**WEEK1**

## Contents

## Contains Duplicate

Given an integer array `nums`, return `true` if any value appears **at least twice** in the array, and return `false` if every element is distinct.

**Example 1:**

**Input:** nums = [1,2,3,1]

**Output:** true

**Explanation:**

The element 1 occurs at the indices 0 and 3.

**Example 2:**

**Input:** nums = [1,2,3,4]

**Output:** false

**Explanation:**

All elements are distinct.

**Example 3:**

**Input:** nums = [1,1,1,3,3,4,3,2,4,2]

**Output:** true

**Constraints:**

- `1 <= nums.length <= 10^5`
- `-10^9 <= nums[i] <= 10^9`

class Solution { public: bool containsDuplicate(vector& nums) { } };

## Best Time to Buy and Sell Stock

You are given an array `prices` where `prices[i]` is the price of a given stock on the $i^{th}$ day.

You want to maximize your profit by choosing a **single day** to buy one stock and choosing a **different day in the future** to sell that stock.

Return *the maximum profit you can achieve from this transaction*. If you cannot achieve any profit, return `0`.

**Example 1:**

**Input:** prices = [7,1,5,3,6,4] **Output:** 5 **Explanation:** Buy on day 2 (price = 1) and sell on day 5 (price = 6), profit = 6-1 = 5. Note that buying on day 2 and selling on day 1 is not allowed because you must buy before you sell.

**Example 2:**

**Input:** prices = [7,6,4,3,1] **Output:** 0 **Explanation:** In this case, no transactions are done and the max profit = 0.

**Constraints:**

- `1 <= prices.length <= 10^5`
- `0 <= prices[i] <= 10^4`

class Solution { public: int maxProfit(vector& prices) { } };

## Range Sum Query - Immutable

Given an integer array `nums`, handle multiple queries of the following type:

1. Calculate the **sum** of the elements of `nums` between indices `left` and `right` **inclusive** where `left <= right`.

Implement the `NumArray` class:

- `NumArray(int[] nums)` Initializes the object with the integer array `nums`.
- `int sumRange(int left, int right)` Returns the **sum** of the elements of `nums` between indices `left` and `right` **inclusive** (i.e. `nums[left] + nums[left + 1] + ... + nums[right]`).

**Example 1:**

**Input** `["NumArray", "sumRange", "sumRange", "sumRange"] [[[-2, 0, 3, -5, 2, -1]], [0, 2], [2, 5], [0, 5]]`
**Output** `[null, 1, -1, -3]` **Explanation** `NumArray numArray = new NumArray([-2, 0, 3, -5, 2, -1]); numArray.sumRange(0, 2); // return (-2) + 0 + 3 = 1 numArray.sumRange(2, 5); // return 3 + (-5) + 2 + (-1) = -1 numArray.sumRange(0, 5); // return (-2) + 0 + 3 + (-5) + 2 + (-1) = -3`

**Constraints:**

- `1 <= nums.length <= 10^4`
- `-10^5 <= nums[i] <= 10^5`
- `0 <= left <= right < nums.length`
- At most `10^4` calls will be made to `sumRange`.

class NumArray { public: NumArray(vector& nums) { } }; /** * Your NumArray object will be instantiated and called as such: * NumArray* obj = new NumArray(nums); * int param_1 = obj->sumRange(left,right); */

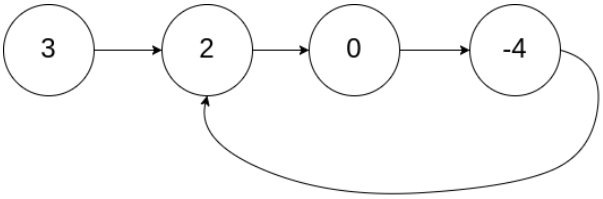
## Linked List Cycle

Given `head`, the head of a linked list, determine if the linked list has a cycle in it.

There is a cycle in a linked list if there is some node in the list that can be reached again by continuously following the `next` pointer. Internally, `pos` is used to denote the index of the node that tail's `next` pointer is connected to. **Note that pos is not passed as a parameter**.

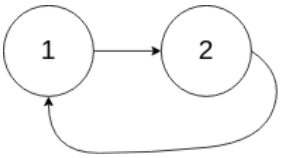
Return `true` *if there is a cycle in the linked list*. Otherwise, return `false`.

**Example 1:**




**Input:** `head = [3,2,0,-4], pos = 1` **Output:** `true` **Explanation:** `There is a cycle in the linked list, where the tail connects to the 1st node (0-indexed).`

**Example 2:**




**Input:** `head = [1,2], pos = 0` **Output:** `true` **Explanation:** `There is a cycle in the linked list, where the tail connects to the 0th node.`

**Example 3:**


**Input:** `head = [1], pos = -1` **Output:** `false` **Explanation:** `There is no cycle in the linked list.`

**Constraints:**

- The number of the nodes in the list is in the range `[0, 10^4]`.
- `-10^5 <= Node.val <= 10^5`
- `pos` is `-1` or a **valid index** in the linked-list.

**Follow up:** Can you solve it using `O(1)` (i.e. constant) memory?

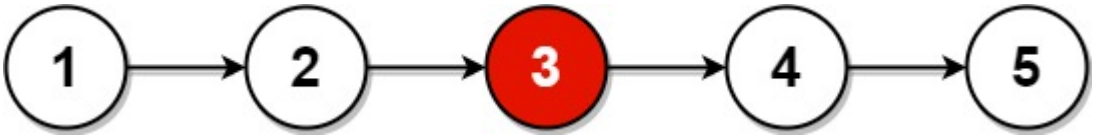
/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode(int x) : val(x), next(NULL) {} * }; */ class Solution { public: bool hasCycle(ListNode *head) { } };

## Middle of the Linked List

Given the `head` of a singly linked list, return *the middle node of the linked list*.

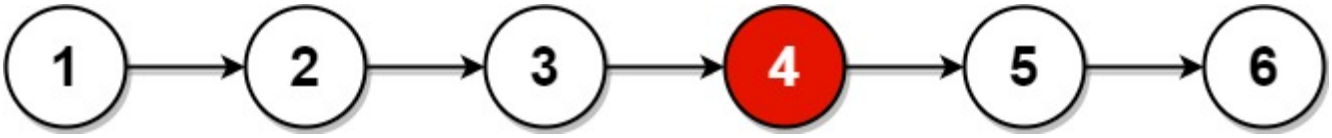
If there are two middle nodes, return **the second middle** node.

**Example 1:**




**Input:** `head = [1,2,3,4,5]` **Output:** `[3,4,5]` **Explanation:** `The middle node of the list is node 3.`

**Example 2:**




**Input:** `head = [1,2,3,4,5,6]` **Output:** `[4,5,6]` **Explanation:** `Since the list has two middle nodes with values 3 and 4, we return the second one.`

**Constraints:**

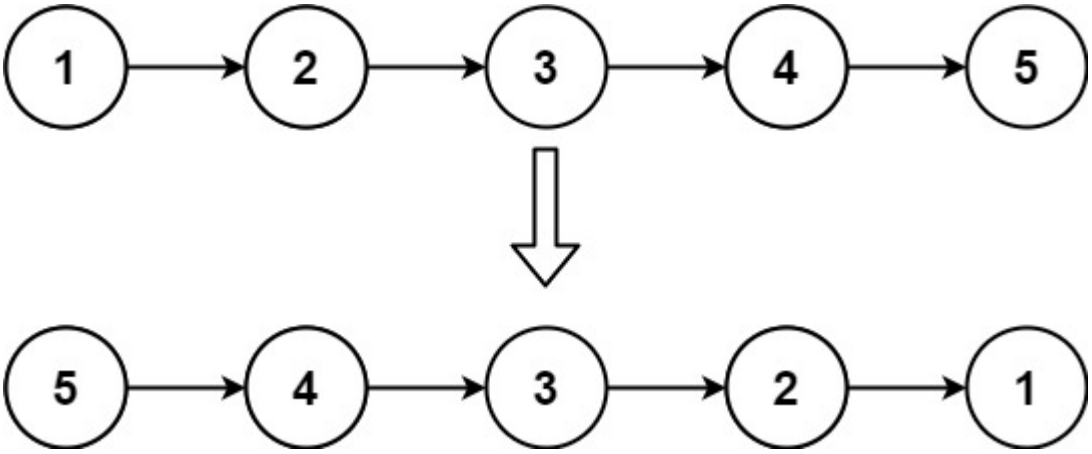
- The number of nodes in the list is in the range `[1, 100]`.
- `1 <= Node.val <= 100`

/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode() : val(0), next(nullptr) {} * ListNode(int x) : val(x), next(nullptr) {} * ListNode(int x, ListNode *next) : val(x), next(next) {} * }; */ class Solution { public: ListNode* middleNode(ListNode* head) { } };

## Reverse Linked List

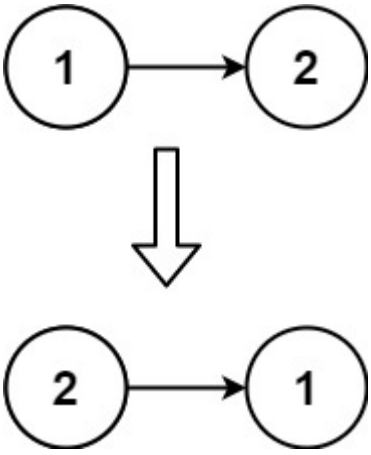
Given the head of a singly linked list, reverse the list, and return *the reversed list*.

**Example 1:**




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

**Example 2:**




**Input:** head = [1,2] **Output:** [2,1]

**Example 3:**

**Input:** head = [] **Output:** []

**Constraints:**

- The number of nodes in the list is the range [0, 5000].
- -5000 <= Node.val <= 5000

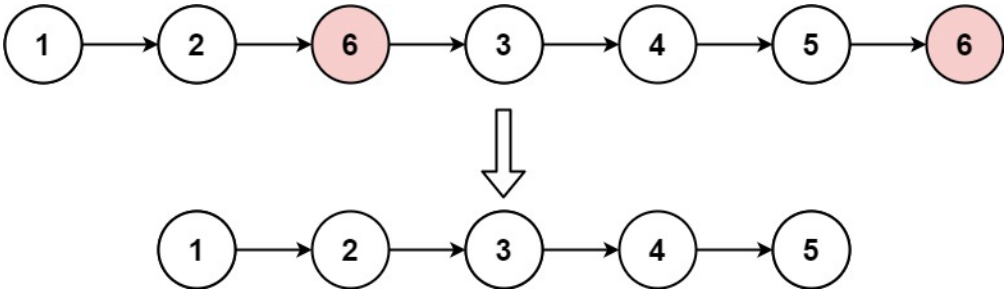
**Follow up:** A linked list can be reversed either iteratively or recursively. Could you implement both?

/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode() : val(0), next(nullptr) {} * ListNode(int x) : val(x), next(nullptr) {} * ListNode(int x, ListNode *next) : val(x), next(next) {} * }; */ class Solution { public: ListNode* reverseList(ListNode* head) { } };

## Remove Linked List Elements

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:** `[]`

**Constraints:**

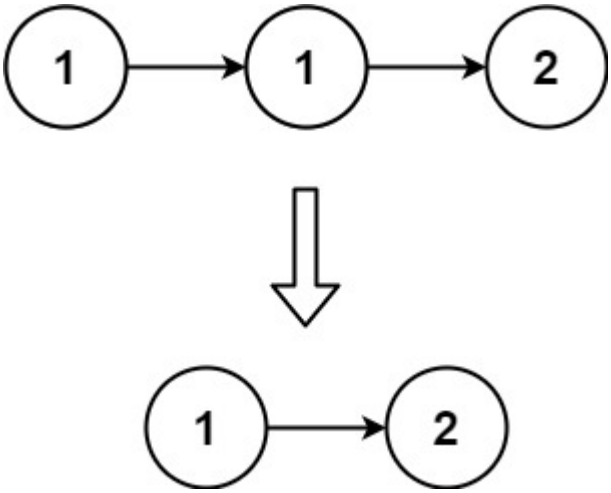
- The number of nodes in the list is in the range `[0, 10^4]`.
- `1 <= Node.val <= 50`
- `0 <= val <= 50`

/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode() : val(0), next(nullptr) {} * ListNode(int x) : val(x), next(nullptr) {} * ListNode(int x, ListNode *next) : val(x), next(next) {} * }; */ class Solution { public: ListNode* removeElements(ListNode* head, int val) { } };

## Remove Duplicates from Sorted List

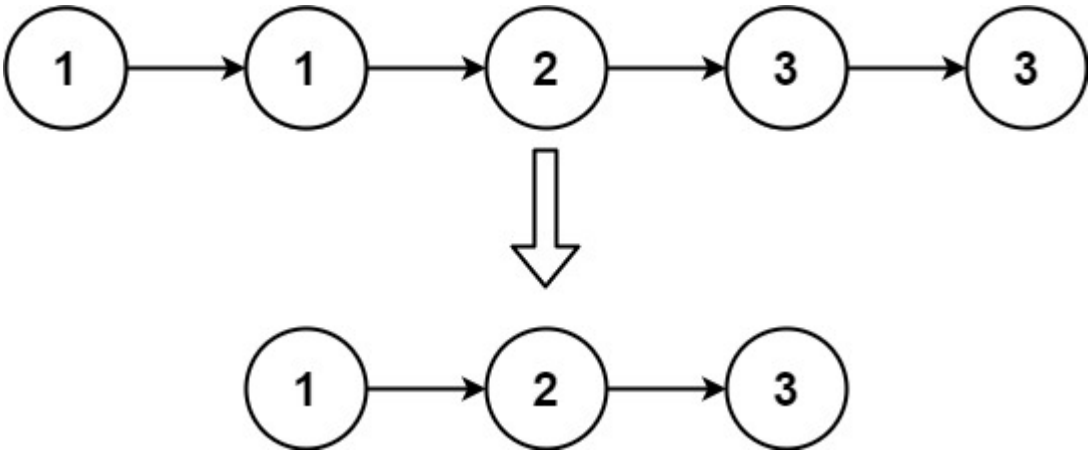
Given the head of a sorted linked list, *delete all duplicates such that each element appears only once*. Return *the linked list **sorted** as well*.

**Example 1:**




**Input:** head = [1,1,2] **Output:** [1,2]

**Example 2:**




**Input:** head = [1,1,2,3,3] **Output:** [1,2,3]

**Constraints:**

- The number of nodes in the list is in the range [0, 300].
- -100 <= Node.val <= 100
- The list is guaranteed to be **sorted** in ascending order.

/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode() : val(0), next(nullptr) {} * ListNode(int x) : val(x), next(nullptr) {} * ListNode(int x, ListNode *next) : val(x), next(next) {} * }; */ class Solution { public: ListNode* deleteDuplicates(ListNode* head) { } };

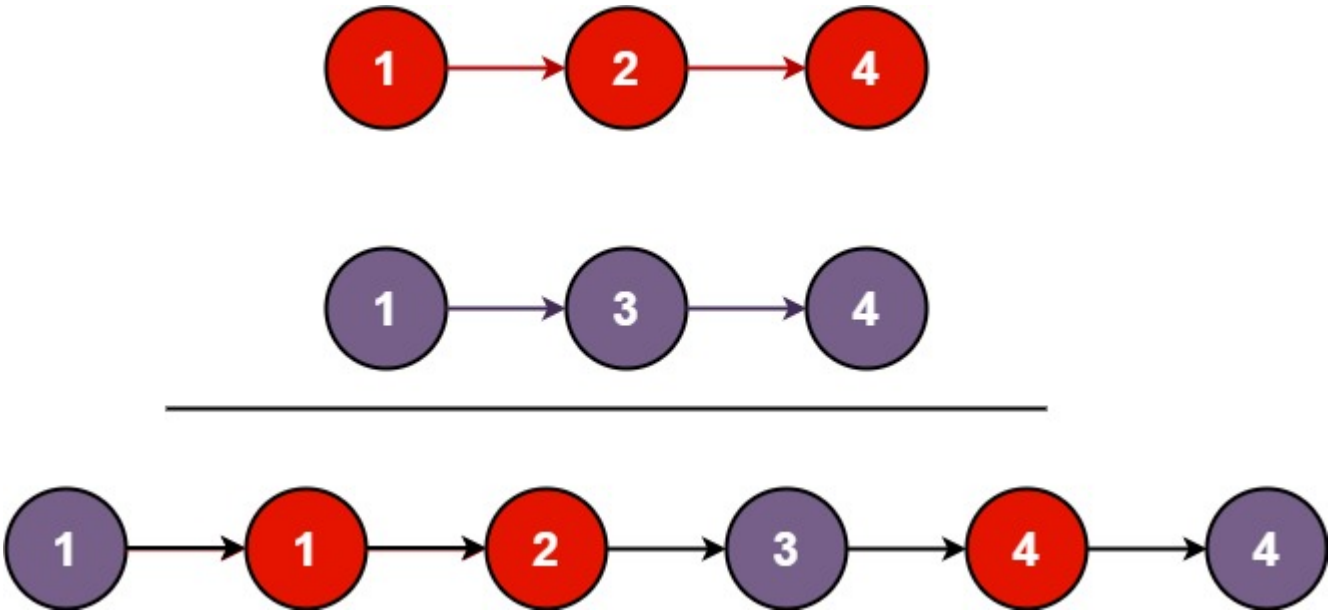
## Merge Two Sorted Lists

You are given the heads of two sorted linked lists `list1` and `list2`.

Merge the two lists into one **sorted** list. The list should be made by splicing together the nodes of the first two lists.

Return *the head of the merged linked list*.

**Example 1:**




**Input:** `list1 = [1,2,4], list2 = [1,3,4]` **Output:** `[1,1,2,3,4,4]`

**Example 2:**

**Input:** `list1 = [], list2 = []` **Output:** `[]`

**Example 3:**

**Input:** `list1 = [], list2 = [0]` **Output:** `[0]`

**Constraints:**

- The number of nodes in both lists is in the range `[0, 50]`.
- `-100 <= Node.val <= 100`
- Both `list1` and `list2` are sorted in **non-decreasing** order.

/** * Definition for singly-linked list. * struct ListNode { * int val; * ListNode *next; * ListNode() : val(0), next(nullptr) {} * ListNode(int x) : val(x), next(nullptr) {} * ListNode(int x, ListNode *next) : val(x), next(next) {} * }; */ class Solution { public: ListNode* mergeTwoLists(ListNode* list1, ListNode* list2) { } };