

Worksheet 3

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Branch: CSE

Semester:5

Section/Group:DWWC-43

Date of

Performance:05-01-
2023

Subject Name:Data Structure

1. Aim/Overview of the practical:

- i) Bob and Alice are having a lockout match between them. There are three problems in the contest worth AA , BB , and CC points respectively. Only the first player to solve a problem gets points for that problem. It is impossible for Bob and Alice to solve a problem at the same time. Chef wants to know if there is any chance of a draw if Bob and Alice manage to solve all 33 problems. A draw occurs when both players end with equal number of points.

- ii) Given the list of numbers, you are to sort them in non decreasing order.

- iii) Chef has a binary string SS of length NN . Chef can perform the following operation on SS any number of times (possibly zero):

- Choose a number XX ($1 \leq X \leq N$) that hasn't been chosen in any previous operation and flip any substring of SS having length XX (i.e. change all 00s to 11s and all 11s to 00s in any substring of SS having length XX).

Chef wants to transform SS into a non-decreasing string using any sequence of operations. Can you help Chef find such a sequence of operations?

If there are multiple answers, print any.

iv) There are NN frogs (numbered 11 through NN) in a line. For each valid ii , the ii -th frog is initially at the position ii , it has weight W_i , and whenever you hit its back, it jumps a distance L_i to the right, i.e. its position increases by L_i . The weights of the frogs are pairwise distinct.

You can hit the back of each frog any number of times (possibly zero, not necessarily the same for all frogs) in any order. The frogs do not interfere with each other, so there can be any number of frogs at the same time at each position.

Your task is to sort the frogs in the increasing order of weight using the smallest possible number of hits. In other words, after all the hits are performed, then for each pair of frogs (i, j) such that $W_i < W_j$, the position of the ii -th frog should be strictly smaller than the position of the jj -th frog. Find the smallest number of hits needed to achieve such a state.

v) Tonight, Chef would like to hold a party for his NN friends.

All friends are invited and they arrive at the party one by one in an arbitrary order. However, they have certain conditions — for each valid ii , when the ii -th friend arrives at the party and sees that at that point, strictly less than A_i other people (excluding Chef) have joined the party, this friend leaves the party; otherwise, this friend joins the party.

Help Chef estimate how successful the party can be — find the maximum number of his friends who could join the party (for an optimal choice of the order of arrivals).

2. Steps for experiment/practical/Code:

i)

```
#include <iostream>
using namespace std;
```

```
int main() {
    int t;
    cin>>t;
    while(t-->0)
    {
        int a,b,c;
        cin>>a>>b>>c;
        if(a+b==c || b+c==a || a+c==b)
            cout<<"YES"<<endl;
        else
            cout<<"NO"<<endl;
    }
    return 0;
}
```

ii)

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
    int n;
    cin>>n;
    int a[n];
    for(int i=0;i<n;i++)
        cin>>a[i];
    sort(a,a+n);
    for(int i=0;i<n;i++)
        cout<<a[i]<<'\\n';
    return 0;
}
```

iii)

```
#include<bits/stdc++.h>
using namespace std;

int main() {
    int T;
    cin >> T;
    while(T--){
        vector<pair<int,int>> v;
        int n;
        cin >> n;
        string s;
        cin >> s;
        int j=0;
        for(int i=0;i<n;i++){
            if(s[i] == '0'){
                j = i;
                while(j<n){
                    if(s[j] == '1')
                        s[j] = '0';
                    else
                        s[j]='1';
                    j++;
                }
                v.push_back({i+1,n-i});
            }
        }
        cout << v.size() << "\n";
        for(auto i:v){
            cout << i.first << " " << i.second << "\n";
        }
    }
}
```

iv)

```
#include <bits/stdc++.h>
using namespace std;
int main() {
    int t;
    cin>>t;
    while(t-->0)
    {
        int n,ans=0;
        cin>>n;
        int w[n];
        for(int i=0;i<n;i++) cin>>w[i];
        int l[n];
        for(int i=0;i<n;i++) cin>>l[i];
        map<int,pair<int,int>>m;
        for(int i=0;i<n;i++) m[w[i]]={i+1,l[i]};
        int start=m[1].first;
        for(int i=2;i<=n;i++)
        {
            if(start<m[i].first)
            {
                start=m[i].first;
            }
            else
            {
                int shh=(start+1-m[i].first);
                int vu;
                if(shh%m[i].second==0) vu=shh/m[i].second;
                else {
                    vu= shh/m[i].second +1;
                }
                ans+=vu;
                start=m[i].first + vu*m[i].second;
            }
        }
        cout<<ans<<endl;
    }
    return 0;
}
```

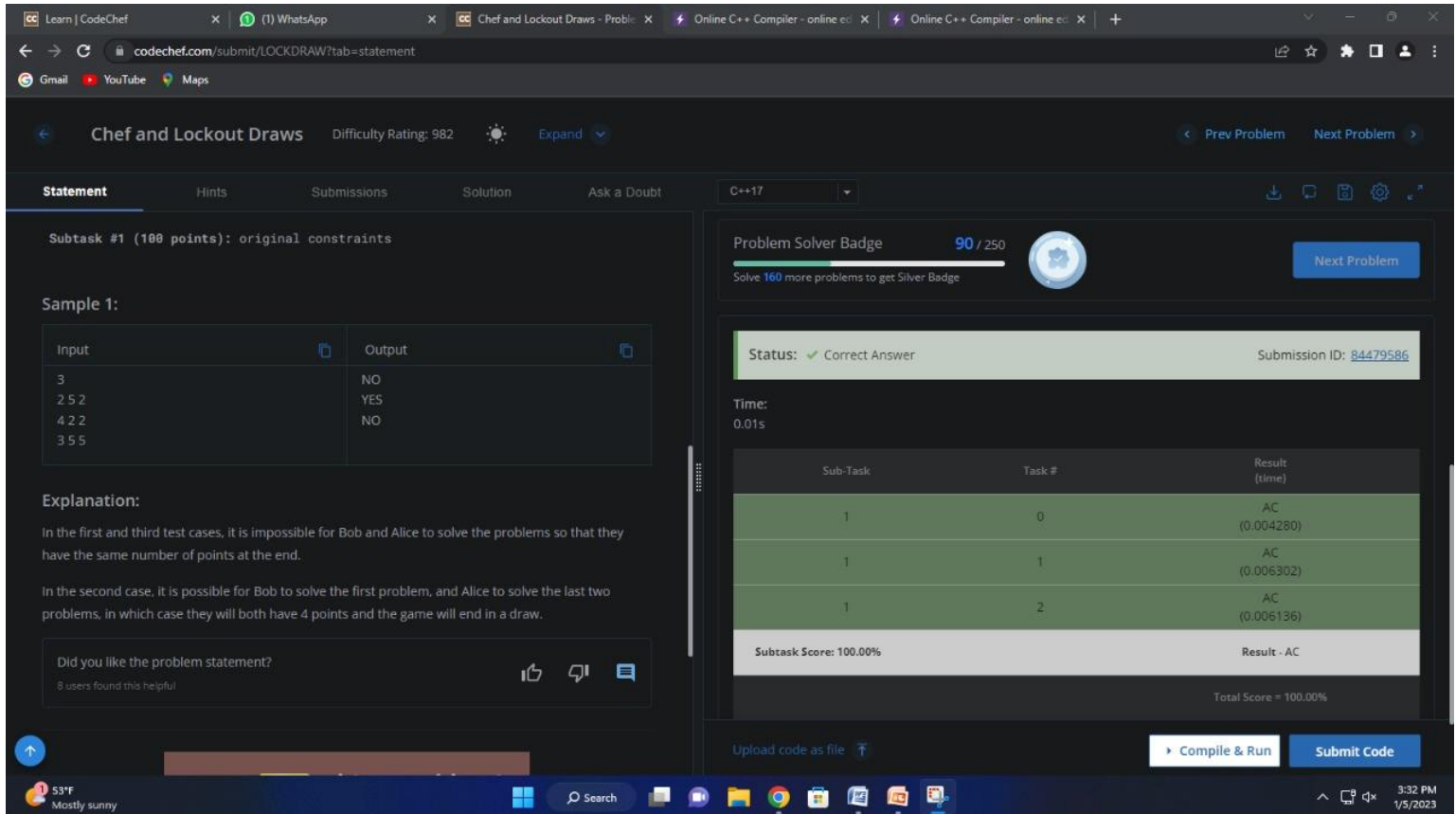
v)

```
#include<bits/stdc++.h>
using namespace std;

int main() {
    int t;
    cin>>t;
    while(t-->0)
    {
        int n;
        cin>>n;
        int arr[n];
        for(int i=0;i<n;i++)
        {
            cin>>arr[i];
        }
        int cnt=0;
        sort(arr,arr+n);
        for(int i=0;i<n;i++)
        {
            if(arr[i]==0 || arr[i]<=cnt)
            {
                cnt++;
            }
            else
            {
                break;
            }
        }
        cout<<cnt<<endl;
    }
    return 0;
}
```

3. Observations/Discussions/ Complexity Analysis:

i)



The screenshot shows the CodeChef interface for the problem "Chef and Lockout Draws". The problem statement is visible on the left, and the submission results are on the right.

Problem Statement: Subtask #1 (100 points): original constraints. Sample 1: Input: 3, 2 5 2, 4 2 2, 3 5 5. Output: NO, YES, NO. Explanation: In the first and third test cases, it is impossible for Bob and Alice to solve the problems so that they have the same number of points at the end. In the second case, it is possible for Bob to solve the first problem, and Alice to solve the last two problems, in which case they will both have 4 points and the game will end in a draw.

Submission Results: Status: Correct Answer. Submission ID: 84479586. Time: 0.01s. Sub-Task Score: 100.00%. Result: AC. Total Score: 100.00%.

Sub-Task	Task #	Result (time)
1	0	AC (0.004280)
1	1	AC (0.006302)
1	2	AC (0.006136)

ii)

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Turbo Sort - Problems | CodeChef

Quick Sort - javatpoint

codechef.com/submit/TSORT?tab=statement

GmailYouTubeMaps

Turbo Sort

Difficulty Rating: 667

Expand

Prev Problem

Next Problem

Statement

Hints

Submissions

Solution

Ask a Doubt

C++17

Test against Custom Input

3
6
7
1

Problem Solver Badge

91 / 250

Solve 159 more problems to get Silver Badge

Next Problem

Status: Correct Answer

Submission ID: 84480800

Time:
0.33s

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View another problem

Upload code as file

Compile & Run

Submit Code

Problem

Given the list of numbers, you are to sort them in non decreasing order.

Input

t – the number of numbers in list, then t lines follow (t <= 10^6).
Each line contains one integer: N [0 <= N <= 10^6]

Output

Output given numbers in non decreasing order.

Sample 1:

Input	Output
5	1
5	3
3	5
6	6
7	7
1	

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Search

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iii)

Flip Sorting

Difficulty Rating: 1585

Expand

Statement

Submissions

Solution

Ask a Doubt

The first line contains a single integer T - the number of test cases. Then the test cases follow.

The first line of each test case contains an integer N - the length of the binary string S .

The second line of each test case contains a binary string S of length N containing 0s and 1s only.

Output Format

For each test case,

Output in the first line K - the number of operations applied.

In each of the following K lines, output two integers i and X - the starting index of the substring selected and the length of the substring. (Note that X selected should not be used in any of the previous operations)

Constraints

$1 \leq T \leq 100$

$1 \leq N \leq 1000$

Sample 1:

Input	Output
3	1
6	1 2
110111	2
9	1 2
110110111	4 3

C++14

Problem Solver Badge

92 / 250

Solve 158 more problems to get Silver Badge

Next Problem

Status: Correct Answer

Submission ID: 84481267

Time: 0.03s

Sub-Task	Task #	Result (time)
1	0	AC (0.004023)
1	1	AC (0.003888)
1	2	AC (0.004870)
1	3	AC (0.004732)
1	4	AC (0.014290)

Upload code as file

Compile & Run

Submit Code

egov

egov@cumail.in

iv)

codechef.com/problems/FROGS?tab=statement

Gmail

YouTube

Maps

Frog Sort

Difficulty Rating: 1588

Expand

Prev Problem

Next Problem

Statement

Submissions

Solution

Ask a Doubt

Subtask #2 (50 points): original constraints

Sample 1:

Input	Output
3	3
3	6
3 1 2	5
1 4 5	
3	
3 2 1	
1 1 1	
4	
2 1 4 3	
4 1 2 4	

Explanation:

Example case 1: We can hit the back of the first frog three times.

Example case 2: We can hit the back of the first frog four times, then hit the back of the second frog two times.

Did you like the problem statement?

C++14

Status: Correct Answer

Submission ID: 84481452

Time: 0.05s

Sub-Task	Task #	Result (time)
1	0	AC (0.004302)
Subtask Score: 50.00%		Result - AC
2	1	AC (0.046864)
Subtask Score: 50.00%		Result - AC
Total Score = 100.00%		

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Compile & Run

Submit Code

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v)

codechef.com/problems/CHFPARTY?tab=statement

Chef and Party

Difficulty Rating: 1223

Statement Hints Submissions Solution Ask a Doubt

• $1 \leq N \leq 10^5$
• the sum of N over all test cases does not exceed 10^6

Sample 1:

Input	Output
3	2
2	4
0 0	0
6	
3 1 0 0 5 5	
3	
1 2 3	

Explanation:

Example case 1: Chef has two friends. Both of them do not require anyone else to be at the party before they join, so they will both definitely join the party.

Example case 2: At the beginning, friends 3 and 4 can arrive and join the party, since they do not require anyone else to be at the party before they join. After that, friend 2 can arrive; this friend would see that there are two people at the party and therefore also join. Then, friend 1 will also join, so in the end, there would be 4 people attending the party.

Example case 3: No one will attend the party because each of Chef's friends will find zero people at the party and hence, regardless of the order in which they arrive, no one will join.

Test against Custom Input

```
3
2
0 0
6
```

Problem Solver Badge 94 / 250

Solve 156 more problems to get Silver Badge

Status: ✔ Correct Answer Submission ID: 84481577

Time: 0.18s

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View another problem

Upload code as file

Compile & Run Submit Code

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Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			