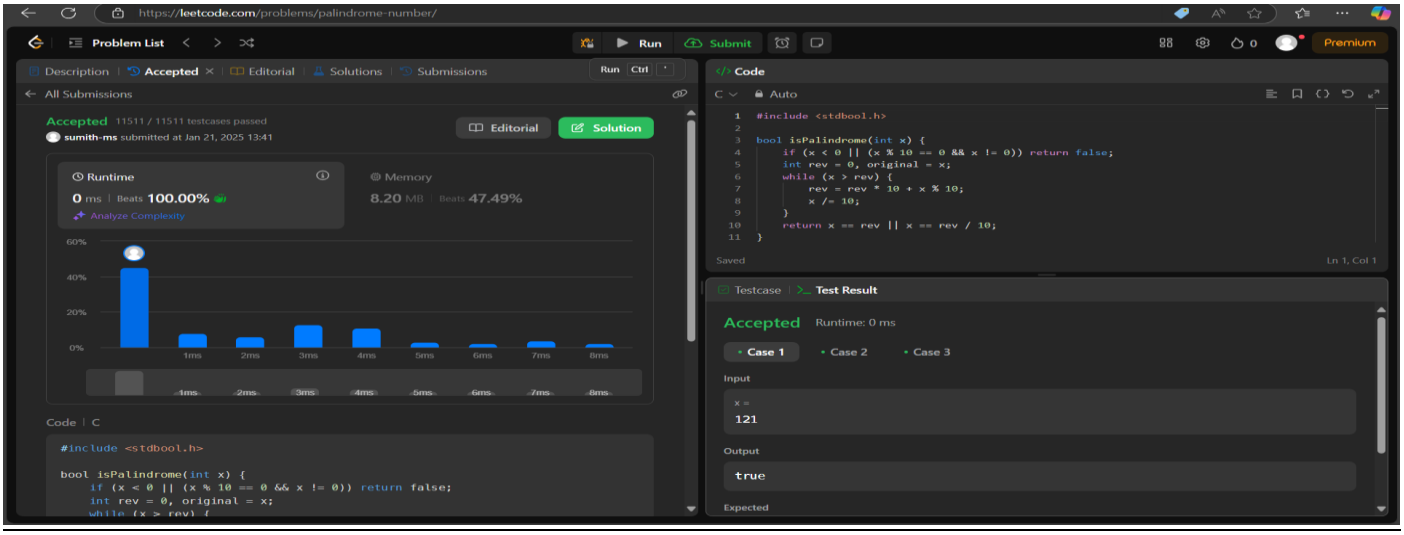
2311CSO20446
M.SUMITH

HOLIDAY ASSIGNMENT

1)PALINDROME NUMBER

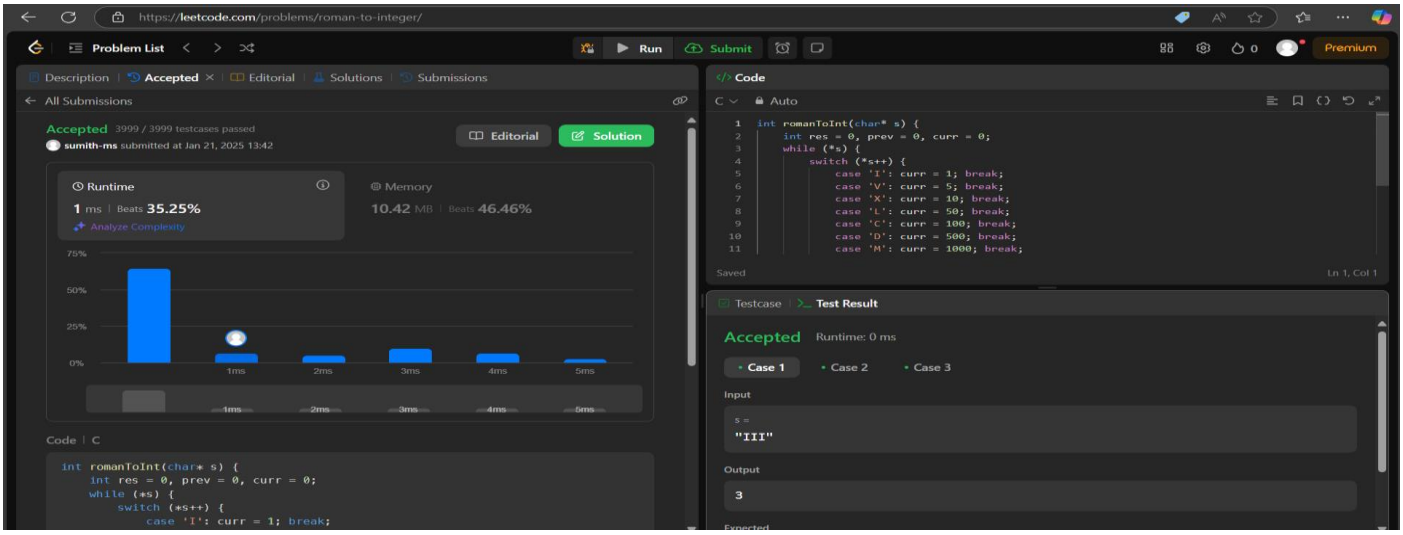
```
#include <stdbool.h>
bool isPalindrome(int x) {
    if (x < 0 || (x % 10 == 0 && x != 0)) return false;
    int rev = 0, original = x;
    while (x > rev) {
        rev = rev * 10 + x % 10;
        x /= 10;
    }
    return x == rev || x == rev / 10;
}
```



2)ROMAN TO INTEGER

```
int romanToInt(char* s) {
    int res = 0, prev = 0, curr = 0;
    while (*s) {
        switch (*s++) {
            case 'I': curr = 1; break;
            case 'V': curr = 5; break;
            case 'X': curr = 10; break;
```

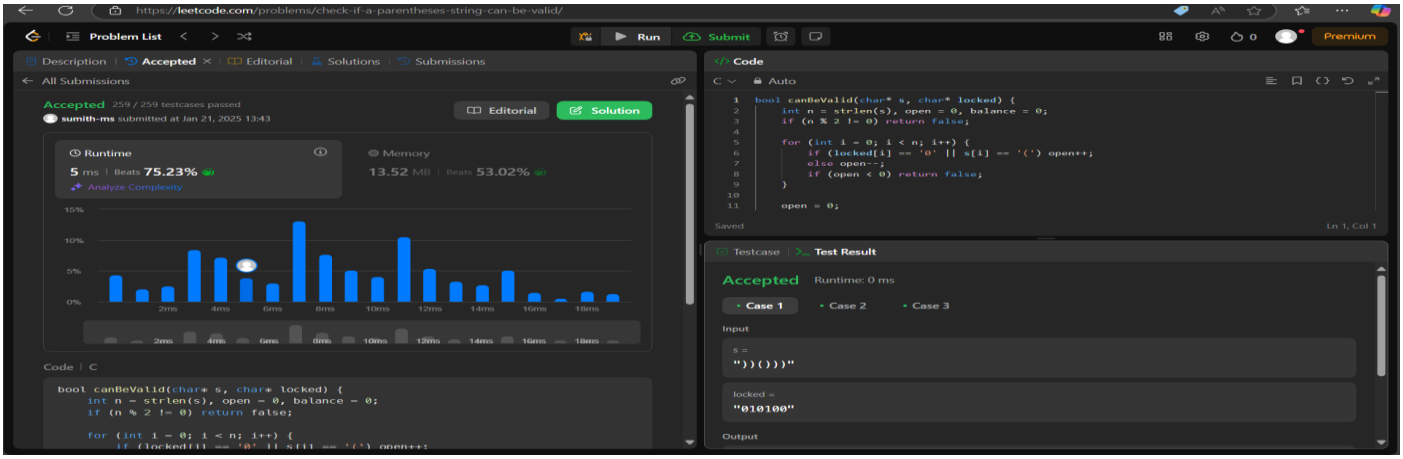
```
        case 'L': curr = 50; break;
        case 'C': curr = 100; break;
        case 'D': curr = 500; break;
        case 'M': curr = 1000; break;
      }
      res += (curr > prev) ? curr - 2 * prev : curr;
      prev = curr;
    }
    return res;
}
```



3)VALIDATING OPENING AND CLOSING PARENTHESIS IN A STRING

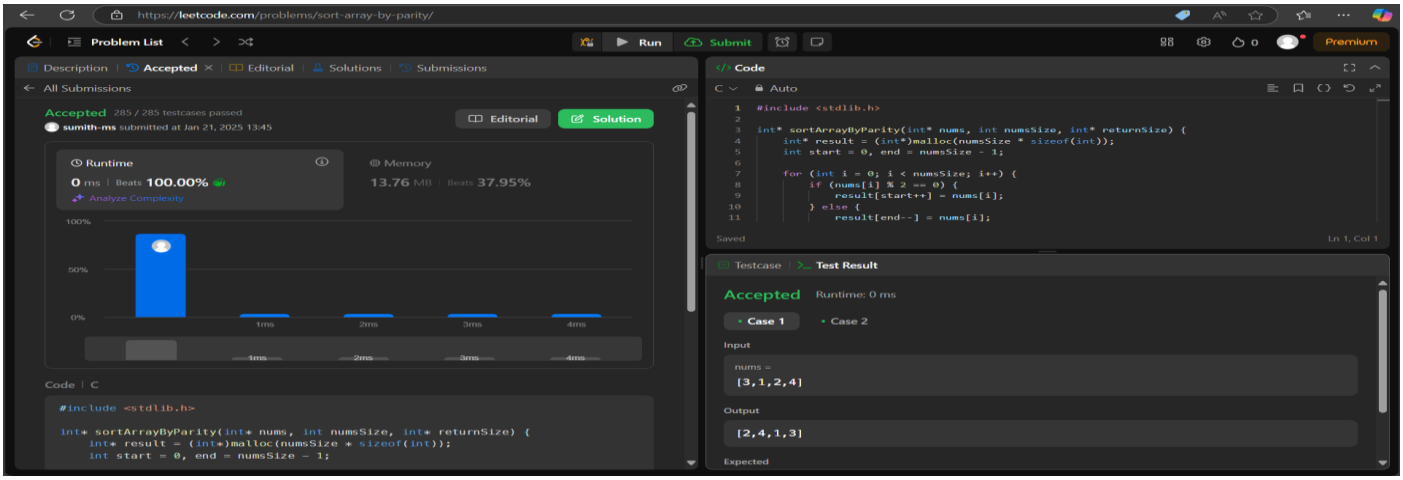
```
bool canBeValid(char* s, char* locked) {
    int n = strlen(s), open = 0, balance = 0;
    if (n % 2 != 0) return false;
    for (int i = 0; i < n; i++) {
        if (locked[i] == '0' || s[i] == '(') open++;
        else open--;
        if (open < 0) return false;
    }

    open = 0;
```

```
    for (int i = n - 1; i >= 0; i--) {
        if (locked[i] == '0' || s[i] == ')') open++;
        else open--;
        if (open < 0) return false;
    }

    return true;
}
```



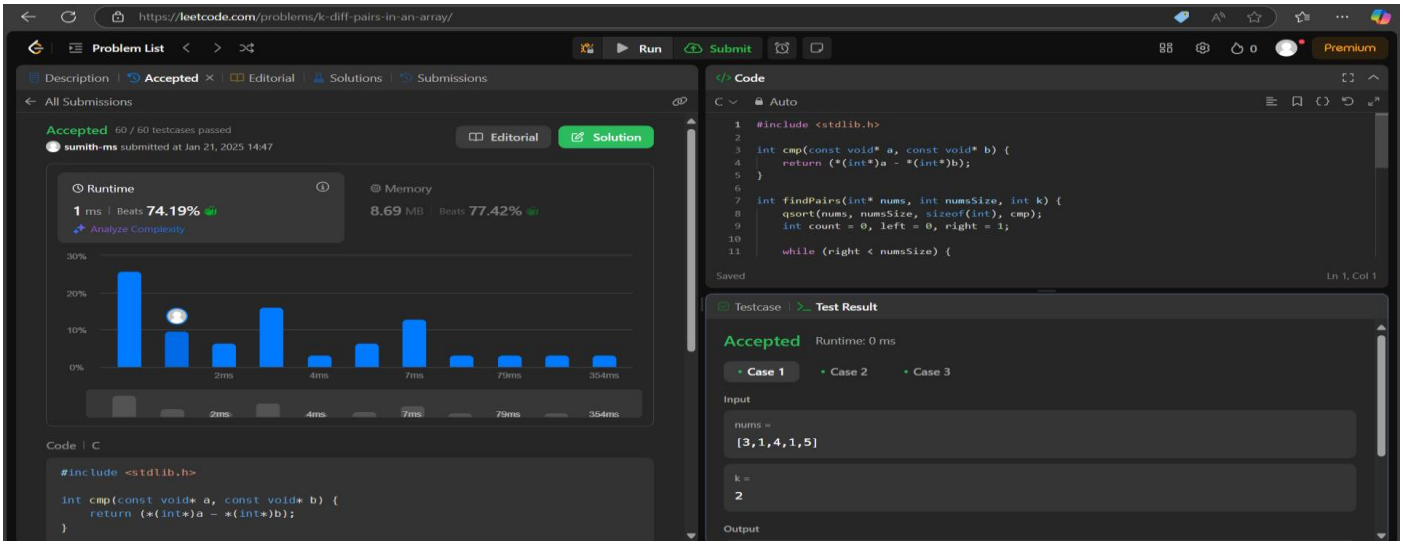
4)**FINDING ODD AND EVEN NUMBERS IN ARRAY**

```
#include <stdlib.h>
int* sortArrayByParity(int* nums, int numsSize, int* returnSize) {
    int* result = (int*)malloc(numsSize * sizeof(int));
    int start = 0, end = numsSize - 1;
    for (int i = 0; i < numsSize; i++) {
        if (nums[i] % 2 == 0) {
            result[start++] = nums[i];
        } else {
            result[end--] = nums[i];
        }
    }
    *returnSize = numsSize;
    return result;
}
```



5)SYMMETRIC PAIRS OF ARRAY

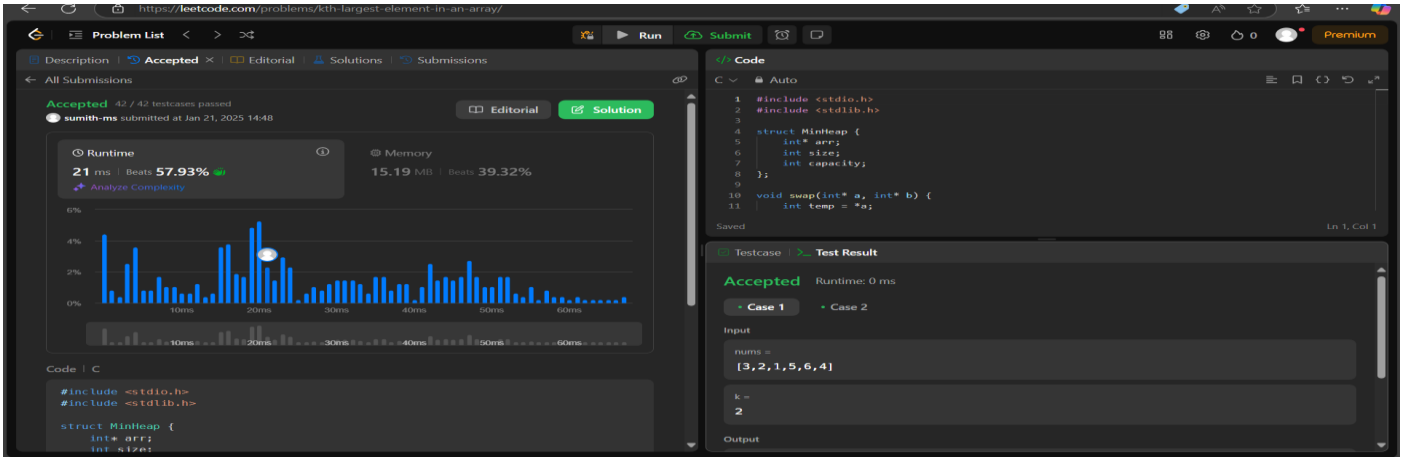
```
#include <stdlib.h>

int cmp(const void* a, const void* b) {
    return (*(int*)a - *(int*)b);
}

int findPairs(int* nums, int numsSize, int k) {
    qsort(nums, numsSize, sizeof(int), cmp);
    int count = 0, left = 0, right = 1;


    while (right < numsSize) {
        if (left == right || nums[right] - nums[left] < k) {
            right++;
        } else if (nums[right] - nums[left] > k) {
            left++;
        } else {
            count++;
            left++;
            right++;
            while (right < numsSize && nums[right] == nums[right - 1]) right++;
        }
    }
    return count;
}
```



6)Kth SMALLEST ELEMENT IN ARRAY

```
#include <stdio.h>
#include <stdlib.h>
struct MinHeap {
    int* arr;
    int size;
    int capacity;
};
void swap(int* a, int* b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}
void heapify(struct MinHeap* heap, int idx) {
    int smallest = idx;
    int left = 2 * idx + 1;
    int right = 2 * idx + 2;
    if (left < heap->size && heap->arr[left] < heap->arr[smallest]) {
        smallest = left;
    }
    if (right < heap->size && heap->arr[right] < heap->arr[smallest]) {
        smallest = right;
```

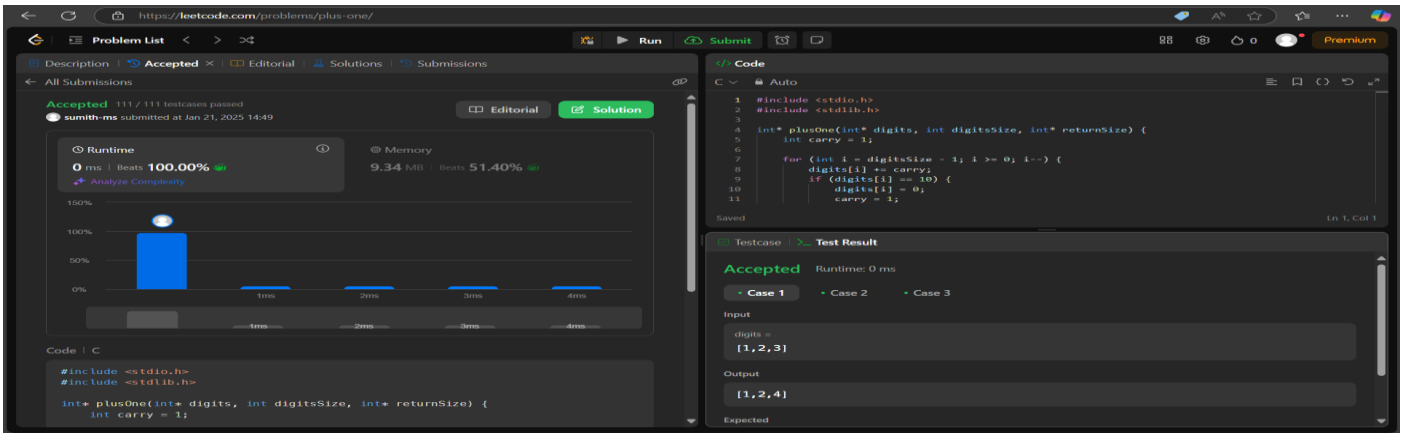
```
    }
    if (smallest != idx) {
        swap(&heap->arr[smallest], &heap->arr[idx]);
        heapify(heap, smallest);
    }
}
void insertMinHeap(struct MinHeap* heap, int val) {
    if (heap->size < heap->capacity) {
        heap->arr[heap->size] = val;
        heap->size++;
        int i = heap->size - 1;
        while (i > 0 && heap->arr[(i - 1) / 2] > heap->arr[i]) {
            swap(&heap->arr[(i - 1) / 2], &heap->arr[i]);
            i = (i - 1) / 2;
        }
    } else if (val > heap->arr[0]) {
        heap->arr[0] = val;
        heapify(heap, 0);
    }
}
int findKthLargest(int* nums, int numsSize, int k) {
    struct MinHeap heap;
    heap.arr = (int*)malloc(k * sizeof(int));
    heap.size = 0;
    heap.capacity = k;
    for (int i = 0; i < numsSize; i++) {
        insertMinHeap(&heap, nums[i]);
    }
    return heap.arr[0];
}
```



7)REPRESENT COMPLEX NUMBERS WITH REAL AND IMAGINARY PARTS

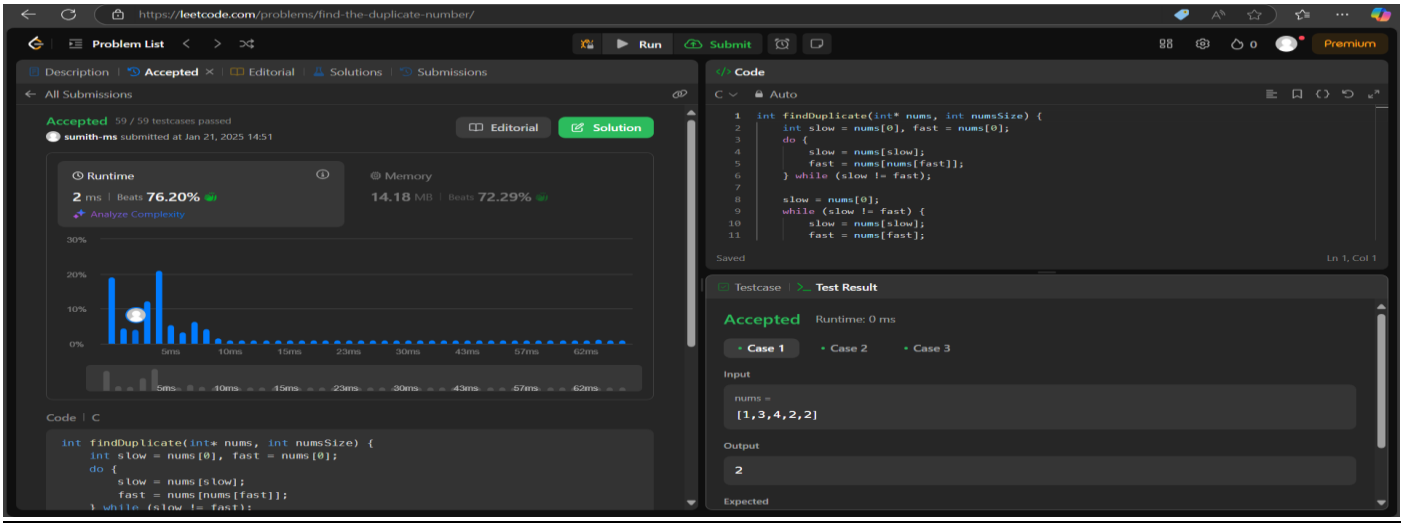
```
#include <stdio.h>
#include <stdlib.h>
int* plusOne(int* digits, int digitsSize, int* returnSize) {
    int carry = 1;
    for (int i = digitsSize - 1; i >= 0; i--) {
        digits[i] += carry;
        if (digits[i] == 10) {
            digits[i] = 0;
            carry = 1;
        } else {
            carry = 0;
            break;
        }
    }
    if (carry) {
        *returnSize = digitsSize + 1;
        int* result = (int*)malloc(sizeof(int) * (*returnSize));
        result[0] = 1;
        for (int i = 1; i < *returnSize; i++) {
            result[i] = digits[i - 1];
        }
        return result;
    } else {
```

```
        *returnSize = digitsSize;
        return digits;
    }
}
```



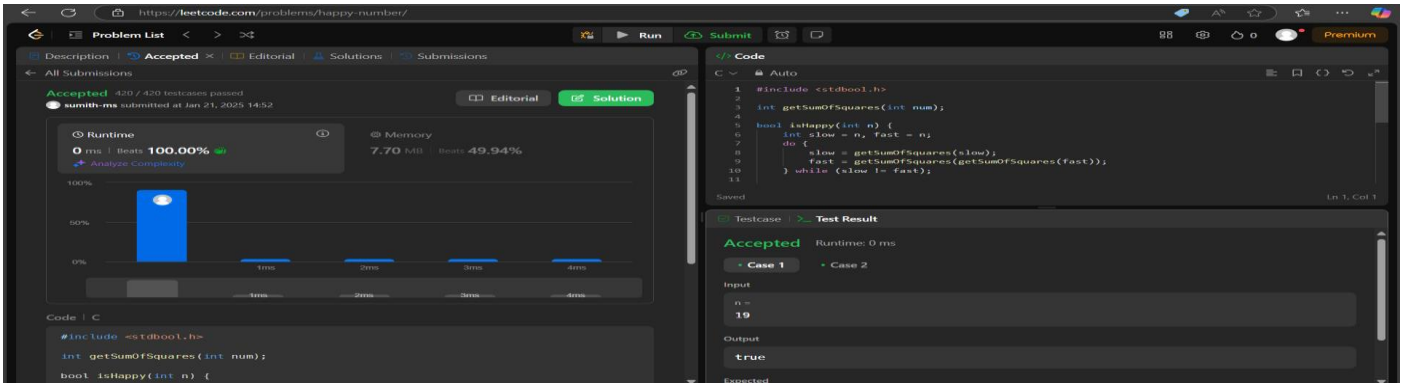
8)MISSING AND DUPLICATE NUMBER IN ARRAY

```
int findDuplicate(int* nums, int numsSize) {
    int slow = nums[0], fast = nums[0];
    do {
        slow = nums[slow];
        fast = nums[nums[fast]];
    } while (slow != fast);
    slow = nums[0];
    while (slow != fast) {
        slow = nums[slow];
        fast = nums[fast];
    }
    return slow;
}
```



9)NUMBER N IS HAPPY

```
#include <stdbool.h>

int getSumOfSquares(int num);

bool isHappy(int n) {
    int slow = n, fast = n;
    do {
        slow = getSumOfSquares(slow);
        fast = getSumOfSquares(getSumOfSquares(fast));
    } while (slow != fast);
    return slow == 1;
}

int getSumOfSquares(int num) {
    int sum = 0;
    while (num > 0) {
        int digit = num % 10;
        sum += digit * digit;
        num /= 10;
    }
    return sum;
}
```



10)BINARY TREE-HEIGHT BALANCE

```
#include <stdbool.h>
#include <stdlib.h>
int height(struct TreeNode* root) {
    if (root == NULL) return 0;
    int leftHeight = height(root->left);
    if (leftHeight == -1) return -1;
    int rightHeight = height(root->right);
    if (rightHeight == -1) return -1;
    if (abs(leftHeight - rightHeight) > 1) return -1;
    return 1 + (leftHeight > rightHeight ? leftHeight : rightHeight);
}
bool isBalanced(struct TreeNode* root) {
    return height(root) != -1;
}
```