Problem solving

Saturday, 4 September 2021 8:48 PM

Q Gravity Flip

→ Given N columns of cubes in a box, i^{th} column has a_i cubes

→ Gravity is in downwards direction

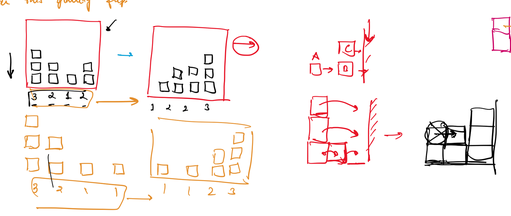
→ Gravity is flipped to right direction.

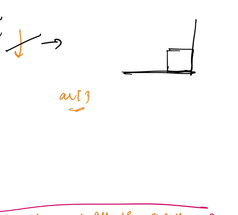
(*) You have to return the height for each column after this gravity flip

Proof by contradiction

There will be some i $a_{i+1} < a_i$

→ i^{th} position has some cubes that won't have any neighbour towards right





AD HOC

Q Circle of Monster

a[] → health of all the monster

b[] → flash damage for each monst

(1) We have N monster sitting on a circular table.

(2) Each monster has health a_i

(3) We have to kill all the monster and we have bullets. 1 bullet decrease the health of a monster by 1 unit

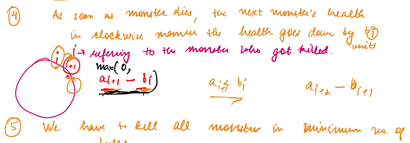
(4) As soon as monster dies, the next monster's health in clockwise manner the health goes down by b_i units

→ referring to the monster who got killed.

$\max(0, a_{i+1} - b_i)$ $a_i \geq b_i$ $a_{i+2} - b_{i+1}$

(5) We have to kill all monster in minimum no of bullets.

(*) if i+1 dead, i+2 won't be affected.



A = [7 2 5]

B = [15 14 3]

Start for i=0

7 bullets

$\max(0, 2-15) = 0$

$2-15$

$\max(5-14, 0) = 0$

Start for i=1

2 bullets

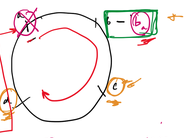
4 bullets

6 bullets

5-14 → 0

0 → observation

(1) We would always kill monster in CLOCKWISE manner



5 bullets

20 bullets

70 bullets

999 bullets

1094

(5)

5 bullet

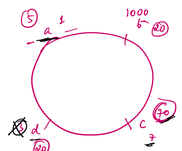
999

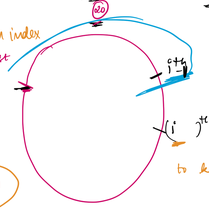
50 bullet

13

1067

$\frac{b_i}{a_i}$ ratio





Start X^{th} index

i^{th} index

i^{th} element to kill i^{th} monster how many bullets will be required

$\max(0, a[x] - b[x-1])$

$a[x]$

$\frac{b_i}{a_i}$

X^{th} index

Total bullets used if we start from x

$\max(0, a[i] - b[i-1])$

$\sum_{0}^{N-1} \max(0, a[i] - b[i-1])$ $- \max(a[x] - b[x-1], 0) + a[x]$

Sum $O(N)$

initial health

ans = INT_MAX

for(x = 0 → N-1)

ans = min(ans, C +

$ans_p = \max(a[i] + b[x-1], 0)$

```
sum = 0
for(i: 0 → n-1)
    sum += max(0, a[i] - b[(i-1+N)%N])
min_bullets = INT_MAX;
for (x = 0 → n-1)
    min_bullets = min(min_bullets, sum - max(0, a[x] - b[(x-1+N)%N]) + a[x])
return min_bullets.
```

i = 0

$i-1 = -1 + N$

5-1 (6)

4+6%6 = (4)

$\boxed{\text{Q minimum}}$

Circular

[i=0]

7 2 5 3 6

15 14 3 4 1

$(i-1+N)\%N$

i = 0

Sum

$\cancel{7-1} + (2-\cancel{15}) + (5-\cancel{14}) + (3-3) + (6-4)$

$7 + (2-15) + (5-14) + (3-3) + (6-4)$

$2-15$

(2)

$\sqrt{1} + \sqrt{2} + \sqrt{3} \ldots + \sqrt{n}$

$n\sqrt{n}$

1 → 2

2 → 2.4

3 → 2.73

4 → 3

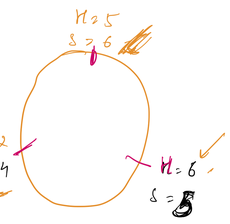
9 →

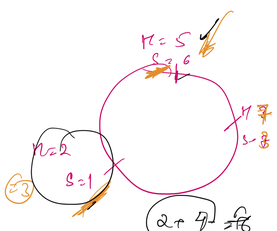
(5)

6+1

(7)

2+1 = (3)





S+1 = (6)

= (7) + 4 = 11

2+4 = 6 ≠ (7)

$i \times i \leq n$ $\lfloor \sqrt{i} \rfloor$

$\sqrt{1} = 1$ $\lfloor \sqrt{2} \rfloor = 1$ $\lfloor \sqrt{3} \rfloor = 1$

$\sum_{i=1}^{\sqrt{n}-1} (2i+1) * i$

$\sqrt{1} + \sqrt{2} + \sqrt{3} \ldots + \sqrt{n}$

$1+1+1 \quad 2+2$

$3 \times 1 + 2 \times 5 + 3 \times 7 + 4 \times 9 \ldots$

$\sum_{i=1}^{\sqrt{n}-1} (2i+1) * i$

$3 \times 1 + 5 \times 2 + 7 \times 3 =$

n = 4

$\sqrt{1} + \sqrt{2} + \sqrt{3} + \sqrt{4}$

$1+1+1+2$

n = 16

$\sum (2i+1) * i$

$\sum 2i^2 + i$

$2\left(\frac{\sqrt{n}(\sqrt{n}-1)(2\sqrt{n}+1)}{6}\right) + \frac{n(n-1)}{2}$

$n\sqrt{n}$

$\sqrt{1} + 5$

$1+1+1+2+2 \ldots + 3 \ldots + 4 + 4$

for (i=0 i<n)

for (j=0 j*j ≤ i) → $\lfloor \sqrt{i} \rfloor$

$\sum_{0}^{n-1} \lfloor \sqrt{i} \rfloor$

$0 + 1 + 1 + 1 + 2 + 2 + 2 + 2 + 2 + 3 + \sqrt{n}$

$\sqrt{0} \to \sqrt{1} \to \sqrt{2} \to \sqrt{3} \to \sqrt{4} \to \sqrt{5} \to \sqrt{6} \to \sqrt{7} \to \sqrt{8} \to \sqrt{9} \to \sqrt{n-1}$

1 − 4 → 3 → 1

4 − 9 → 5 → 3

16 − 9 → 7

25 − 16 → 9

36 − 25 → 11

$\sum_{i=1}^{\sqrt{n}} i * (2i+1)$

$\sum (2i^2 + i)$

$(\sqrt{n})^3 = n\sqrt{n}$

$\frac{\sqrt{n}(\sqrt{n}+1)(2\sqrt{n}+1)}{6} + \frac{\sqrt{n}(\sqrt{n}+1)}{2}$

$n\sqrt{n}$

for(i=0 : k<n

for (j=0 j*j=i*i;

$\sqrt{1} + \sqrt{2}$ $n\sqrt{n}$

(2)

i → 1

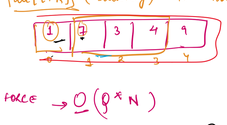
1 → 2

Q

You are given an array with N numbers. You have Q queries in which L & R values will be given. You have to tell if the arr[L:R] (subarray) is non-decreasing or not

[2 1 4] arr[L] ≤ arr[R]

[2 1 3 0]

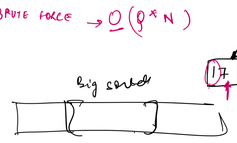


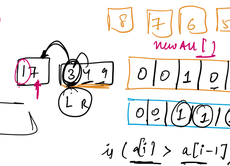
0 1 → Yes

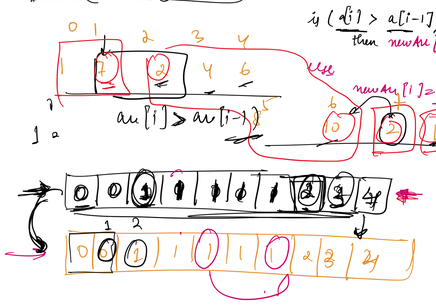
1 3 → No

(N) + Q

BRUTE FORCE → O(Q*N)







[8] [7] [6] [5]

newArr[]

newArr[i] ± newArr[i-1]

O(max(Q, N))

O(Q+N)

n + Q

if (a[i] > a[i-1])

then newArr[i] = 0

else newArr[i] = 1

N → 10^3

Q = 10^5

for (i = 1 → n-1)

if (arr[i] > arr[i-1])

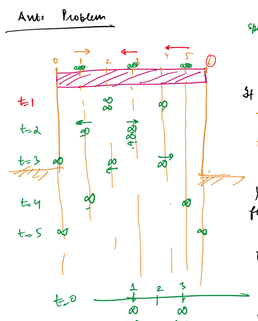
else

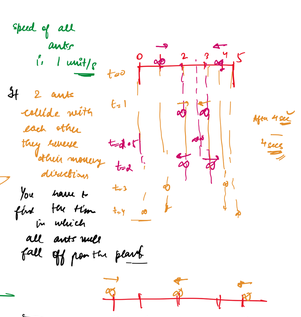
counter++

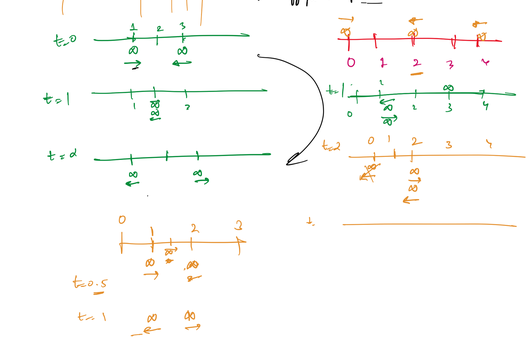
newArr[i] = 1

count = 4 6

Q Ants Problem







speed of all ants is 1 unit/s

If 2 ants collide with each other they reverse their moving directions

You have to find the time in which all ants will fall off from the plank