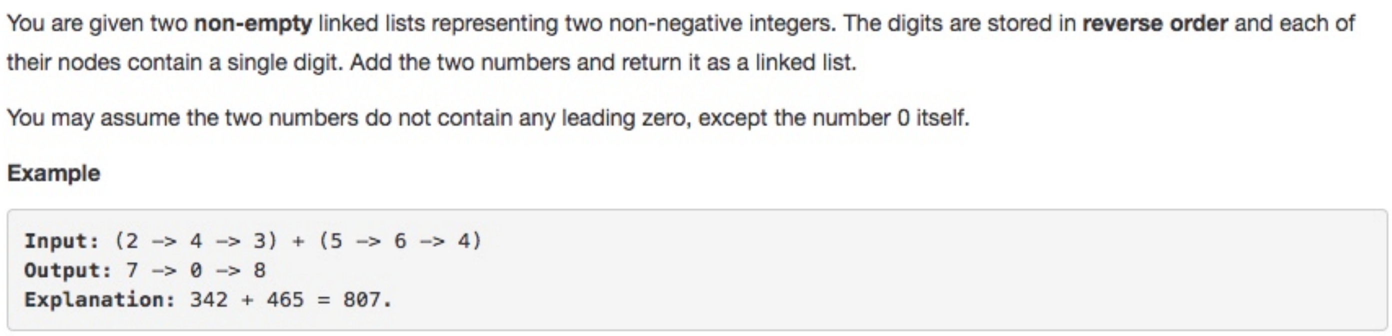
002. Add Two Numbers

002 Add Two Numbers

- **Linked List+Math**

Description



You are given two **non-empty** linked lists representing two non-negative integers. The digits are stored in **reverse order** and each of their nodes contain a single digit. Add the two numbers and return it as a linked list.

You may assume the two numbers do not contain any leading zero, except the number 0 itself.

Example

```
Input: (2 -> 4 -> 3) + (5 -> 6 -> 4)
Output: 7 -> 0 -> 8
Explanation: 342 + 465 = 807.
```

1. Thought Line

(1) Discuss how to reverse a linked list

```
ListNode* reverseListOrder(ListNode* lst){
    ListNode* dummyHead = new ListNode(0);
    ListNode* dummyTail = nullptr;
    ListNode* insertTo = dummyTail;
    while(lst!=nullptr){
    ListNode* insertNode = new ListNode(lst->val);
    insertNode->next = insertTo;
    dummyHead->next = insertNode;
    insertTo = insertNode;
    lst = lst->next;
    }
    return dummyHead->next;
}
```

(2) Math logic

- Need to analyze the carry direction.
- in "2 -> 4 -> 3"+"5 -> 6 -> 4", it is from left to right
- in "342"+"465", it is from right to left

2. Linked List + Math

```
/**
 * Definition for singly-linked list.
 * struct ListNode {
 *     int val;
 *     ListNode *next;
 *     ListNode(int x) : val(x), next(NULL) {}
 * };
 */
class Solution {

private:
    ListNode* addList(ListNode* l1, ListNode* l2){
        ListNode* dummyHead = new ListNode(0);
        ListNode* head = dummyHead;
        signed int carry = 0;
        while(l1!=nullptr || l2!=nullptr || carry !=0){
            int l1Val = (l1!=nullptr) ? l1->val : 0;
            int l2Val = (l2!=nullptr) ? l2->val : 0;
            int sumOfl1l2carry = l1Val + l2Val + carry;

            head->next = new ListNode (sumOfl1l2carry%10);
            carry = sumOfl1l2carry/10;

            l1 = (l1!=nullptr)? l1->next : nullptr;
            l2 = (l2!=nullptr)? l2->next : nullptr;
            head = head->next;
        }
        return dummyHead->next;
    }

public:
    ListNode* addTwoNumbers(ListNode* l1, ListNode* l2) {
        if (l1==nullptr) return l2;
        if (l2==nullptr) return l1;
        ListNode* l1Addl2 = addList(l1,l2);
        return l1Addl2;
    }
};
```