ASSIGNMENT

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Branch: CSE **Section/Group:** NTPP_IOT-602/A
Semester: 6th **Date of Performance:** 05/04/2025
Subject: AP 2

1. **Aim:**
   a. **Two Sum**
   b. **Longest Substring Without Repeating Characters**
   c. **Palindrome Number**
2. **Objective:**
   a. Given an array of integers nums and an integer target, return indices of the two numbers such that they add up to target.
   b. Given a string s, find the length of the longest substring that does not contain any repeating characters.
   c. Given an integer x, return true if x is a palindrome, and false otherwise.
3. **Code:**
   a. **Two Sum**

```
from typing import List
class Solution:
    def twoSum(self, nums: List[int], target: int) -> List[int]:
        num_map = {}  # Dictionary to store value:index
        for i, num in enumerate(nums):
            diff = target - num
            if diff in num_map:
                return [num_map[diff], i]
            num_map[num] = i
        return []  # Return empty if no solution found (though the problem
guarantees one)
# Example usage:
sol = Solution()
print(sol.twoSum([2, 7, 11, 15], 9))  # Output: [0, 1]
print(sol.twoSum([3, 2, 4], 6))       # Output: [1, 2]
```

   b. **Longest Substring Without Repeating Characters**

```
class Solution:
    def lengthOfLongestSubstring(self, s: str) -> int:
        char_set = set()
```

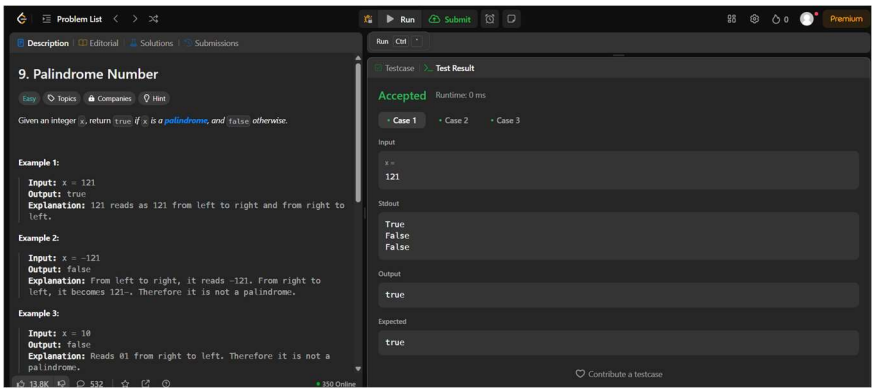
```
        left = 0
        max_length = 0
        for right in range(len(s)):
            while s[right] in char_set:
                char_set.remove(s[left])
                left += 1
            char_set.add(s[right])
            max_length = max(max_length, right - left + 1)
        return max_length
# Example usage:
sol = Solution()
print(sol.lengthOfLongestSubstring("abcabcbb"))  # Output: 3
print(sol.lengthOfLongestSubstring("bbbbb"))     # Output: 1
print(sol.lengthOfLongestSubstring("pwwkew"))    # Output: 3
```

c. Palindrome Number

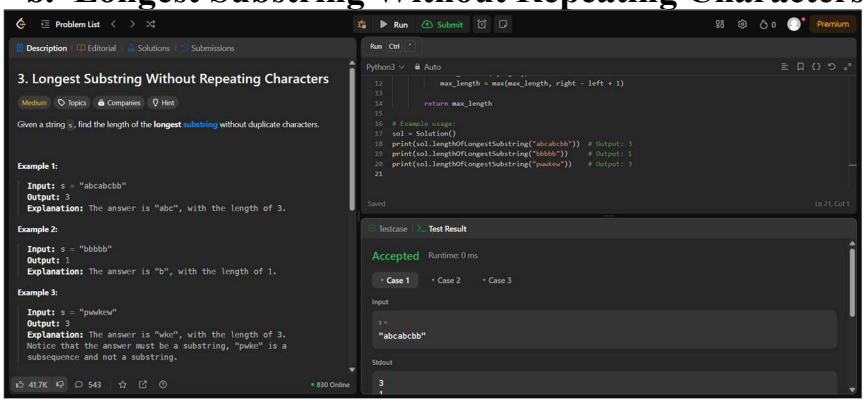
```
class Solution:
    def isPalindrome(self, x: int) -> bool:
        if x < 0:
            return False  # Negative numbers are not palindromes
        return str(x) == str(x)[::-1]  # Check if string representation is equal to its
reverse
# Example usage:
sol = Solution()
print(sol.isPalindrome(121))   # Output: True
print(sol.isPalindrome(-121))  # Output: False
print(sol.isPalindrome(10))    # Output: False
```

4. Output:

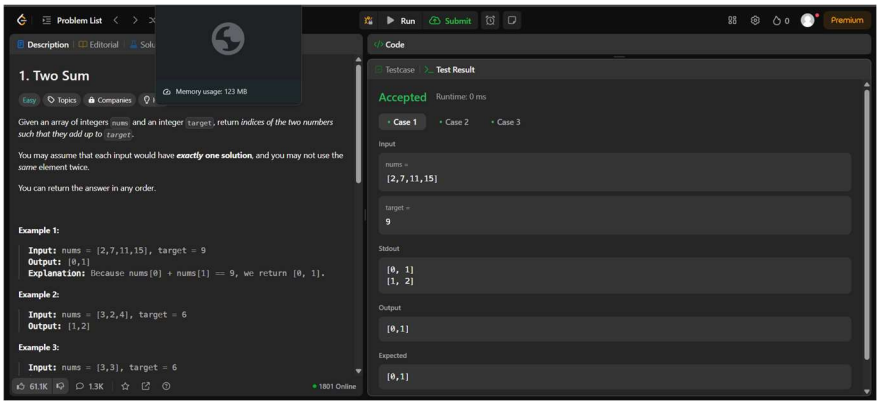
a. Two Sum



b. Longest Substring Without Repeating Characters



c. Palindrome Number



5. Learning Outcome

1) Understand how to implement efficient algorithms using hash maps for constant-time lookups.
2) Gain the ability to use sliding window techniques to solve substring-related problems.
3) Learn to manipulate and compare strings for palindrome validation.
4) Enhance problem-solving skills through real-world coding challenges.
5) Develop proficiency in writing clean, readable, and testable Python code.