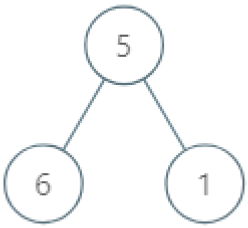
Q. Maximum Average Subtree

Given the `root` of a binary tree, find the maximum average value of any subtree of that tree.
(A subtree of a tree is any node of that tree plus all its descendants. The average value of a tree is the sum of its values, divided by the number of nodes.)

Example 1:



```
Input: [5,6,1]

Output: 6.00000

Explanation:

For the node with value = 5 we have an average of (5 + 6 + 1) / 3 = 4.

For the node with value = 6 we have an average of 6 / 1 = 6.

For the node with value = 1 we have an average of 1 / 1 = 1.

So the answer is 6 which is the maximum.
```

Note:

1. The number of nodes in the tree is between `1` and `5000`.
2. Each node will have a value between `0` and `100000`.
3. Answers will be accepted as correct if they are within `10^-5` of the correct answer.

Q. Decode String

Given an encoded string, return its decoded string.

The encoding rule is: `k[encoded_string]`, where the *encoded_string* inside the square brackets is being repeated exactly *k* times. Note that *k* is guaranteed to be a positive integer.
You may assume that the input string is always valid; No extra white spaces, square brackets are well-formed, etc.

Furthermore, you may assume that the original data does not contain any digits and that digits are only for those repeat numbers, *k*. For example, there won't be input like `3a` or `2[4]`.
Examples:

```
s = "3[a]2[bc]", return "aaabcbc".

s = "3[a2[c]]", return "accaccacc".

s = "2[abc]3[cd]ef", return "abcabccdcdcdef".
```

Q. Find Leaves of Binary Tree

Given a binary tree, collect a tree's nodes as if you were doing this: Collect and remove all leaves, repeat until the tree is empty.

Example:

```
Input: [1,2,3,4,5]


          1

         / \

        2   3

       / \

      4   5


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

Explanation:

1. Removing the leaves [4,5,3] would result in this tree:

```
          1

         /

        2
```

2. Now removing the leaf [2] would result in this tree:

```
          1
```

3. Now removing the leaf [1] would result in the empty tree:

```
          []
```

Q. Longest Increasing Subsequence

Given an unsorted array of integers, find the length of longest increasing subsequence.

Example:

```
Input: [10,9,2,5,3,7,101,18]
Output: 4
Explanation: The longest increasing subsequence is [2,3,7,101], therefore the leng
th is 4.
```

Note:

- There may be more than one LIS combination, it is only necessary for you to return the length.
- Your algorithm should run in O(n^2) complexity.

Follow up: Could you improve it to O(*n* log *n*) time complexity?

Q. Find Median from Data Stream

Median is the middle value in an ordered integer list. If the size of the list is even, there is no middle value. So the median is the mean of the two middle value.

For example,
`[2,3,4]`, the median is `3`
`[2,3]`, the median is `(2 + 3) / 2 = 2.5`
Design a data structure that supports the following two operations:

- void addNum(int num) - Add a integer number from the data stream to the data structure.
- double findMedian() - Return the median of all elements so far.

Example:

```
addNum(1)

addNum(2)

findMedian() -> 1.5

addNum(3)

findMedian() -> 2
```

Follow up:

1. If all integer numbers from the stream are between 0 and 100, how would you optimize it?
2. If 99% of all integer numbers from the stream are between 0 and 100, how would you optimize it?

Q. Meeting Rooms II

Given an array of meeting time intervals consisting of start and end times `[[s1,e1],[s2,e2],...]` ($s_i < e_i$), find the minimum number of conference rooms required.

Example 1:

```
Input: [[0, 30],[5, 10],[15, 20]]
Output: 2
```

Example 2:

```
Input: [[7,10],[2,4]]

Output: 1
```

NOTE: input types have been changed on April 15, 2019. Please reset to default code definition to get new method signature.

Q. Basic Calculator II

Implement a basic calculator to evaluate a simple expression string.

The expression string contains only **non-negative** integers, `+`, `-`, `*`, `/` operators and empty spaces . The integer division should truncate toward zero.

Example 1:

```
Input: "3+2*2"

Output: 7
```

Example 2:

```
Input: " 3/2 "

Output: 1
```

Example 3:

```
Input: " 3+5 / 2 "

Output: 5
```

Note:

- You may assume that the given expression is always valid.
- **Do not** use the `eval` built-in library function.

Q. Kth Largest Element in an Array

Find the **k**th largest element in an unsorted array. Note that it is the kth largest element in the sorted order, not the kth distinct element.

Example 1:

```
Input: [3,2,1,5,6,4] and k = 2
Output: 5
```

Example 2:

```
Input: [3,2,3,1,2,4,5,5,6] and k = 4
Output: 4
```

Note:
You may assume k is always valid, 1 ≤ k ≤ array's length.

Q. Number of Islands

Given a 2d grid map of `'1'`s (land) and `'0'`s (water), count the number of islands. An island is surrounded by water and is formed by connecting adjacent lands horizontally or vertically. You may assume all four edges of the grid are all surrounded by water.
Example 1:

```
Input:

11110

11010

11000

00000
```

```
Output: 1
```

Example 2:

```
Input:

11000

11000

00100

00011


Output: 3
```

Q. Single Number

Given a **non-empty** array of integers, every element appears *twice* except for one. Find that single one.

Note:

Your algorithm should have a linear runtime complexity. Could you implement it without using extra memory?

Example 1:

```
Input: [2,2,1]

Output: 1
```

Example 2:

```
Input: [4,1,2,1,2]

Output: 4
```

Q. Best Time to Buy and Sell Stock III

Say you have an array for which the *i*th element is the price of a given stock on day *i*.

Design an algorithm to find the maximum profit. You may complete at most *two* transactions.

Note: You may not engage in multiple transactions at the same time (i.e., you must sell the stock before you buy again).

Example 1:

```
Input: [3,3,5,0,0,3,1,4]

Output: 6

Explanation: Buy on day 4 (price = 0) and sell on day 6 (price = 3), profit = 3-0
= 3.

             Then buy on day 7 (price = 1) and sell on day 8 (price = 4), profit =
4-1 = 3.
```

Example 2:

```
Input: [1,2,3,4,5]

Output: 4

Explanation: Buy on day 1 (price = 1) and sell on day 5 (price = 5), profit = 5-1
= 4.

             Note that you cannot buy on day 1, buy on day 2 and sell them later,
as you are

             engaging multiple transactions at the same time. You must sell before
buying again.
```

Example 3:

```
Input: [7,6,4,3,1]

Output: 0

Explanation: In this case, no transaction is done, i.e. max profit = 0.
```

Q. Best Time to Buy and Sell Stock

Say you have an array for which the i^{th} element is the price of a given stock on day *i*.

If you were only permitted to complete at most one transaction (i.e., buy one and sell one share of the stock), design an algorithm to find the maximum profit.

Note that you cannot sell a stock before you buy one.

Example 1:

```
Input: [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.

             Not 7-1 = 6, as selling price needs to be larger than buying price.
```

Example 2:

```
Input: [7,6,4,3,1]

Output: 0

Explanation: In this case, no transaction is done, i.e. max profit = 0.
```

Q. Symmetric Tree

Given a binary tree, check whether it is a mirror of itself (ie, symmetric around its center).

For example, this binary tree `[1,2,2,3,4,4,3]` is symmetric:

```
    1

   / \

  2   2

 / \ / \

3  4 4  3
```

But the following `[1,2,2,null,3,null,3]` is not:

```
    1
   / \
  2   2
   \   \
   3    3
```

Note:
Bonus points if you could solve it both recursively and iteratively.

Q. Reverse Linked List II

Reverse a linked list from position *m* to *n*. Do it in one-pass.

Note: 1 ≤ *m* ≤ *n* ≤ length of list.

Example:

```
Input: 1->2->3->4->5->NULL, m = 2, n = 4
Output: 1->4->3->2->5->NULL
```

Q. Merge Intervals

Given a collection of intervals, merge all overlapping intervals.

Example 1:

```
Input: [[1,3],[2,6],[8,10],[15,18]]
Output: [[1,6],[8,10],[15,18]]
Explanation: Since intervals [1,3] and [2,6] overlaps, merge them into [1,6].
```

Example 2:

```
Input: [[1,4],[4,5]]

Output: [[1,5]]

Explanation: Intervals [1,4] and [4,5] are considered overlapping.
```

NOTE: input types have been changed on April 15, 2019. Please reset to default code definition to get new method signature.

Q. Maximum Subarray

Given an integer array `nums`, find the contiguous subarray (containing at least one number) which has the largest sum and return its sum.

Example:

```
Input: [-2,1,-3,4,-1,2,1,-5,4],

Output: 6

Explanation: [4,-1,2,1] has the largest sum = 6.
```

Follow up:

If you have figured out the O(*n*) solution, try coding another solution using the divide and conquer approach, which is more subtle.

Q. Permutations

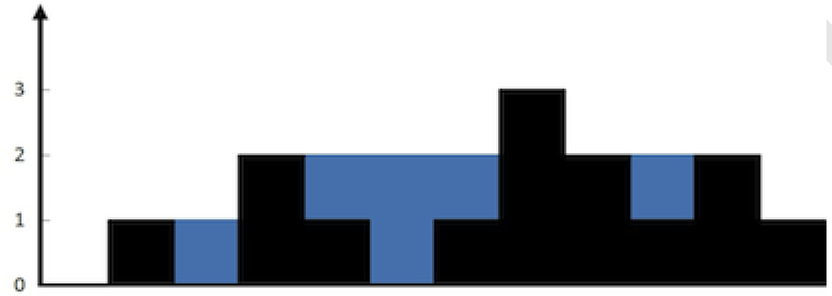
Given a collection of **distinct** integers, return all possible permutations.

Example:

```
Input: [1,2,3]

Output:

[

  [1,2,3],
  [1,3,2],

  [2,1,3],

  [2,3,1],

  [3,1,2],

  [3,2,1]

]
```

Q. Trapping Rain Water

Given *n* non-negative integers representing an elevation map where the width of each bar is 1, compute how much water it is able to trap after raining.



The above elevation map is represented by array [0,1,0,2,1,0,1,3,2,1,2,1]. In this case, 6 units of rain water (blue section) are being trapped. **Thanks Marcos** for contributing this image!

Example:

```
Input: [0,1,0,2,1,0,1,3,2,1,2,1]

Output: 6
```

Q. Merge Two Sorted Lists

Merge two sorted linked lists and return it as a new list. The new list should be made by splicing together the nodes of the first two lists.

Example:

```
Input: 1->2->4, 1->3->4
```

```
Output: 1->1->2->3->4->4
```

Q. Longest Substring Without Repeating Characters

Given a string, find the length of the **longest substring** without repeating characters.

Example 1:

```
Input: "abcabcbb"

Output: 3

Explanation: The answer is "abc", with the length of 3.
```

Example 2:

```
Input: "bbbbb"

Output: 1

Explanation: The answer is "b", with the length of 1.
```

Example 3:

```
Input: "pwwkew"

Output: 3

Explanation: The answer is "wke", with the length of 3.
             Note that the answer must be a substring, "pwke" is a subsequence and
not a substring.
```

https://www.geeksforgeeks.org/tag/atlassian/

https://www.geeksforgeeks.org/atlassian-interview-experience/

Reference:- Leetcode 1120, 394, 366, 300, 295, 253, 227, 215, 200, 136, 123, 121, 101, 92, 56, 53, 46, 42, 21, 3.

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