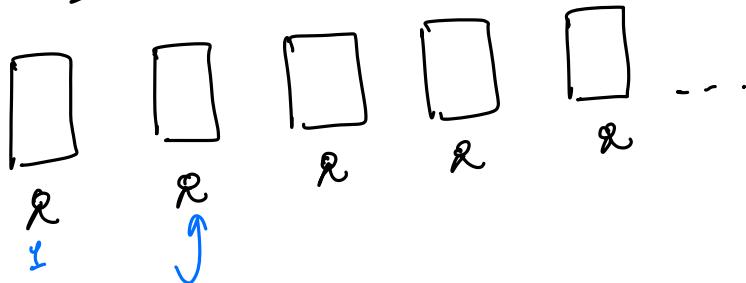


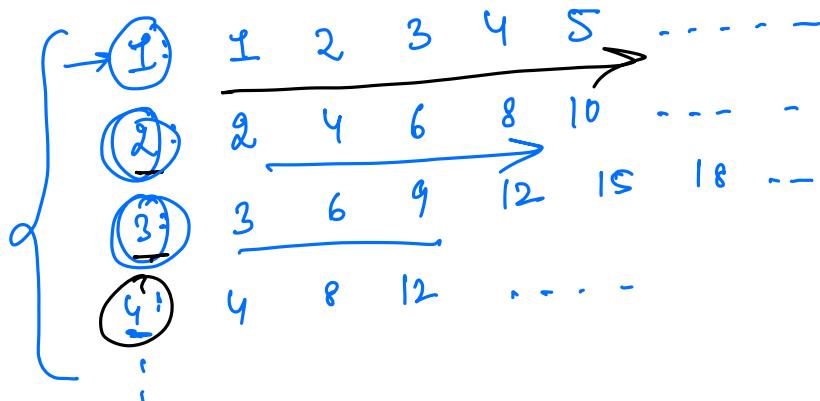
①

N doors



all doors
are closed

toggle



N-door
person

Q → which all doors will be open at last?

	1	2	3	4	5	6	7	8	9	10
1st	0	0	0	0	0	0	0	0	0	0
2nd	0	C	0	C	0	C	0	C	0	C
3rd	0	C	C	C	0	0	0	C	C	C
n	0	C	C	0	0	0	0	C	C	C

Final
state

0 C C 0 C C C C 0 C

10

18

A hand-drawn diagram consisting of two columns of circles. The left column contains three circles labeled 1, 2, and 3 from top to bottom. The right column contains three circles labeled 4, 6, and 9 from top to bottom. Lines connect circle 1 to circle 4, circle 2 to circle 6, and circle 3 to circle 9. There are also lines connecting the bottom of circle 1 to the top of circle 3, and the bottom of circle 3 to the top of circle 1.

toggle

class 7

Factors of 18

closed

Diagram illustrating toe placement:

- Left Foot:**
 - Toes 1 and 4 are **open**.
 - Toes 2 and 3 are **closed**.
 - Toes 1 and 5 are **rd** (round).
 - Toes 2 and 3 are **fr** (flat).
- Right Foot:**
 - Toes 1 and 4 are **closed**.
 - Toes 2 and 3 are **fr** (flat).
 - Toes 1 and 5 are **rd** (round).
 - Toes 2 and 3 are **open**.

An arrow points from the number 1 on the left foot towards the number 1 on the right foot.

odd no of factors → open

even no → closed

2

→ factos ocorridos no país

N*

perfect square

| * 16

28

48

odd no
factors

Hand-drawn diagram illustrating the factor pairs of 18. The number 18 is at the top. Below it are three pairs: 1×18 , 2×9 , and 3×6 . An arrow points from 18 to each pair. To the right, an arrow points from the pairs to the word "even".

All the perfect squares \rightarrow door will be open
otherwise closed

1 4 9

10

1 4 9 16 25

7 1 7

1

(1) odd no factors open

(2)

$p \rightarrow$ prime number

is divisible by 24

$p^2 - 1$

$$a^2 - b^2 = (a-b)(a+b)$$

$3 < p \leq 10$

1000

10^{18}

"122"

even

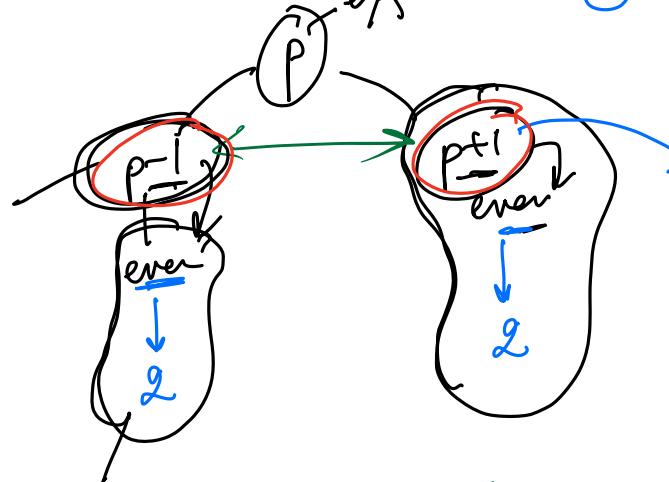
$$(p-1)(p+1) \div 24 = 0$$

$$24 = 2^3 \times 3$$

1
2
3

exist?

even

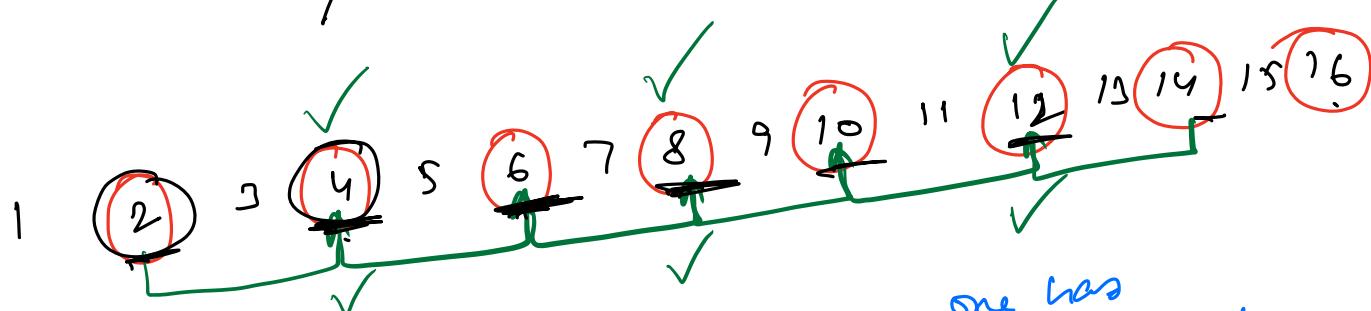


$$2 \times 2 \times \dots$$

4

$$2 \times \frac{2}{2} \times \dots$$

2 x 2 x 1



Observe → out of 2 consecutive even no - one has to be divisible by 4

$p-1$ p $p+1$

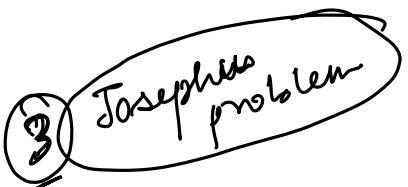
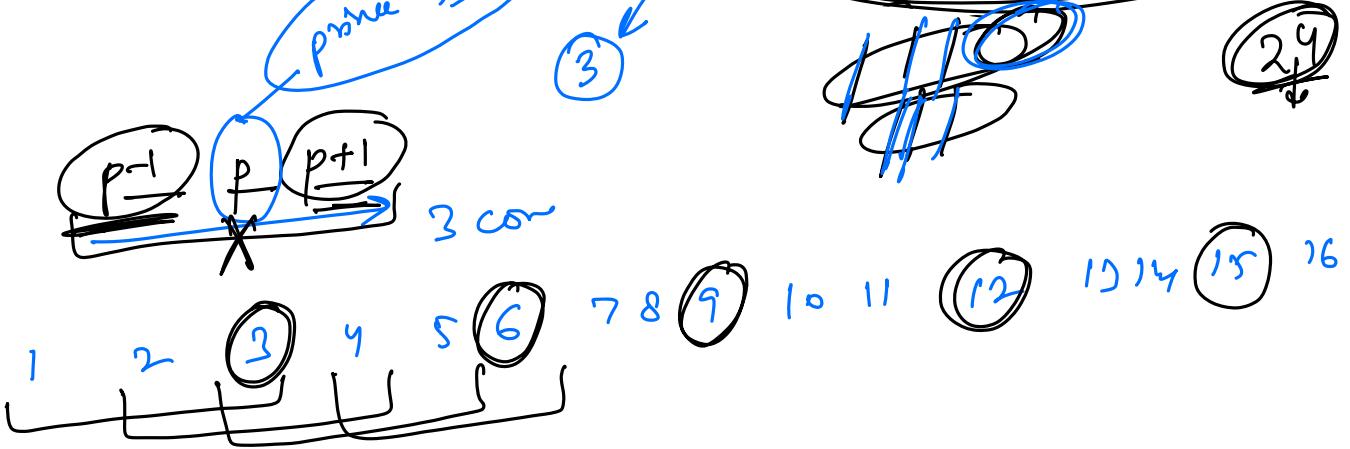
not div by 3

3 4 5 6 7 8 9 10 11 12
0 1 2 0 1 2 0 1 2 ...

I will always get a 3

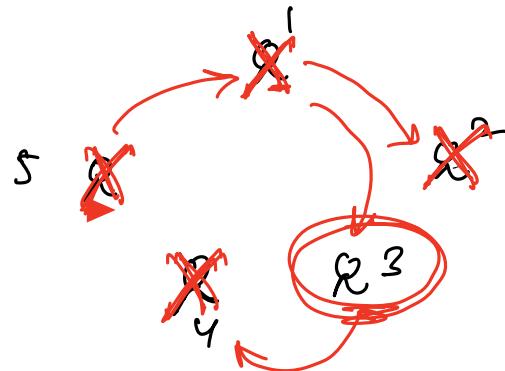
return tree;

$p^2 - 1$
 $\div 24 \approx$

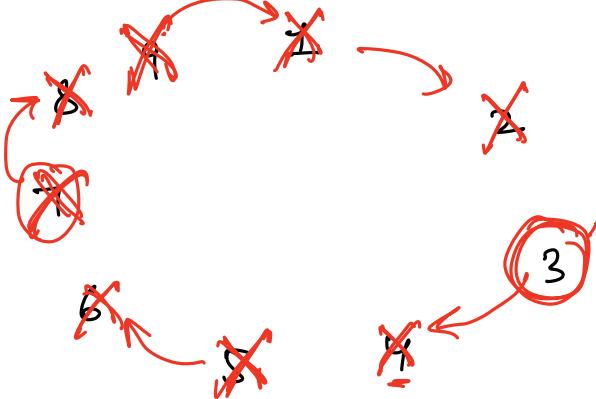


Q There are N people stand in a circle. Every person has a seed and kill the next person (clockwise) on their chance. We start from 1st person. Who will survive?

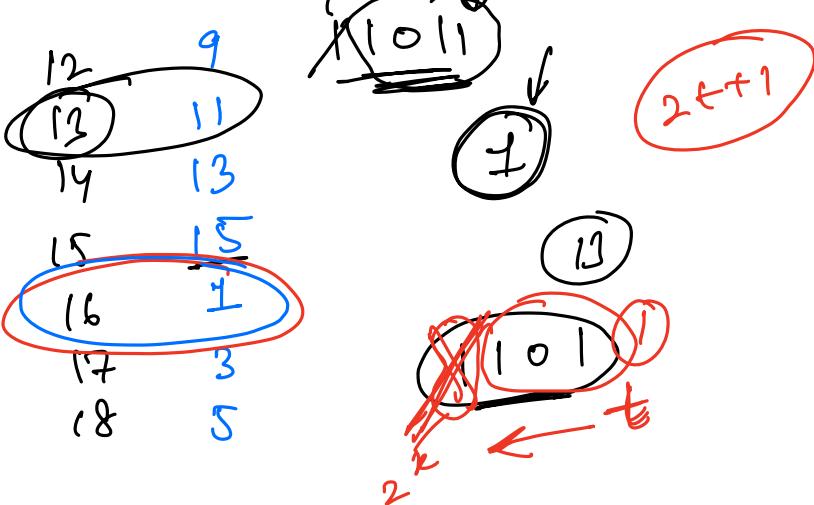
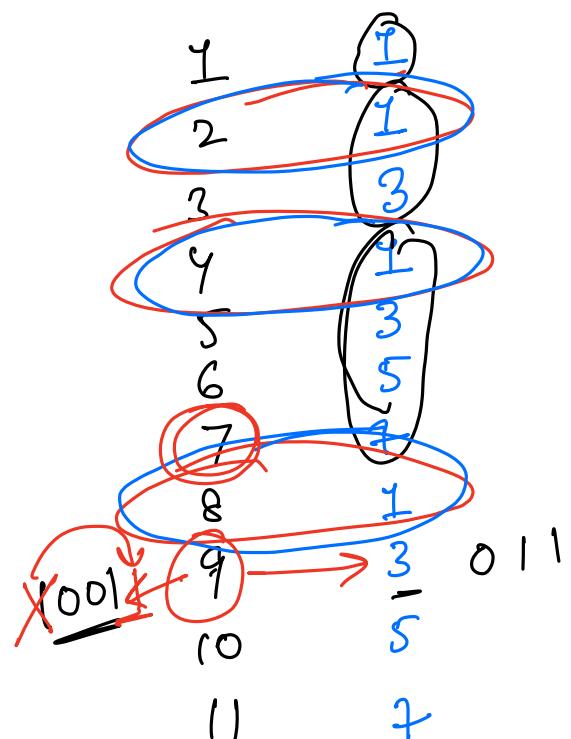
(5)



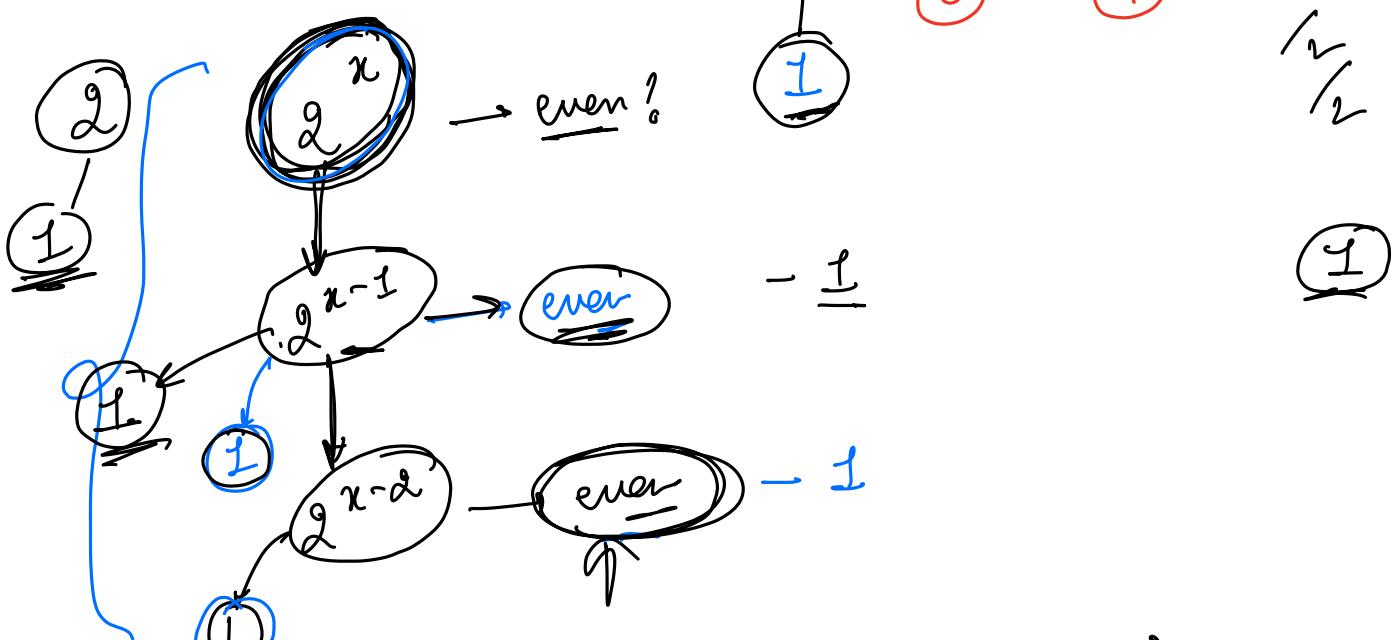
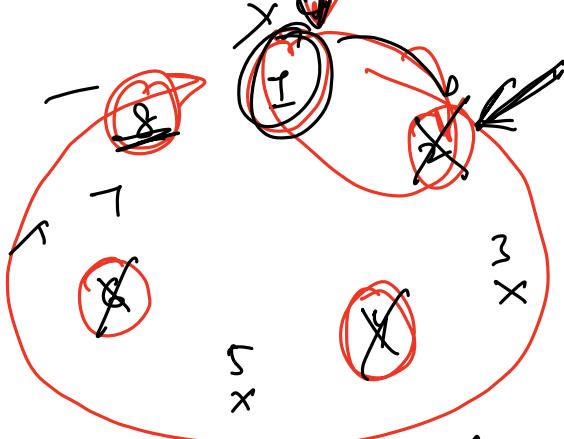
(9)



(10) → (7)



all of these are even no → starting person survives
first iteration



If N is power of 2, the surviving person will be the starting one!

$$13 = 8 + 5$$

nearest power of 2

$$N = \underline{\underline{2^x}} + \underline{\underline{t}} + \underline{\underline{1}}$$

nearest
pow
of 2

$$12 = 8 + 4$$

$$\underline{\underline{2t}} + \underline{\underline{1}}$$

$$\begin{array}{c}
 N = 2^x + t + 1 \\
 \downarrow \quad \downarrow \quad \downarrow \\
 8 \quad 2t \quad 1
 \end{array}$$

12

log₂ 12 ↓ ...

2 *3* *4* *5* *6* *7* *8* *9* *10* *11* *12* - 1

log₂ N ↓

1735 = 1024 + 711

$$N = \underline{\underline{1735}} \rightarrow \underline{\underline{1024}}$$

$$1735 = 1024 + \underline{\underline{711}} + \underline{\underline{t}}$$

$$\underline{\underline{2t+1}} \rightarrow \underline{\underline{1423}}$$

$$\log_{\frac{a}{b}} 1735 \rightarrow$$

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

$$\log_2 1735 = \underline{\underline{2^x}} = 1735$$

$$2^x = 1735$$

$$x \log_2 2 = \log_2 1735$$

$$\underline{\underline{x}} = \log_2 1735$$

$$\underline{\underline{2^{10}}} \dots = 1735$$

$$\text{int } x = \log_2 N$$

$$\text{intt} = N - \frac{2}{2^t}$$

$$\text{cout} \ll 2^t + 1;$$

Q4

N^{th} magical number

number which can be expressed
as a sum of unique powers of 5
or powers of 5

X

$$5 \rightarrow 5^1$$

$$5 \rightarrow 5^1$$

$$25 \rightarrow 5^2$$

$$30 \rightarrow 5^2 + 5^1$$

$$125 \rightarrow 5^3$$

$$130 \rightarrow 5^3 + 5^1$$

$$150 \rightarrow 5^3 + 5^2$$

replace with 2

✓

001	1	5 ¹
010	2	5 ²
001	3	5 ² + 5 ¹
100	4	5 ³ + 0 * 5 ² + 0 * 5 ¹
	5	5 ³ + 5 ²
	6	5 ³ + 5 ² + 5 ¹
	7	5 ³ + 5 ² + 5 ¹

1
2
3
4
5
6
7
8

001
010
011
100
101
110
111
1000

$2^3 + 0 * 2^2 + 0 * 2^1$
 $2^3 + 0 * 2^2 + 2^1$
 $2^3 + 2^2$
 $2^3 + 2^2 + 2^1$

$N \rightarrow$ bit representation

0^{t+1}

1
2
3
4
5
6
7
8

001
010
011
100
101
110
111
1000

Q73

$$\begin{array}{r}
 273 \\
 \times 2 \\
 \hline
 546 \\
 \times 2 \\
 \hline
 1092 \\
 \times 2 \\
 \hline
 2184 \\
 \times 2 \\
 \hline
 4368 \\
 \times 2 \\
 \hline
 8736 \\
 \times 2 \\
 \hline
 17472 \\
 \times 2 \\
 \hline
 34944 \\
 \times 2 \\
 \hline
 69888 \\
 \times 2 \\
 \hline
 139776 \\
 \times 2 \\
 \hline
 279552
 \end{array}$$

$$\begin{array}{r}
 100010001 \\
 \times 50005 \\
 \hline
 50005
 \end{array}$$

$$\begin{aligned}
 & x \leftarrow 1 \ll i \\
 & ans + = 5^{i+1}
 \end{aligned}$$

Q5 Rearrange the Array!

N integers:

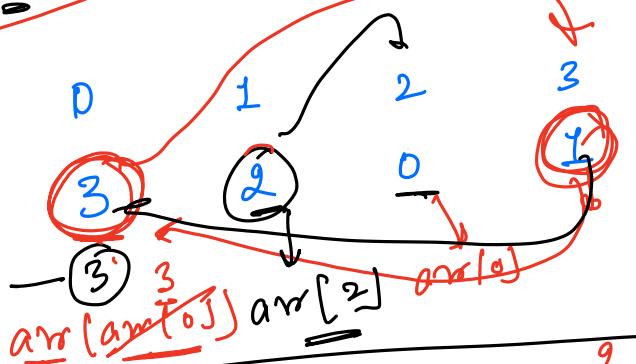
arr[i]

arr[arr[i]]

index

curr \rightarrow

arr[i]



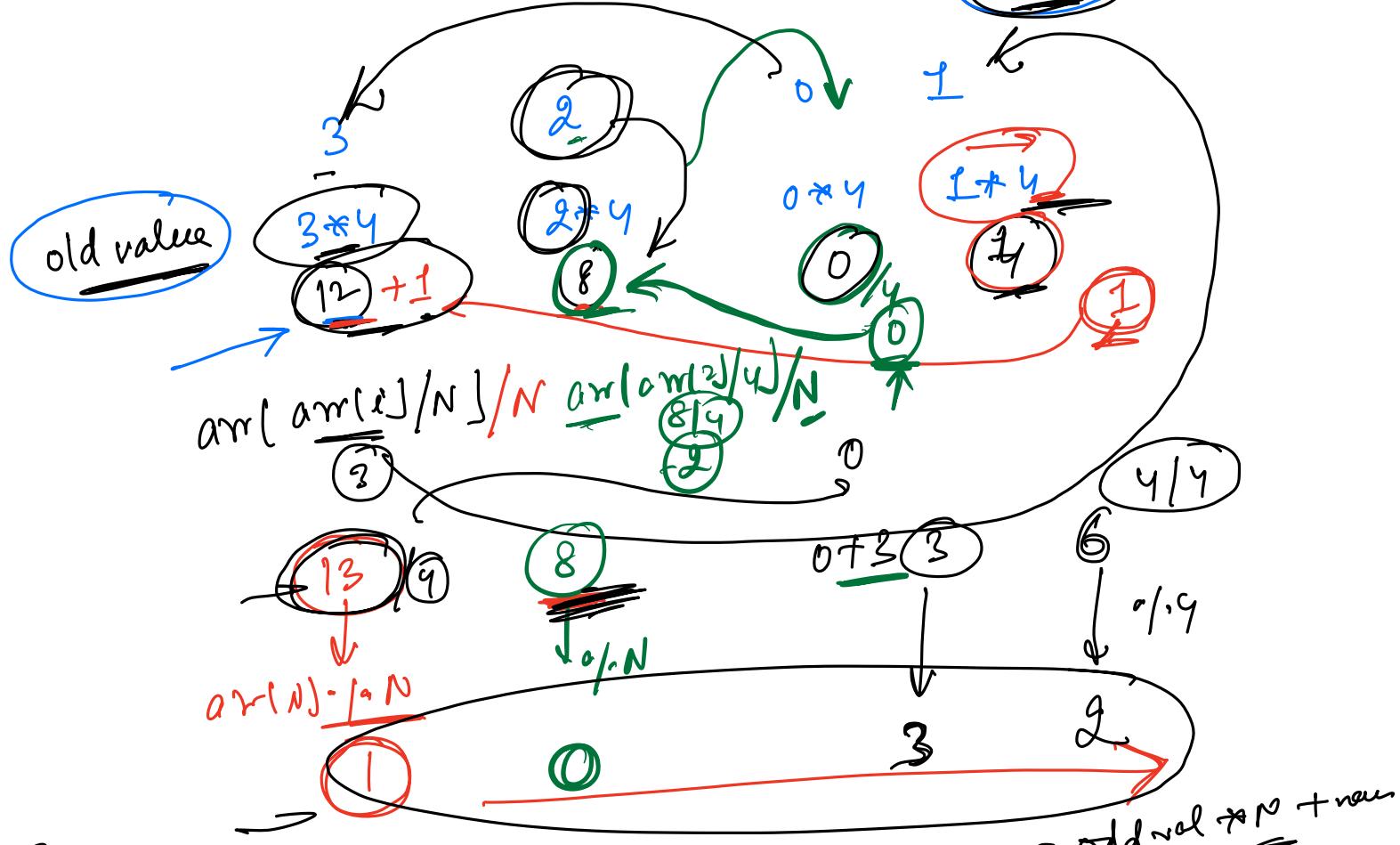
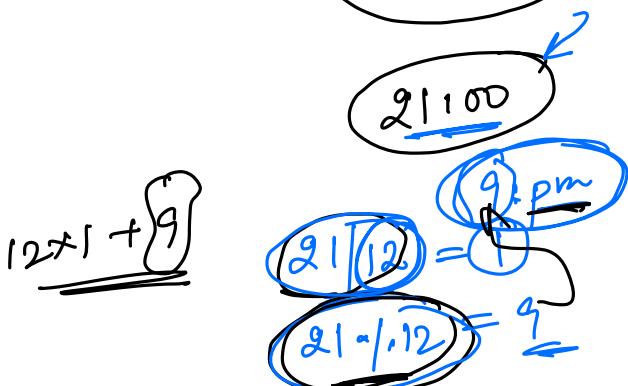
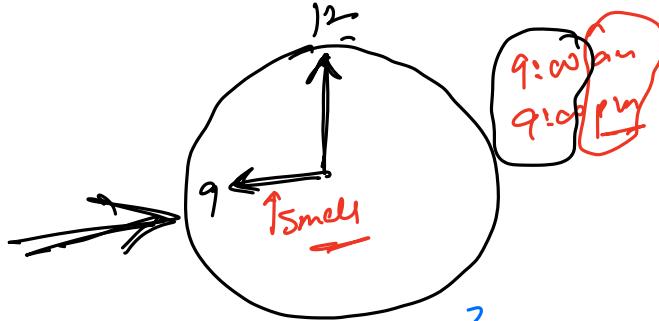
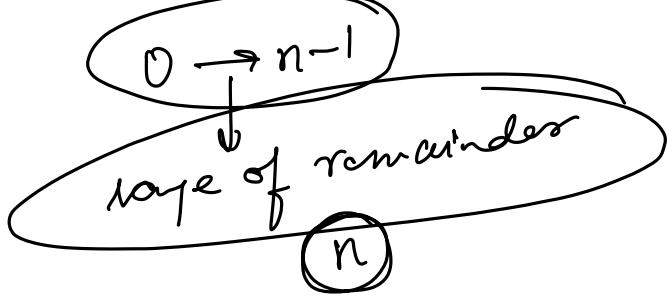
Extra space

O(1)

0 - n - 1

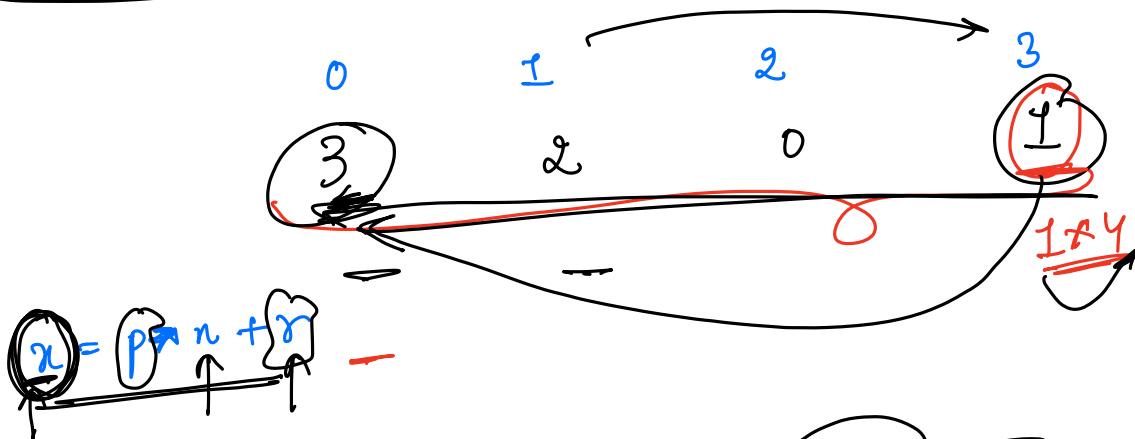
$n = p \times q + r$

Odd value \rightarrow factor
New value \rightarrow remainder

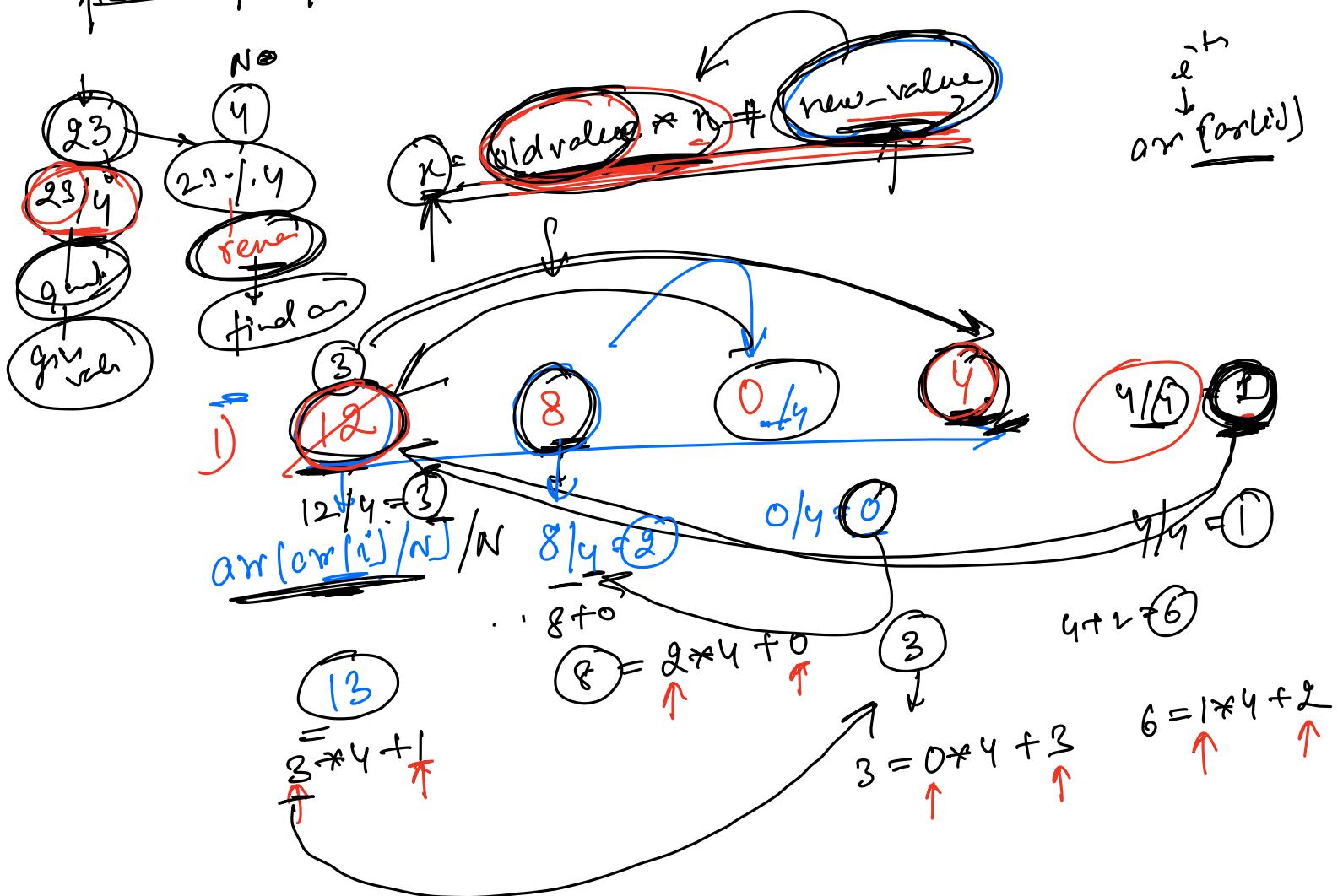


- 1) $i=0 \rightarrow N$ map the odd values
- $\text{arr}[i] = \text{arr}[i] \cdot N$
- 2) $i=0 \rightarrow N$
- $\text{arr}[i] \leftarrow \text{arr}(\text{arr}[i]/N)/N$
- 3) $i=0 \rightarrow N$
- $\text{arr}[i] = \text{arr}[i] \circ /c N$
- $x = \text{odd val} \cdot N + \text{new}$

Doubt session



$$0 \rightarrow n-1$$



13

8

2

6

13.1.4

8° 1.4

34

61.4

1

0

2

2

doj

$$2^x = N$$

$$N = 2^x + t$$

$$\log_2 2^x = \log_2 N$$

$$x \log_2 2 = \log_2 N$$

$$x = \log_2 N$$

$$2^x \leq N$$

$$x \leq \log_2 N$$