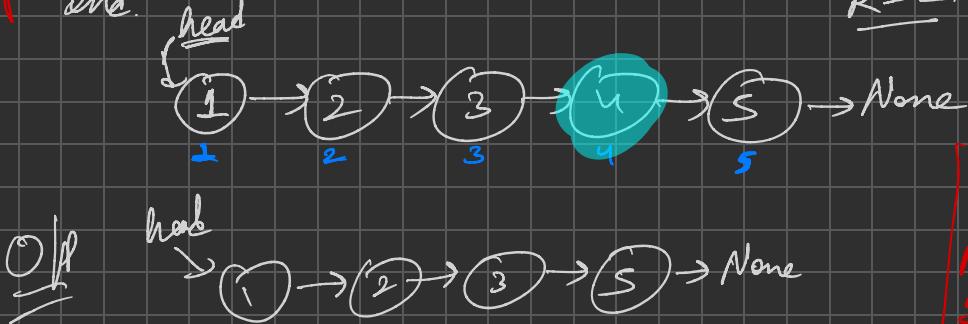


LINKED LISTS

PB
Google
NY
Microsoft

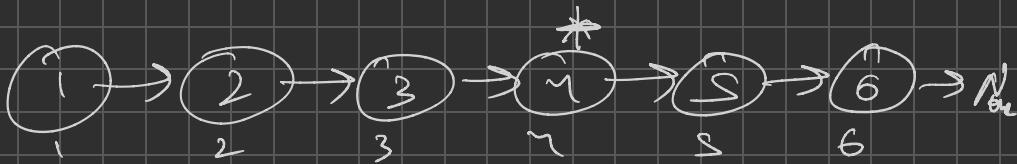
Given a LL, remove the k^{th} node from the end.

$$R = 2$$



We know how to remove the n^{th} node from the beginning.

' k^{th} ' node from end = $(N - k + 1)^{\text{th}}$ node from the beginning



3^{rd} from end = 4^{th} node

$N = 6, k = 3, N - k + 1 = 6 - 3 + 1 = 4^{\text{th}}$ from the beginning

head

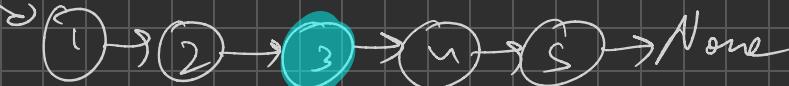
*



$$k = 2$$

head

→



$$k = 3$$

head

→



$$k = 2$$

head

→



$$k = 4^{\text{th}}$$

p.next

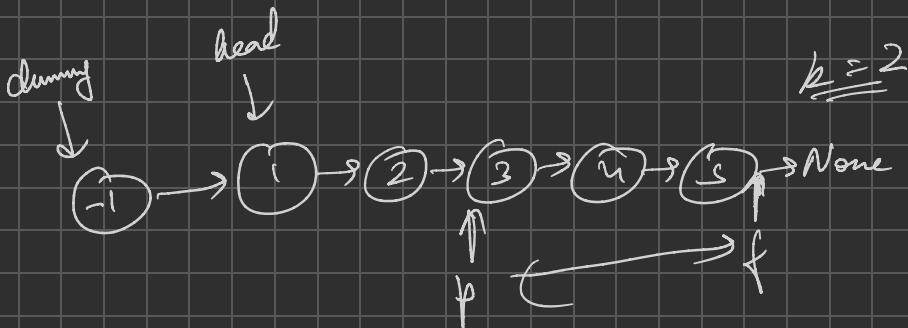
p.next.next

↑
p

↑
p

O(N)

$p.\text{next} = p.\text{next.next}$



def remove (head, k):

dummy = Node (-1)

dummy.next = head // placey at the beg.

present = dummy. (new head)

future = dummy

for i in range (k):

future = future.next

T.C. $\rightarrow O(n)$

S.C. $\rightarrow O(1)$

while future.next != None:

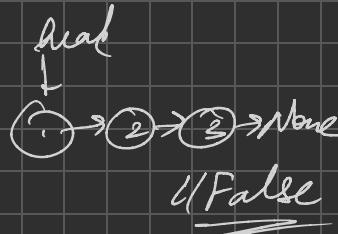
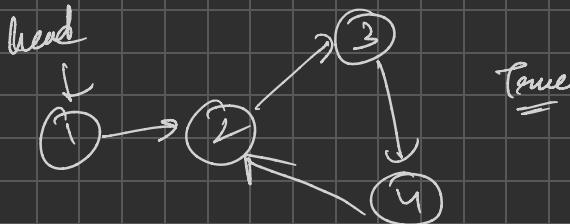
: present = present.next

: future = future.next

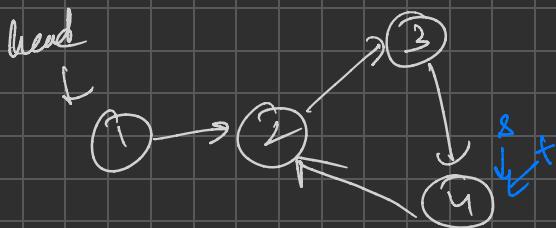
: present.next = present.next.next

return dummy.next

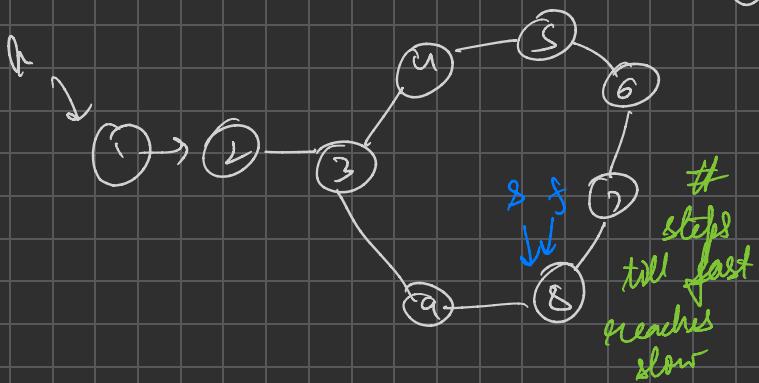
♀ Determine if the LL has a cycle.



Floyd's Tortoise & Hare problem



$$s = \text{slow}$$
$$f = \text{fast} \cdot \text{next}$$



= list. b/w 2 pts
diff b/w speeds

$$\Rightarrow \frac{N}{2-1} = N$$

Q* Given LL - with cycle, find the starting pt. of cycle.

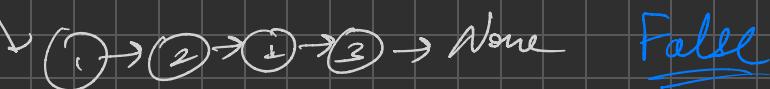
Palindrome linkedlist

Read



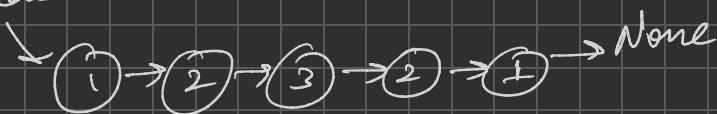
True

Read



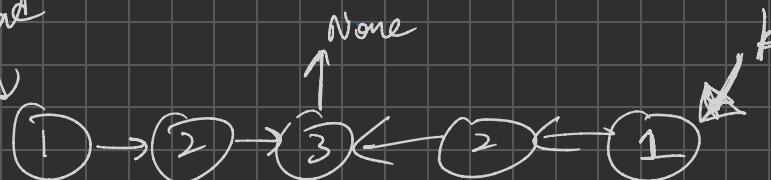
False

Read



↓
Black Box
(magic)

Read



while $p2 \neq \text{None}$:

if $p1.\text{data} == p2.\text{data}$:
 $p1 = p1.\text{next}$ t
 $p2 = p2.\text{next}$

else: False

Reverse Linkedlist

head



head

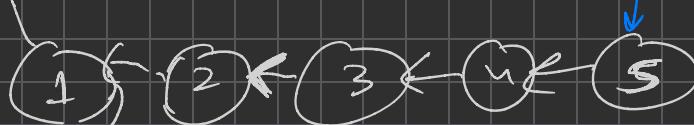


OR



head

head



prev

temp cur
↓
None

temp = cur.next

cur.next = prev

prev = cur

cur = temp

temp = cur.next

cur.next = prev

prev = cur

cur = temp

$\text{cur} = \text{head}$
 $\text{prev} = \text{None}$

while $\text{cur} \neq \text{None}$

$\text{temp} = \text{cur}. \text{next}$

$\text{cur}. \text{next} = \text{prev}$

$\text{prev} = \text{cur}$

$\text{cur} = \text{temp}$

$\text{head} = \text{prev}$

'1' '2' '3'

1 2 3 \rightarrow 1 3 2 2 1 3 2 3 1 3 1 2

1 3 2 \rightarrow 2 1 3 3 1 2

6 3 1 \rightarrow X

2 6 3 1 \rightarrow 3 1 2 6

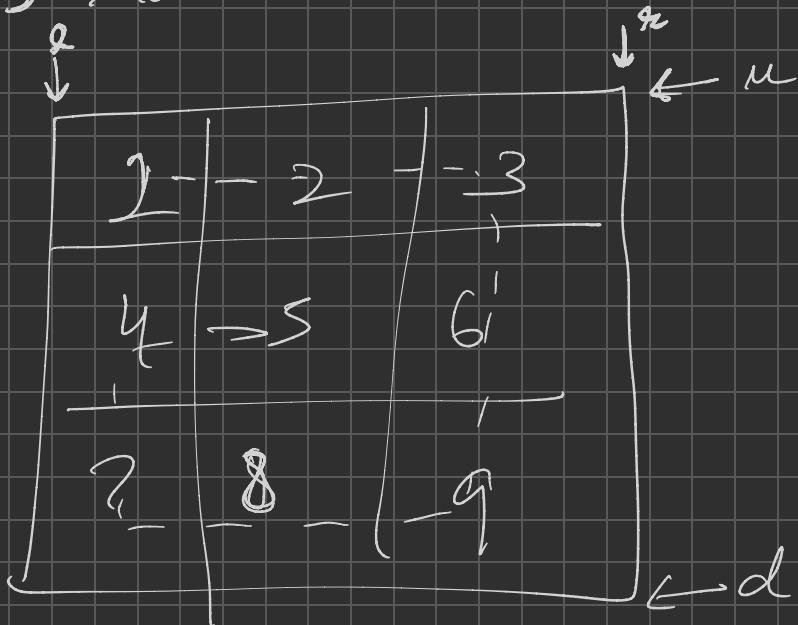
*
3 6 2 1 \Rightarrow (3*) 1 2 6
sort

4 6 3 1 \rightarrow 6 1 3 4

~~125~~ 76 3 1 → 126 1357 ~~2113567~~
 126 ~~7531~~ → 126 1357 1725631

12345687

12345?6



123698745