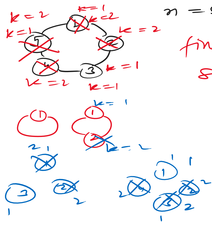
Josephus Problem !

1823 → Leetcode

Winner of the Circular Game



n	w
1	1
2	1
3	3
4	1
5	3
6	5

k = 2

Solve(n, k) → Solve(n-1, k)

Solve(2, k) → Solve(1, k)

1 → 1

Solve(3, k) → Solve(2, k)

→ 1 + k

1 + 2 = 3

Solve(4, k) → Solve(3, k)

→ 3 + k = 3 + 2 = 5

Solve(5, k) → 5 % n = 5 % 4 = 1

→ Solve(4, k)

→ 3 + k = 1 + 2 = 3

[Solve(n, k) = [Solve(n-1, k) + k] % n]

* Why add k & why % n ?

k = 1

k counted once

k = 2

k = 1, 2 and so on

k count increases with the person count, so we add k.

[n = 1, k can't be counted
n = 2, k can be counted once
n = 3, k can be counted twice

0 % 5 = 0
1 % 5 = 1
2 % 5 = 2
3 % 5 = 3
4 % 5 = 0
5 % 5 = 0

Shifted

Normalization

When you have circular arrangement, always use %

* Hamming Weight

count = 0, 1, 1, 2, 1, 3 → n

Integer → 11 →

1011 → 3

0000 → 0

while(n > 0) & while(n != 0)

1011 & 0001 = 0001

(n & 1) = 1 → True

n = n >> 1

0001 → 0 → stop

1 0 1 & 0 0 1 = 0 0 1

1 0 & 0 1 = 0 0

TC ⑤

Chocolate Distribution Problem :

7, 3, 2, 4, 9, 12, 56

Sort → 2, 3, 4, 7, 9, 12, 56

m = 3

i = 0

j = m - 1 = 2

Mx − Mn

4 − 2 = 2

7 − 3 = 4

9 − 4 = 5

12 − 7 = 5

56 − 9 = 47

0 1 2

i++ 1,

j-- 3

* Minimum Cost of Ropes :

O(1) priority-queue

[4, 3, 2, 6]

X

Sort → 2, 3, 4, 6

① n log n 2+3 = 5 → 5, 4, 6

② Sort → 4, 5, 6

n log n 4+5 = 9

9, 6

⑭ Sort → 6, 9 6+9 = 15

n log n

o/p = 29

cost → 5 + 9 = 14 + 15 = 29

4, 3, 2, 6

Min-heap

CBT

Sort (n log n)

O(1)

Memory

6
4
2+3=5
4+5=9
6+9=15

= 29