Contest 2

1.5 hours

3 questions
No MCQ

→ Revise class notes
→ HW / Assignments

Sorting, Bit Manipulation, modular

Interview problems

Q1) Given an array of 0 & 1. You are allowed to replace one of the '0' with '1'. Return the count of max consecutive 1s in the array.

0 1 2 3 4 5 6 7 8
A= { 1 1 0 1 1 0 1 1 1 }

0 1 2 3 4 5 6 7 8
A= { 1 1 1 1 1 0 1 1 1 }   Consec 1s : 5

0 1 2 3 4 5 6 7 8
A= { 1 1 0 1 1 1 1 1 1 }   count 1s : 6

Ans : 6

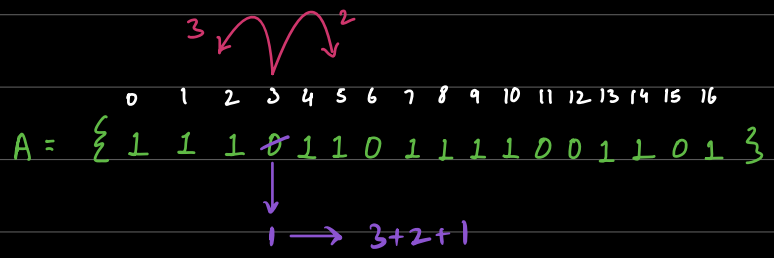
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
A = { 1 1 1 0 1 1 0 1 1 1 1 0 0 1 1 0 1 }

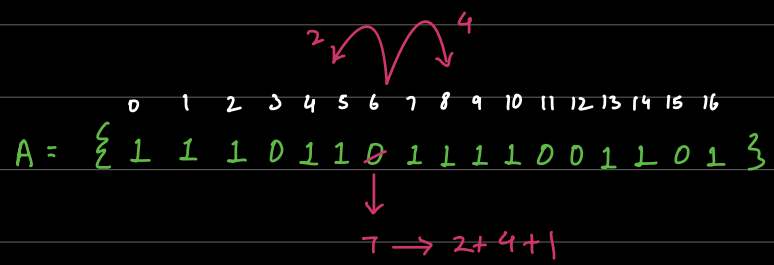
l = 0   l = 3

r = 0   r =

{ 0, 1, 1, 1, 0, 1, 1, 0, 1, 1, 0 }

↓ 4   ↓ 6   ↓ 5   ↓ 3

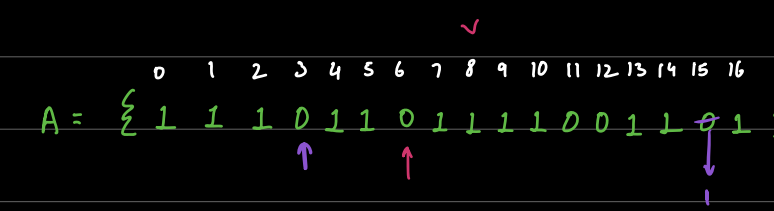


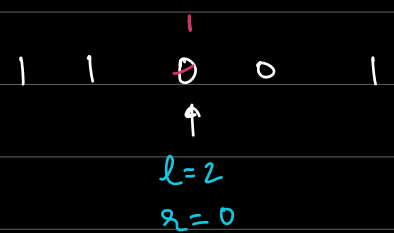


For any zero replaced by 1

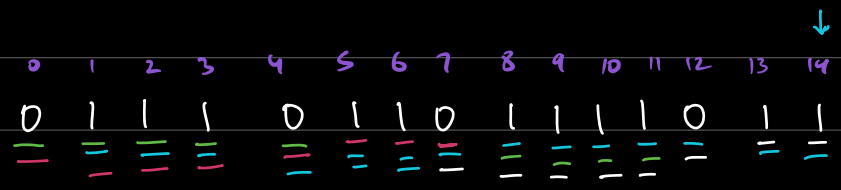
obs:

> Count of consecutive 1s = no. of consec 1s on left
> + " " " right
> + 1



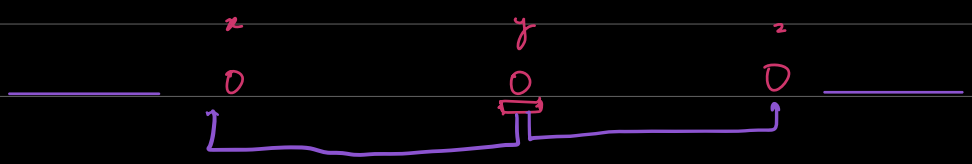


```
consec1max = 0
for (i=0; i<N; i++) {
    if (A[i] == 0) {
        # count consec 1s on left and right
        l = 0
        for (j=i-1; j>=0; j--) {
            if (A[j] == 0) {
                break
            }
            l++
        }

        r = 0
        for (j=i+1; j<N; j++) {
            if (A[j] == 0) {
                break
            }
            r++
        }

        consec1 = l+r+1
        consec1max = max(consec1max, consec1)
    }
}
if (consec1max == 0) { return A.size() }

return consec1max
```



Every element gets iterated not more than 3 times

TC: $O(3N) \simeq O(N)$



Q4) Given an array, find number of triplets i, j & k such that

$i < j < k$

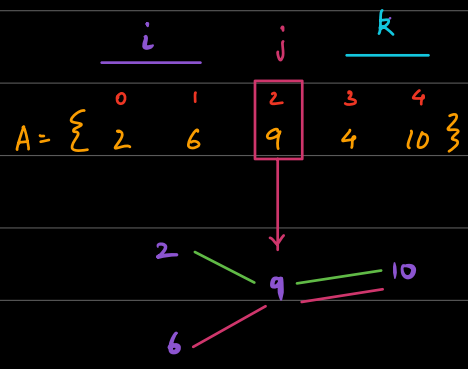
$A[i] < A[j] < A[k]$

	0	1	2	3	4
A = {	2	6	9	4	10 }

i	j	k	A[i]	A[j]	A[k]
0	1	2	2	6	9
0	1	4	2	6	10
0	2	4	2	9	10
0	3	4	2	4	10
1	2	4	6	9	10

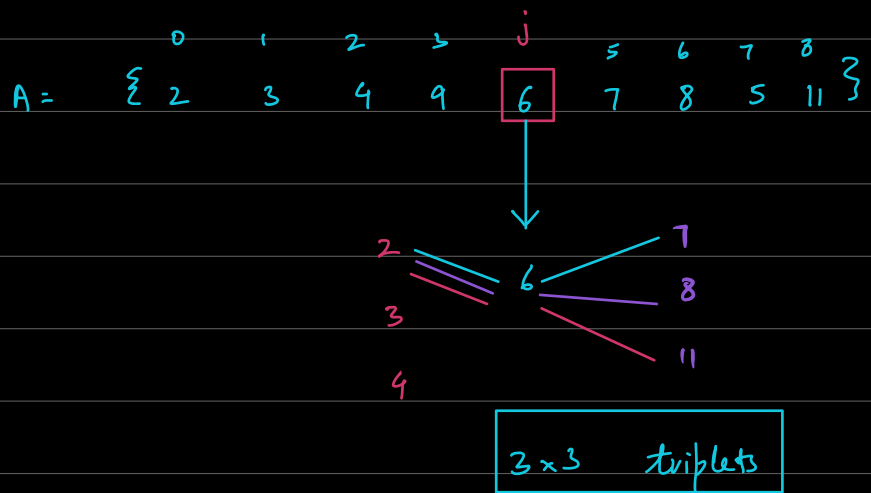
5 triplets are there

Brute force : 3 nested loops



$i < j < k$

$A[i] < A[j] < A[k]$



3 x 3 triplets

	0	1	2	3	4
A = {	2	6	9	4	10 }
l	0	1	2	1	4
r	4	2	1	1	0
ans:	0	1x2 = 2	1x2 = 2	1	0

Ans: 2+2+1 = 5

ans = 0

TC: $O(N^2)$

for every index j

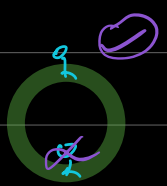
l = 0 i: j-1 → 0 if (A[j] > A[i]) l++

r = 0 k: j+1 → N-1 if (A[k] > A[j]) r++

ans += l*r

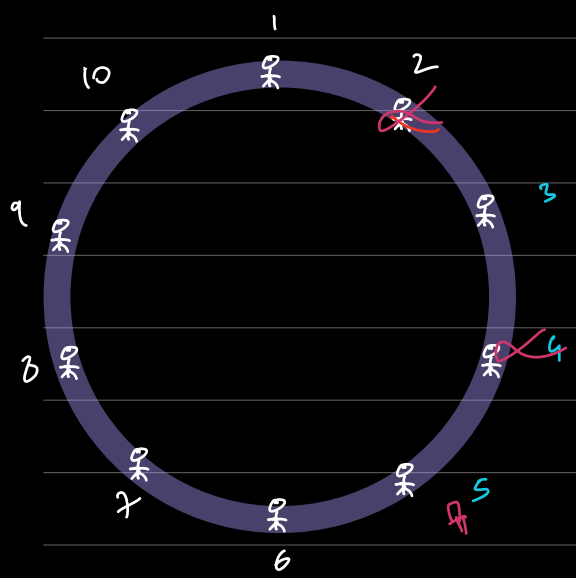
return ans

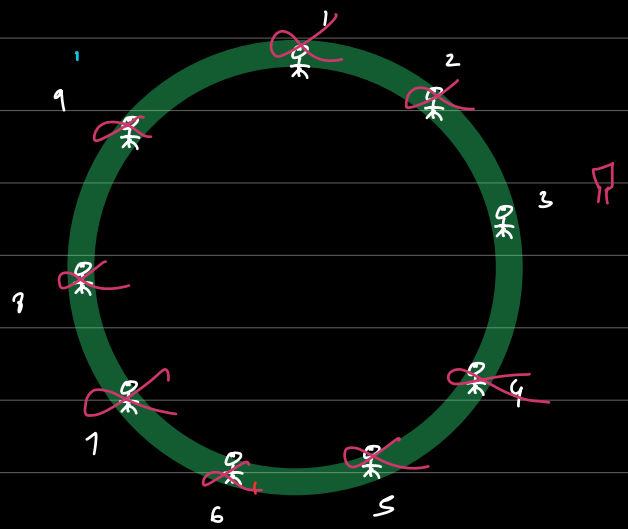
Break (10:20 - 10:30)



Josephus → Jewish soldier

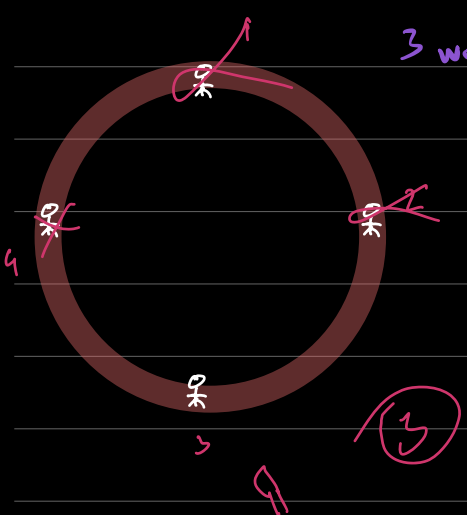
Josephus problem



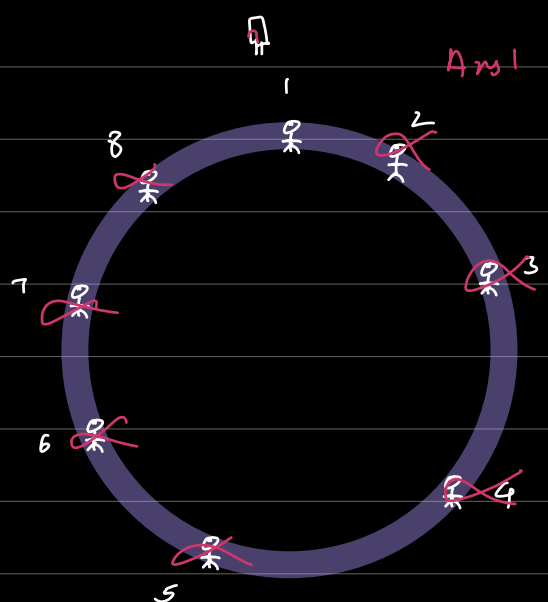


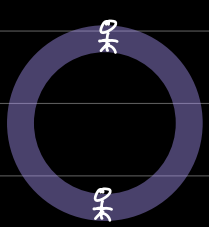
3 started

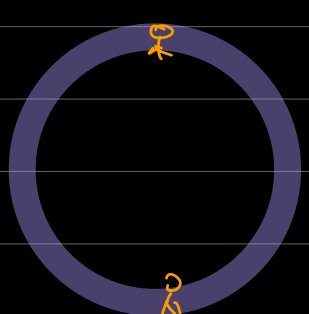
3 won

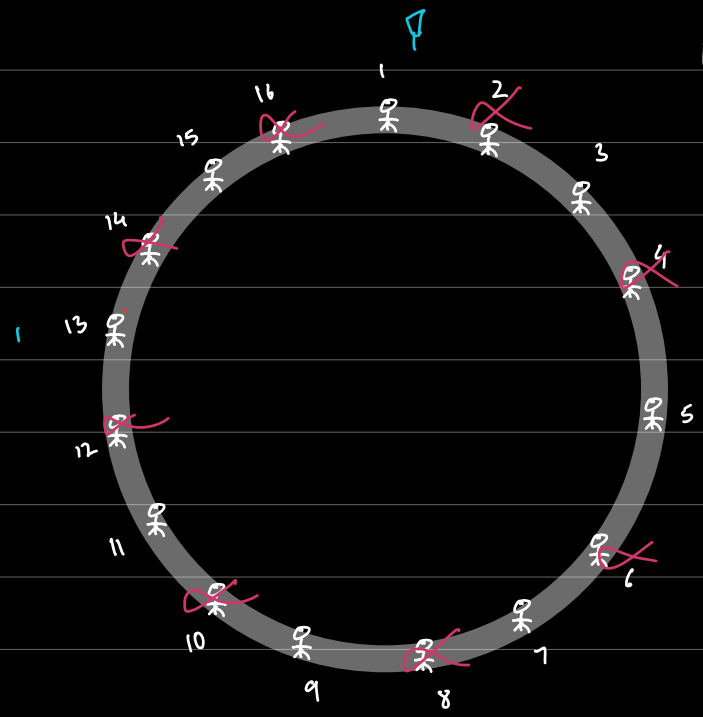


Ans!





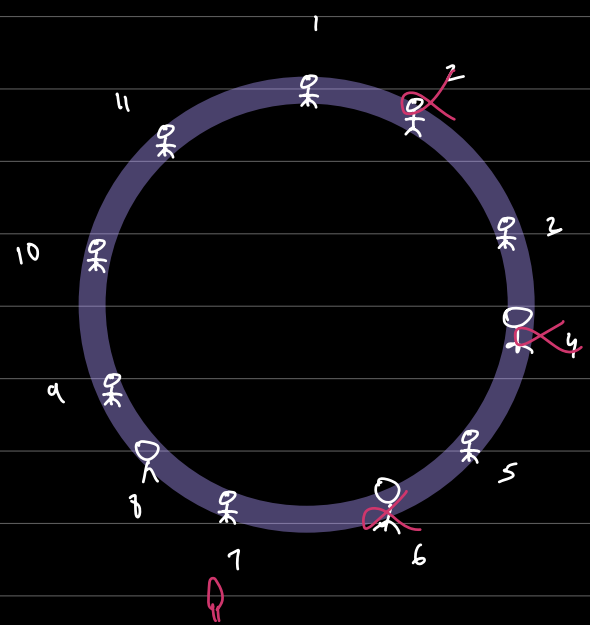




I started

I won this game

1st will win



7th person will win

obs:

$x + x$

When N is a power of 2
whoever stats the game wins

N	No. of people killed before 2^N		winner
17	1 → 16		3
12	4 → 8	Alive	9
67	3 → 64		7
133	5 → 128		11th (2kills + 1)
13	5 → 8		11 (2ki+1)
147	147−128 → 19		2×19 +1 = 39

$1 \xrightarrow{\alpha} 2 \longrightarrow 3$

$1 \xrightarrow{\alpha} 2 \longrightarrow 3 \xrightarrow{\alpha} 4 \longrightarrow 5 \xrightarrow{\alpha} 6 \longrightarrow 7$ (9)

257	1 → 256	1 + 2×1 = 3

Kills = (N − find closest 2^k)

2× kills +1

$(\log_2 13) = 3.\ldots$

closest power of 2 = int $(\log_2 N) = 3$

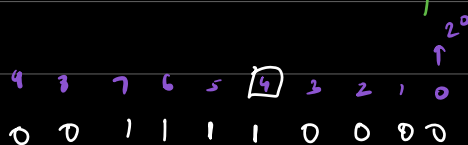
kills = $(N - 2^{\text{closest power of 2}})$

return $2 * kills + 1$

Rapid fire

X number of setbits from index B

4 setbits after index 3



$[4, x] = 4$

$x - 4 + 1 = 4$

$x = 7$

$4 \longrightarrow 7$, $x = 0$

```
for (i=4; i<7; i++){
    set(i, 0)
}
```

y bits after x^{th} index

$$[x+1, z] = y$$

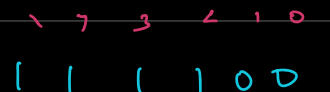
$$z - (x+1) + 1 = y$$

$$z = y + x$$

```
for (i = x+1; i <= y+x; i++) {
    |
    3
```

(Q2) set y bits after x unset bits — Microsoft

$y = 4$ $x = 2$



$$[x, z] = y$$

$$z - x + 1 = y$$

$$z = y + x - 1$$

$$[x, y + x - 1]$$

```
int a=0
for (i=x; i<= y+x-1; i++)
    a= set(a,i)
```

set y bits after x unset bits

y = 4 x = 3

6	5	4	3	2	1	0
1	1	1	1	0	0	0

$[x, z] = y$

$z - x + 1 = y$

$z = y + x - 1$

```
a = 0
for (i=x; i<=y+x-1; i++){
    a= set(i,a)
}
```