69. Sqrt(x)

Example 1:

Input: x = 4
Output: 2
Explanation: The square root of 4 is 2, so we return 2.

Example 2:

Input: x = 8
Output: 2
Explanation: The square root of 8 is 2.82842..., and since we round it down to the nearest integer, 2 is returned.

```
class Solution:
    def mySqrt(self, x: int) -> int:
        start = 0
        end = x
        if x == 1:
            return 1
        while start <= end:
            mid = start + (end - start) // 2
            if mid * mid <= x < (mid+1) ** 2:
                return mid
            elif mid ** 2 < x:
                start = mid + 1
            else:
                end = mid - 1
        # #return int(mid)
```

121. Best Time to Buy and Sell Stock

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.

```
class Solution:
    def maxProfit(self, prices: List[int]) -> int:
        # mn = min(prices)
        # # if mn == prices[-1]:
        # #     return 0
        # mx = mn
        # x = 0
        # for i in range(len(prices)):
        #     if prices[i] == mn:
        #         x = i
        #         break
        # for i in range(x, len(prices)):
        #     if prices[i] > mx:
        #         mx = prices[i]
        # return mx - mn
        output, x = 0, 0
        # for i in range(len(prices)):
        #     for j in range(1, len(prices) - i):
        #         if prices[i] < prices[i + j]:
        #             x = prices[i + j] - prices[i]
        #             if x > output:
        #                 output = x
        # return output
        left = 0
        right = 1
        maxProfit = 0
        while(right < len(prices)):

            if prices[left] < prices[right]:
                curProfit = prices[right] - prices[left]
                maxProfit = max(curProfit, maxProfit)
                # if curProfit > maxProfit:
                #     maxProfit = curProfit
            else:
                left = right
            right += 1
        return maxProfit

        # while(left < len(prices) - 1):

        #     if prices[right] > prices[left]:
        #         curProfit = prices[right] - prices[left]
        #         maxProfit = max(curProfit, maxProfit)

        #     right += 1
        #     if right == len(prices):
```

```
        #         left += 1
        #         right = left + 1
        # return maxProfit
```

125. Valid Palindrome

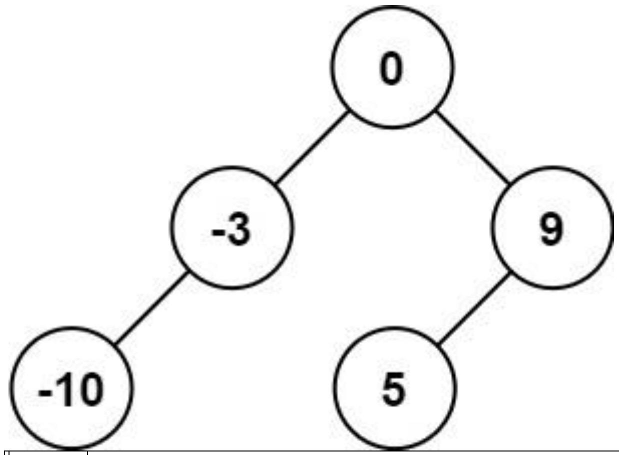
Example 1:

Input: s = "A man, a plan, a canal: Panama"
Output: true
Explanation: "amanaplanacanalpanama" is a palindrome.

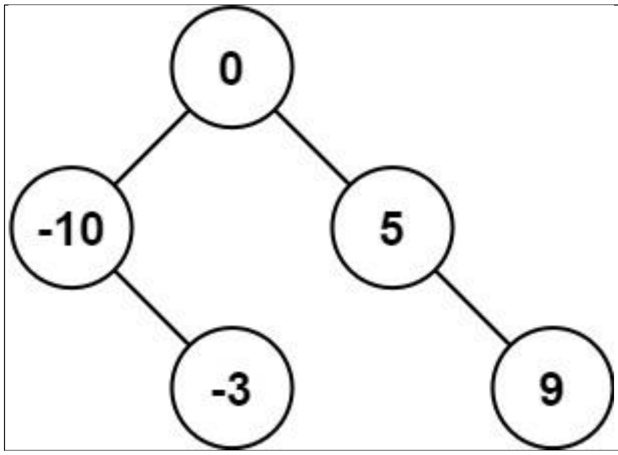
```
class Solution:
    def isPalindrome(self, s: str) -> bool:
        s = s.lower()
        # pattern = r'[^A-Za-z0-9]+'
        # s = re.sub(pattern, '', s)
        # extra = ""
        # for char in s:
        #     if char.isalnum():
        #         extra += char
        # s = extra

        # j = -1
        # for i in range(len(s)//2):
        #     if s[i] != s[j]:
        #         return False
        #     j -= 1
        # return True

        def alphaNum(c : str) -> bool:
            if (ord("a") <= ord(c) <= ord("z") or ord('0') <= ord(c) <= ord('9')):

                return True
            else:
                return False
            # return (ord('a') <= ord(c) <= ord('z') or
            #         ord('0') <= ord(c) <= ord('9') )

        l, r = 0, len(s) - 1

        while l <= r:
            while l < r and alphaNum(s[l]) == False:
                l += 1
            while r > l and alphaNum(s[r]) == False:
                r -= 1

            if s[l] != s[r]:
                return False
            l += 1
            r -= 1
        return True

        #Valid Palindrome 2 where you can delete at most one character
        # l, r = 0, len(s) - 1

        # while l < r:
        #     if s[l] != s[r]:
        #         skipL = s[l + 1:r + 1]
        #         skipR = s[l:r]
        #         return skipL == skipL[::-1] or skipR == skipR[::-1]
        #     l += 1
        #     r -= 1
        # return True
```

108. Convert Sorted Array to Binary Search Tree

Example 1:



Input: nums = [-10,-3,0,5,9]
Output: [0,-3,9,-10,null,5]
Explanation: [0,-10,5,null,-3,null,9] is also accepted:



```
# Definition for a binary tree node.
# class TreeNode:
#     def __init__(self, val=0, left=None, right=None):
#         self.val = val
#         self.left = left
#         self.right = right
class Solution:
    def sortedArrayToBST(self, nums: List[int]) -> Optional[TreeNode]:
        def helper(l, r) -> TreeNode:
            if r < l:
                return None
            m = l + (r - l) // 2
            root = TreeNode(nums[m])
            root.left = helper(l, m - 1)
            root.right = helper(m + 1, r)

            return root
        if nums is None:
            return None
        return helper(0, len(nums) - 1)
```

Medium

3. Longest Substring Without Repeating Characters(Medium)

Example 1:

Input: s = "abcabcbb"
Output: 3
Explanation: The answer is "abc", with the length of 3.

Example 2:

Input: s = "bbbbb"
Output: 1

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

```
class Solution:
    def lengthOfLongestSubstring(self, s: str) -> int:
        st = set()
        l = 0
        res = 0

        #sliding window problem
        for r in range(len(s)):
            while s[r] in st:
                st.remove(s[l])
                l += 1
            st.add(s[r])
            res = max(res, r - l + 1)
        return res
```

5. Longest Palindromic Substring (Medium)

Example 1:

Input: s = "babad"
Output: "bab"
Explanation: "aba" is also a valid answer.

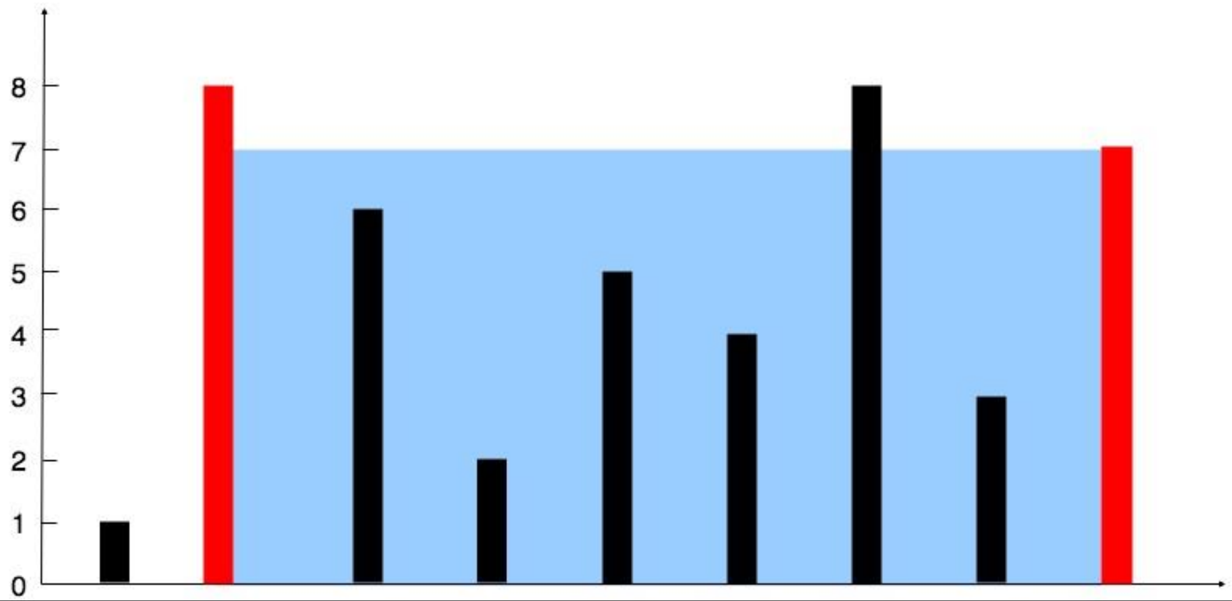
Example 2:

Input: s = "cbbd"
Output: "bb"

```
class Solution:
    def longestPalindrome(self, s: str) -> str:
        #res = ""
        resLen = 0
        resL, resR = 0, 0
        for i in range(len(s)):
            #odd length
            l, r = i, i
            while l >= 0 and r < len(s) and s[l] == s[r]:
                if r - l + 1 > resLen:
                    resLen = r - l + 1
                    resL, resR = l, r
                l -= 1
                r += 1
            #even length
            l, r = i, i + 1
            while l >= 0 and r < len(s) and s[l] == s[r]:
                if r - l + 1 > resLen:
                    resLen = r - l + 1
                    resL, resR = l, r
                l -= 1
                r += 1


        return s[resL: resR + 1]


        # res = ""
        # resLen = 0

        # for i in range(len(s)):
        #     #odd length
        #     l, r = i, i
        #     while l >= 0 and r < len(s) and s[l] == s[r]:
        #         if r - l + 1 > resLen:
        #             resLen = r - l + 1
        #             res = s[l:r+1]
        #         l -= 1
        #         r += 1
        #     #even length
        #     l, r = i, i + 1
        #     while l >= 0 and r < len(s) and s[l] == s[r]:
        #         if r - l + 1 > resLen:
        #             resLen = r - l + 1
        #             res = s[l:r+1]
        #         l -= 1
        #         r += 1


        # return res
```

11. Container with Most Water (Medium)

Example 1:	



Input: height = [1,8,6,2,5,4,8,3,7]
Output: 49
Explanation: The above vertical lines are represented by array [1,8,6,2,5,4,8,3,7]. In this case, the max area of water (blue section) the container can contain is 49.

```
class Solution:
    def maxArea(self, height: List[int]) -> int:
        area = 0
        l, r = 0, len(height) - 1
        while l < r:
            a = (r - l) * min(height[l], height[r])
            area = max(a, area)

            if height[l] < height[r]:
                l += 1
            else:
                r -= 1
        return area
```

```
        #mn = 0
        # for i in range(len(height)):
        #     for j in range(1, len(height) - i):
        #         mn = min(height[i], height[i + j])
        #         #print("Height, y = ", mn)
        #         #print("x = ", j - i)
        #         a = (i + j - i) * mn
        #         #print("Area = ",a)
        #         area = max(area, a)
        # return area

        # for i in range(len(height)):
        #     for j in range(i + 1, len(height)):
        #         a = (j - i) * min(height[i], height[j])
        #         area = max(a, area)
        # return area
```

33. Search in Rotated Sorted Array (Medium)

There is an integer array nums sorted in ascending order (with **distinct** values).

Prior to being passed to your function, nums is **possibly rotated** at an unknown pivot index k (1 <= k < nums.length) such that the resulting array is [nums[k], nums[k+1], ..., nums[n-1], nums[0], nums[1], ..., nums[k-1]] (**0-indexed**). For example, [0,1,2,4,5,6,7] might be rotated at pivot index 3 and become [4,5,6,7,0,1,2].

Given the array nums **after** the possible rotation and an integer target, return *the index of* target *if it is in* nums*, or* -1 *if it is not in* nums.

You must write an algorithm with O(log n) runtime complexity.

Example 1:

Input: nums = [4,5,6,7,0,1,2], target = 0
Output: 4

Example 2:

Input: nums = [4,5,6,7,0,1,2], target = 3
Output: -1

Example 3:

Input: nums = [1], target = 0
Output: -1

```
class Solution:
    def search(self, nums: List[int], target: int) -> int:
        l, r = 0, len(nums) - 1
```

```
while l <= r:
    m = l + (r - l) // 2
    if nums[m] == target:
        return m
    if nums[m] >= nums[l]:
        #left sorted portion
        if nums[l] > target or nums[m] < target:
            l = m + 1
        else:
            r = m - 1
    else:
        #right sorted portion
        if nums[r] < target or nums[m] > target:
            r = m - 1
        else:
            l = m + 1
return -1
```