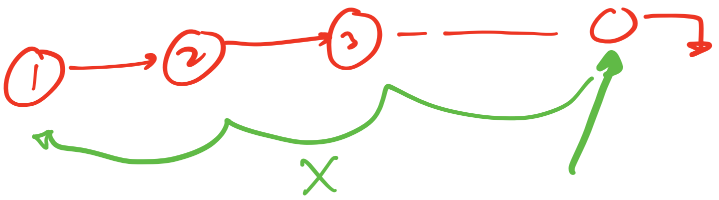
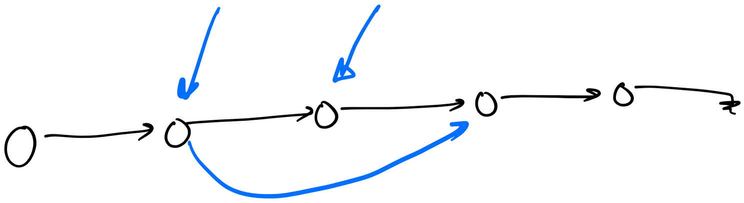
DLL < Doubly Linked List >

Given a LL. ⊙ Can you traverse backwards?



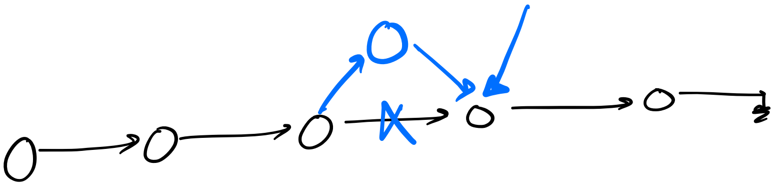
⊙ Given a ptr. to a node. delete it!

→ O(N)

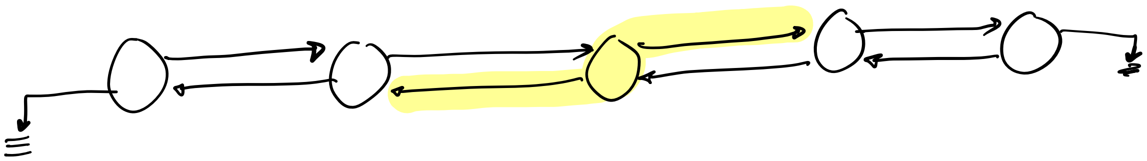


⊙ Given ptr to a node. insert a node before it!

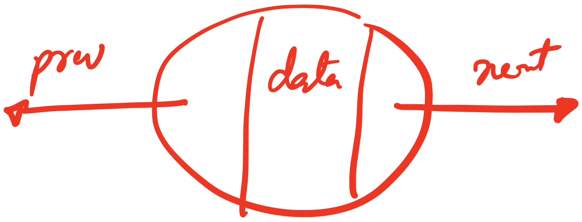
→ O(N)



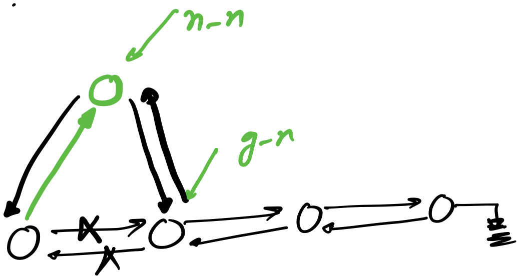
Obs: We do not have ref of prev Node.



```
Class Node {
    data;
    Node next;
    Node prev;
    Node(val) {
        data = val;
        next = NULL;
        prev = ___;
    }
}
```



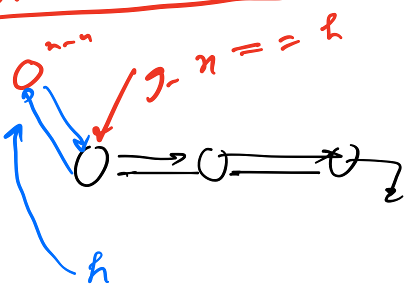
⊙ Given a DLL. & a given_node. → g-n
Add a new_node before it!
↓ n-n



g-n.prev.next = n-n
n-n.next = g-n
n-n.prev = g-n.prev
g-n.prev = n-n

$\boxed{TC = O(1)}$

CORNER CASE

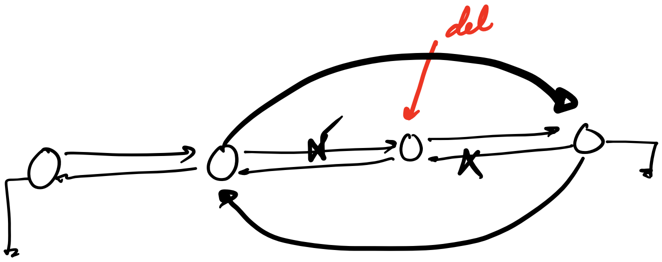


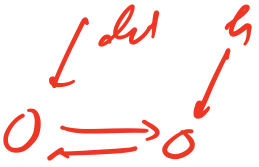
⊙ Given a DLL, given ptr to a node 'del' delete that node!

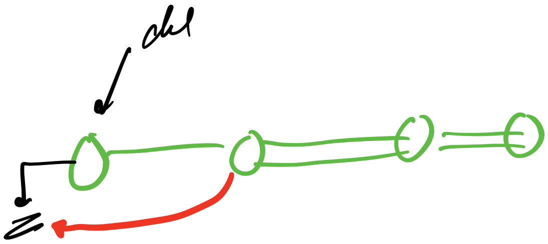
```
if(del == h) h = h.next

if( del.prev != NULL)
    del.prev.next = del.next
if ( del.next != NULL)
    del.next.prev = del.prev
```

$\boxed{TC = O(1)}$

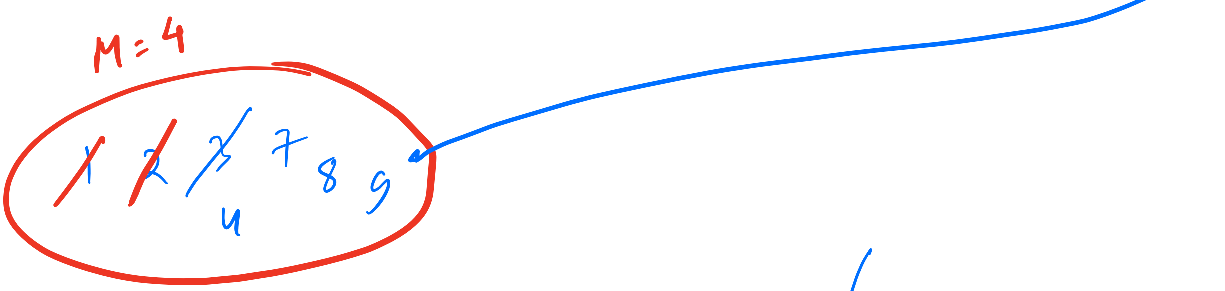




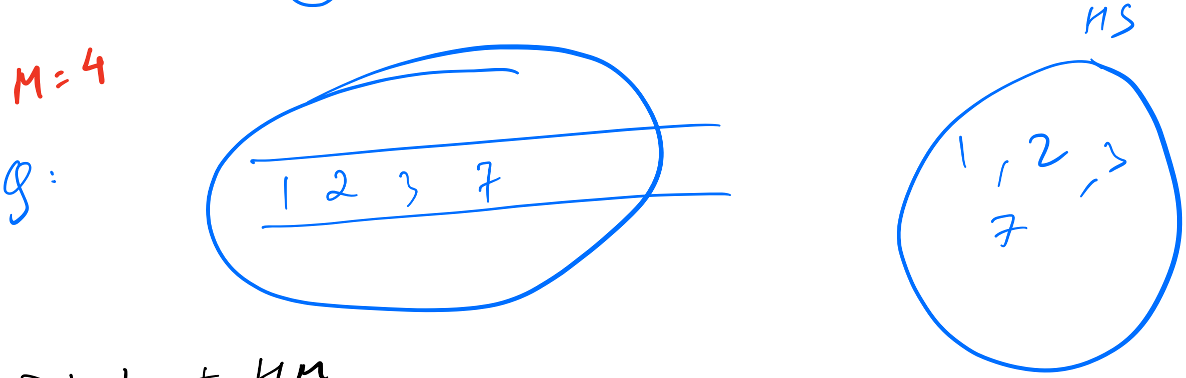


④ LRU [Least Recently Used]

1 2 2 1 1 3 7 8 4 7 4 9

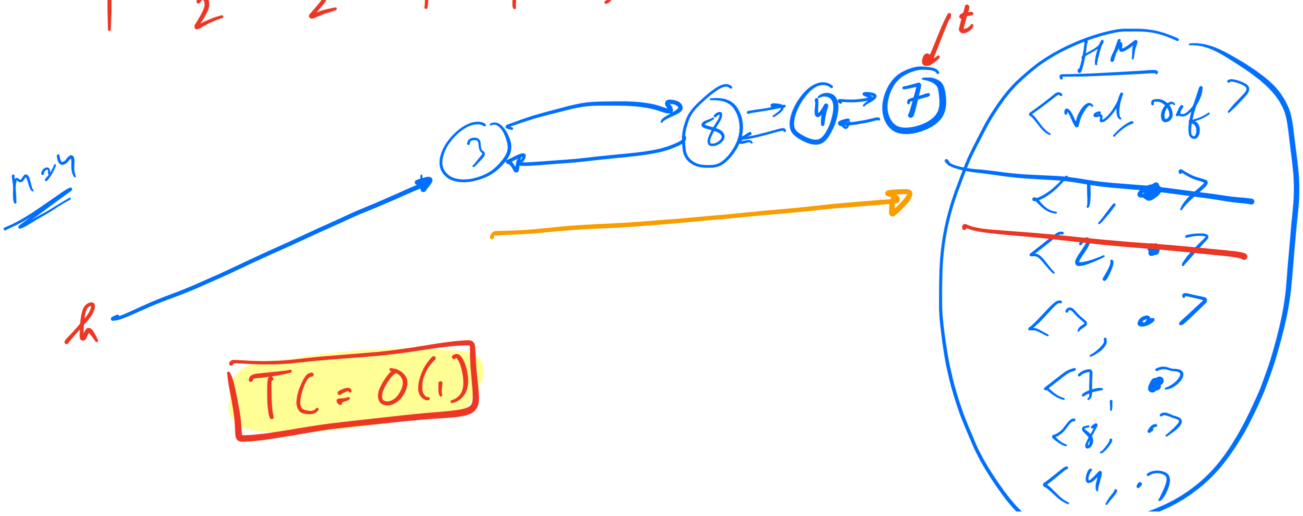


1 2 2 1 1 3 7 8 4 7 4 9

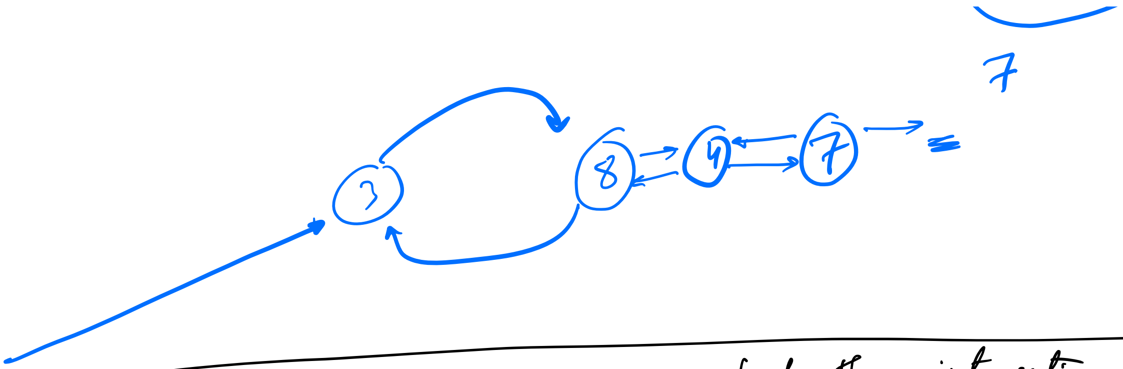


DLL + HM

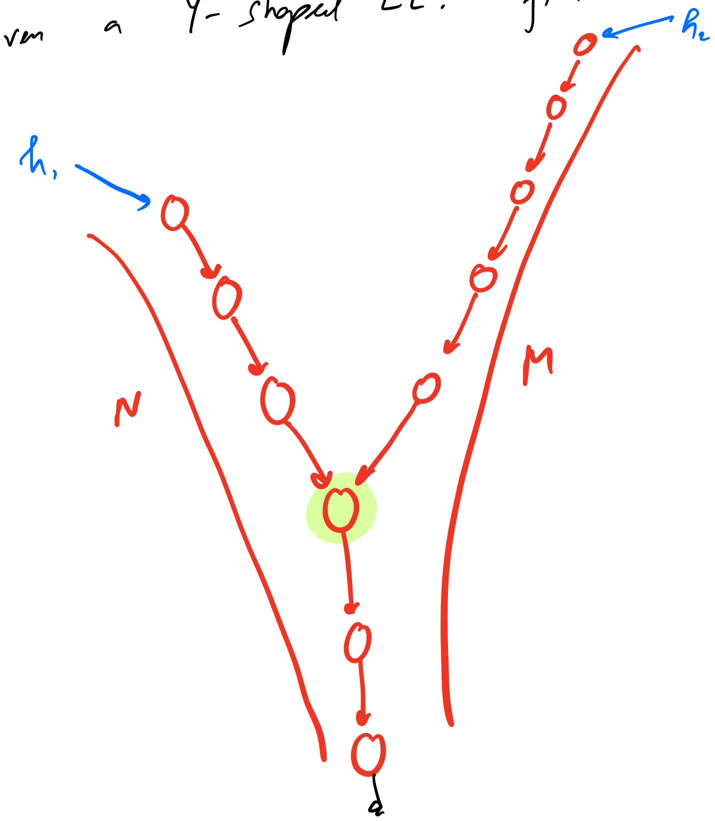
1 2 2 1 1 3 7 8 4 7 4 9



$\boxed{TC = O(1)}$



Q Given a Y-shaped LL. find the intersection.



1) HS

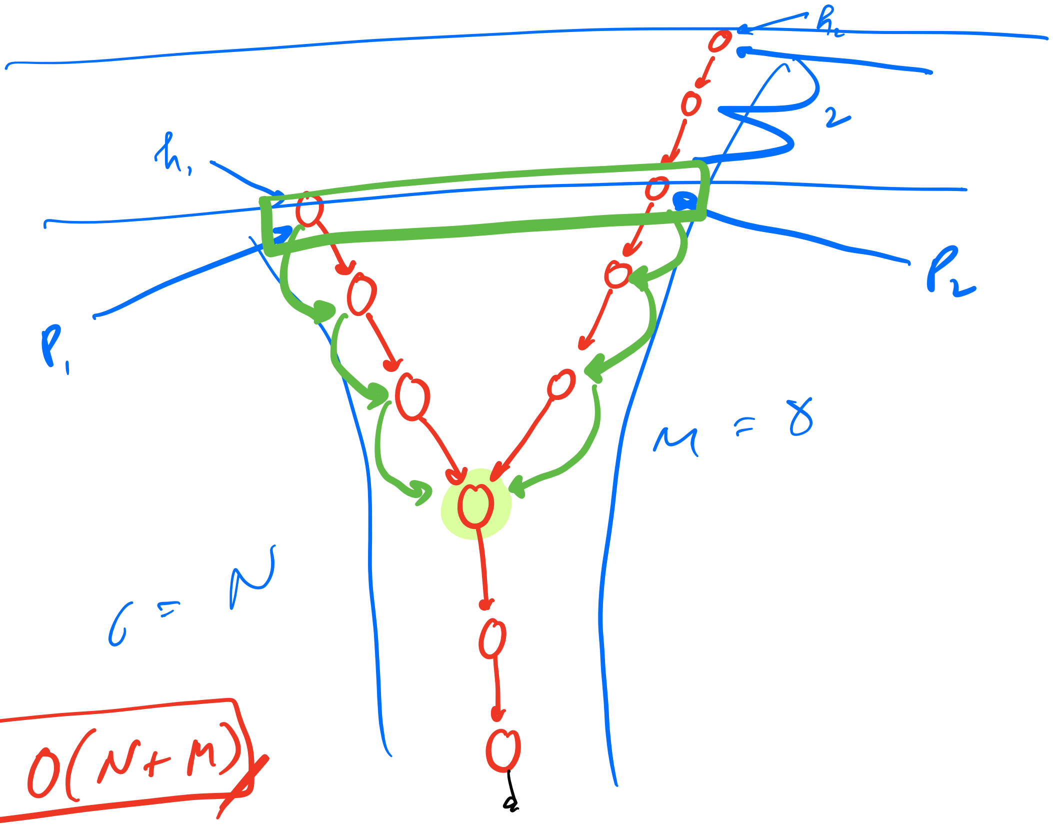
Insert ALL node ref of One LL

find the first ref of 2nd LL in HS.

$$\boxed{TC = O(N+M)}$$

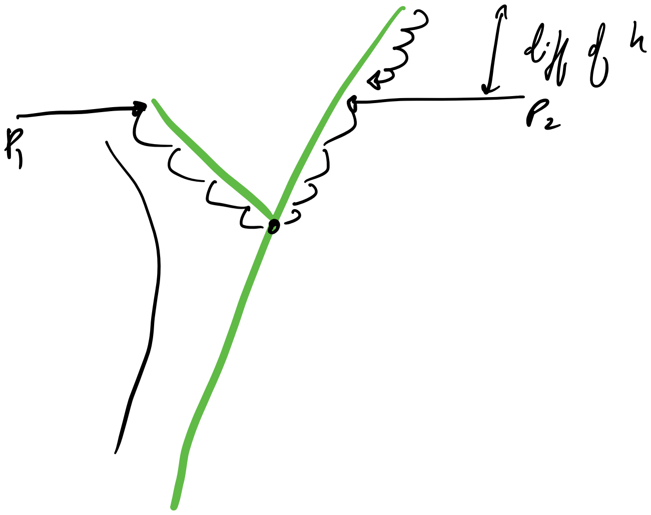
$$\boxed{SC = O(\min(N,M))}$$

II

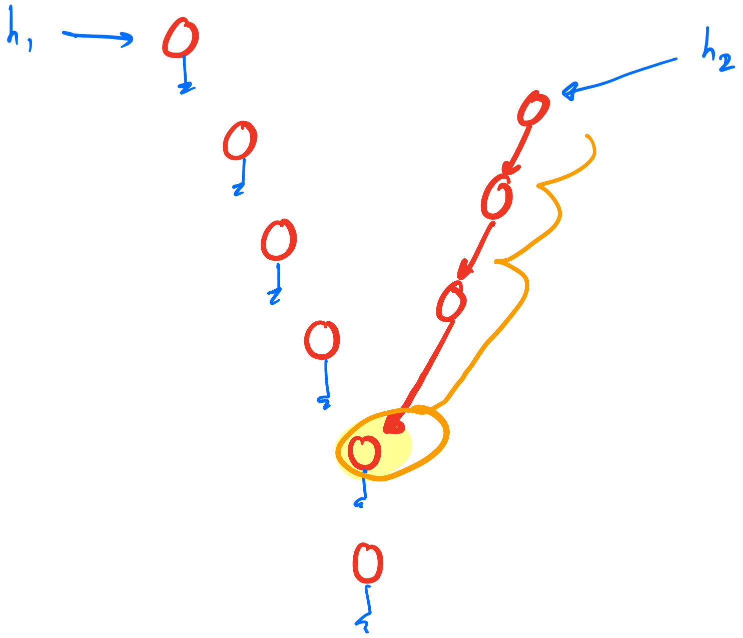


$$\boxed{TC = O(N+M)}$$

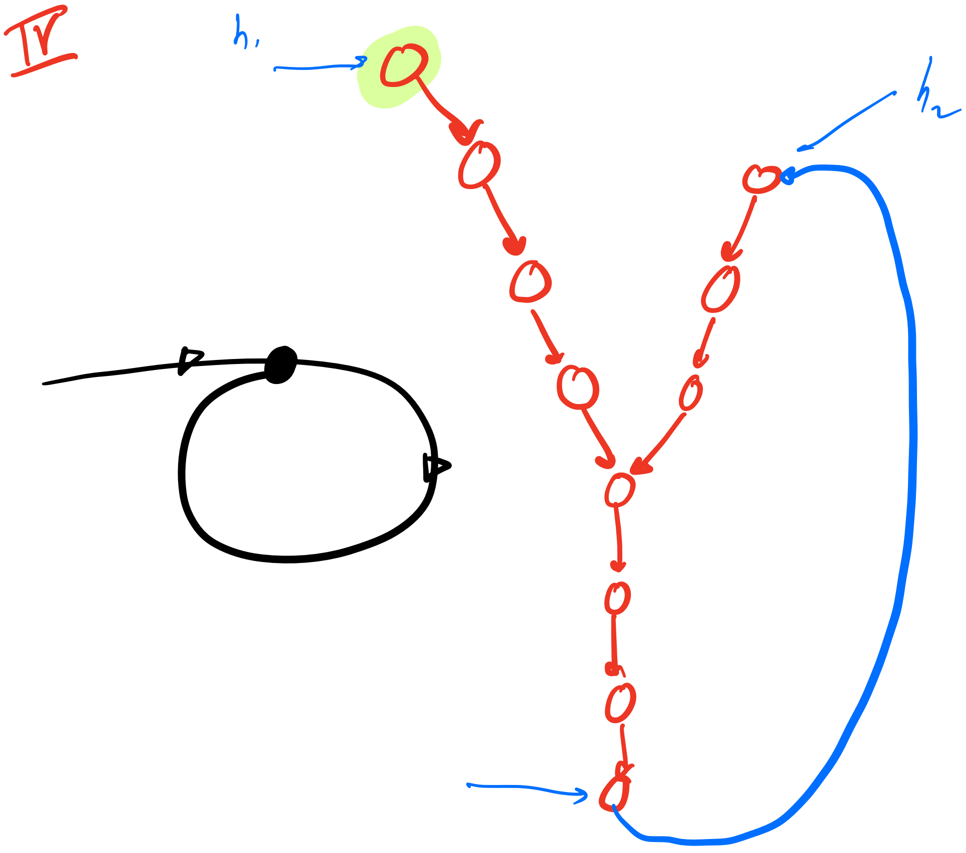
$$\boxed{SC = O(1)}$$

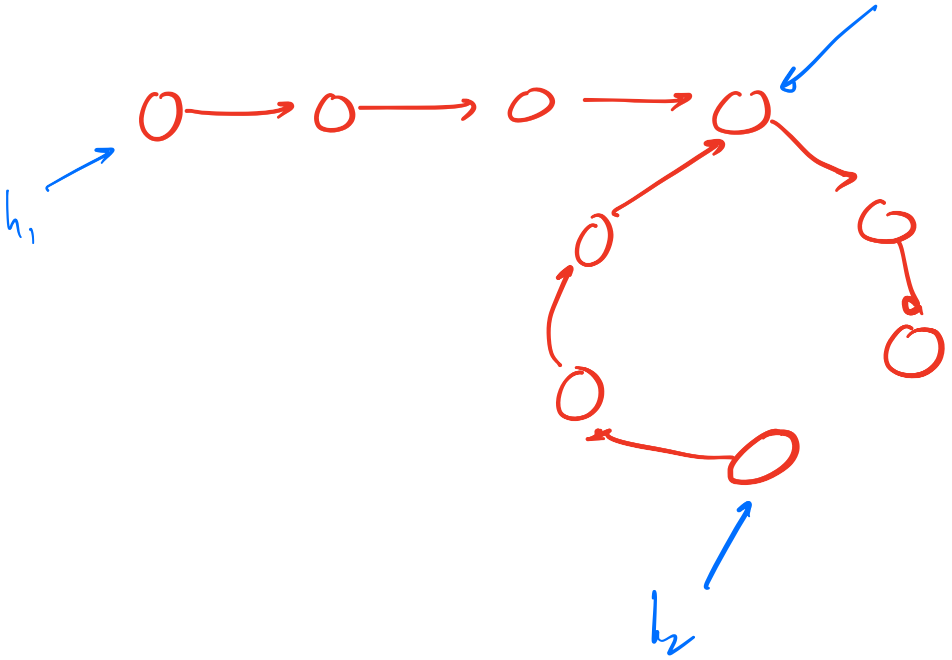


III



IV





Q Given a LL. find the length of the longest odd length palindromic sub L.L.

1 → 2 → 3 → 4 → 5 → 4 → 3 → 1 → 2 → 1

→ 5

1) BF

find ALL sub LL → N^2

↓ check if it is a palindrom → N

$\boxed{TC = O(N^3)}$

A: 1 2 3 4 5 4 3 1 2 1

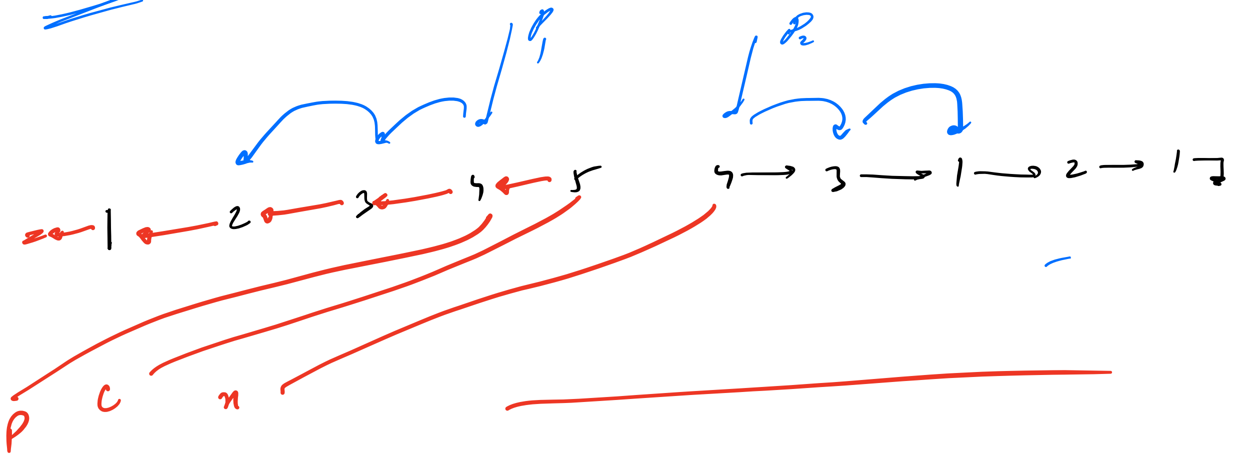
1 1 1 1 5 1 1 1 3 → MAX: 5

Idea: EXPAND AROUND CENTER

N x N

$\boxed{TC = O(N^2)}$

LL



1 1 1 1 5

rev

```
P1 = prev,   P2 = nxt;   cnt = 1
while( P1 != NULL && P2 != NULL &&
        P1 . data == P2 . data) {
        P1 = P1. next;
        P2 = P2. next;
        cnt += 2;
}
ret cnt;
```

$\boxed{TC : O(N^2)}$

MANACHER's ALGO

→ finds longest palindromic S.A in O(N) → TC
O(N) → SC