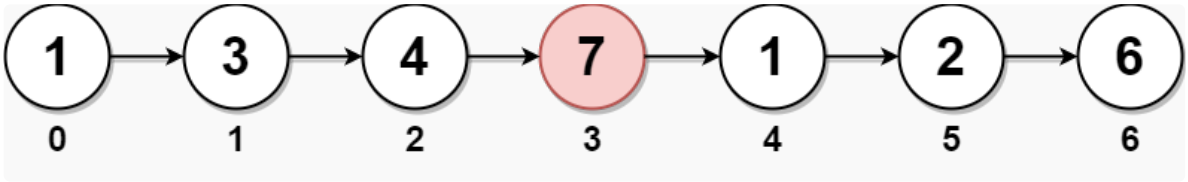
Assignment Solutions | Linkedlist - 2 | Week 15

1. You are given the `head` of a linked list. **Delete** the **middle node**, and return *the* `head` *of the modified linked list*. **[Leetcode 2095]**

   The **middle node** of a linked list of size `n` is the `⌊n / 2⌋th` node from the **start** using **0-based indexing**, where `⌊x⌋` denotes the largest integer less than or equal to `x`.

   - For `n` = `1`, `2`, `3`, `4`, and `5`, the middle nodes are `0`, `1`, `1`, `2`, and `2`, respectively.

   Example 1:



   Input: head = [1,3,4,7,1,2,6]

   Output: [1,3,4,1,2,6]

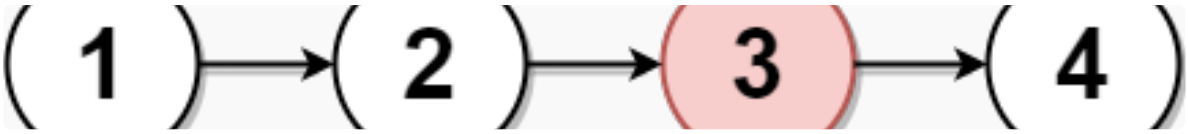
   Explanation:

   The above figure represents the given linked list. The indices of the nodes are written below.

   Since n = 7, node 3 with value 7 is the middle node, which is marked in red.

   We return the new list after removing this node.

   Example 2:



   Input: head = [1,2,3,4]

   Output: [1,2,4]

   Explanation:

   The above figure represents the given linked list.

   For n = 4, node 2 with value 3 is the middle node, which is marked in red.

Example 3:

Input: head = [2,1]

Output: [2]

Explanation:

The above figure represents the given linked list.

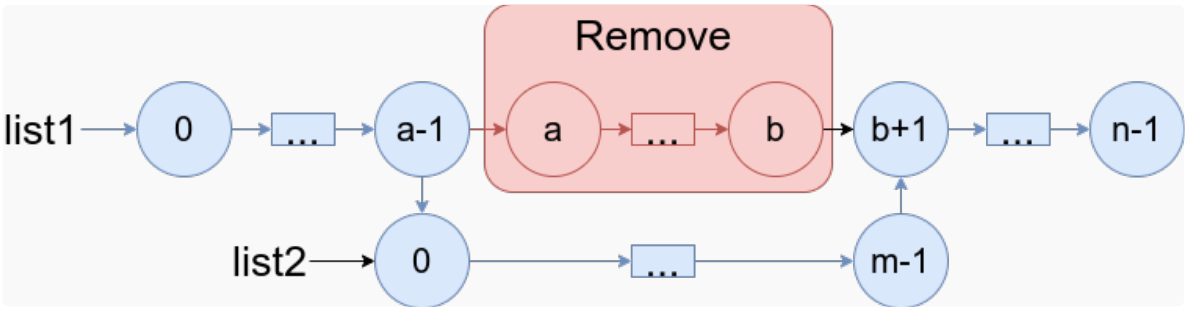
For n = 2, node 1 with value 1 is the middle node, which is marked in red.

Node 0 with value 2 is the only node remaining after removing node 1.

Solution :

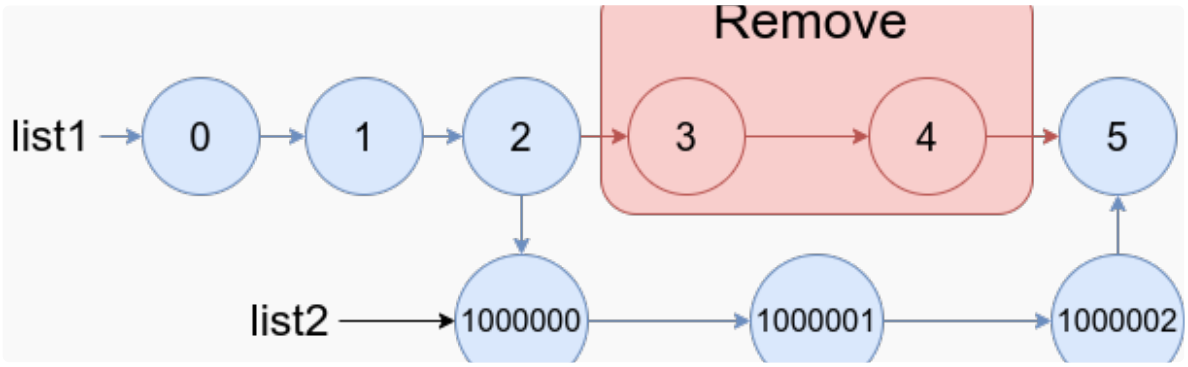
```
class Solution {
public:
    ListNode* deleteMiddle(ListNode* head) {
        if(!head or !head->next)return NULL;

        ListNode *fast = head , *slow = head;

        while(fast and fast->next){
            slow = slow->next;
            fast = fast->next->next;
        }

        ListNode *prev = NULL , *curr = head;

        while(curr != slow){
            prev = curr;
            curr = curr->next;
        }

        prev->next = curr->next;

        return head;
    }
```

2. You are given two linked lists: `list1` and `list2` of sizes `n` and `m` respectively.
   Remove `list1`'s nodes from the `ath` node to the `bth` node, and put `list2` in their place.
   [Leetcode 1669]
   The blue edges and nodes in the following figure indicate the result:



Build the result list and return its head.

Example 1:

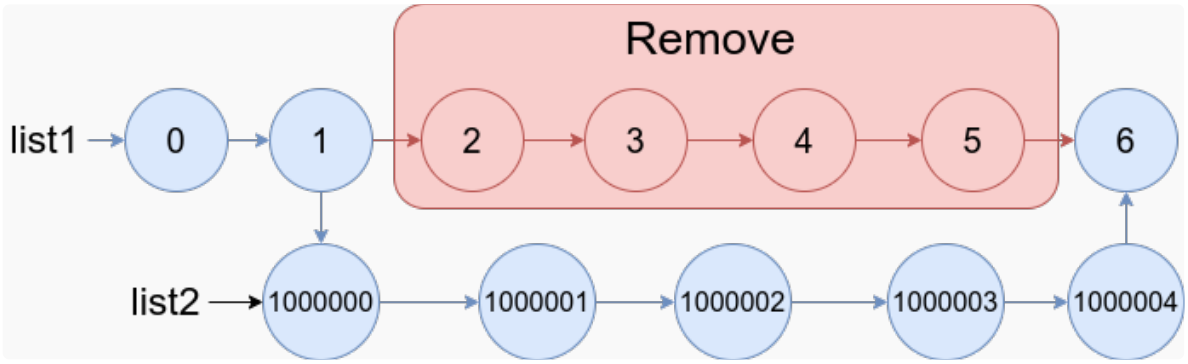


Input: list1 = [0,1,2,3,4,5], a = 3, b = 4, list2 = [1000000,1000001,1000002]

Output: [0,1,2,1000000,1000001,1000002,5]

Explanation: We remove the nodes 3 and 4 and put the entire list2 in their place. The blue edges and nodes in the above figure indicate the result.

Example 2:



Input: list1 = [0,1,2,3,4,5,6], a = 2, b = 5, list2 = [1000000,1000001,1000002,1000003,1000004]

Output: [0,1,1000000,1000001,1000002,1000003,1000004,6]

Explanation: The blue edges and nodes in the above figure indicate the result.

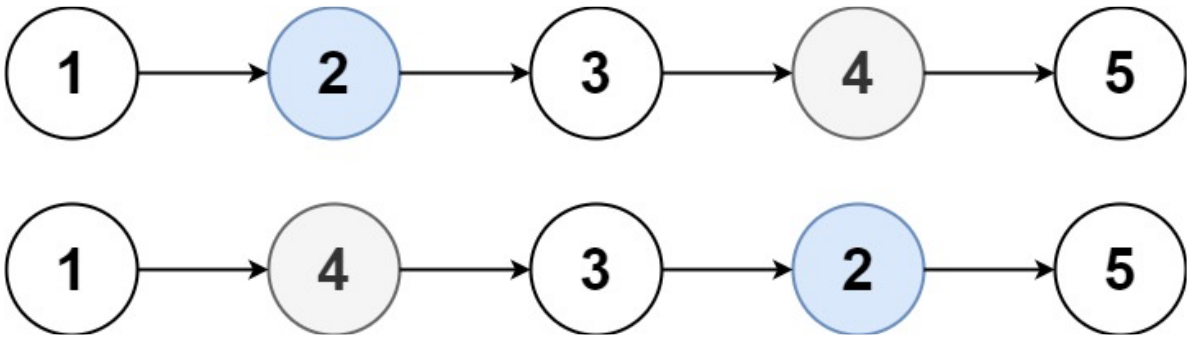
Solution :

```
class Solution {
public:
    ListNode* mergeInBetween(ListNode* list1, int a, int b, ListNode* list2) {
        ListNode *curr = list1;
        a--;
        while(a--){
            curr = curr->next;
        }

        b++;
        ListNode *curr2 = list1;
        while(b--){
            curr2 = curr2->next;
        }

        ListNode *temp = list2;

        while(temp->next)temp = temp->next;
        temp->next = curr2;
        curr->next = list2;

        return list1;
    }
```

3. 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**).* **[Leetcode 1721]**

   Example 1:



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

   Output: [1,4,3,2,5]

   Example 2:

   Input: head = [7,9,6,6,7,8,3,0,9,5], k = 5

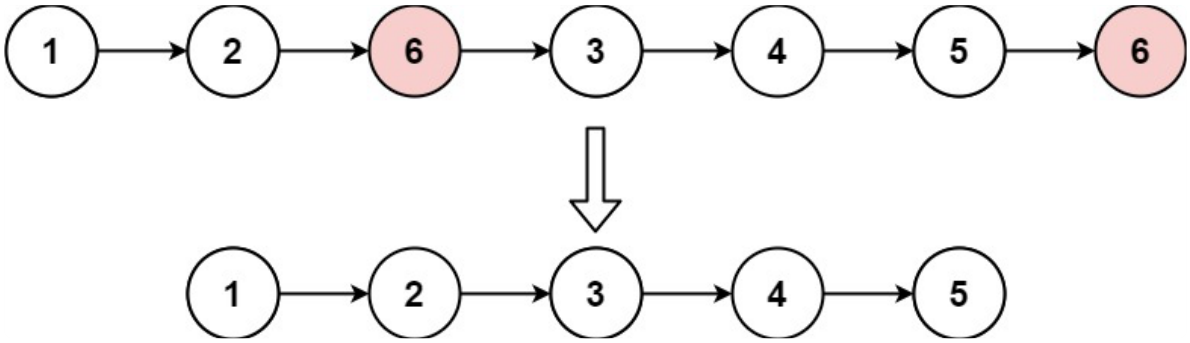
   Output: [7,9,6,6,8,7,3,0,9,5]

   Solution :

```cpp
class Solution {
public:
    ListNode* swapNodes(ListNode* head, int k) {
        ListNode *temp = head;
        k--;
        while(k--)temp = temp->next;
        ListNode *p1 = temp->next , *p2 = head;

        while(p1){
            p1 = p1->next;
            p2 = p2->next;
        }

        swap(temp->val , p2->val);
        return head;
    }
};
```

4. Given the `head` of a linked list and an integer `val`, remove all the nodes of the linked list that has `Node.val == val`, and return *the new head*.

Example 1:



Input: head = [1,2,6,3,4,5,6], val = 6

Output: [1,2,3,4,5]

Example 2:

Input: head = [], val = 1

Output: []

Example 3:

Input: head = [7,7,7,7], val = 7

Output: []

Solution :

```
class Solution {
public:
    ListNode* removeElements(ListNode* head, int val) {
        ListNode *curr = head;

        while(curr and curr->val == val){
            curr = curr->next;
        }

        head = curr;

        while(curr){
            if(curr->next and curr->next->val == val)
                curr->next = curr->next->next;
            else curr = curr->next;
        }
        return head;
    }
};
```

5. Find the length of loop in Cycle of Linked List.

Solution :

```
#include<bits/stdc++.h>
using namespace std;
class node{
   public :
      int data;
      node *next;
      node(int n){
         data = n;
         next = NULL;
      }
};
class linkedlist{
   public:
      node *head,*tail;
      linkedlist(){
         head = NULL;
         tail = NULL;
      }
      void display(){
         node *temp = head;
```

```
    while(temp){
    cout<<temp->data<<" ";
    temp = temp->next;
    }
    cout<<endl;
}
void addFirst(int val){
    node *temp = new node(val);
    if(head == NULL)head = temp;
    else {
    temp->next = head;
    head = temp;
    }
    if(tail == NULL)tail = head;
    }
    void addCycle(int idx){
    node *temp = head;
    idx--;
    while(idx--){
    temp = temp->next;
    }
    temp->next->next = head->next;
}
int findLength(){
    node *fast = head->next;
    node *slow = head;
    int fl = 0;
    while(fast and fast->next){
    if(fast == slow){
    fl = 1;
    break;
    }
    fast = fast->next->next;
    slow = slow->next;
    }
    if(fl == 0)return 0;
    int cnt = 1;
    slow = slow->next;
```

```
            while(slow != fast){
            cnt++;
            slow = slow->next;
             }
            return cnt;
        }
};
int main(){
    linkedlist ll;
    ll.addFirst(1);
    ll.addFirst(2);
    ll.addFirst(3);
    ll.addFirst(4);
    ll.addFirst(5);
    ll.addFirst(6);
    ll.addCycle(4);
    cout<<ll.findLength()<<endl;
}
```
