PW SKILLS

Linked List

Part – 3

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COLLEGE WALLAH

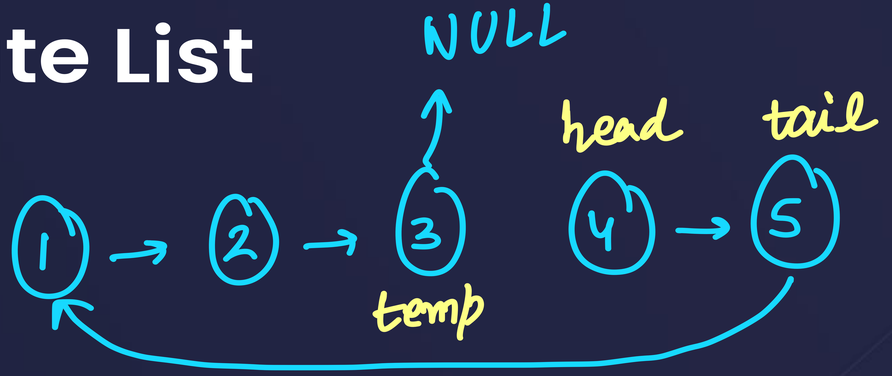
Ques: Remove Duplicates from Sorted List [Leetcode - 83]

```
Node* a = head;
Node* b = head->next;
```

```
while (b != NULL) {
    while (b != NULL && b->val == a->val)
        b = b->next;
    a->next = b;
    a = b;
    if (b != NULL) b = b->next;
}
```

Ques: Rotate List

[Leetcode - 61]



tail → next = head

head = temp → next

temp → next = NULL

K = 2

K = 90

K > n

1 2 3

K = 10

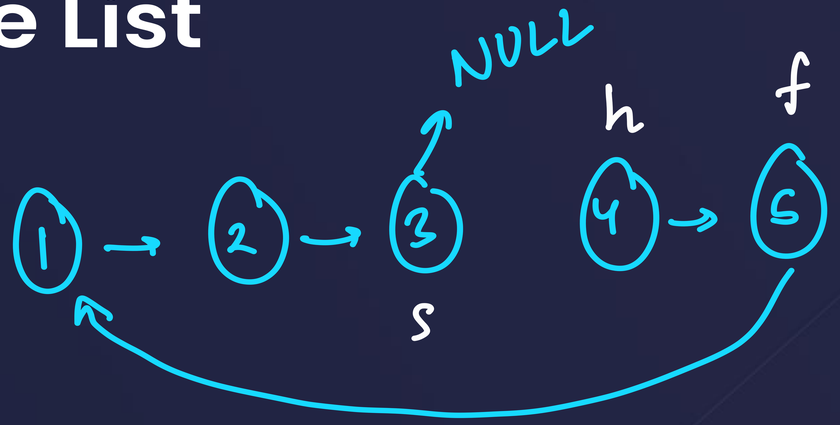
K = K % n

Ques: Rotate List

[Leetcode - 61]

n-2

x x



k = 2

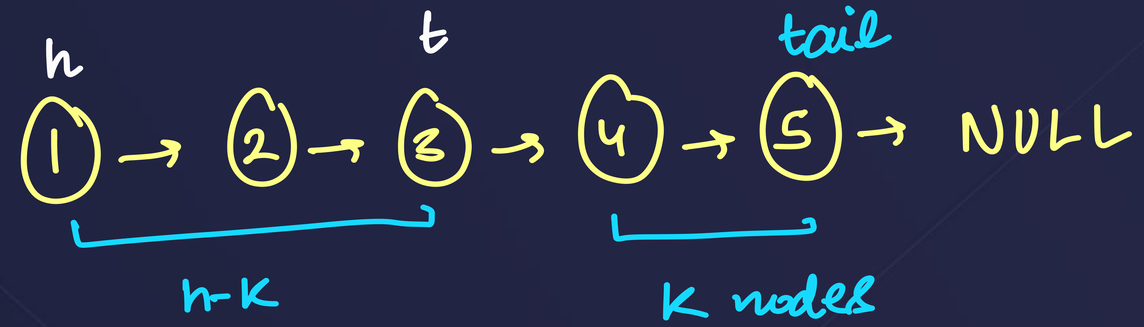
when → k < n

Steps

1) s = f = h
2) move fast k steps ahead
3) move slow & fast till f.next → null
4) f → next = head
5) h = s → next
6) s → next = NULL

Ques: Rotate List

[Leetcode - 61]



$K = K \% n$

$K = \cancel{12}\ 2$

$n = 5$

Ques: Spiral Matrix IV [Leetcode - 2326]

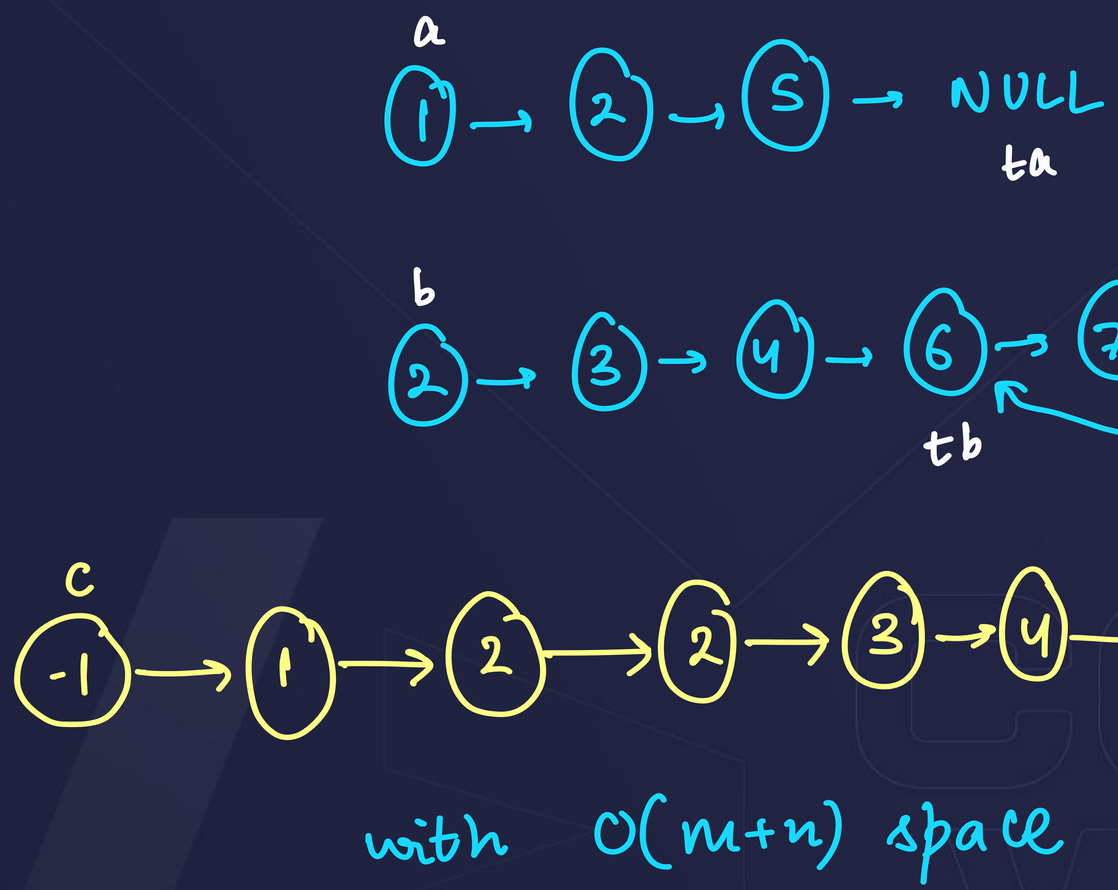
Spiral Matrix , Spiral Matrix II

$n = 3, m = 4$

1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → NULL

1	2	3	4
-1	-1	-1	5
-1	8	7	6

Ques: Merge 2 sorted lists [Leetcode - 21]

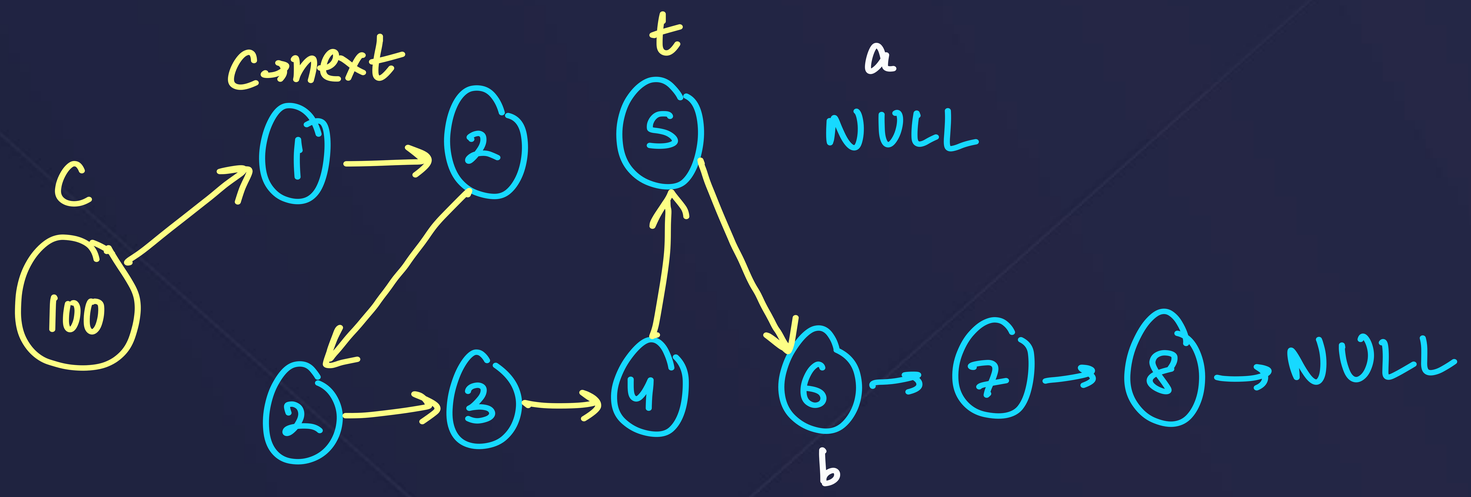


Farzi / Extra Node

T.C. = O(m+n)

S.C = O(m+n)/O(1)

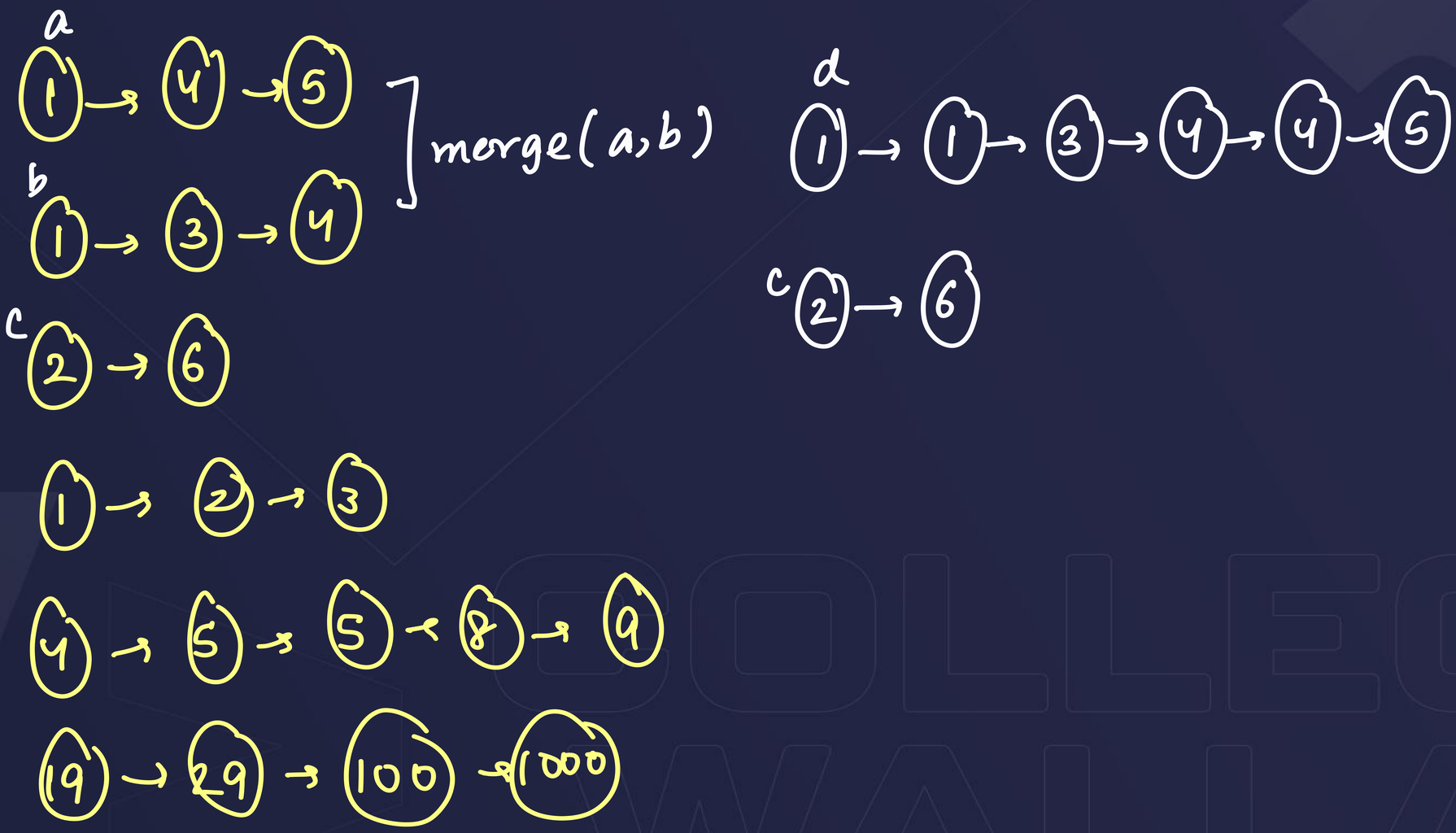
Ques: Merge 2 sorted lists O(1) Space [Leetcode - 21]




```
if (a->val <= b->val)
    t->next = a;
    a = a->next
    t = t->next
```

Ques: Merge k sorted lists

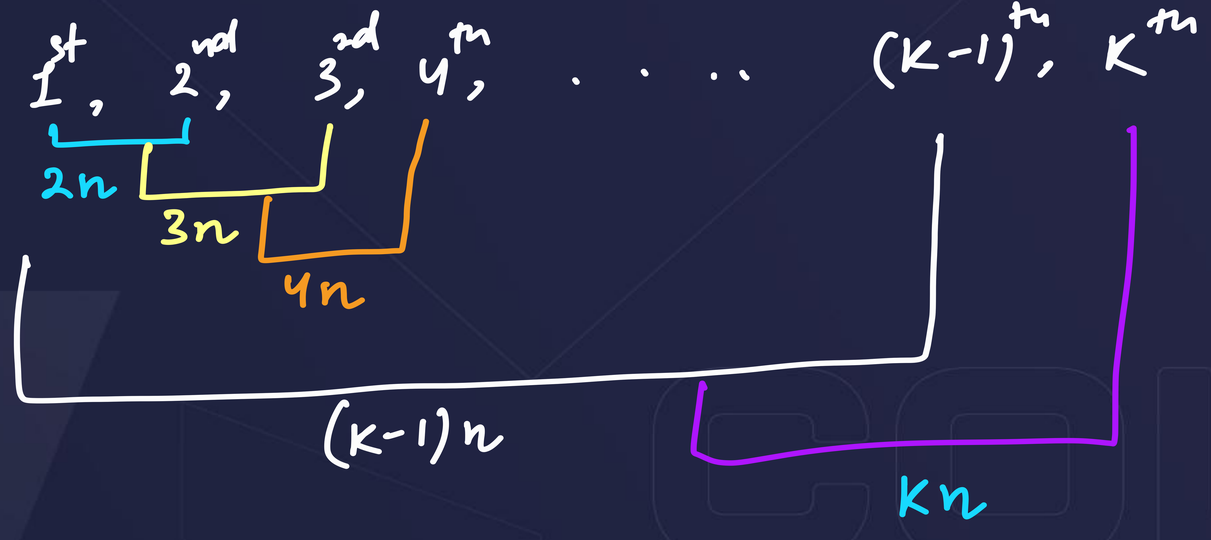
[Leetcode - 23]



Ques: Merge k sorted lists [Leetcode - 23]

Time Complexity

→ K lists & each LL has on an average 'n' elements



$$tno = 2n + 3n + 4n + \ldots (K-1)n + Kn$$
$$= n[2+3+4+\ldots K]$$

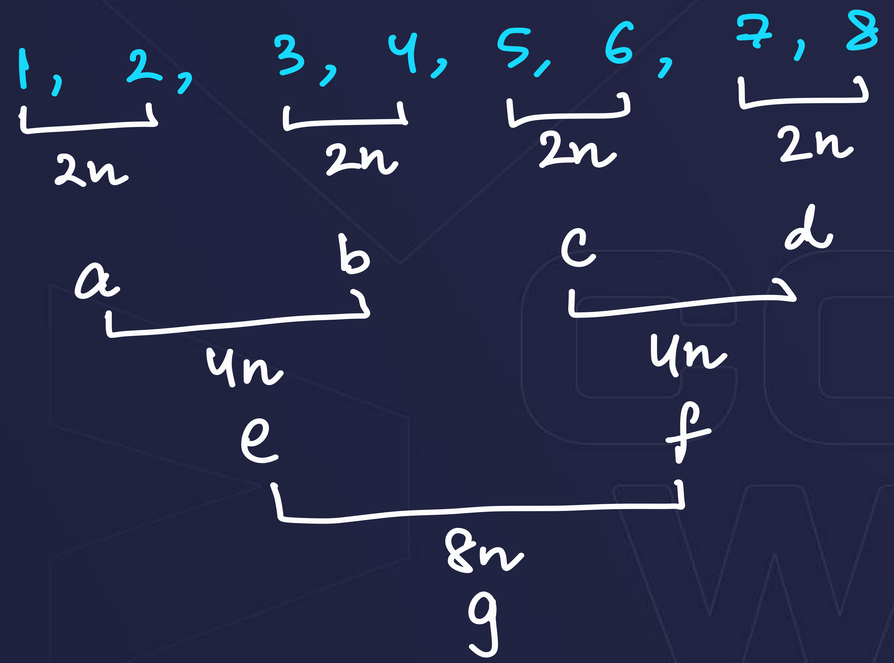
$$tno = n\left[\underline{1+2\ldots K} - 1\right]$$
$$= n \cdot \frac{K(K+1)}{2} - n$$

$$T.C. = O(n \cdot K^2)$$

Ques: Merge k sorted lists [Leetcode - 23]

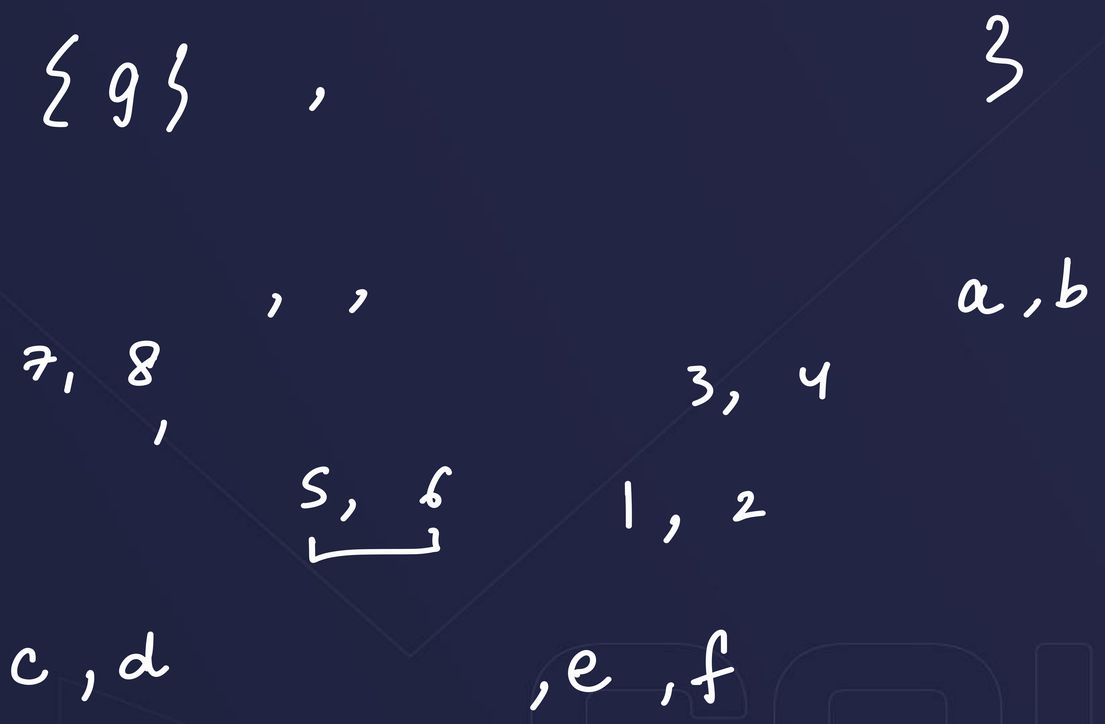
1, 2, 3, 4, 5, 6, 7, 8

$$TNO = n \cdot \frac{K(K+1)}{2} - n = n \cdot \frac{8 \cdot 9}{2} - n = 35n$$



$$T.N.O = 8n + 8n + 8n$$
$$= 24n$$
$$= O(n \cdot K \cdot \log K)$$

Ques: Merge k sorted lists [Leetcode - 23]



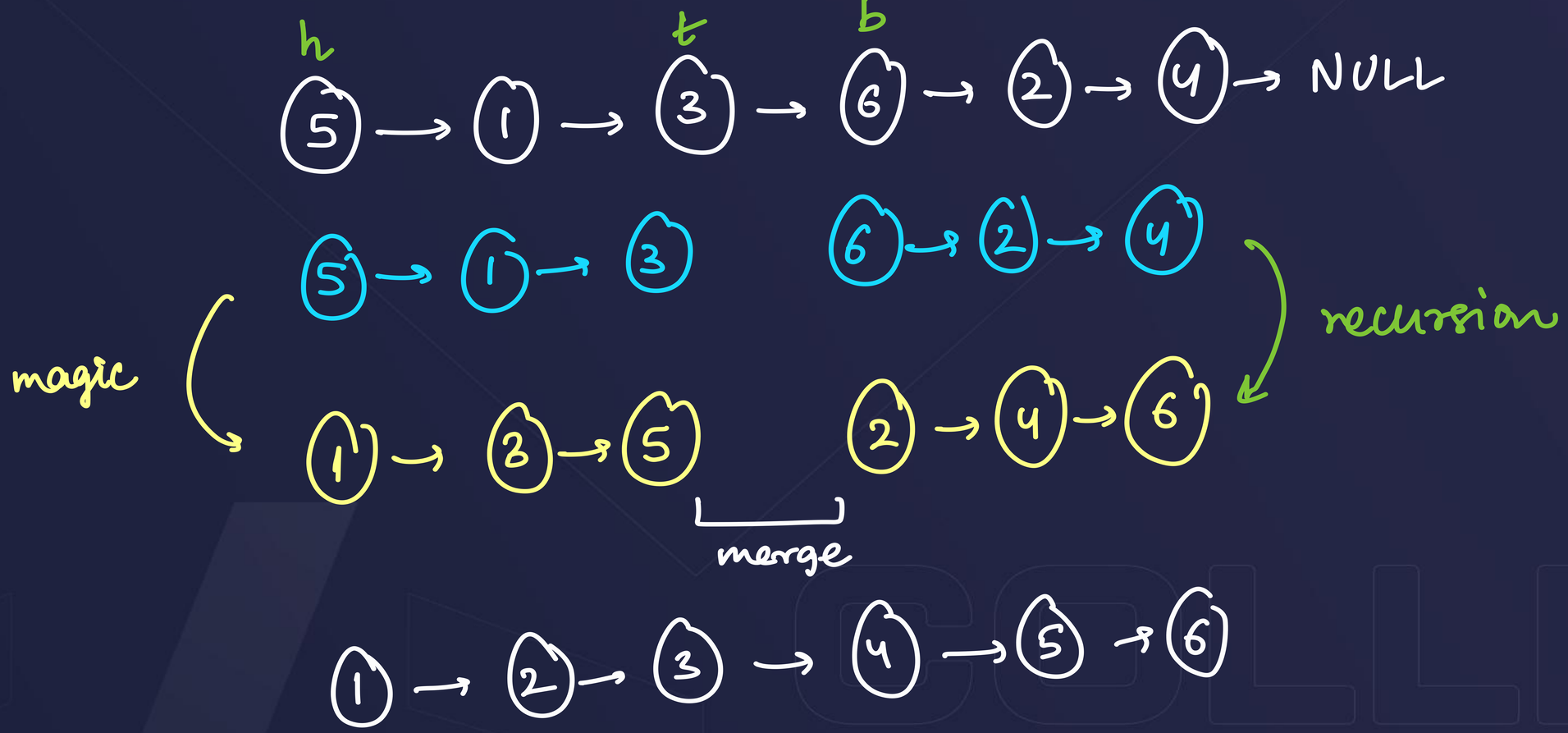
Ques: Merge k sorted lists [Leetcode - 23]

$1, 2, 3 \ldots \ldots, 31, 32$

$$n \cdot \frac{\overset{16}{\cancel{32}} \cdot 31}{\cancel{2}} - n = 495n$$

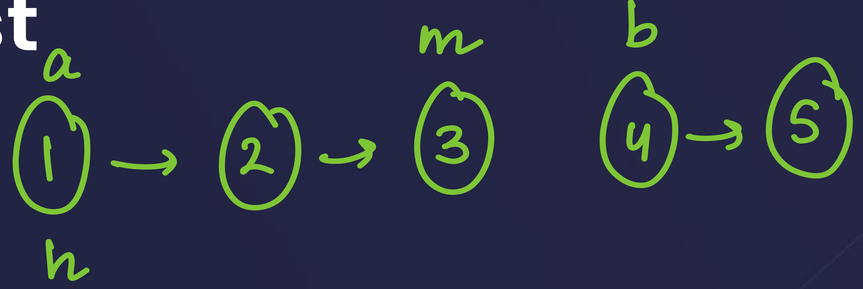
$$\rightarrow 32n + 32n + 32n + 32n + 32n = 160n$$

Ques: Sort List (merge Sort) O(1) [Leetcode - 148]



Ques: Sort List

[Leetcode - 148]



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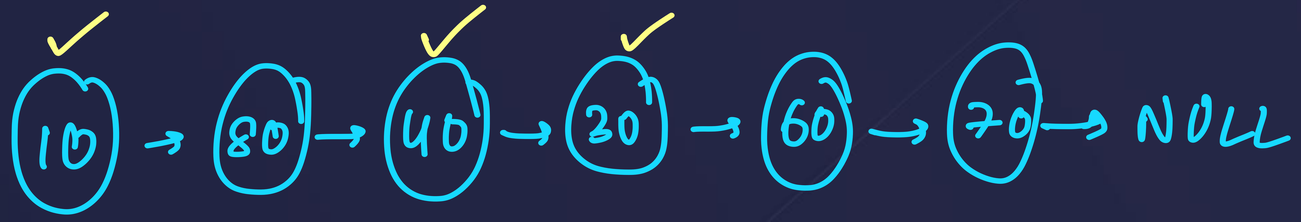
Ques: Partition List

[Leetcode - 86]

Quick Sort

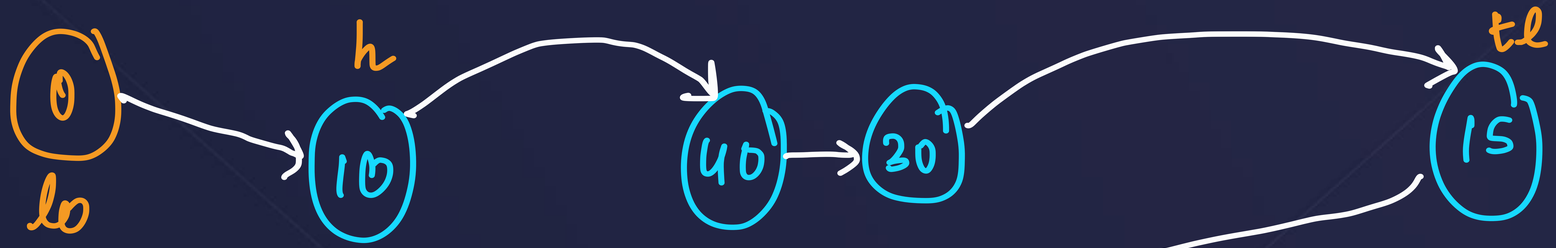


50, 40, 40, 30, 80, 10, 60

30, 40, 40, 50, 80, 10, 60

Ques: Partition List

[Leetcode - 86]



x = 41

t->val < x

tl->next = t

t = t->next

tl = tl->next

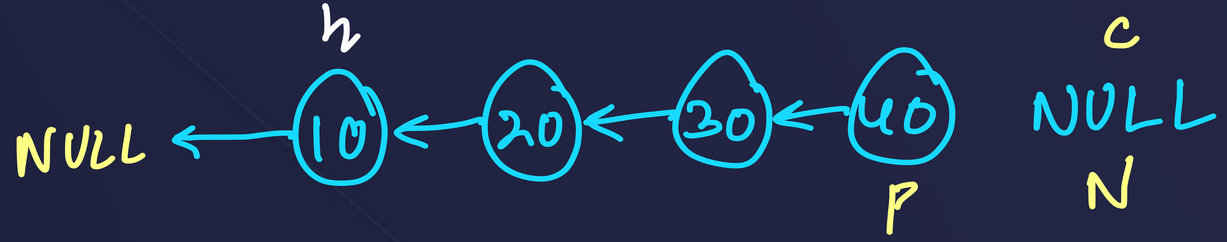
t->val >= x

th->next = t

t = t->next

th = th->next

Ques: Reverse Linked List (Iterative) [Leetcode - 206]



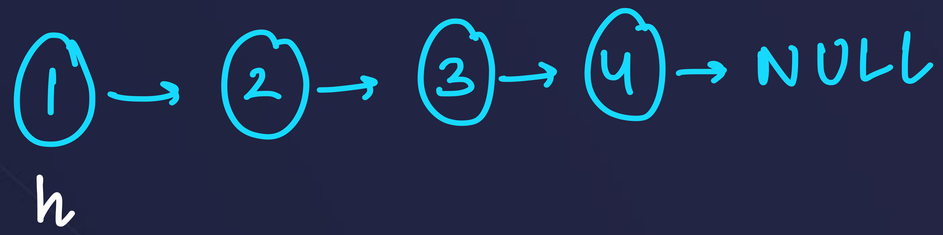
prev , curr, Next

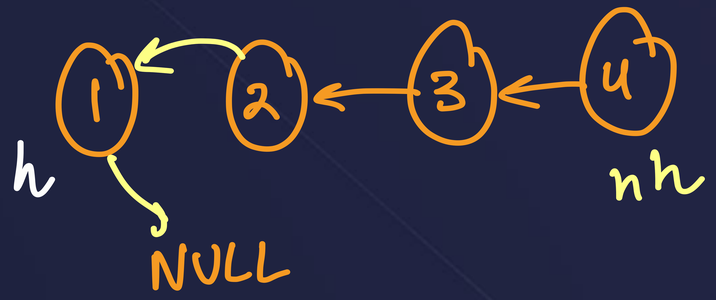
```
while (curr){
    Next = curr → next
    curr → next = prev
    prev = curr
    curr = Next
}
return prev;
```

Time Complexity → O(n)

Space Complexity → O(1)

Ques: Reverse Linked List (Recursive) [Leetcode - 206]





T.C. = O(n)

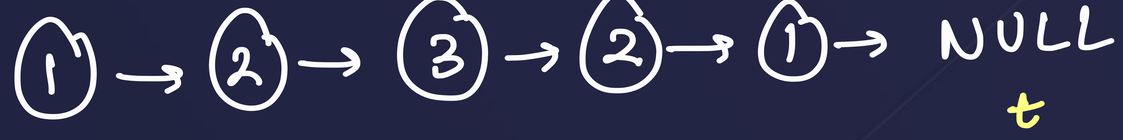
S.C. = O(n)

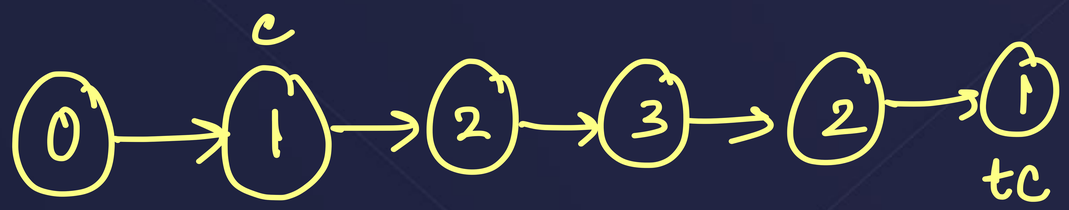
```
nhead = reverse(head->next);
h->next->next = h
h->next = NULL
return nohead
```

Ques: Palindrome Linked List [Leetcode - 234]

M-I : Bad [T.C. = $O(n^2)$] → getNodeAt(idx) S.C. = O(1)

M-2 :





c = reverse(c)

→ check every element of original & duplicate(reversed)

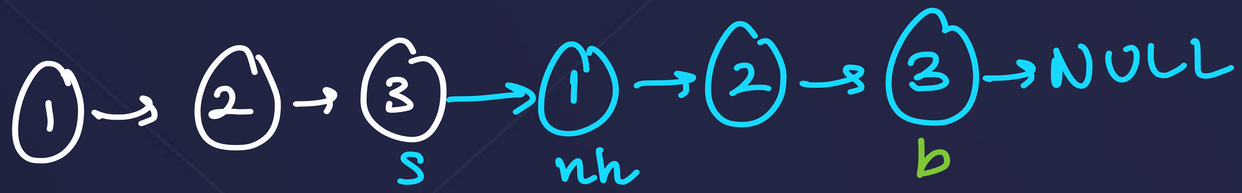
Okayish Method → T.C. = O(n)

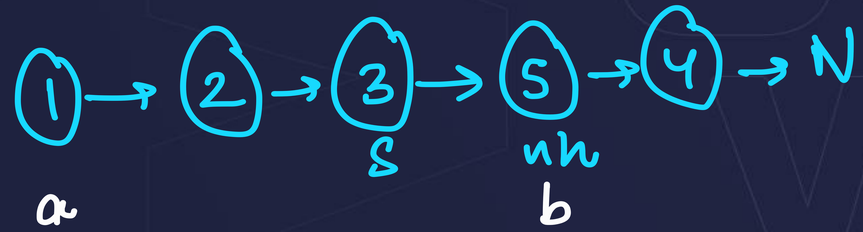
S.C. = O(n)

Ques: Palindrome Linked List [Leetcode - 234]

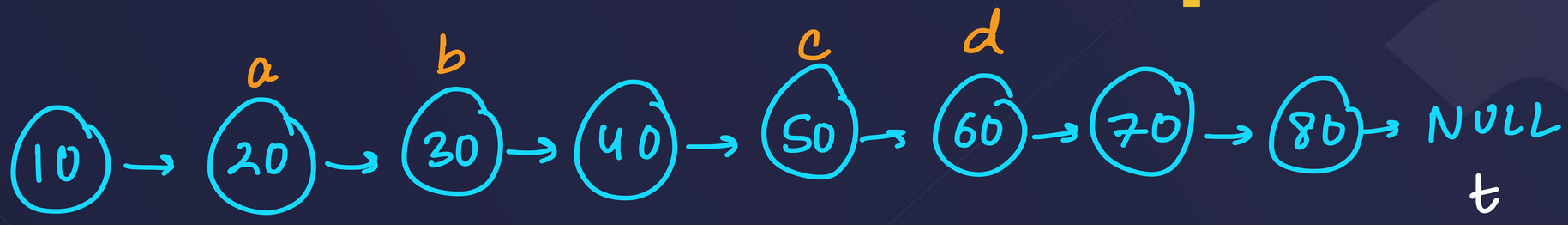
M-3 : T.C. = O(n) , S.C. = O(1)

Hint : if the first & second halves of LL are reverse of each other → true

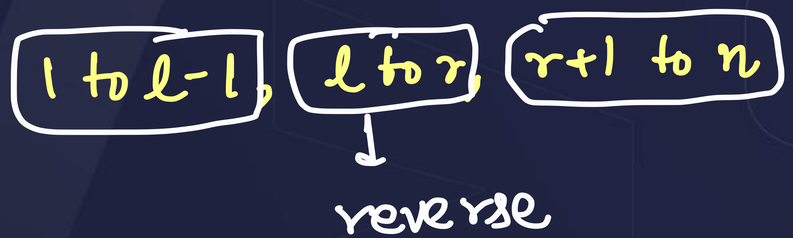




Ques: Reverse Linked List II [Leetcode - 92]



Hint : Break the list into 3 lists -




```
while(temp){
    if(n == l-1)  a = temp
    if(n == l)    b = temp
    if(n == r)    c = temp
    if(n == r+1)  d = temp
    temp = temp->next
    n++
}
```

3

temp = head

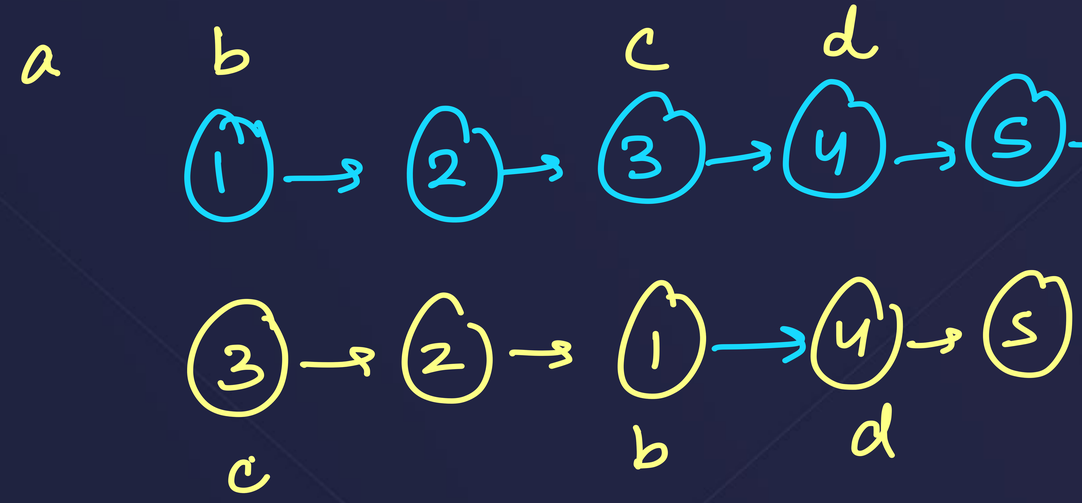
n = 1 2 3 4 5 6 7 8 9

l = 3

r = 5

Ques: Reverse Linked List II

[Leetcode - 92]



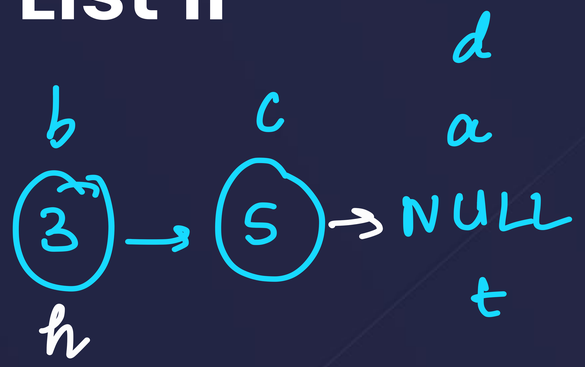
left = 1

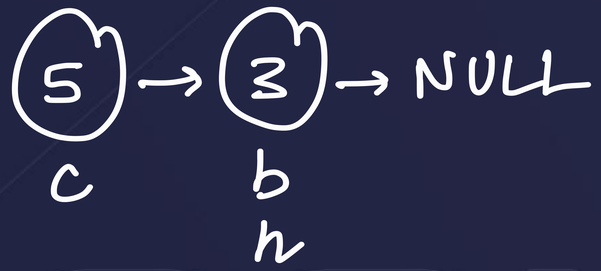
right = 3

Ques: Reverse Linked List II

[Leetcode - 92]

```
if(left==right) return head;
ListNode* a = NULL;
ListNode* b = NULL;
ListNode* c = NULL;
ListNode* d = NULL;
ListNode* temp = head;
int n = 1;
while(temp){
    if(n==left-1) a = temp;
    if(n==left) b = temp;
    if(n==right) c = temp;
    if(n==right+1) d = temp;
    temp = temp->next;
    n++;
}
if(a) a->next = NULL;
c->next = NULL;
c = reverseList(b);
if(a) a->next = c;
b->next = d;
return head;
```



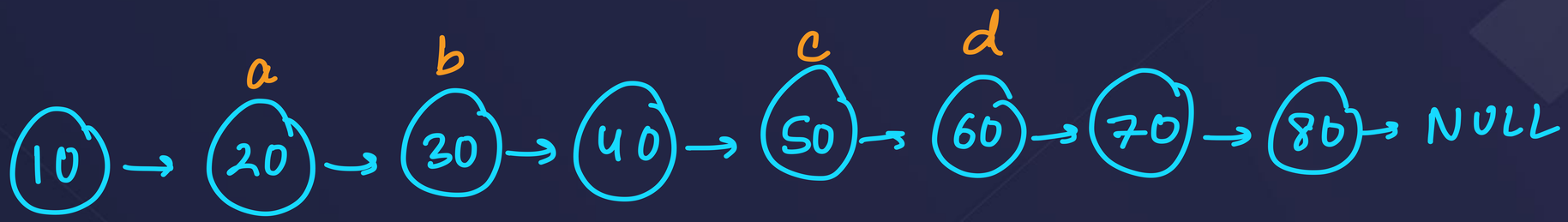


left = 1

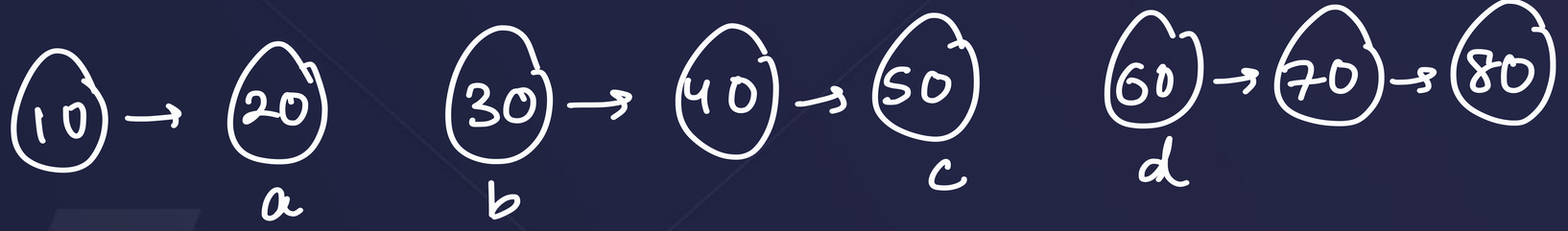
right = 2

n = 12

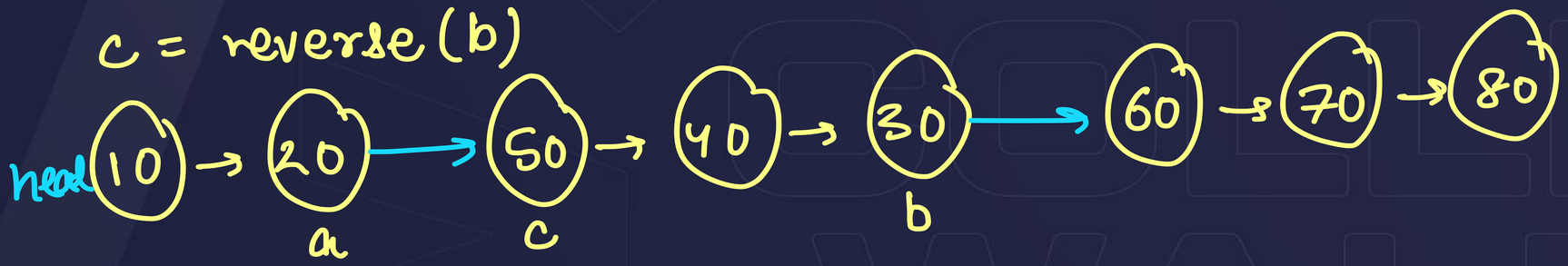
Ques: Reverse Linked List II [Leetcode - 92]



a → next = NULL , c → next = NULL ,



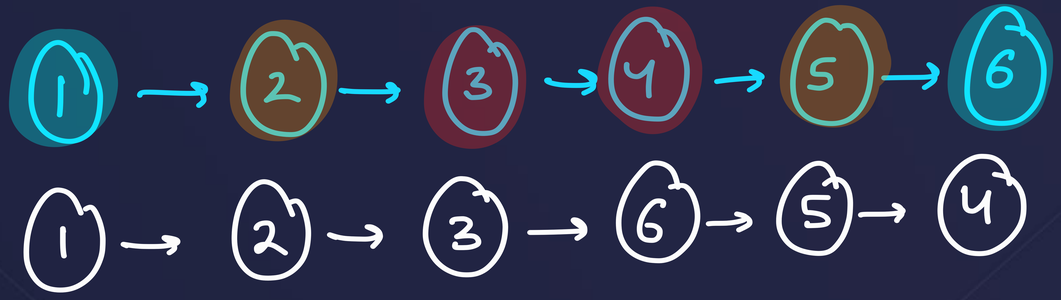
c = reverse(b)



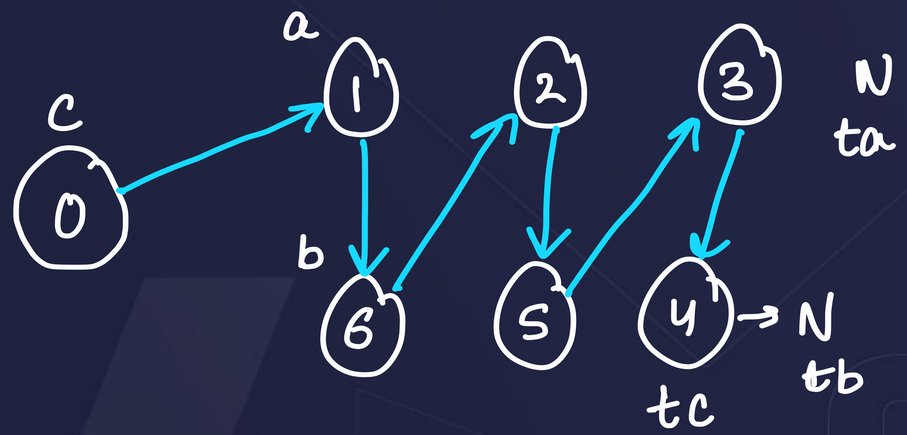
a → next = c , b → next = d

Ques: Reorder List

[Leetcode - 143]



#Hints
1) Palindrome LL
2) Partition LL / Merge 2 Sorted
3) Farzi Node



loop

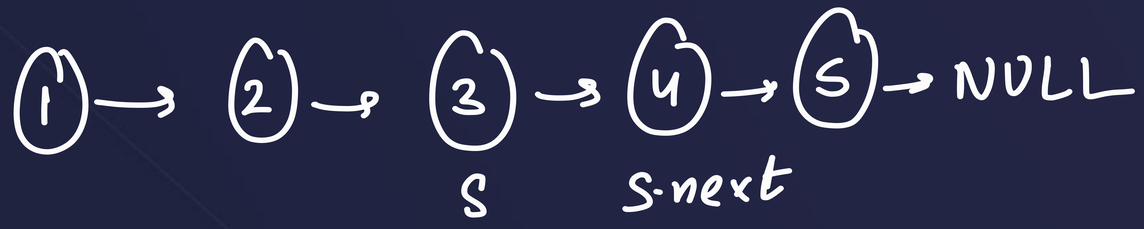
```
tc->next = ta
tc = tc->next
ta = ta->next
tc->next = tb
tc = tc->next
tb = tb->next
```

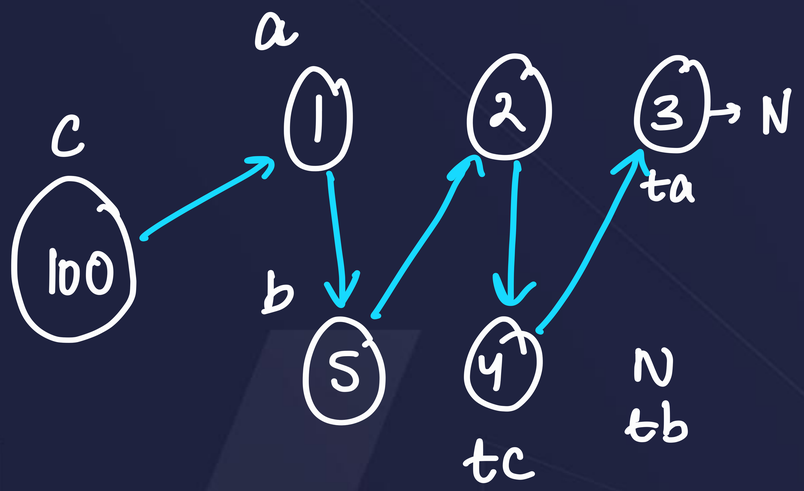
tc → next ≠ null

→ 1 → 6 → 2 → 5 → 3 → 4

Ques: Reorder List

[Leetcode - 143]






```
ListNode* slow = head;
ListNode* fast = head;
while(fast->next!=NULL && fast->next->next!=NULL){
    slow = slow->next;
    fast = fast->next->next;
}
// slow is at the left middle / middle
ListNode* b = reverseList(slow->next);
ListNode* a = head;
slow->next = NULL; // for breaking the lists
// merge these two - a and b alternatively
ListNode* c = new ListNode(100);
ListNode* tempC = c;
ListNode* tempA = a;
ListNode* tempB = b;
while(tempA && tempB){
    tempC->next = tempA;
    tempA = tempA->next;
    tempC = tempC->next;
    tempC->next = tempB;
    tempB = tempB->next;
    tempC = tempC->next;
}
tempC->next = NULL; a
head = c->next;
```

Next Lecture

More problems on Linked Lists!

THANK YOU

COLLEGE WALLAH