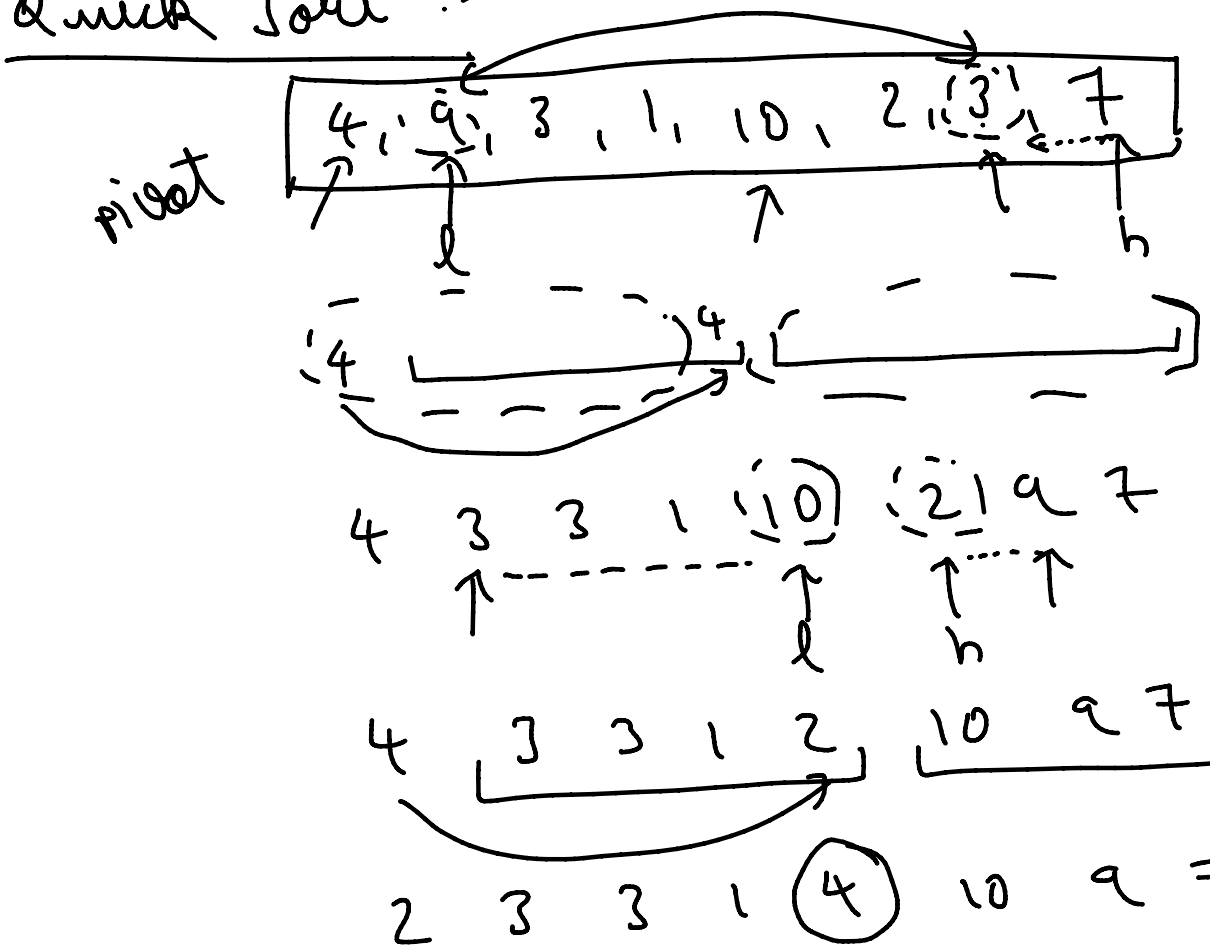
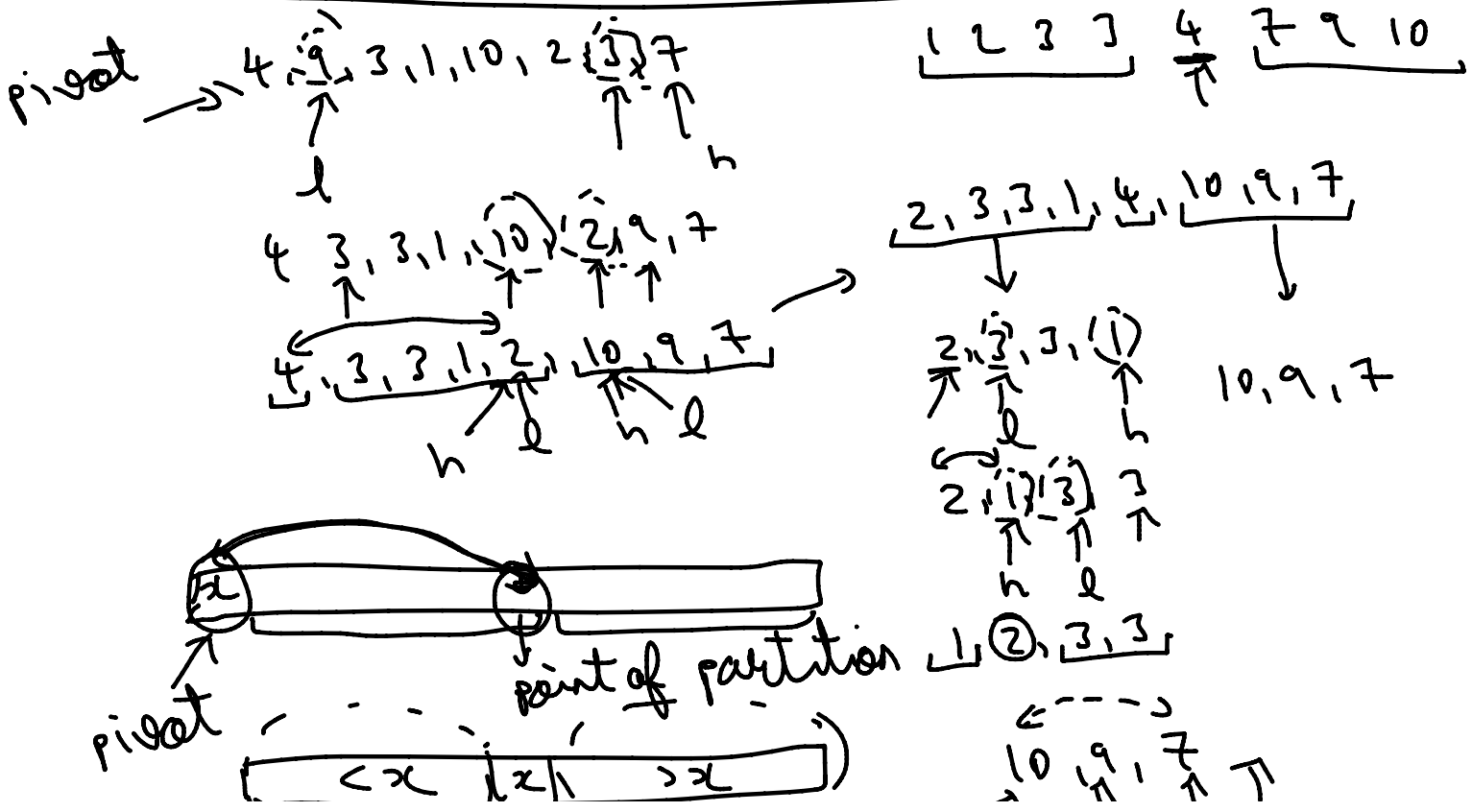
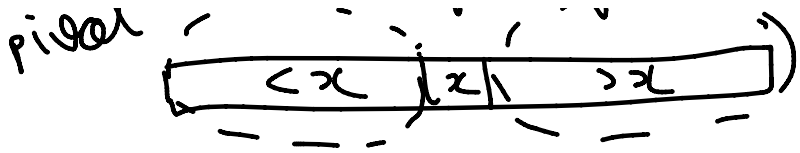
Sorting - 2

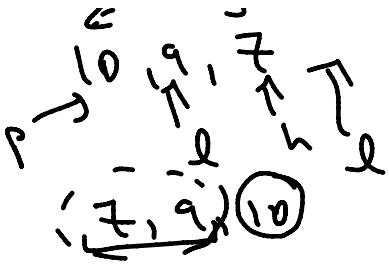
23 June 2024 13:52

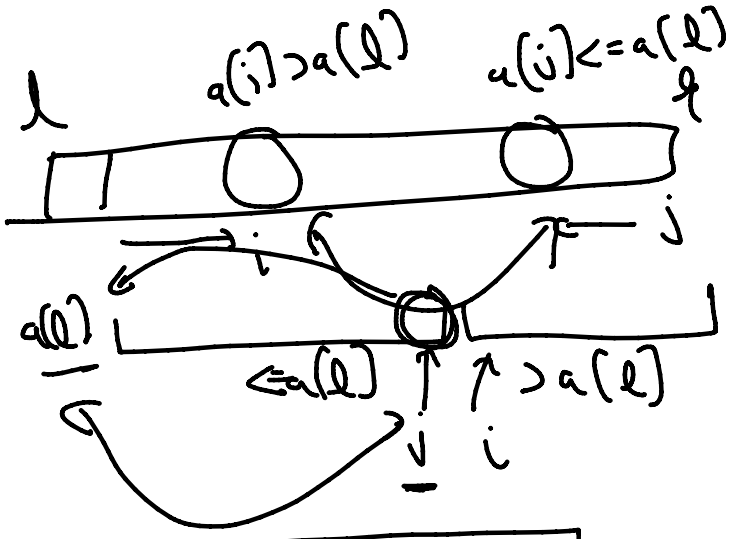
Quick Sort :-

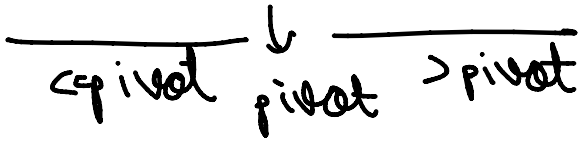




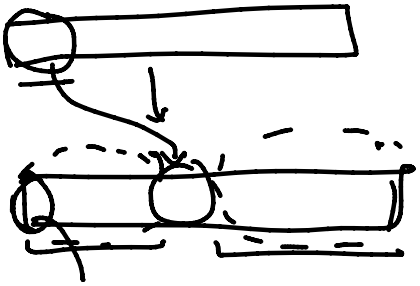


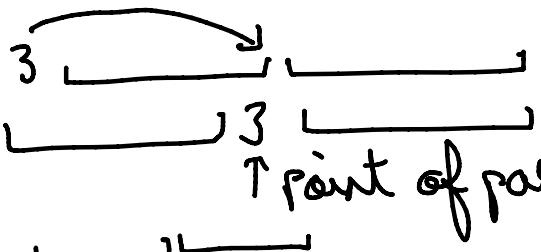


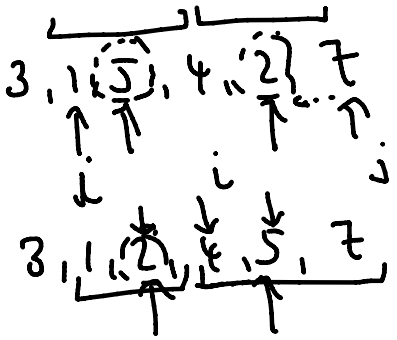


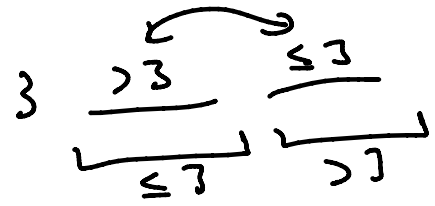


→ 3, 1, 5, 4, 2, 7



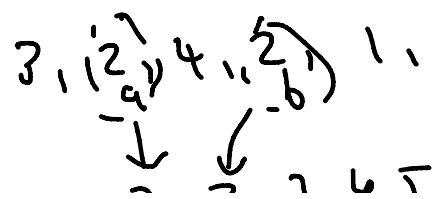






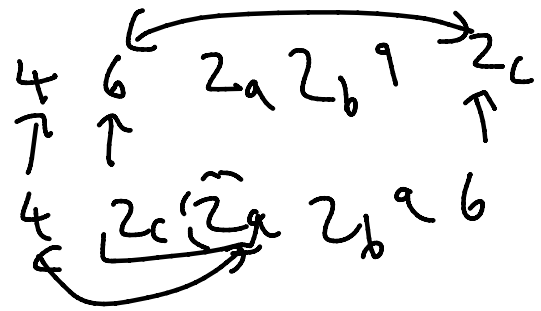
In-place → Yes

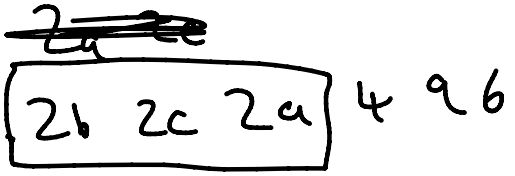
Stable → ? not stable.



Stable → ? not stable.

1, 2, 3, 4, 3, 2, 8, 9





TC :-

Best case :-

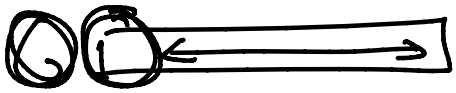
$T(n) = 2T(n/2) + n$

$= O(n \log n)$

$AS = O(\log n)$ → Avg case

$AS = O(n)$ → worst

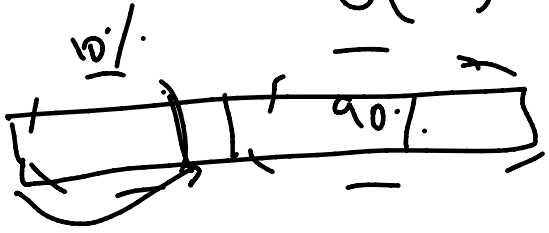
Worst case :-



$T(n) = T(n-1) + n$

$= O(n^2)$

Avg Case :-



$T(n) = T(n/10) + T(9n/10) + n$

$T(n) \rightarrow n$

$\frac{n}{10} + \frac{9n}{10} = n \rightarrow T(n/10) \rightarrow T(9n/10) \rightarrow$

$n \rightarrow \frac{9n}{10} \rightarrow \frac{81n}{100} \cdots$

$K = \frac{\log_2 n}{\log_2 10/9}$

$n \to \frac{9n}{10} \to \frac{81n}{100} \cdots$

$\left(\frac{9}{10}\right)^K n = 1$

$\left(\frac{10}{9}\right)^K = n$

$\Rightarrow K \log_{\frac{10}{9}} 10/9 = \log_{\frac{10}{9}} n$

$K = \log_{\frac{10}{9}} n$

$\log_b a = \frac{\log_c a}{\log_c b}$

$K = \frac{\log_2 n}{\log_2 10/9} = \frac{10 \log_2 n}{0.13}$

$T = \frac{n \log_2 n}{0.13} \approx 10 n \log_2 n \approx O(n \log_2 n)$ Avg

---

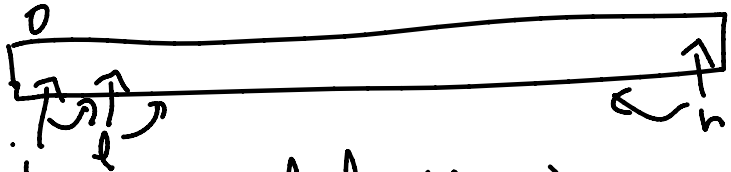
Q/ Triplet with sum 0 :-

sort → T

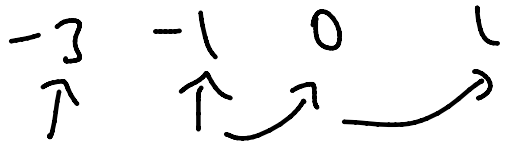
$a[i]+a[l]+a[h]=0$

$a[i]+a[l]+a[h]<0 \to l++$

$a[i]+a[l]+a[h]>0 \to h--$



while (l<h)



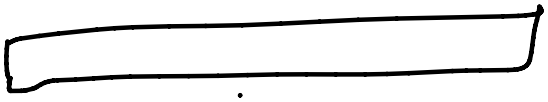
$-2<0$

$-1<0$

+

↑ ↑↗ → ↑ i<0 return true.

Closer Sort :-

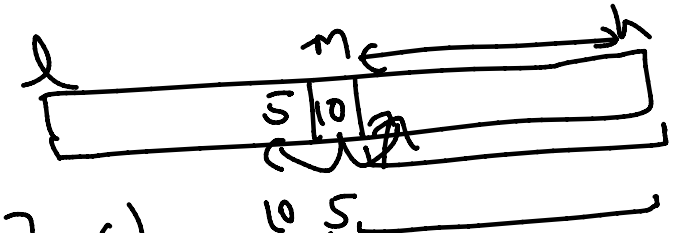


1, 2, 3, 4, 5, 6, 7, 8, 9

1, 2, 3, 4, 6, 5, 7, 8, 9

2, 1, 3, 4, 6, 5, 7, 9, 8

(5) (x)




```
if(a[m]>x)
{
   (m+1)
   (l, m-1)
}
```

```
if(a[m]==x)
   true;
5  10
if(a[m]<x)
{
   m-1 → check
   (m+1, h)
}
```

1, 2, 3, 4, 5, 6, 7, 8, 9

1, 2, 3, 5, 4, 6, 7, 8, 9

```
if(a[m]<x)
{
   m-1 → x ?
   (m+1, h)
}
```

x = 6

5 < 6

x = 5

→ O(n)

3, 4, 1, 1, 5, 2, 1, 3

1 1 2 3 3 4 5

O(max(Ai))

0	1	2	3	4	5
0	2	1	2	1	1

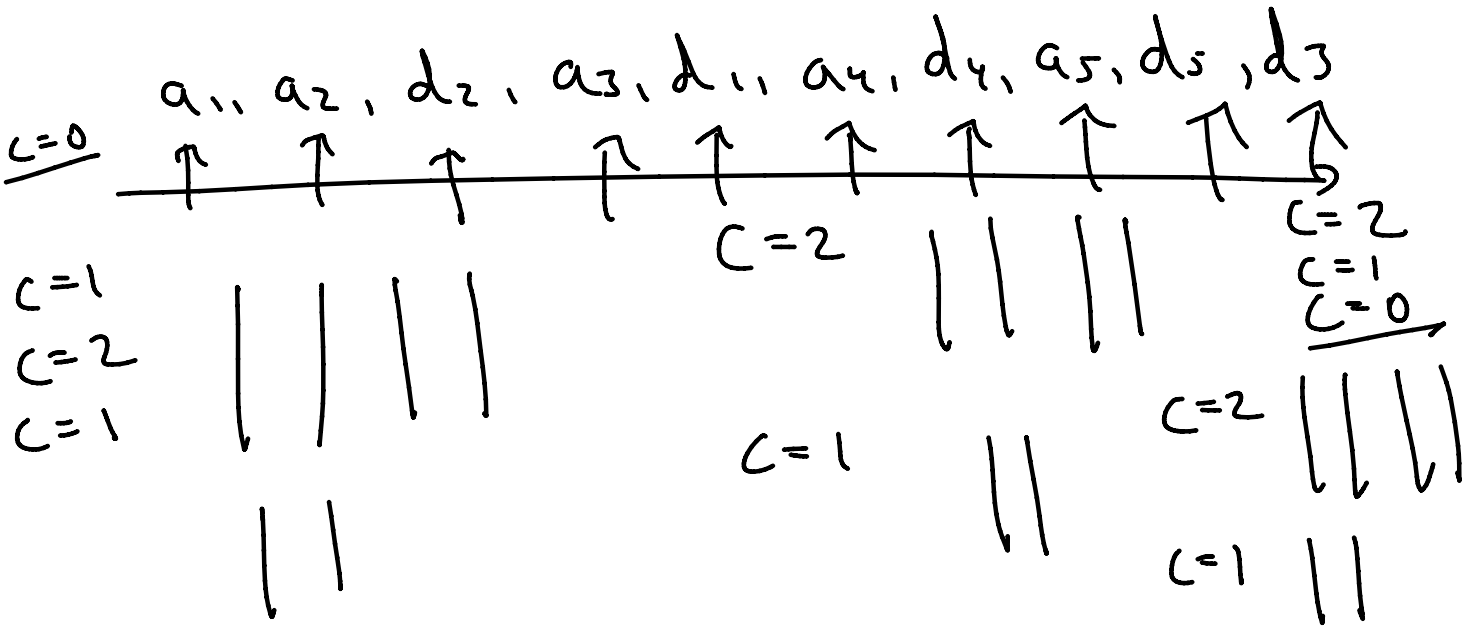
→ C[10^6]

Ai < 10^6

1 1 2 3 3 4 5 → (Ai ≤ 10⁶)

→ a_1, a_2, a_3, a_4, a_5

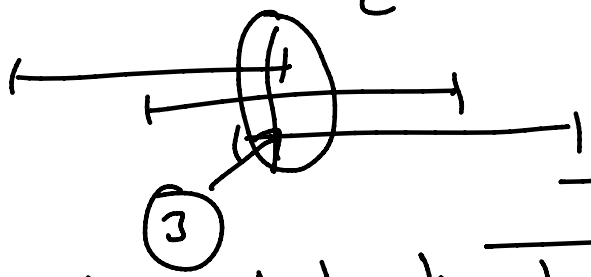
d_1, d_2, d_3, d_4, d_5



→ arr

→ dep

C - -



a = 1, 2, 7, 4 — ans = 2 4

b = 2, 4, 6, 7, 8

a = 1, 2, 2, 6 → ans = 2, 6

1 = 2 2 2 4 → 1, 2, 3, 6

b = 2, 2, 2, 8 →

→ 2, 2, 3, 6

ans = 2, 6

→ 1, 2, 3, 4, 5

→ 1, 3, 4, 4, 6, 7

ans = 1, 1, 2, 3, 4, 5, 6, 7

if(a1[i] <= a2[j]
{

}else{

}

Triangles

2 3 4 5 6

(h-l)

a[i]+a[l] > a[h]

ans++ i

ans = ans + h-l

h--;

i l h

a[i]+a[j] > a[k]

50 70

i j

119

j+1

i → K-1

j+1 to n-1

for i

j

K

50 + (>70)

4 5 6 7 8

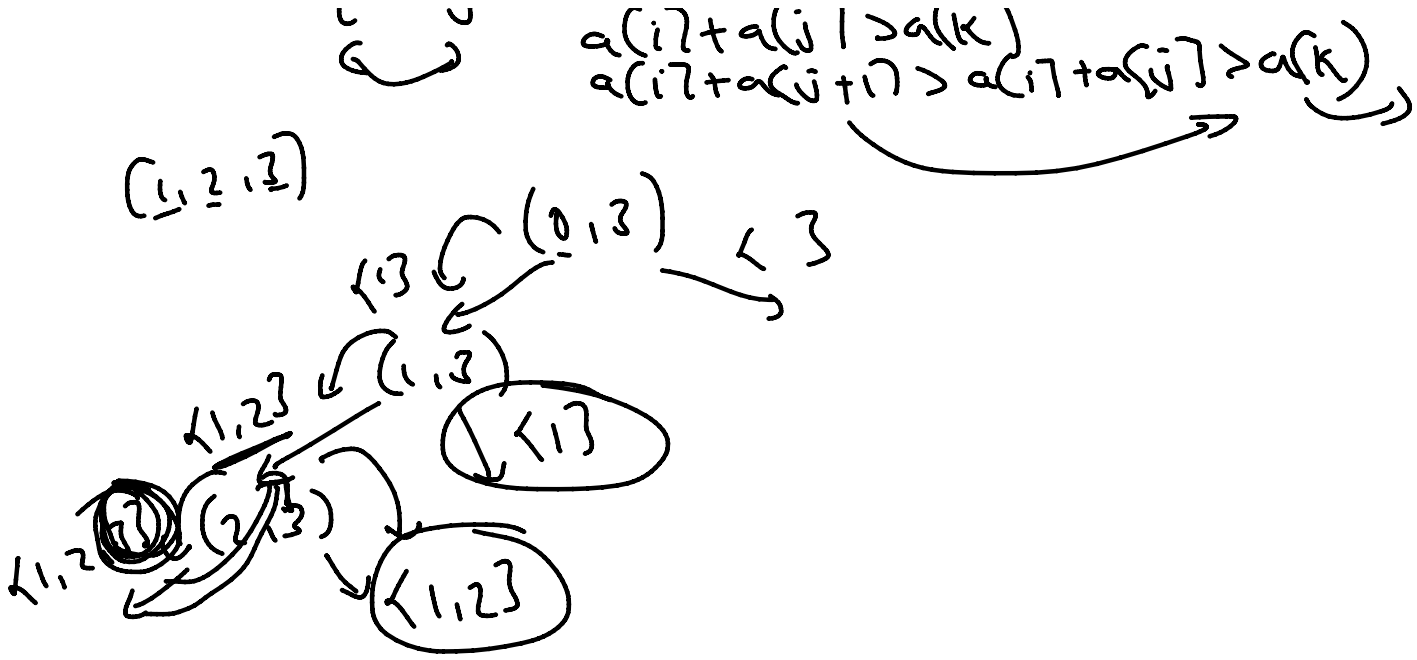
1 3

i j K

(K-j-1)

a[i]+a[j] > a[k]

a[i]+a[j+1] > a[i]+a[j] > a[k]


a[i]+a[j]>a[k]
a[i]+a[j+1]>a[i]+a[j]>a[k]
(1,2,3)
(0,3)
<3
<1,3]
(1,3)
<1,2,3]
<1,3]
<1,2
(2,3)
<1,2]