Programming Competition Test

Duration: 2 hours Total Marks: 100

Instructions

1. This test contains algorithmic problems similar to those found on LeetCode or HackerRank.
2. Use efficient algorithms to avoid timeouts; naive solutions may not receive full marks.
3. Submit solutions in C++, Python, or Java.
4. For each problem, write a function or program according to the specified input/output format.
5. Clearly comment your code if necessary.

Problem 1: Two Sum

Difficulty: Easy

Given an array of integers `nums` and an integer `target`, return indices of the two numbers such that they add up to `target`. Assume exactly one solution exists.

Input format:

- First line contains an integer n ($2 \leq n \leq 10^5$), the size of the array.
- Second line contains n integers, the elements of the array.
- Third line contains the integer `target`.

Output format:

- Print two integers, the indices of the elements adding up to `target`.

Example(s):

```
Input:
4
2 7 11 15
9

Output:
0 1
```

Problem 2: Longest Substring Without Repeating Characters

Difficulty: Medium

Given a string `s`, find the length of the longest substring without repeating characters.

Input format:

- A single line containing the string `s` ($1 \leq |s| \leq 10^5$).

Output format:

- A single integer, the length of the longest substring without repeated characters.

Example(s):

```
Input:
abcabcbb

Output:
3
```

Problem 3: Merge Intervals

Difficulty: Hard

Given a collection of intervals, merge all overlapping intervals.

Input format:

- First line contains an integer n ($1 \leq n \leq 10^4$), the number of intervals.
- Next n lines contain two integers each, representing the start and end of each interval.

Output format:

- Print the merged intervals in ascending order of start times.

Example(s):

```
Input:
4
1 3
2 6
8 10
15 18

Output:
1 6
8 10
15 18
```