Today's content

→ Max Consecutive ones.

a) Atmost one Replace

b) Atmost one swap.

→ Josephus Problem (Fun Puzzle)

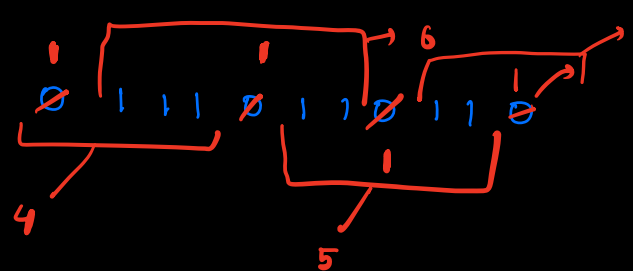
Amazon

Q. Given a binary array [], we can atmost replace a single 0 with 1.
Find max consecutive 1's we can get in our array.

Ex 1 1 0 1 1 0 1 1

ans = 5

Ex 1 0 1 1 0 1 1 0 1 1 0



ans = 6.

Ex 1 1 1 0 1 1 0 1 1 1 0 0 1 1 0 1 1

3+2+1 = 6

2+4+1 = 7

4+0+1 = 5

0+2+1 = 3

2+2+1 = 5.

ans = 7

For every '0'

(a) Count no of consecutive 1's in left side → l

(b) Count no of consecutive 1's in right side → r

(c) ans of this zero = l + r + 1

```
int xplacc1zero (int arr[])
{
    int cnt = 0
    for( i=0; i<N; i++)
    {   if( arr[i] == 1) cnt ++
    }
    if( cnt == N)  return N,

        maxans = 0
        for( i=0; i<n; i++)
        {
            if ( arr[i] == 0)
            {
                // cal ans for this 0.
                l = 0, r = 0
                for( j = i-1 ; j>=0; j--)
                {   if ( arr[j] == 1) l++
                    else break
                }
                for( j = i+1; j<N; j++)
                {   if ( arr[j] == 1) r++
                    else break
                }
                tmpans = l + r + 1
                maxans = max ( maxans, tmpans)
            }
        }
}
```

return maxans.

TC: $O(N^2)$ → $O(N)$

SC: $O(1)$

Time complexity

```
for( i=0 ; i<N ; i++)
{
    if( i==1)
    {
        for( j=0 ; j<N ; j++)
        {
            print()
        }
    }
}
```

$O(N)$

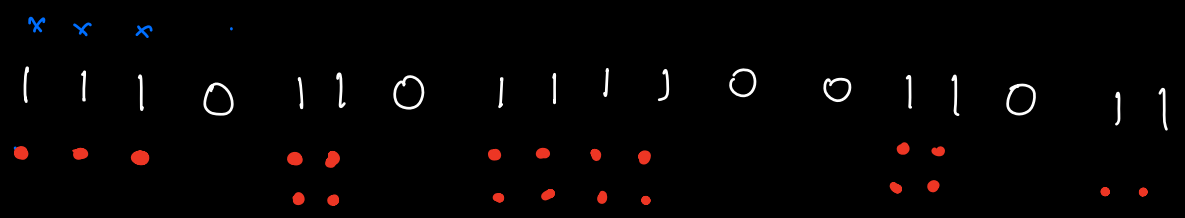
```
for( i=0 ; i<N ; i++)
{
    if( i%2==1)
    {
        for( j=0 ; j<N ; j++)
        {
            print()
        }
    }
}
```

$O(N^2)$

$\frac{N}{2}$ N

i : 0 1 2 3 . . . N

0 0 0 0 0 0 0 0 0 0 0 0 0 0



TC: $O($ outside loop + inside loop $)$

: $O(N + 2N)$

: $O(N)$

	Mon	Tue	Wed			Sat	Sun
70 kms	10 km	10 km	10 km			10	10
10 kms	0	0	0	0	0	10	0

```
for( i=0 ; i<N; i++ )
{
    for( j=0; j<N; j++)
    {
        print (N)
    }
}
```

TC: O(N²)

Time complexity

i	
0	2+2+2+2+2
1	
2	
3	
:	
N	2+

N²

(No of Outside iteration) * (inside iteration every time)

```
for( i=0 ; i<N ; i++)
{
    if( i==1 )
    {
        for( j=0 ; j<N ; j++)
        {
            print()
```

```
for( i=0 ; i<N ; i++)
{
    for( j=0 ; j<i ; j++)
    {
        print()
```

i	#
0	0
1	1
2	2
3	3
4	4
.	.
.	.
N-1	N

$0+1+2+3+4+\dots+N$

$\frac{N(N-1)}{2}$ → $O(N^2)$

outside

inside

$TC: O\left(N + \frac{N(N-1)}{2}\right)$

$TC: O(N^2)$

inside loops + outside loop

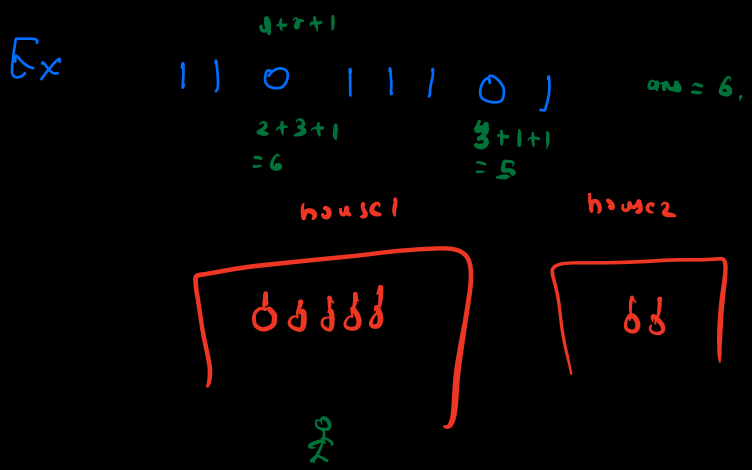
N

O

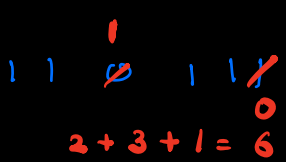
Amazon

Q. Given a binary array [ ], we can atmost swap a single 0 with 1.
Find max consecutive 1's we can get in our array

Ex



Ex



l+r

l+r = total no of 1's

```
int replace1zero(int arr[])
{
    int cnt = 0
    for(i=0; i<N; i++)
    {   if(arr[i]==1) cnt++
    }
    if(cnt==N) return N.

    maxans = 0
    for(i=0; i<n; i++)
    {
        if(arr[i]==0)
        {
            // cal ans for this 0.
            l=0, r=0
            for(j=i-1; j>=0; j--)
            {   if(arr[j]==1) l++
                else break
            }
            for(j=i+1; j<N; j++)
            {   if(arr[j]==1) r++
                else break
            }
            if(l+r==cnt) tmpans = l+r
            else tmpans = l+r+1

            maxans = max(maxans, tmpans)
        }
    }
    return maxans.
}
```

1 1 0 1 1 0 1

ans=5

2+0+1 = 3

r=3 l=2 2+1=5

Q. Josephus Problem (Squid Game)

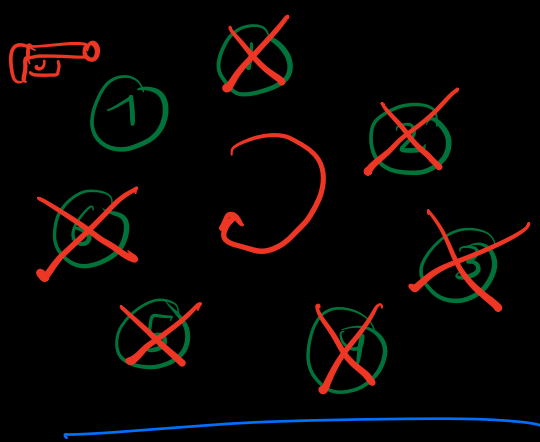
Clockwise.

N people standing in a circle, Person 1 have gun.

Each person will kill adajcent clockwise person,

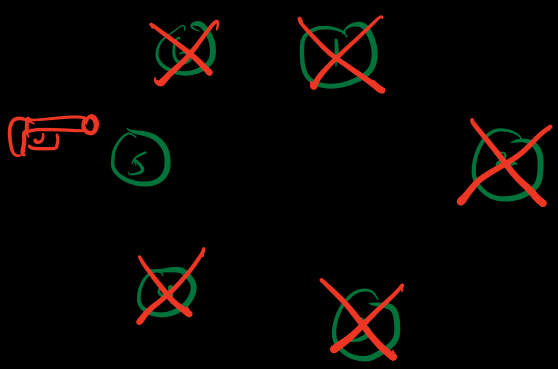
And then pass the gun to the next adajcent clockwise

find last man standing?



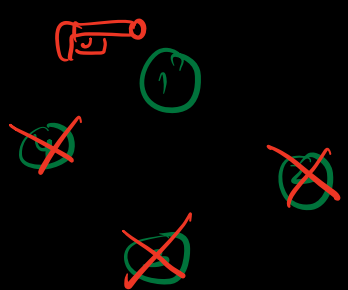
ans = 7

N = 6

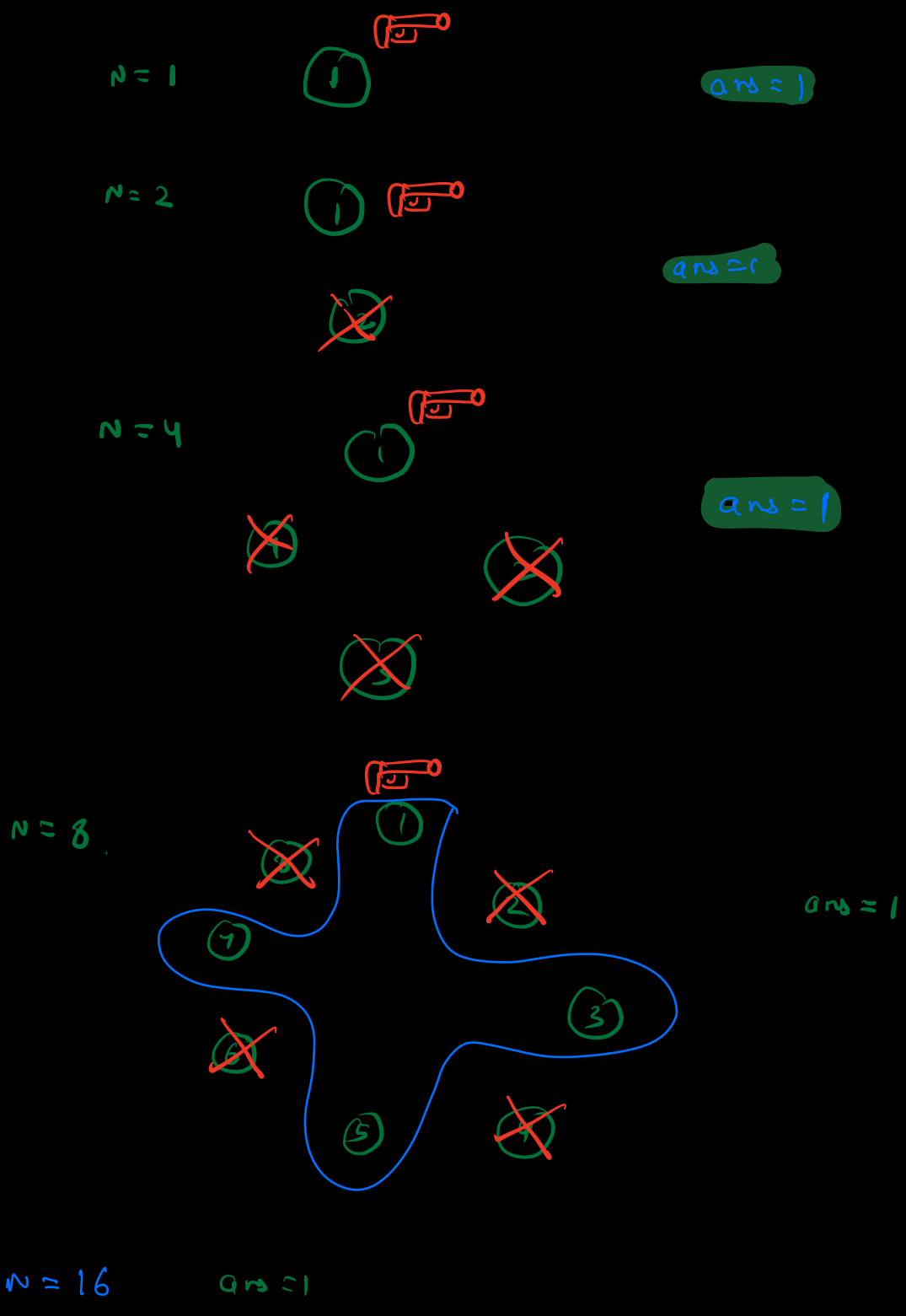


ans = 5.

N = 4

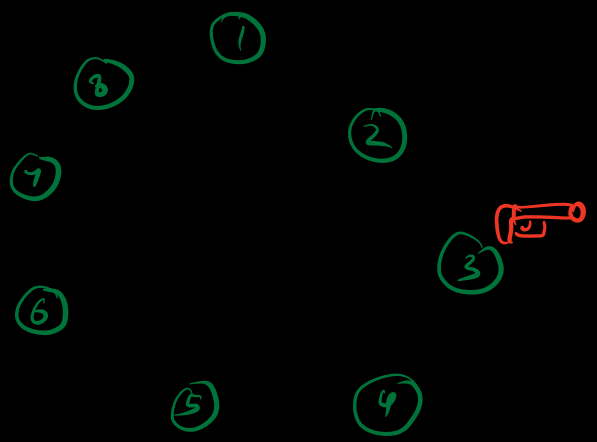


ans = 1


N = 1
ans = 1
N = 2
ans = 1
N = 4
ans = 1
N = 8
ans = 1
N = 16
ans = 1

1, 2, 4, 8, 16, 32, 64, 128 - - -

All powers of 2 have ans = 1

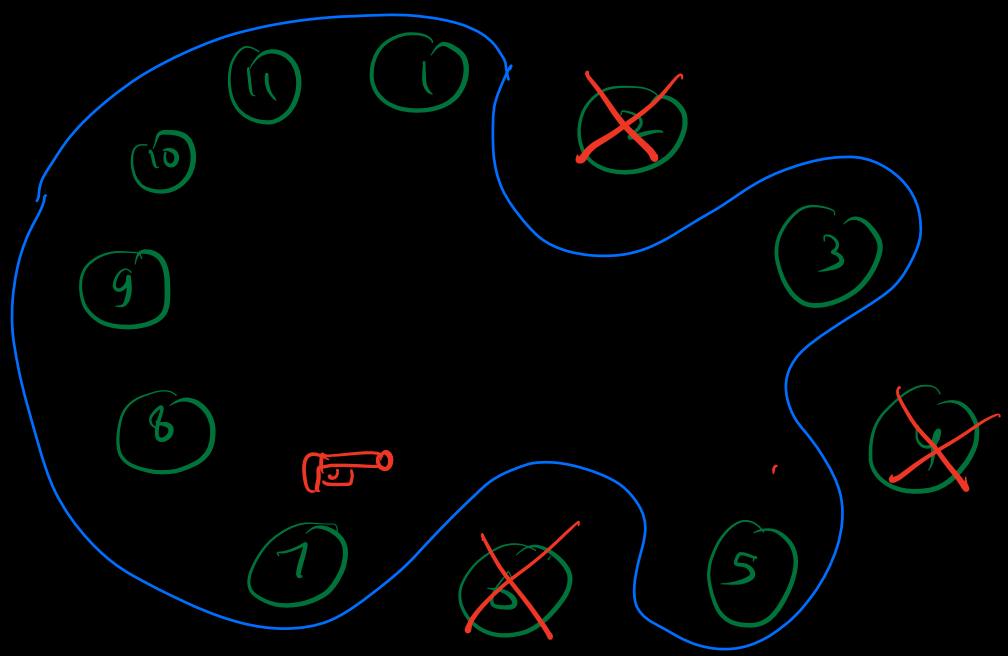


ans = 3.

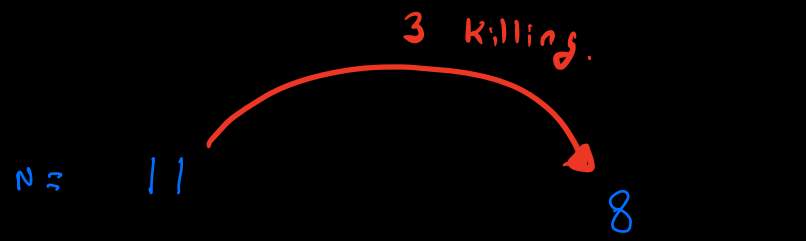
If powers of 2 are remaining people,

whoever is holding the gun,

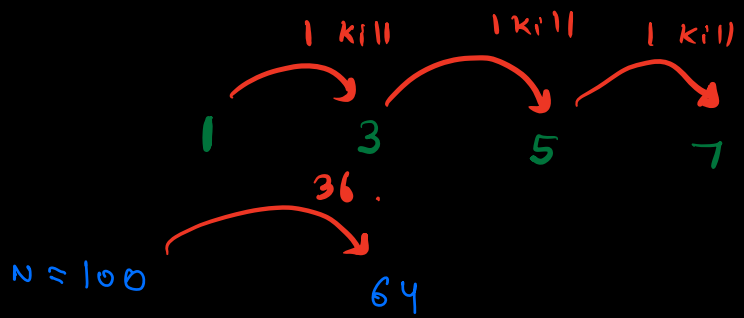
wins the game.



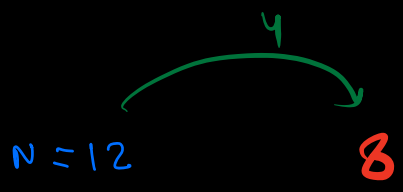
ans = 7



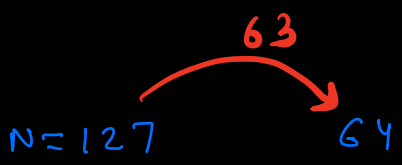
ans = 7



1 + 36 * 2 = 73



$1 + 4 \times 2 = 9$



$1 + 63 \times 2 = 127$

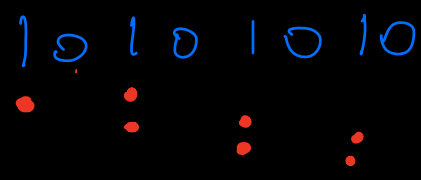
HW: find nearest power of 2 $\leq N$?

x

Killing $= N - x$

ans = $1 + 2(N - x)$

Doubts



$1 + 2 + 3 + 4 + \ldots N-1 = \frac{N(N-1)}{2}$

i	j
0	0
1	0+1
2	0+1+2
3	0+1+2+3
	+