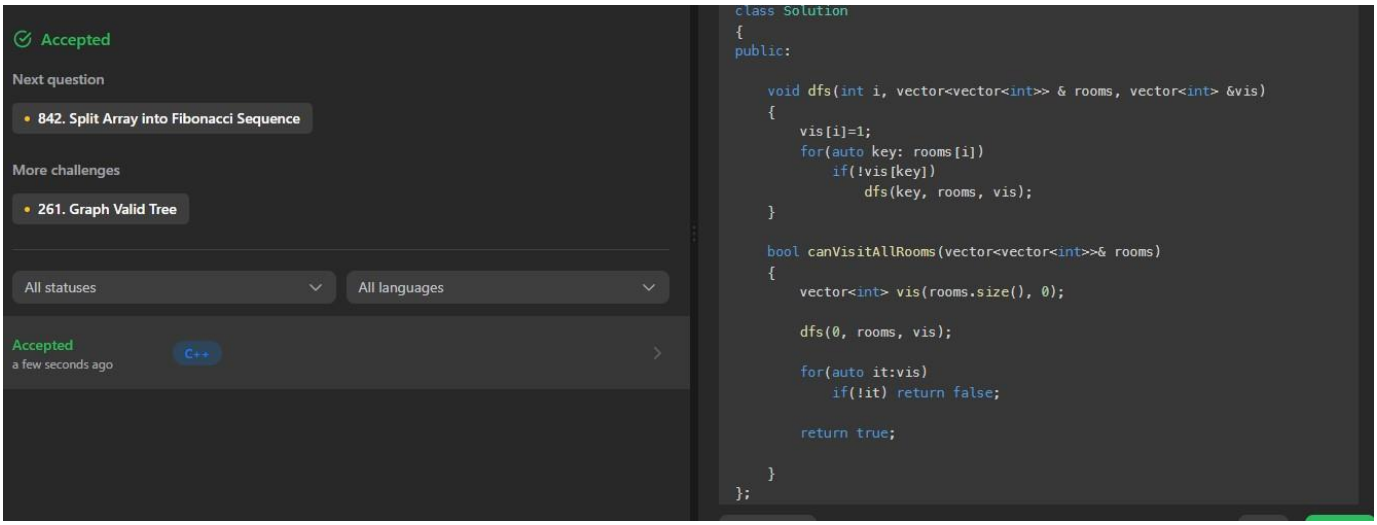
WORKSHEET 8

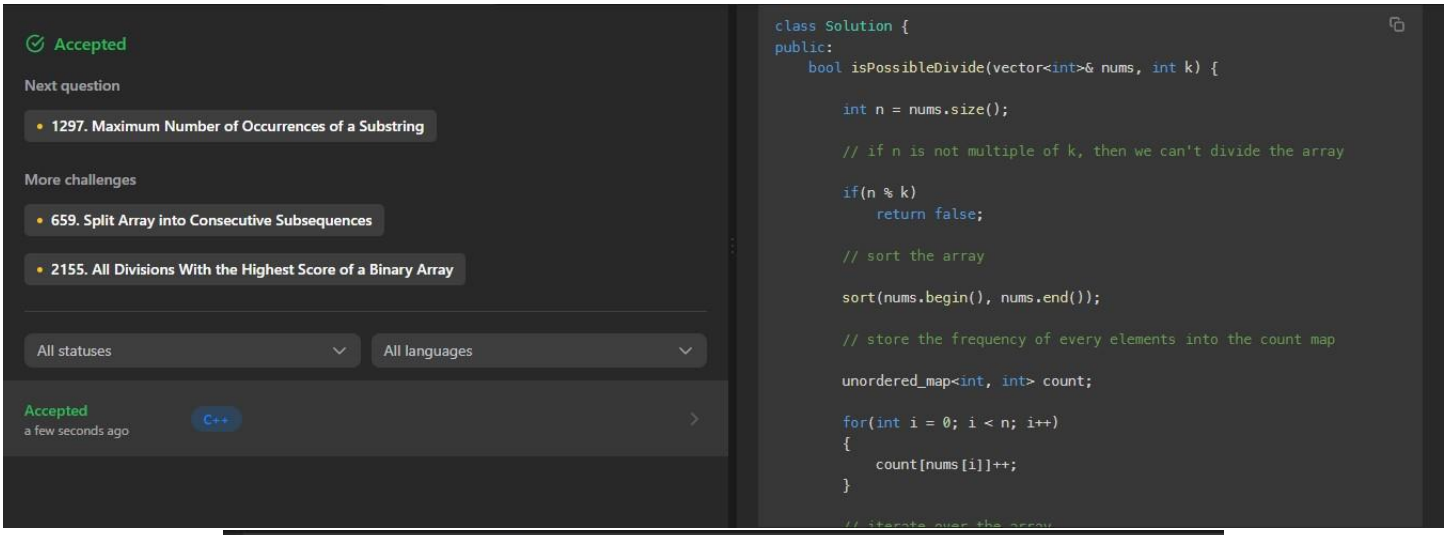
Student Name: Harsh Chauhan **UID:** 21BCS10053

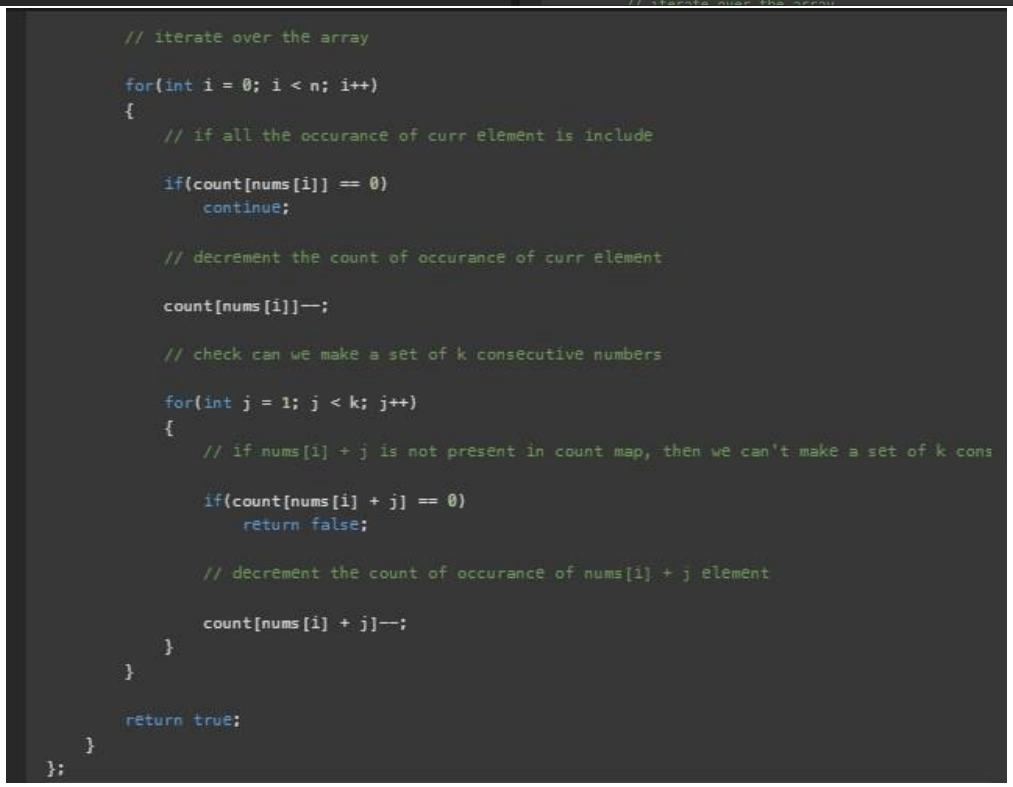
Subject Name: IT Skills (DSA)

Question 1. KEYS AND ROOMS (DIVIDE AND CONQUER)



Question 2. DIVIDE ARRAY IN SETS OF K CONSECUTIVE NUMBERS (DIVIDE AND CONQUER)

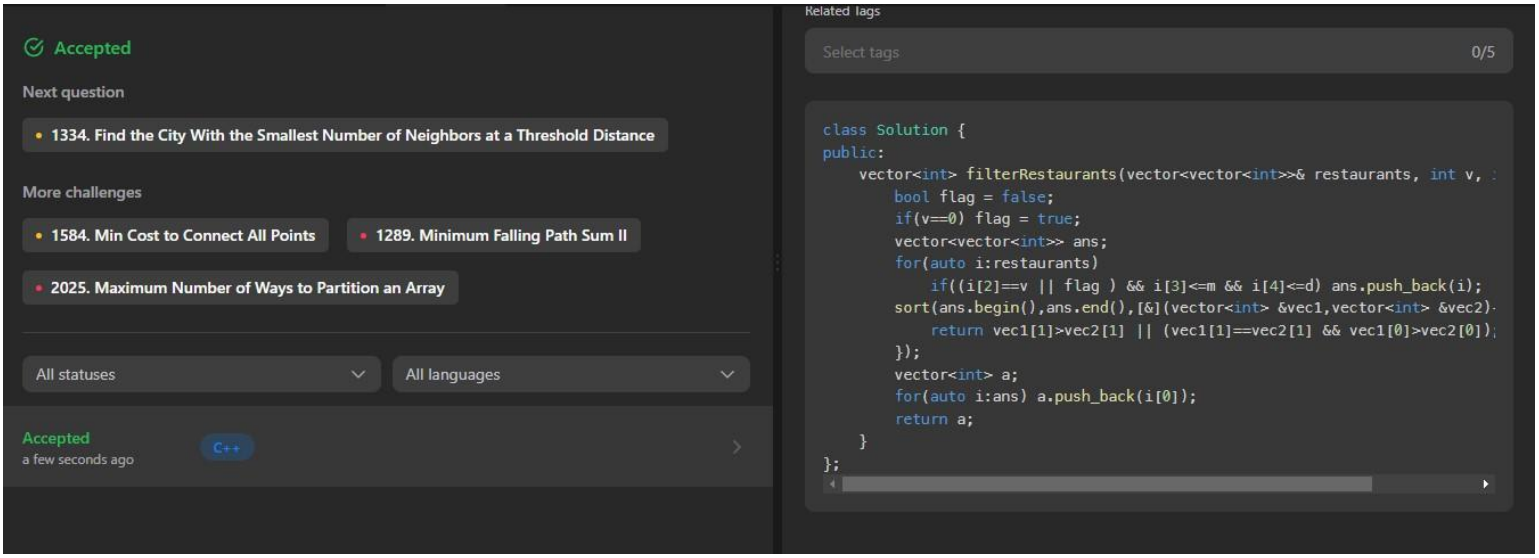


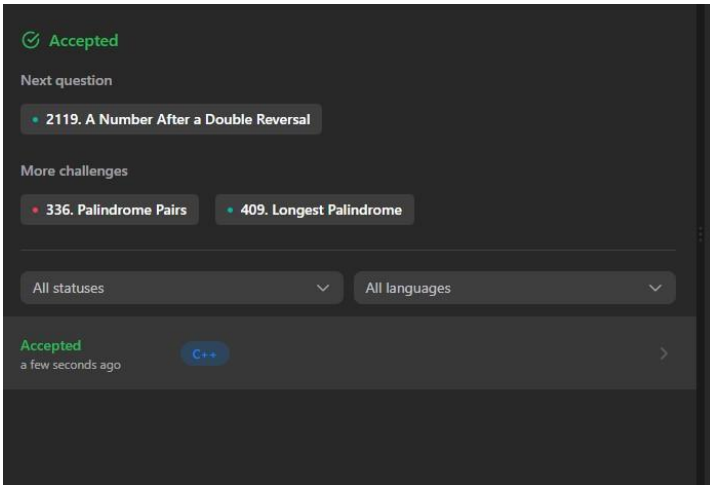


Question 3. FILTER RESTAURANTS BY VEGAN-FRIENDLY, PRICE AND DISTANCE (DIVIDE AND CONQUER)

Question .

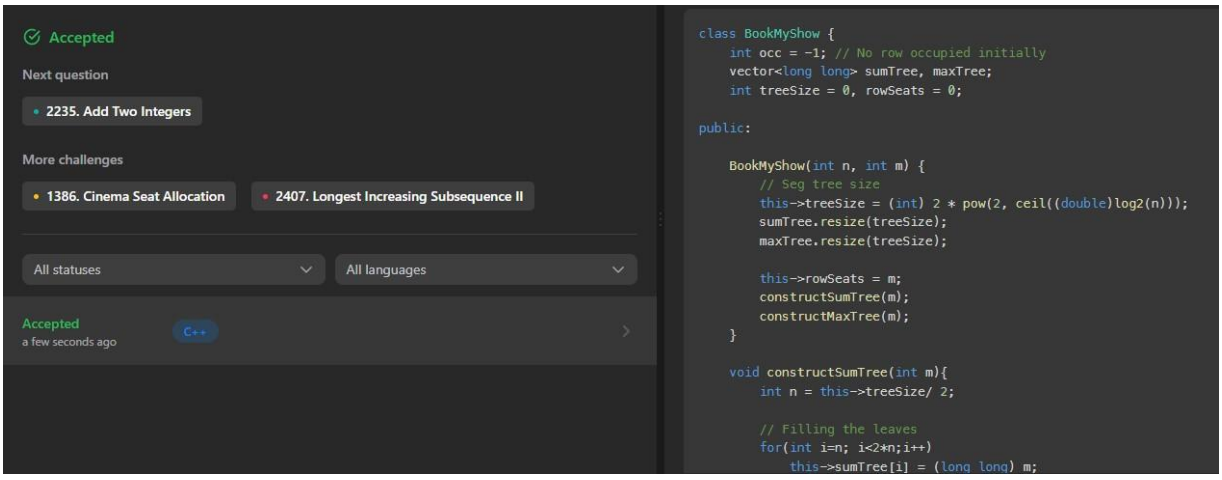
4 LONGEST PALINDROME BY CONCATENATING TWO LETTER WORDS (DIVIDE AND CONQUER)






```cpp
class Solution {
public:
    int longestPalindrome(vector<string>& words) {

        //initialize  a map to store the occurances of all words
        unordered_map<string, int> mp;

        //storing occurances of all words
        for(auto i:words) mp[i]++;

        //this variable will be used later
        bool flag = false;
        int ans = 0;

        //iterating our map
        for(auto i:mp){

            string temp = i.first;
            reverse(temp.begin(), temp.end());

            //checking if it is palindrome word itself and the count of it
            //this word can be inserted in the middle of our palindrome as
            //but this can be done only once
            if(temp == i.first and i.second%2!=0 and flag == false){
                //we mark our flag to true because we want to insert this element onl
                flag = true;
                ans+=2;
                mp[temp]--;
            }

            //checking if the word as well its reverse exist in the map
            if(mp.find(i.first)!=mp.end() and mp.find(temp)!=mp.end()){

                //for the case when the word is not palindrome we will increase our a
                if(i.first!=temp){
                    ans += min(mp[i.first], mp[temp])*2*2;
                    mp[i.first]=mp[temp]=0;
                }
                //for the case when it is palindrome we just divide the count of the
                else{
                    ans+=mp[temp]/2 *2*2;
                    mp[i.first]=mp[temp]=0;

                }
            }
        }
        return ans;

    }
};
```

Question 5. BOOKING CONCERT TICKETS IN GROUPS (DIVIDE AND CONQUER)




```cpp
class BookMyShow {
    int occ = -1; // No row occupied initially
    vector<long long> sumTree, maxTree;
    int treeSize = 0, rowSeats = 0;

public:

    BookMyShow(int n, int m) {
        // Seg tree size
        this->treeSize = (int) 2 * pow(2, ceil((double)log2(n)));
        sumTree.resize(treeSize);
        maxTree.resize(treeSize);

        this->rowSeats = m;
        constructSumTree(m);
        constructMaxTree(m);
    }

    void constructSumTree(int m){
        int n = this->treeSize/ 2;

        // Filling the leaves
        for(int i=n; i<2*n;i++)
            this->sumTree[i] = (long long) m;
```

Question .

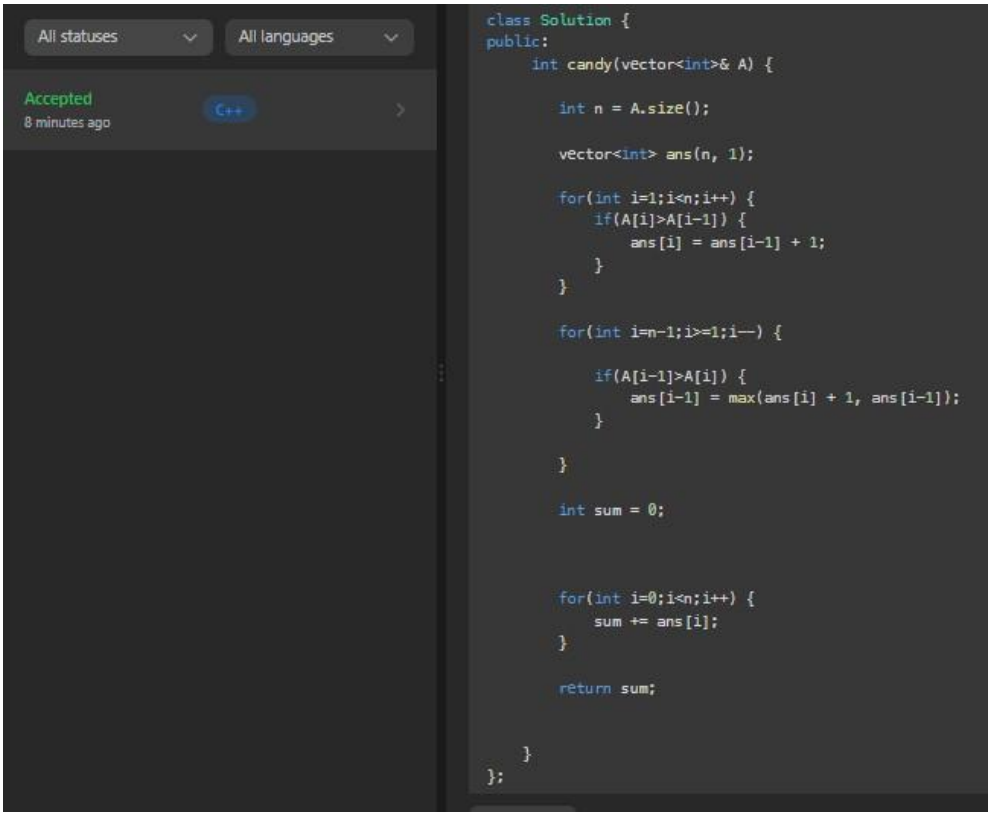
```
        // Forming the higher nodes
        for(int i=n-1;i>=1;i--)
            this->sumTree[i] = this->sumTree[2*i] + this->sumTree[2*i+1];
    }

    void constructMaxTree(int m){
        int n = this->treeSize/ 2;

        // Filling the leaves
        for(int i=n; i<2*n;i++)
            this->maxTree[i] = (long long) m;

        // Forming the higher nodes
        for(int i=n-1;i>=1;i--)
            this->maxTree[i] = max(this->maxTree[2*i], this->maxTree[2*i+1]
    }

    long long rangeSum(int minRow, int maxRow){
        long long sum = 0;
        int n = treeSize / 2;
        minRow += n; maxRow += n;
        while(minRow <= maxRow){
            if(minRow % 2 == 1) sum += this->sumTree[minRow++]; // Right ch
            if(maxRow % 2 == 0) sum += this->sumTree[maxRow--]; // Left chi
            minRow /= 2; maxRow /= 2;
        }
```

```
        return sum;
    }

    void updateSumTree(int index, int newValue){
        int n = this->treeSize / 2;
        int temp = index;
        index += n;
        this->sumTree[index] = newValue; // Update leaf
        index /= 2;
        while(index > 0){
            this->sumTree[index] = this->sumTree[2*index] + this->sumTree[2
            index /= 2;
        }
    }

    long long rangeMax(int minRow, int maxRow){
        long long ans = 0;
        int n = this->treeSize / 2;
        minRow += n; maxRow += n;
        while(minRow <= maxRow){
            if(minRow % 2 == 1) ans = max(ans, this->maxTree[minRow++]); //
            if(maxRow % 2 == 0) ans = max(ans, this->maxTree[maxRow--]); //
            minRow /= 2; maxRow /= 2;
        }
```

```
        return ans;
    }

    void updateMaxTree(int index, int newValue){
        int n = this->treeSize / 2;
        int temp = index;
        index += n;
        this->maxTree[index] = newValue; // Update leaf
        index /= 2;
        while(index > 0){
            this->maxTree[index] = max(this->maxTree[2*index], this->maxTree[2*index + 1]);
            index /= 2;
        }
    }

    vector<int> gather(int k, int maxRow) {
        int minRow = occ + 1;
        if(maxRow < minRow) return {};
        if(rangeMax(minRow, maxRow) < k) return {};

        int minIndex = maxRow;
        int seats = 0;
        int low = minRow, high = maxRow;
        while(low <= high){
            int midRow = (low + high)/2;
            int maxSeats = rangeMax(minRow, midRow);
            if(maxSeats >= k){
                high = midRow - 1;
                seats = maxSeats;
                minIndex = midRow;
            }
            else low = midRow + 1;
        }
```

```
        int r = minIndex, c = this->rowSeats - seats;

        // Updatng the segment trees
        this->updateMaxTree(minIndex, seats - k);
        this->updateSumTree(minIndex, seats - k);
        return {r,c};
    }

    bool scatter(int k, int maxRow) {
        int minRow = occ + 1;
        if(maxRow < minRow) return false;
        if(rangeSum(minRow, maxRow) < k) return false;

        int minIndex = maxRow;
        long long seats = 0;
        int low = minRow, high = maxRow;
        while(low <= high){
            int midRow = (low + high)/2;
            long long rangeSeats = rangeSum(minRow, midRow);
            if(rangeSeats >= k){
                high = midRow - 1;
                seats = rangeSeats;
                minIndex = midRow;
            }
            else low = midRow + 1;
        }

        // Updating the occupied rows
        occ = minIndex - 1;

        // Updating the segment trees
        this->updateSumTree(minIndex, seats - k);
        this->updateMaxTree(minIndex, seats - k);
        return true;
    }
};
```

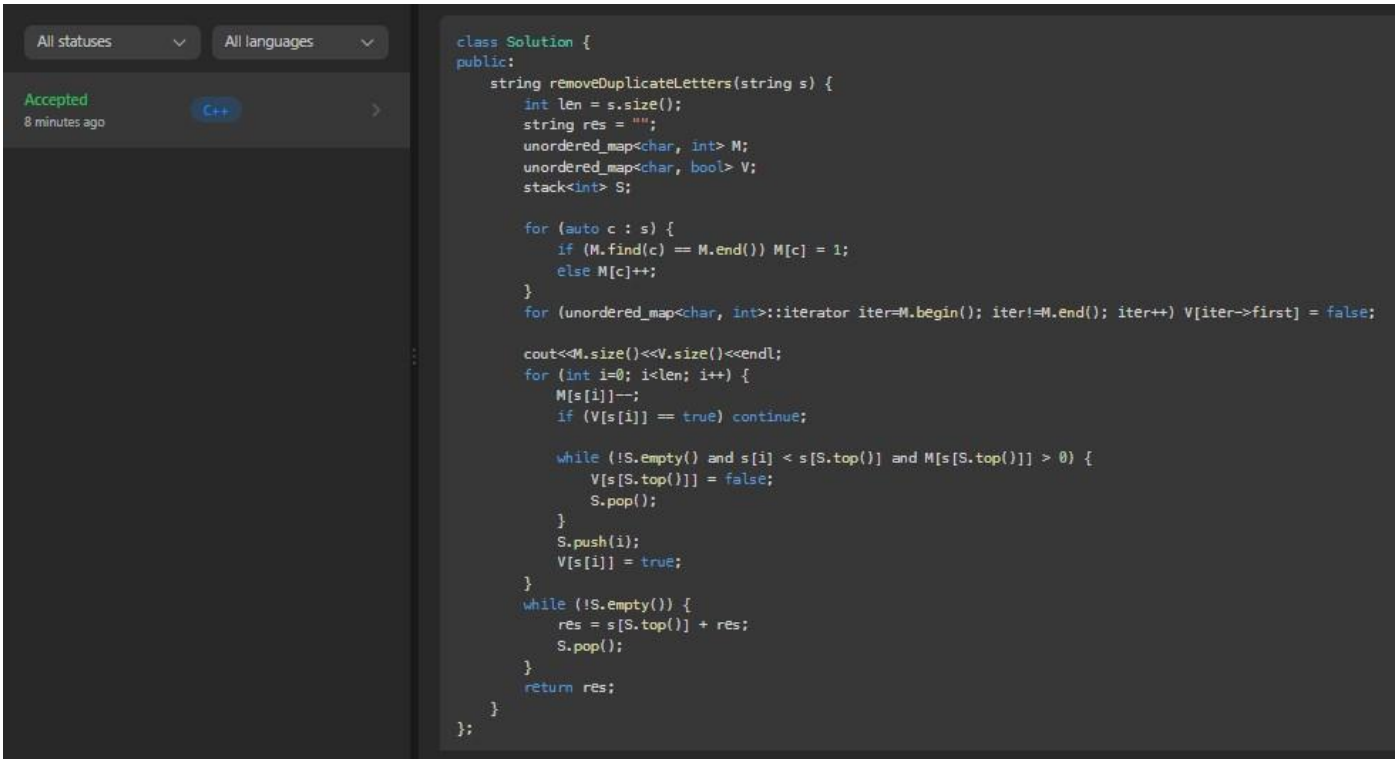
6 CANDY (GREEDY APPROACH)




```
class Solution {
public:
    int candy(vector<int>& A) {

        int n = A.size();

        vector<int> ans(n, 1);

        for(int i=1;i<n;i++) {
            if(A[i]>A[i-1]) {
                ans[i] = ans[i-1] + 1;
            }
        }

        for(int i=n-1;i>=1;i--) {

            if(A[i-1]>A[i]) {
                ans[i-1] = max(ans[i] + 1, ans[i-1]);
            }

        }

        int sum = 0;



        for(int i=0;i<n;i++) {
            sum += ans[i];
        }

        return sum;


    }
};
```

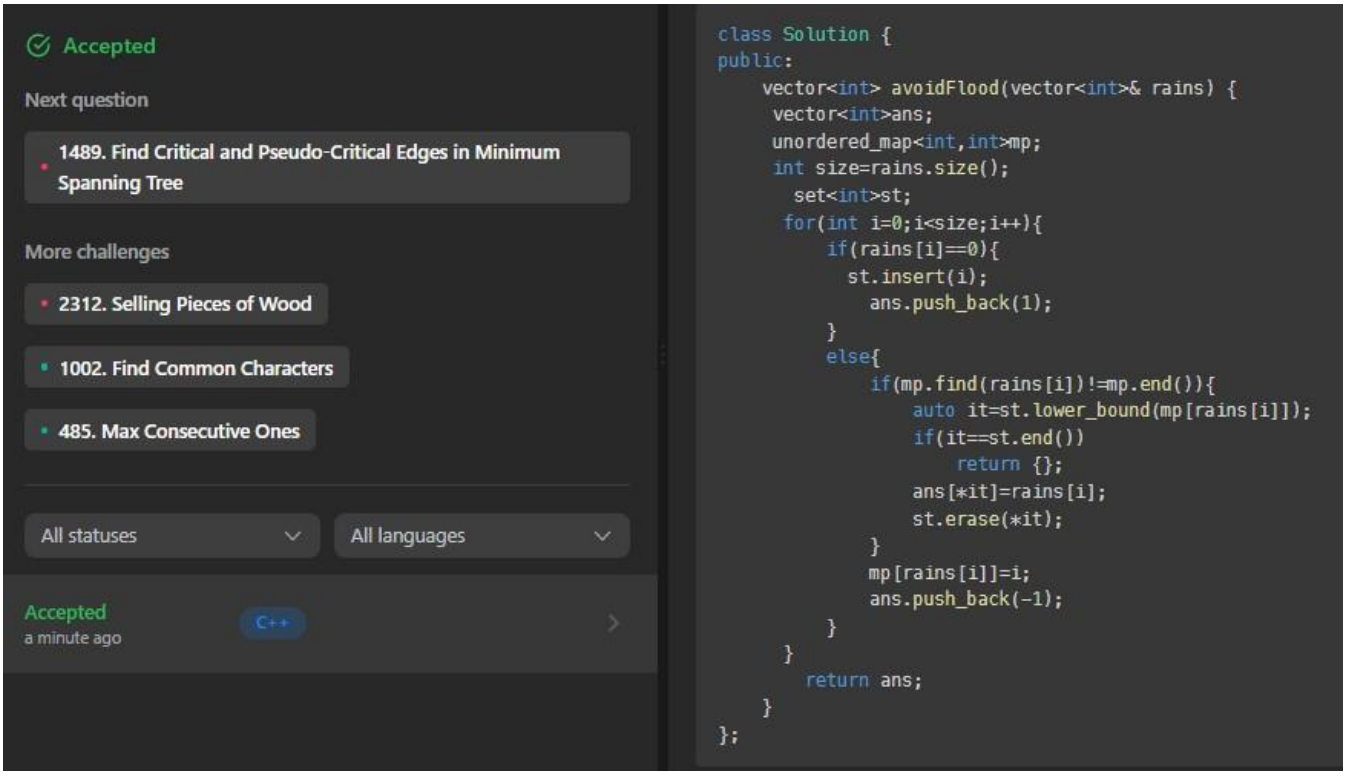
Question 7. REMOVE DUPLICATE LETTERS (GREEDY APPROACH)

Question .

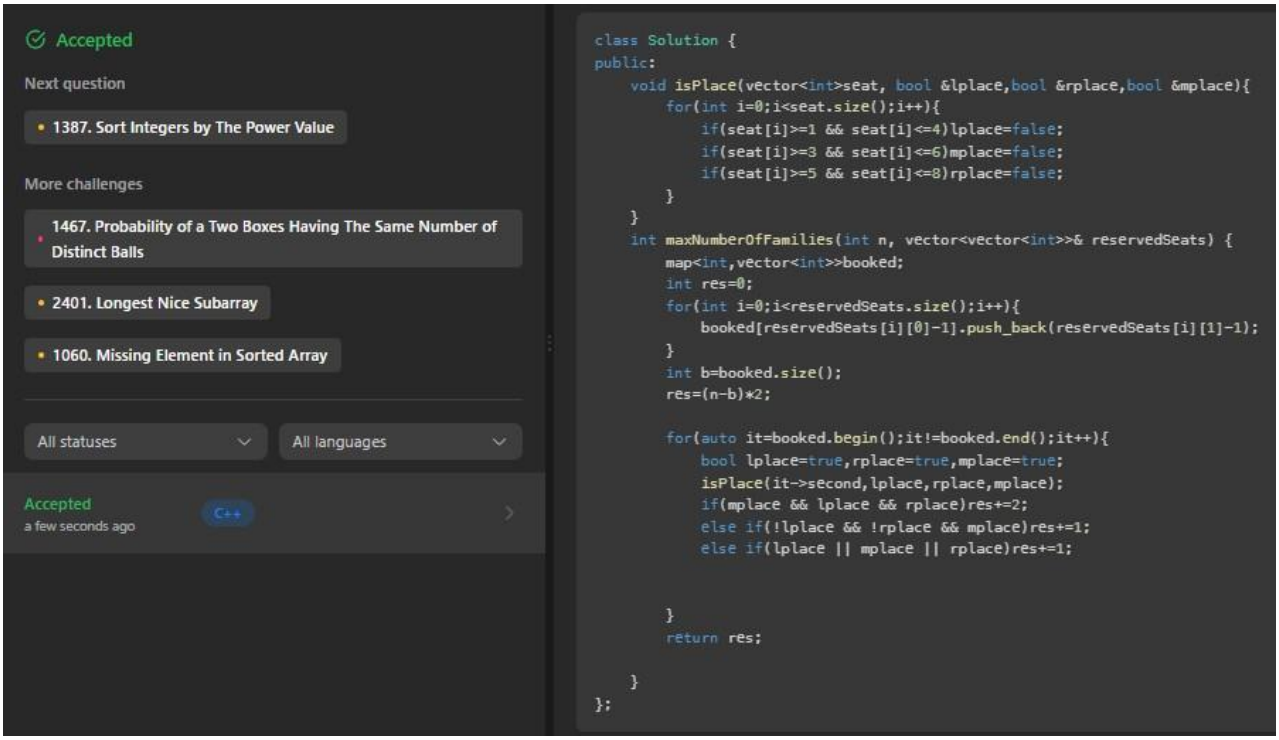



```cpp
class Solution {
public:
    string removeDuplicateLetters(string s) {
        int len = s.size();
        string res = "";
        unordered_map<char, int> M;
        unordered_map<char, bool> V;
        stack<int> S;

        for (auto c : s) {
            if (M.find(c) == M.end()) M[c] = 1;
            else M[c]++;
        }
        for (unordered_map<char, int>::iterator iter=M.begin(); iter!=M.end(); iter++) V[iter->first] = false;

        cout<<M.size()<<V.size()<<endl;
        for (int i=0; i<len; i++) {
            M[s[i]]--;
            if (V[s[i]] == true) continue;

            while (!S.empty() and s[i] < s[S.top()] and M[s[S.top()]] > 0) {
                V[s[S.top()]] = false;
                S.pop();
            }
            S.push(i);
            V[s[i]] = true;
        }
        while (!S.empty()) {
            res = s[S.top()] + res;
            S.pop();
        }
        return res;
    }
};
```

Question 8. AVOID FLOOD IN THE CITY (GREEDY APPROACH)

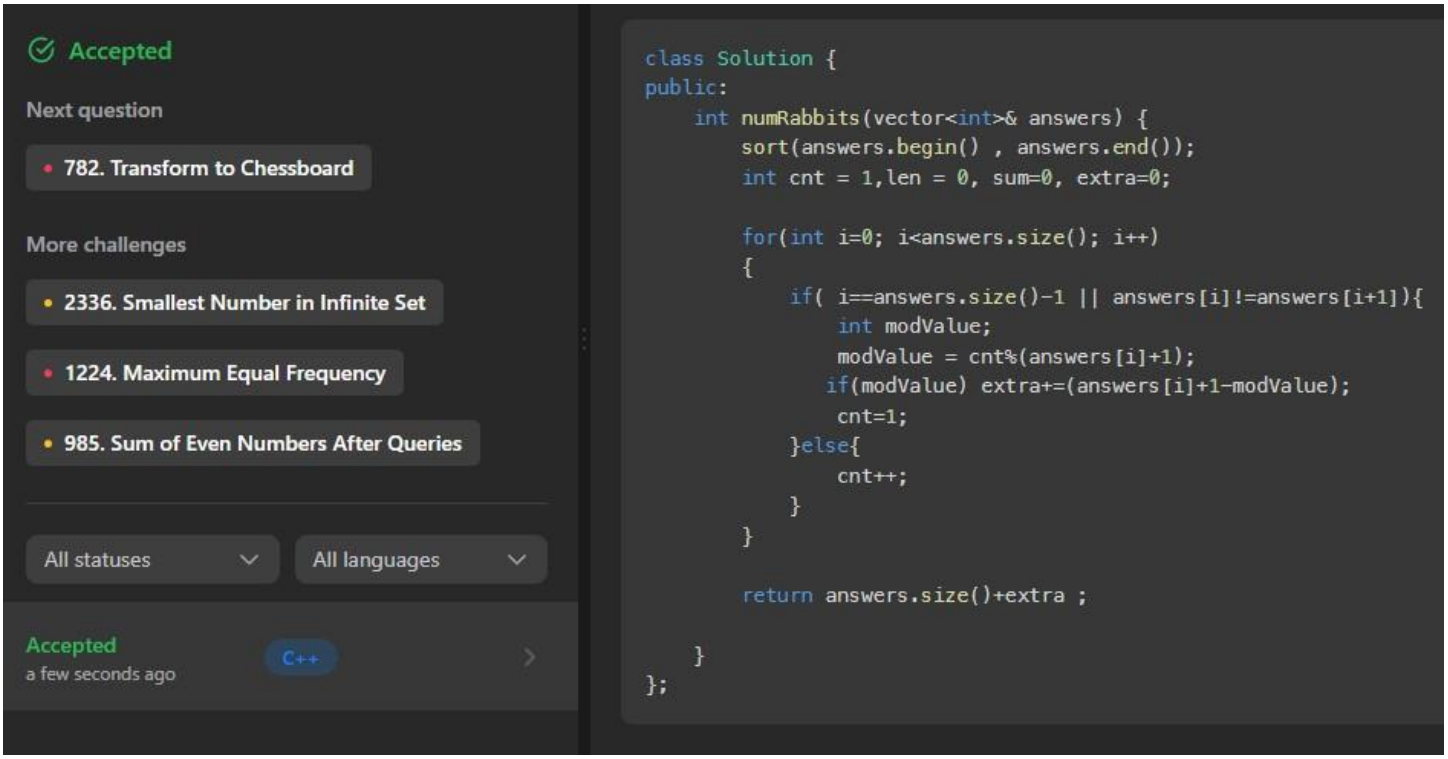


Question 9. CINEMA SEAT ALLOCATION (GREEDY APPROACH)



10 RABBITS IN FOREST (GREEDY APPROACH)

Question .


Accepted
Next question
782. Transform to Chessboard
More challenges
2336. Smallest Number in Infinite Set
1224. Maximum Equal Frequency
985. Sum of Even Numbers After Queries
All statuses
All languages
Accepted
a few seconds ago
C++
class Solution {
public:
int numRabbits(vector<int>& answers) {
sort(answers.begin() , answers.end());
int cnt = 1,len = 0, sum=0, extra=0;
for(int i=0; i<answers.size(); i++)
{
if(i==answers.size()-1 || answers[i]!=answers[i+1]){
int modValue;
modValue = cnt%(answers[i]+1);
if(modValue) extra+=(answers[i]+1-modValue);
cnt=1;
}else{
cnt++;
}
}
return answers.size()+extra ;
}
};