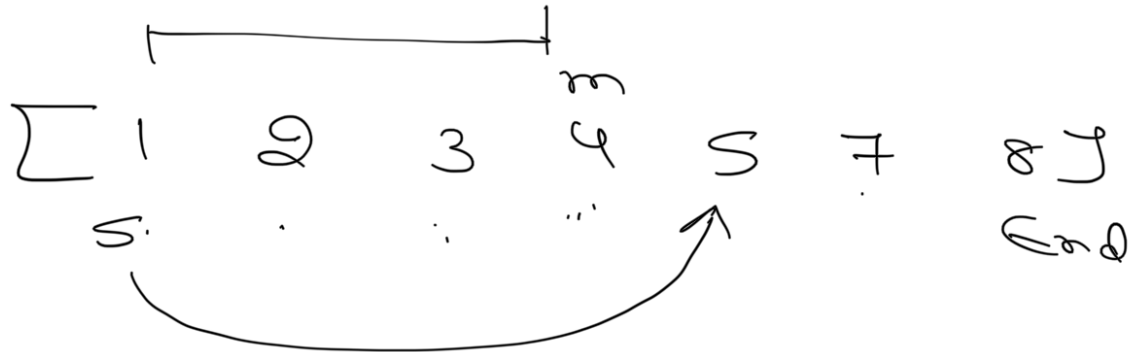
① $\Rightarrow \quad S \Rightarrow 0 \qquad end \Rightarrow 6$

$\Rightarrow \quad mid = (0+6)//2 \Rightarrow 3$

$\Rightarrow \quad T \quad > \quad [m]$

$\qquad 6 \quad > \quad 4$

$\Rightarrow \quad S = m+1 \Rightarrow 4$

② $\qquad S = 4 \quad , \quad end \Rightarrow 6$

$\Rightarrow \quad mid = (6+4)//2$

$\qquad \Rightarrow 5$

$\Rightarrow \quad Compare$

$\qquad Target \quad [5]$

$\qquad 6 \quad < \quad 7$

→ end = $n-1$

[1 2 3 4 5 7 8
            ↑   ↑
           Se   mid
           en   ↑
                    e
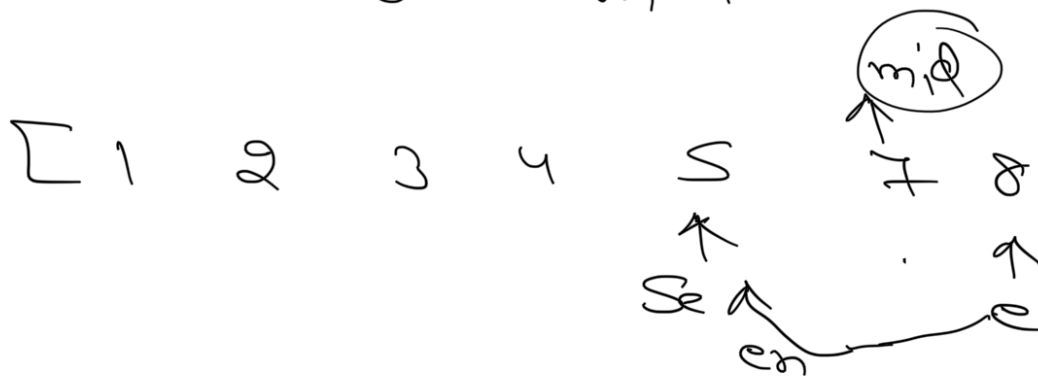
③ S = 4 , end ≥ 4

→ mid = 4

→ Compare

              T   [3]
→   6 > 5

→   S → mid + 1

      S ≥ 5 , end = 4
         ↑   ↑

              end 0   Start
                 ↓   ↑
   1   2   3   4   5   6   7

st > end
No

$\Rightarrow$ N $\leftarrow$ length

①   N/2 $\Rightarrow$ (N/2)

②   N/4 $\Rightarrow$ $\dfrac{N}{2^2}$

③   N/8 $\Rightarrow$ $\dfrac{N}{2^3}$

K

$\dfrac{N}{(2)^K}$ $\Rightarrow$ 1

$$\boxed{\dfrac{N}{2^K}} = 1$$

$$N = 2^k$$

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

$$\Rightarrow k \boxed{\log_2 2}$$

$$\boxed{\Rightarrow \log_2 2 \Rightarrow 1}$$

$$\log_2 N \Rightarrow k \times 1$$

$$k \Rightarrow \boxed{\log_2 N}$$

max iteration