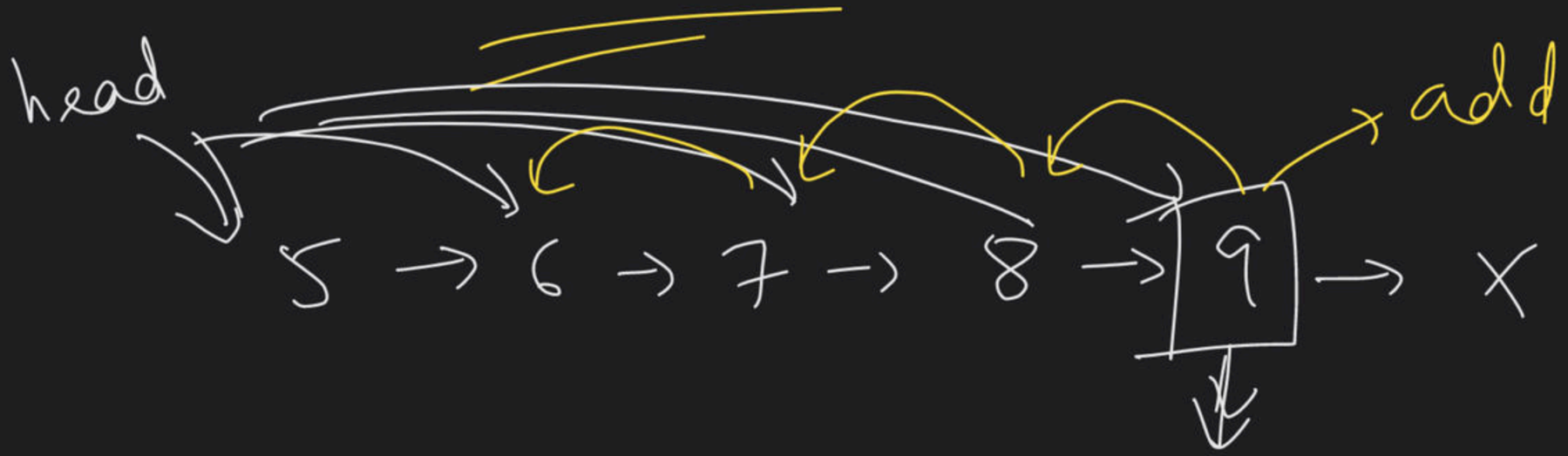
Mega Class: LinkedList

Special class

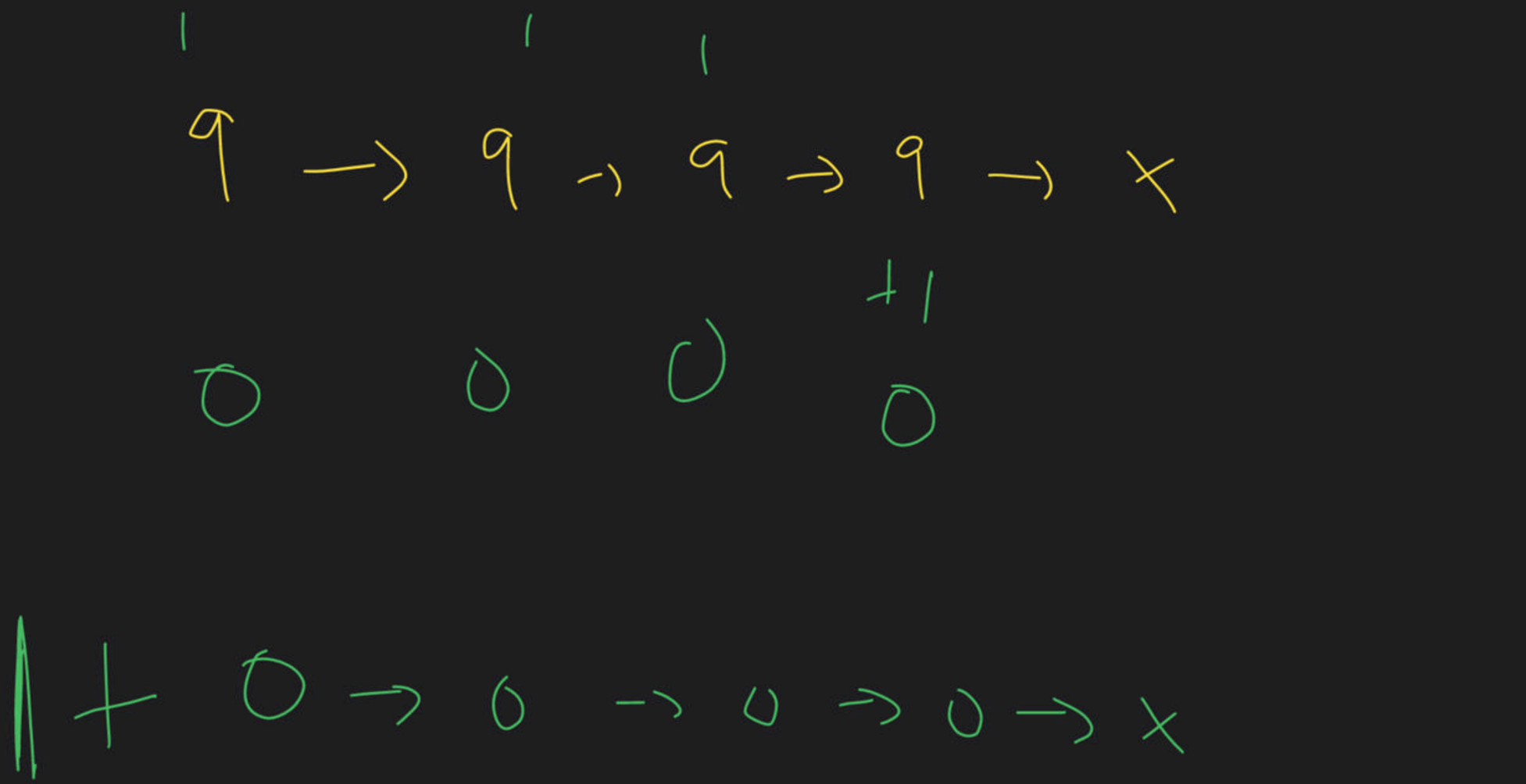
Love Babbar • July 28, 2024

① Add 1 to LL Head RE



⇒

① Head RE
② add
③ Carry update


1 1 1
9 → 9 → 9 → 9 → x
+1
0 0 0 0
1 + 0 → 0 → 0 → 0 → x

(2) Add 2 Numbers Rep. By LL.

$9 \rightarrow 9 \rightarrow 9 \rightarrow 9 \rightarrow X$

$9 \rightarrow 9 \rightarrow 9 \rightarrow 9 \rightarrow 9 \rightarrow 9 \rightarrow X$

=>

$$\begin{array}{r} 0\ 0\ 9\ 9\ 9\ 9 \\ +\ 9\ 9\ 9\ 9\ 9\ 9 \\ \hline \end{array}$$

Org no

1234 = 4 → 3 → 2 → 1 → X

1 1 1 0 0 1234

271986 = 6 → 8 → 9 → 1 → 7 → 2 → X

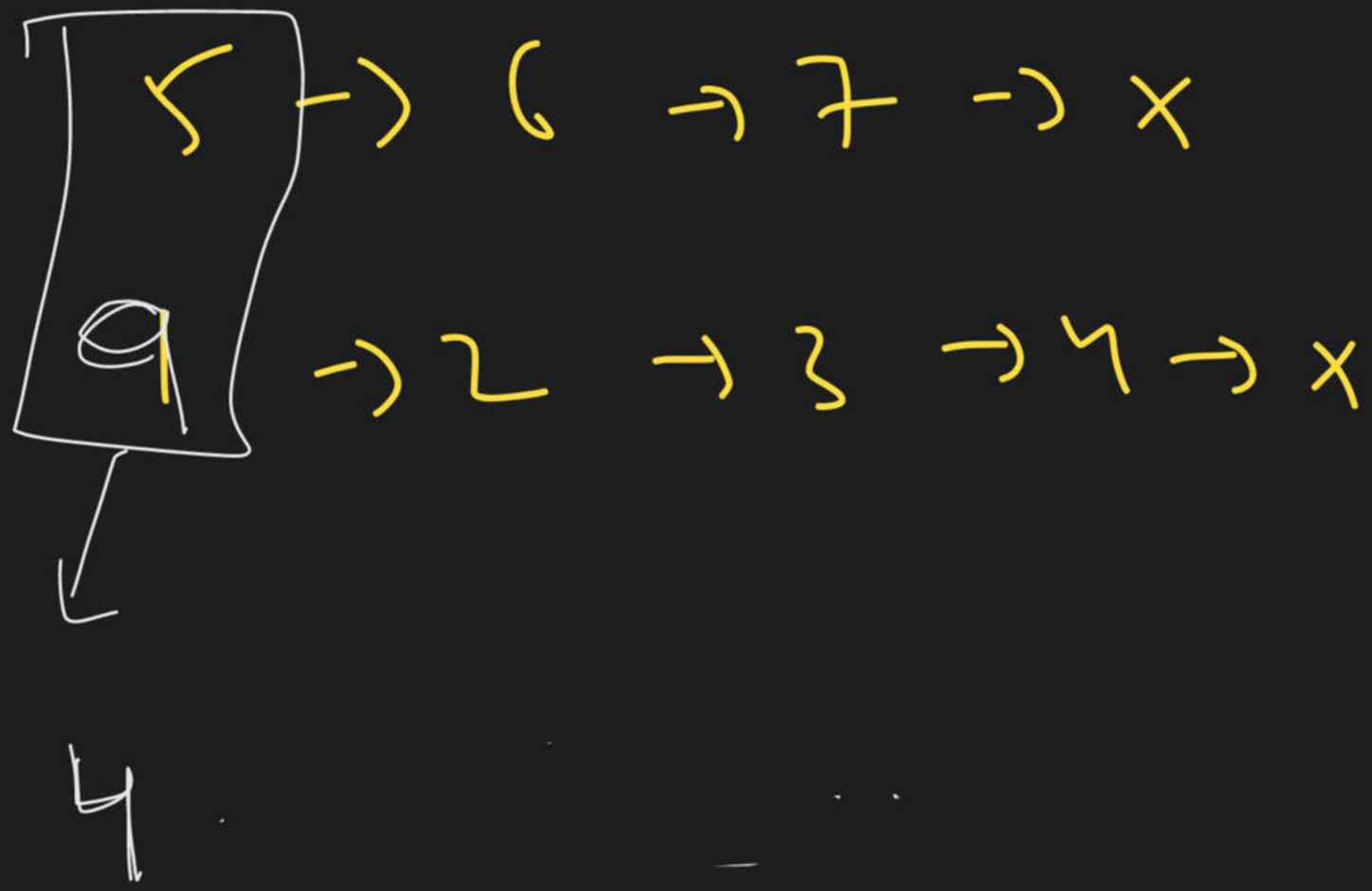
l_2

001234
271986
20

Approach?

0 → 2 → 2 → 3 → 7 → 2 → X

Recursive



Loop detection

slow / fast ptr

1. Middle finding
2. Check loop T/F
3. find the starting pt. of loop
4. Remove the cycle

1 → 2 → 3 → 4 → 5 → 6 → 7 → X

S

F

dist

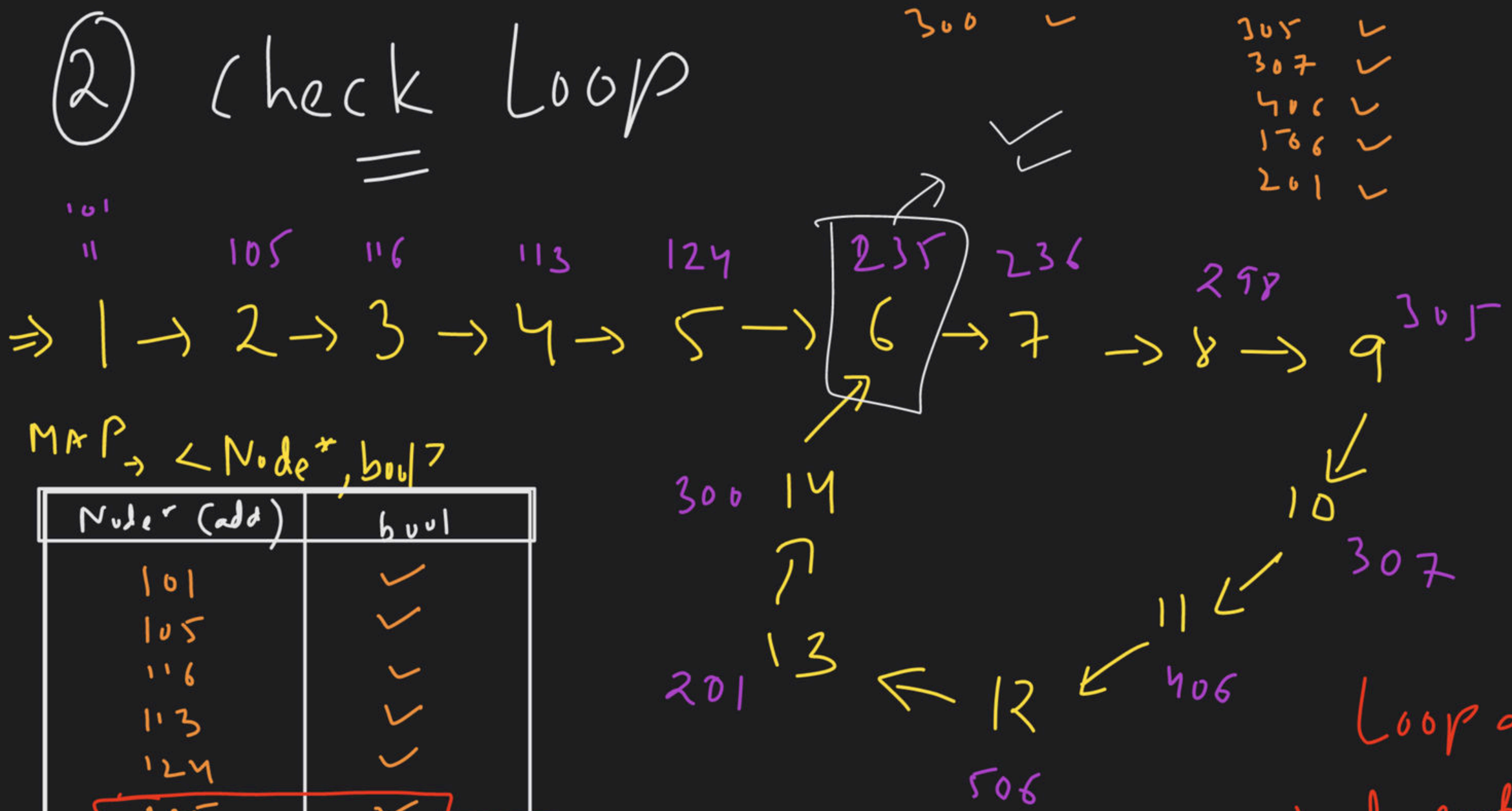
F ⇒ Y = 7

S ⇒ x speed

F ⇒ 2x speed

S ⇒ $\frac{Y}{2}$

② Check Loop



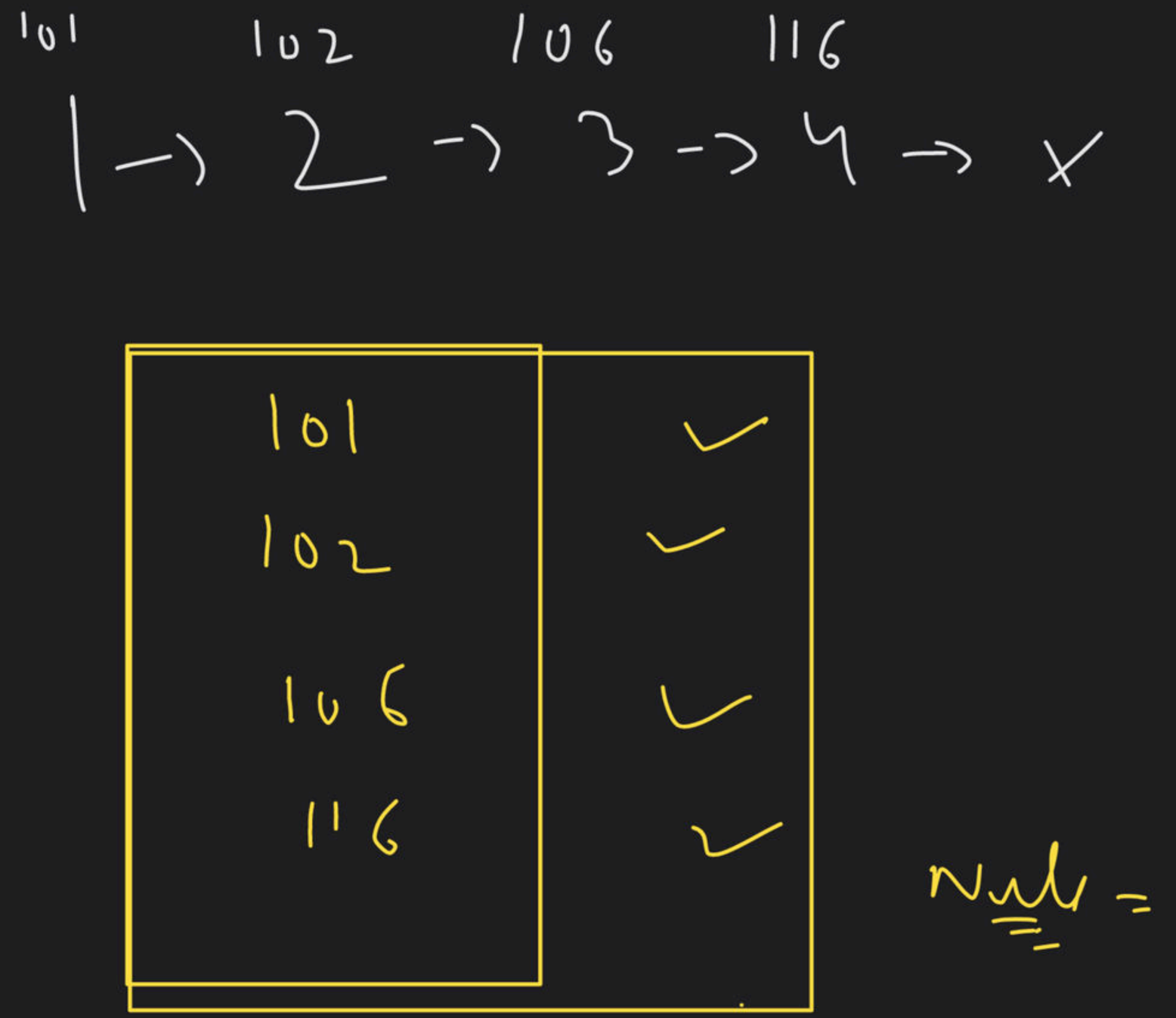
MAP → <Node*, bool>

Node* (add)	bool
101	✓
105	✓
116	✓
113	✓
124	✓
235	✓
236	✓
298	✓

already

Loop dete'

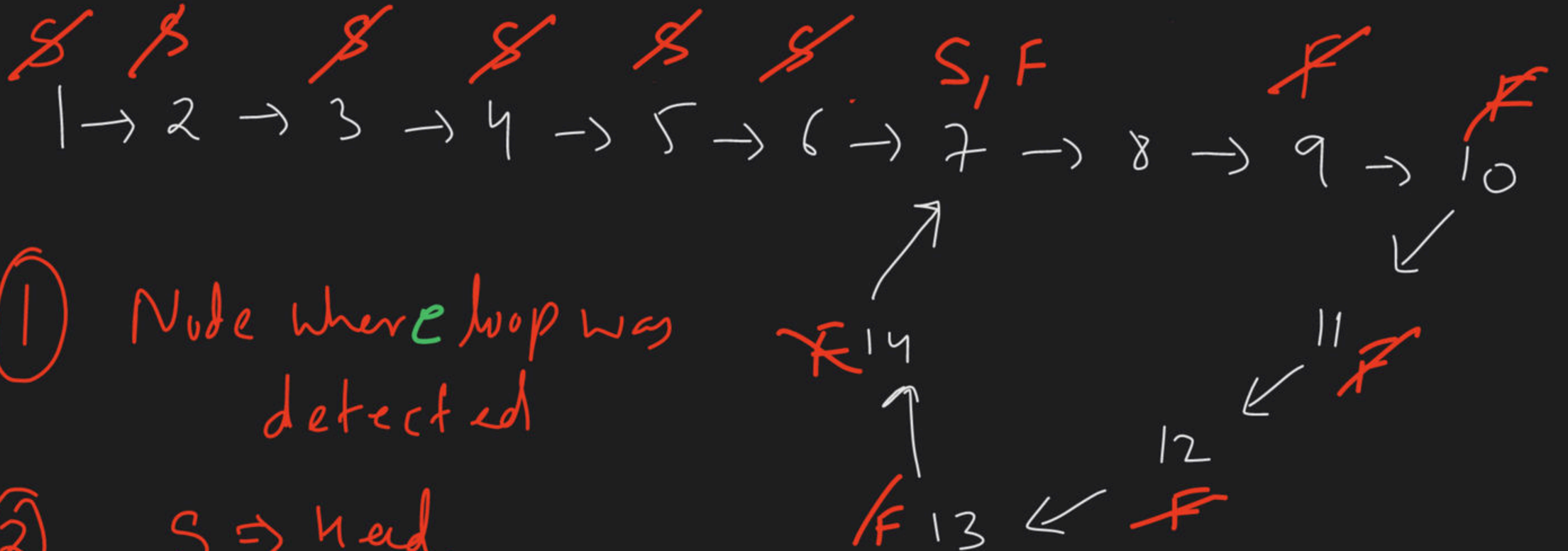
visited entry
mil ggi mtlb


101
102
106
116
1 -> 2 -> 3 -> 4 -> X
101
102
106
116
null =

③ find S.P of Loop

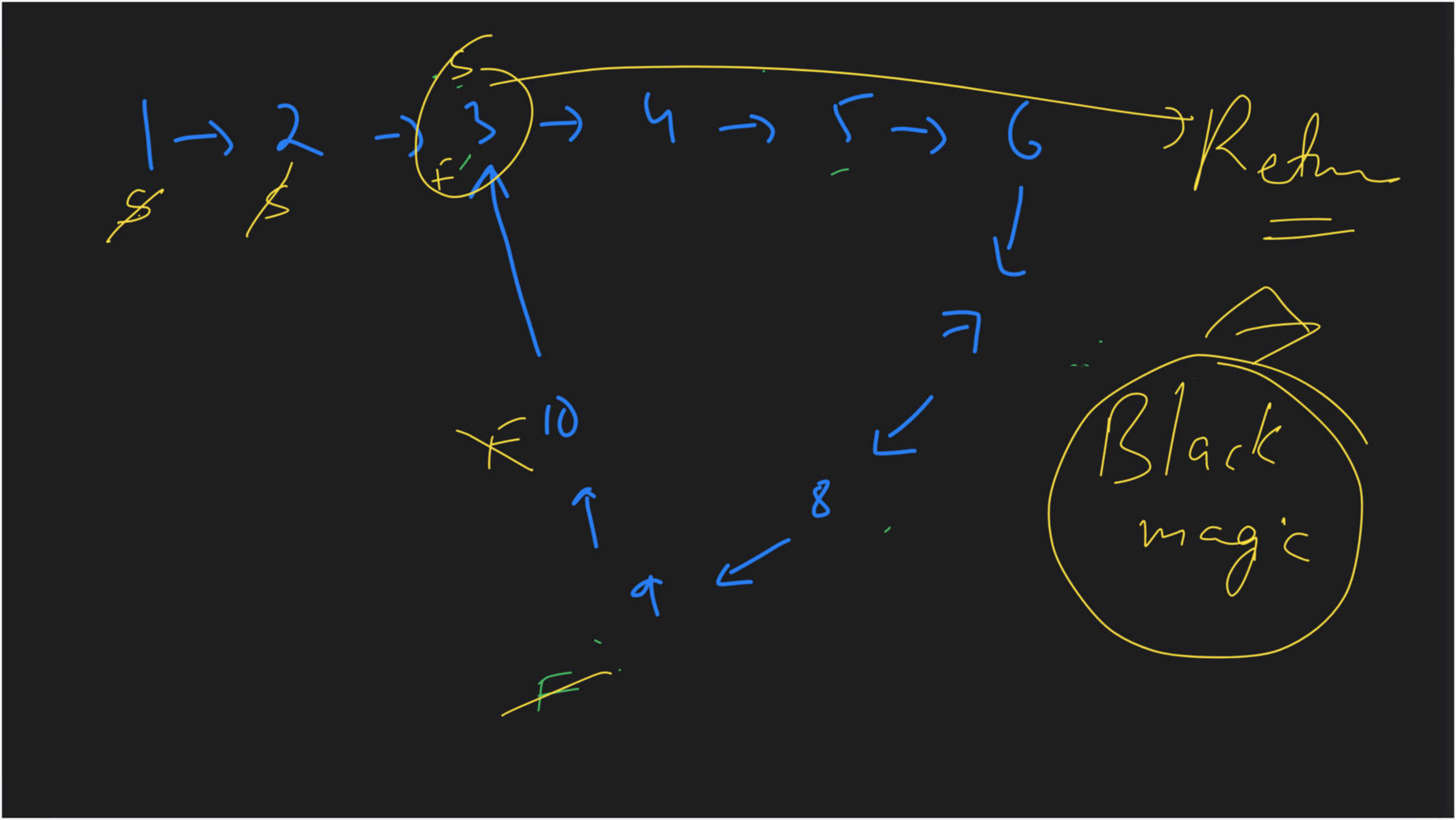
(M1) Map se, while detecting Loop the node which is already visited & we are visting that again is the starting point.

M2 Slow / Fast ptr.



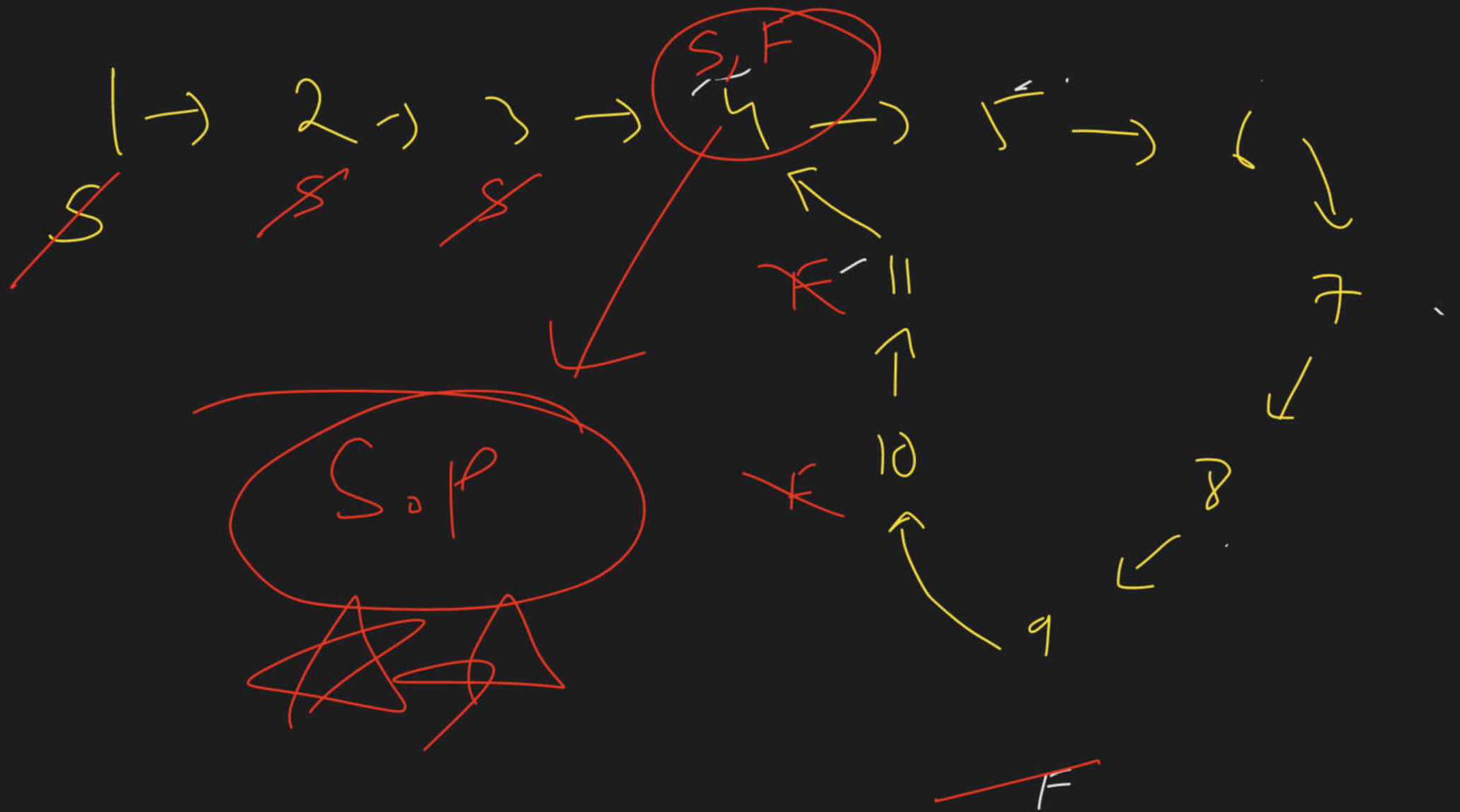
1. Node where loop was detected
2. S ⇒ Head.

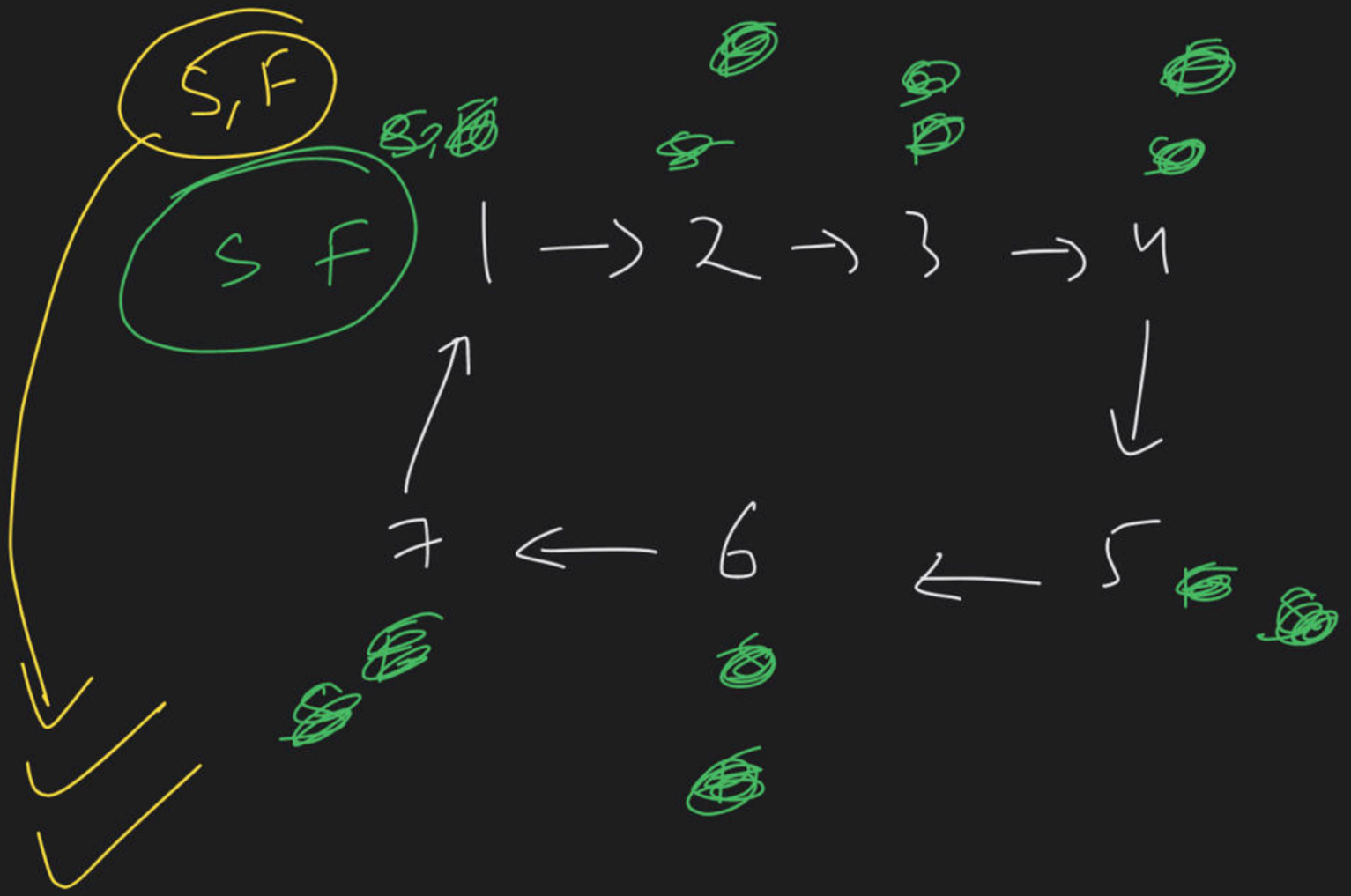
Move F & S with 1x speed

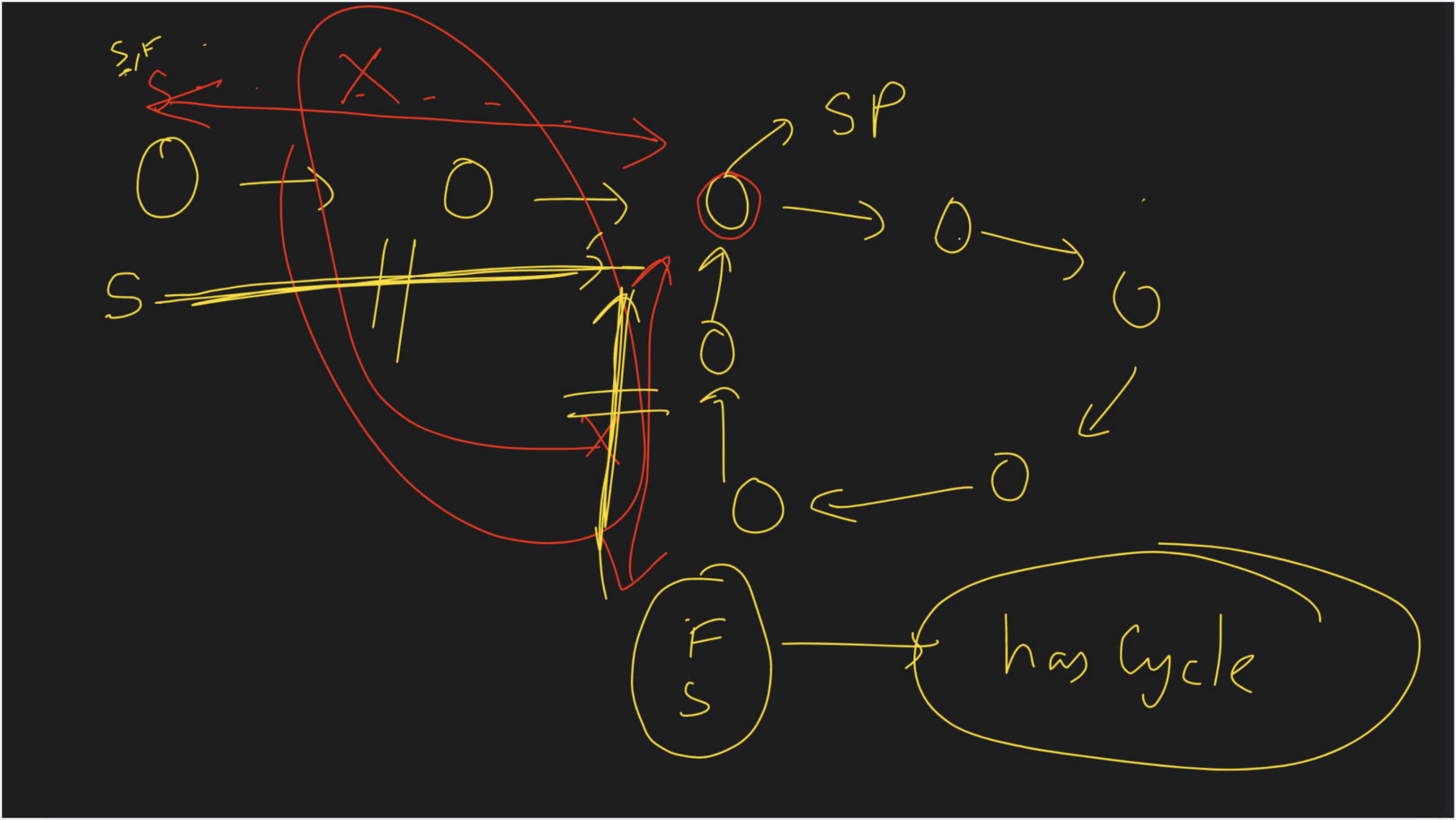

1 → 2 → 3 → 4 → 5 → 6 → Return
x = 10
8
Black magic

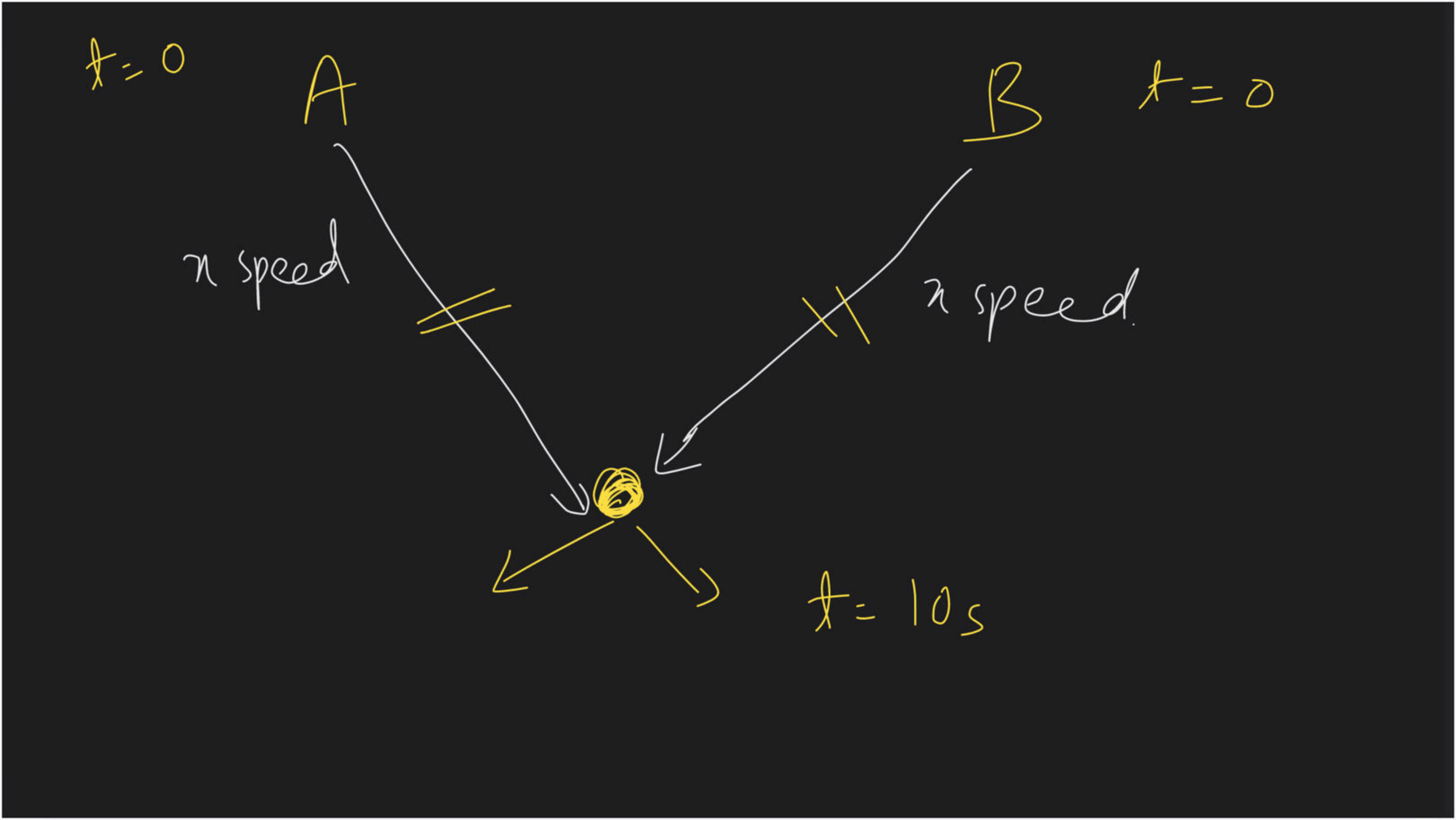
Algo : ① find cycle ⇒ By check Cycle f"
& Return where S == F ;

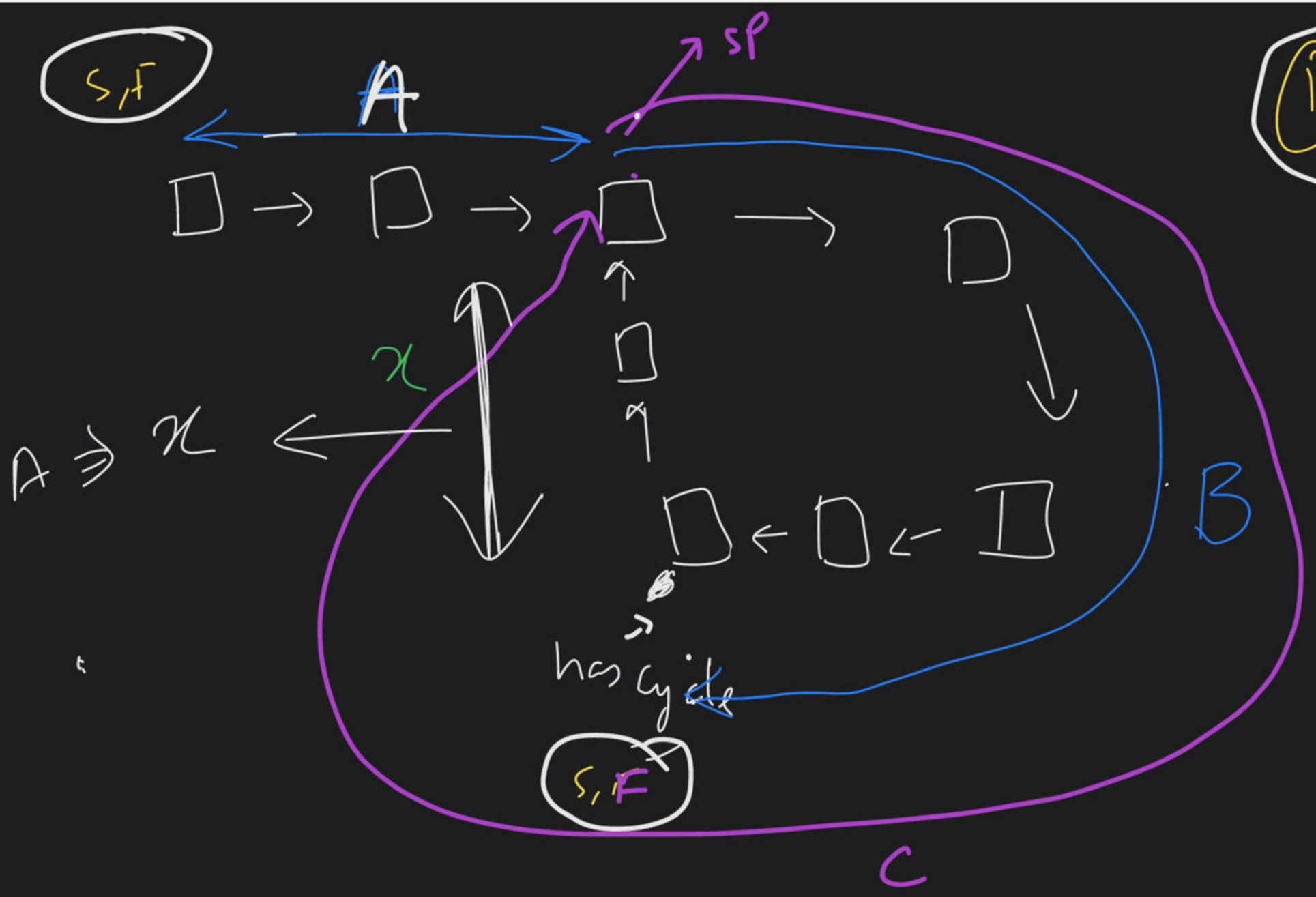
② Put Slow to head
& move S & F with 1x speed
Retn where they meet.


1
2
3
S
S
S
S, F
4
5
6
7
8
9
10
11
S.P
F


S, F
S F
1 → 2 → 3 → 4
7 ← 6 ← 5


S/F
X
sp
S
F
S
has Cycle


t = 0
A
B
t = 0
n speed
n speed
t = 10s



① has Cycle

$B + x = C$

$k_2 < k_1$

Distance Travelled by fast ptr $= 2 \left[\text{Dist Travelled By slow ptr} \right]$

$$A + k_1 C + B = 2\left[A + k_2 C + B\right]$$

$$A + k_1 C + B = 2A + 2k_2 C + 2B$$

$$(k_1 - k_2)\, C = A + B$$

$k_1 - k_2 = K$

$$A + B = k * C$$

$$A + B = C$$

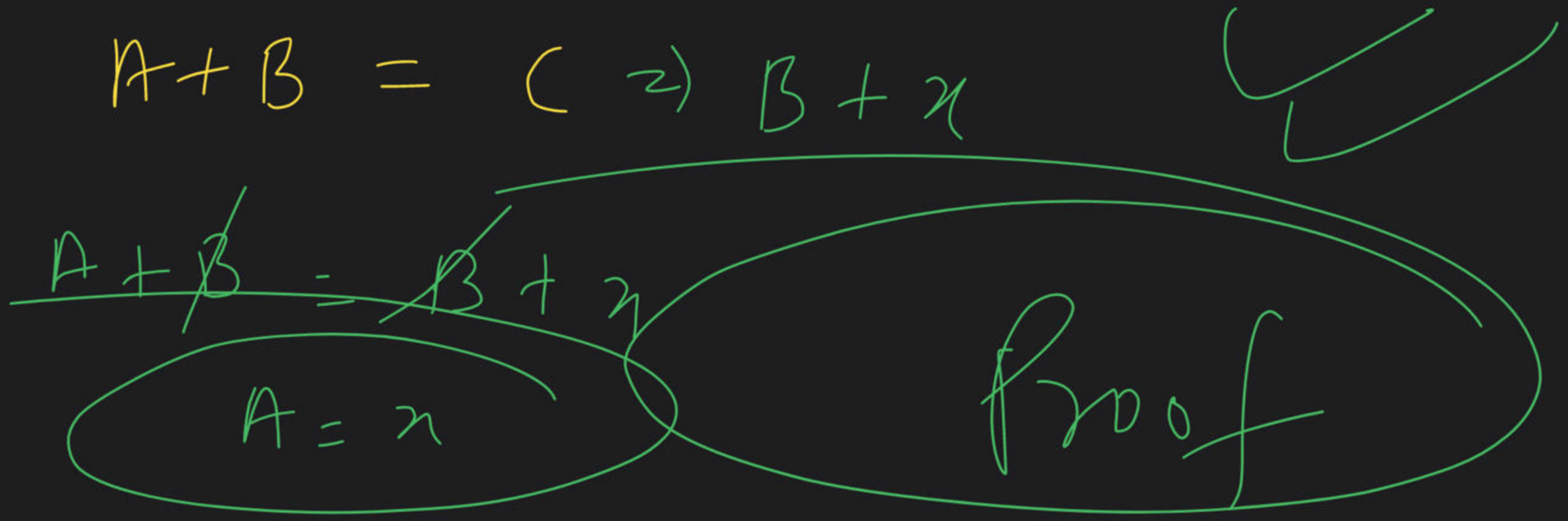
$$A + B = C \Rightarrow B + X = C$$

$$A + B = B + X$$

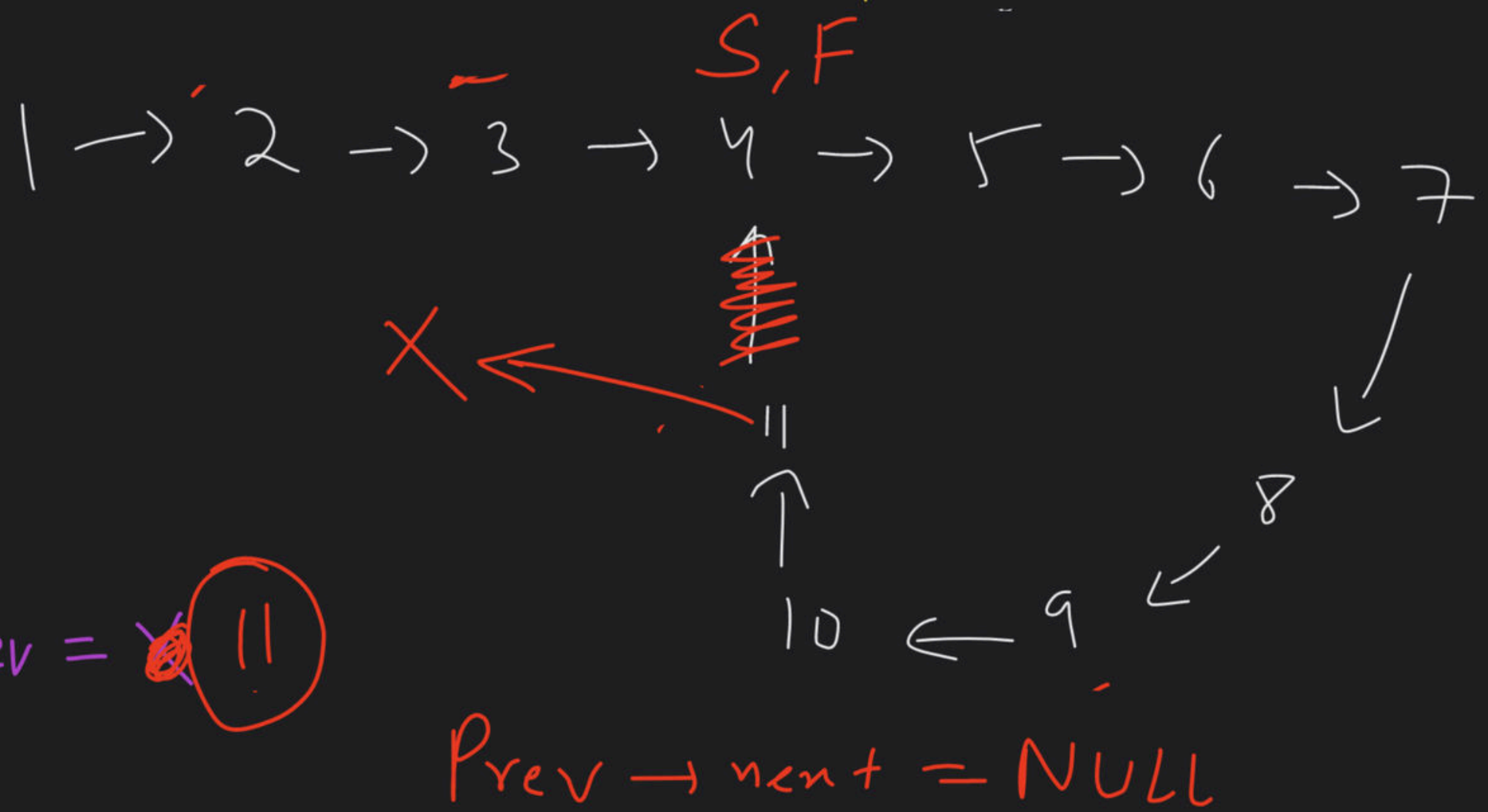
$A + B = k C$

Displacement

$A + B = C \Rightarrow B + x$



⑤ Remove Loop



Break : 4:PM vaps

LC: 725

LL: 725 : Split LL into Parts

① LL , K →

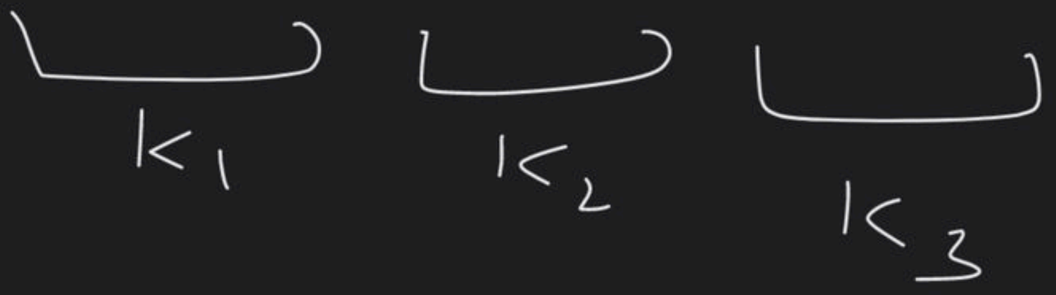
→ K → diff parts divide.

1 → 2 → 3 → 4 → x

K = 2

1 → 2 → x , 3 → 4 → x

k-parts ⇒



$k_1 = k_2$,

$$\left| len(k_1) - len(k_2) \right| \leq 1$$

$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow \vee$ $\quad k = 2$

$[1 \rightarrow 2 \rightarrow 3]$ $\quad [4 \rightarrow]$

3 $\quad$ 1 $\quad \rightarrow$ (2) X.

1 → 2 → 3 → 4 → X

k = 10

[1], [2], [3], [4], [ ] [ ] [ ]
[ ] [ ] [ ]

$k = 3$

$1 \to 2 \to 3 \to 4 \to 5 \to 6 \to 7 \to 8 \to 9 \to 10 \to X$

Ideal case $\Rightarrow$ all k parts have equal no. of Elements.

Part Size $\Rightarrow$ $N/k \Rightarrow 10/3 = 3$

extra Nodes

$N \% k$

$10 \% 3 = 1$

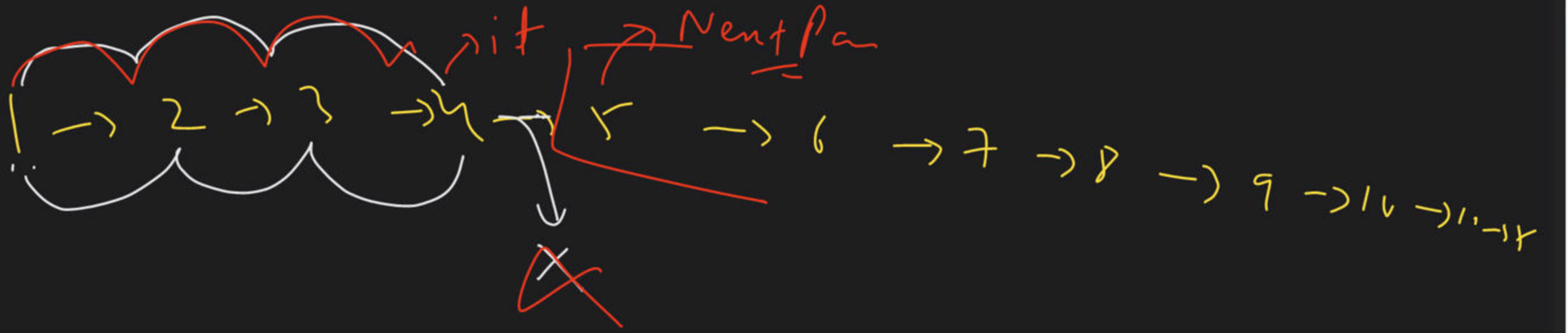
1 -> 2 - - .. - - 10 -> 11 -> X

K = 3

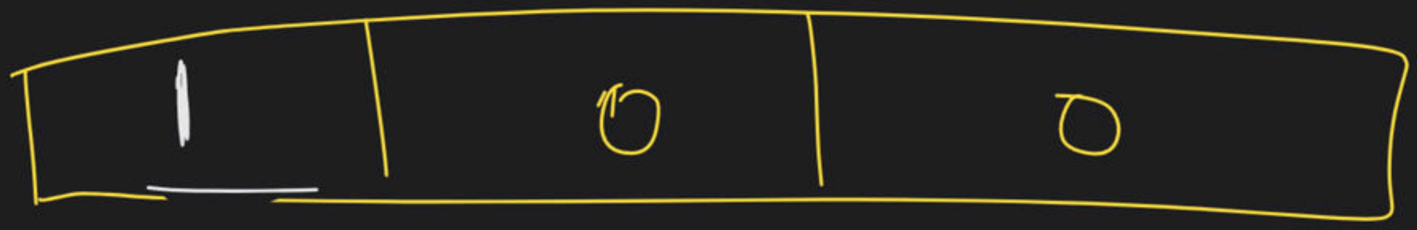
N = 11

ideal -> Part Size = 11/3 = 3

extraNodes -> 11 % 3 = 2



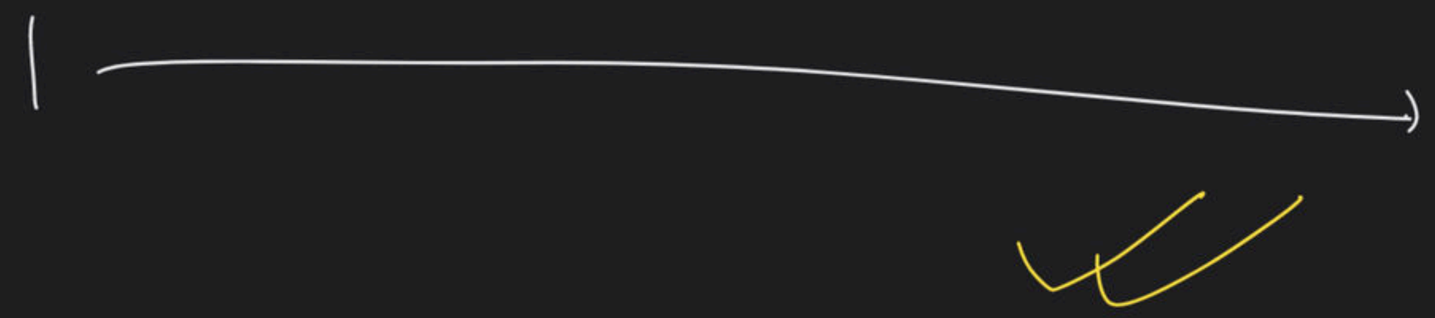
(4)



Vector ans

ans[i] = it;

K = 3



I Bucket → 4 → 1 → 2 → 3 → 4 → ✗

II " , 4 → 5 → 6 → 7 → 8 → X

III " 3 → 9 → 10 → 11 → X

5 LC = 430 : Flatten Multilevel Doubly LL

5 Min : Think & Read => 4:45 PM