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T.C. o(n)
S.C. o(1)
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Leetcode
Daily Challenge

04/04/2022

problem

Swapping Nodes in a Linked List

problem liked by

1711 people

difficulty

Medium

est. time

10-15 min

Let's build **Intuition**

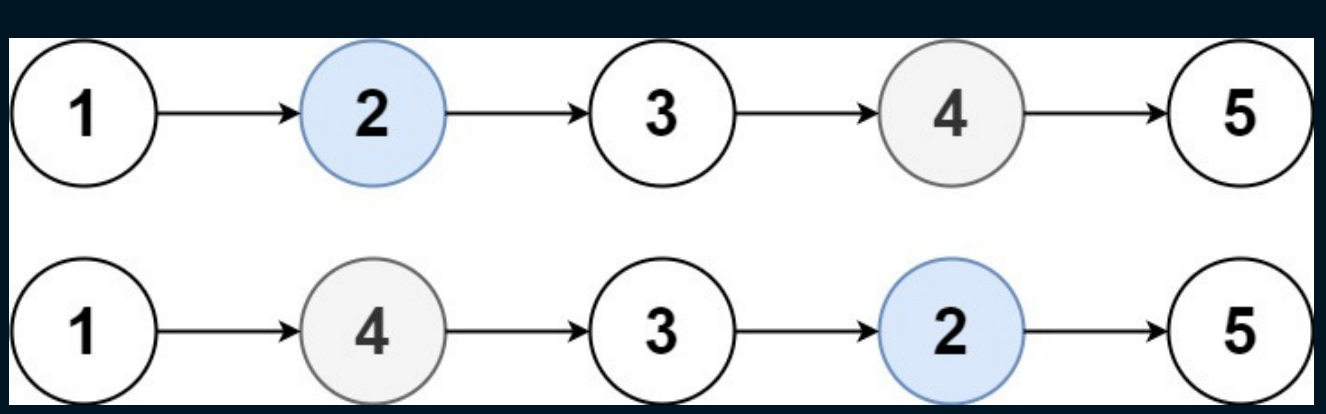
can be asked in...

65%
Accuracy

Statement

Description

- You are given the head of a linked list, and an integer k.
- Return the head of the linked list after swapping the values of the kth node from the beginning and the kth node from the end (the list is 1-indexed)



i/p

head = [1,2,3,4,5], k = 2

o/p

[1,4,3,2,5]

Observation

i/p	o/p
head = [1,2,3,4,5], k = 2	[1,4,3,2,5]

Ruyank: Good morning Bhaiyaa, can we discuss today's problem ?

Bhaiyaa: Hey Ruyank, we can but let's keep it short !

First tell me what is asked & what is given in problem ?

Ruyank: Bhaiyaa, we are given a Linked List and integer K, we want to swap the Kth node from start & Kth node from end

Bhaiyaa: Now what is your initial approach ?

Ruyank: Bhaiyaa, obviously we want to swap 2 nodes, but instead of swapping nodes we can swap their values & we are done

Bhaiyaa: But even to swap their values you have to store those 2 Nodes somewhere & how will you do that ?

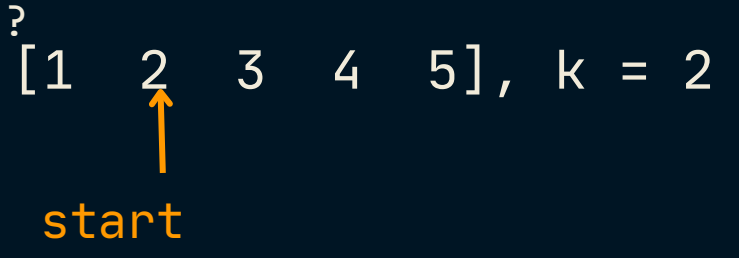
Observation

i/p	o/p
head = [1,2,3,4,5], k = 2	[1,4,3,2,5]

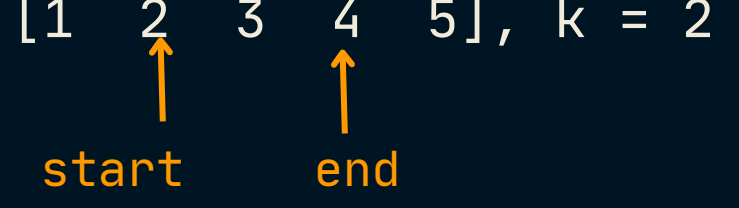
Ruyank: Bhaiyaa, I'll use 2 variable 'start' & 'end'

start will point Kth value from start & end will point Kth value from end

Bhaiyaa: To get Kth value from start you will run a loop for K-1 iterations to reach Kth node but how would you get Kth from end ?



Ruyank:
- Bhaiyaa, I'll get the length of List (1 loop), here len = 5
- Then as I can observe from given List is that Kth node from end is actually (length-k+1)th node from start i.e. 2nd node from end is (5-2+1) = 4th node from start(in above testcase).
- So I'll run a loop for (length-k) iterations & store Kth from end in end variable



Finally swap(start->val, end->val) & return the head

Observation

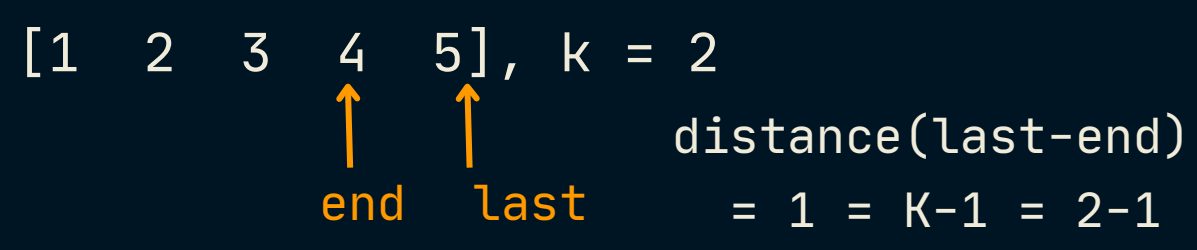
Till now from 'Bhaiyaa' & 'Ruyank's conversation what we got

1) Iterate for K-1 iteration & store start node
2) Calculate length of List in one loop
3) Iterate for (len-K) & store end node
4) swap(start->val, end->val)

Bhaiyaa: Ruyank, your solution is good but you are running 3 loops, can you come up with a one pass & single loop solution ?

Ruyank: I'm not getting it bhaiyaa, can you help plssss!!!

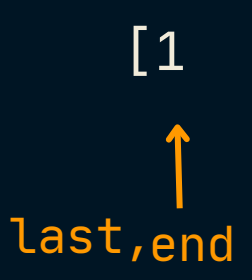
Bhaiyaa: Let's start with 'end' node first, so distance of end node from last node is K-1



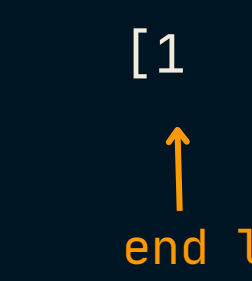
So to get this configuration 1st move your last node to k-1 position from beginning & then move end & last both nodes 1 by 1 (as it will maintain the dist. b/w last & end -> k-1) & the moment you last node reaches end, your end node would have reached its correct position

Ruyank: And bhaiyaa, we will know the last node has really reached the end of list when 'last->next == NULL'

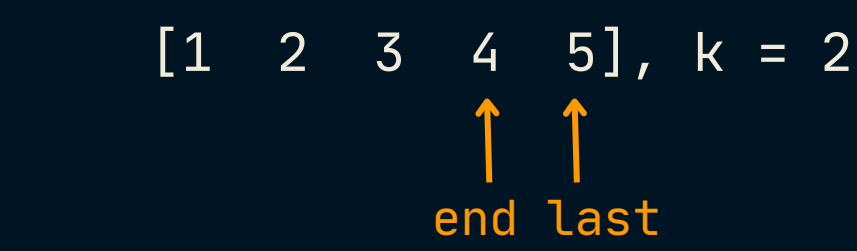
Observation



initially



last has moved to k-1 positions



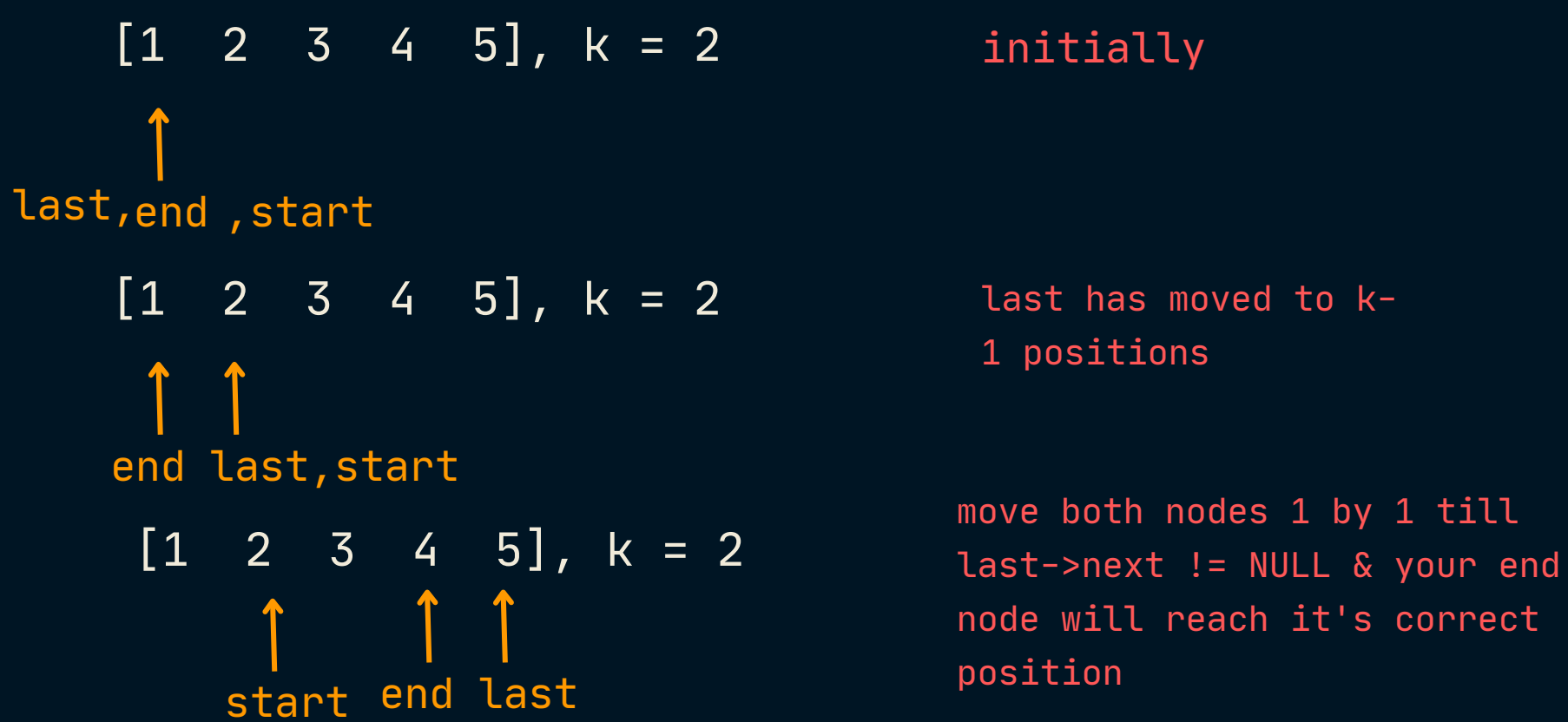
move both nodes 1 by 1 till last->next != NULL & your end node will reach it's correct position

Ruyank: Bhaiyaa, I can sense that above thing I can do in 1 pass & 1 loop with few conditions but we also need start node which points Kth node from start ?

Bhaiyaa: Kth node from start means distance from 1st node or head node would be K-1

Ruyank: Wait wait, I got it bhaiyaa, we already moved last node to K-1 position(initially) so that would be our start node as well

Observation



Bhaiyaa: Ruyank, so finally you got you start & end nodes, now what's remaining.

Ruyank: swap(start->val, end->val)

```cpp
class Solution {
public:
    ListNode* swapNodes(ListNode* head, int k) {

        ListNode* start = head;
        ListNode* end   = head;
        ListNode* last  = head;

        while(last->next != NULL) {
            if(k <= 1) {
                end = end->next;
            } else {
                k--;
                start = start->next;
            }
            last = last->next;
        }

        swap(start->val, end-> val);
        return head;
    }
};
```

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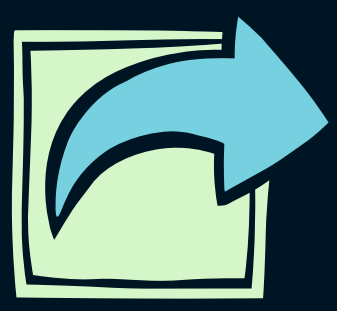

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