Islamic University of Technology
Department of Computer Science and Engineering

Lab 6: Minimum Spanning Tree

CSE 4404: Algorithms Lab
Summer 2023-24

Task A. Data Center Disaster

Time Limit: 1 second | Memory Limit: 512 MB

It's July 4202 and the cables connecting the data centers of a country were destroyed — due to excessive rain or, strangely enough, water dropped from helicopters.

Due to a sudden drop in foreign remittance, the government can no longer afford to repair all damaged cables. Instead, it has decided to restore connectivity by selectively repairing a subset of the cables — just enough to ensure that every data center can communicate with every other. The restoration must be done with the minimum possible cost.

Unfortunately, the engineer assigned to create the repair plan holds a BSc. in *Theatre and Performance Studies* and has long forgotten how to do math. So he has come to you for help in calculating the minimum budget for the project.

Input Format

The first line contains two integers n and m ($1 \leq n \leq 10^5,\ 1 \leq m \leq 2 \cdot 10^5$) — the number of data centers and cables.

Then, there are m lines, each containing three integers a, b, and c ($1 \leq a, b \leq n,\ 1 \leq c \leq 10^9$) — indicating that there is a cable between data center a and data center b, and repairing it will cost c.

All cables are bidirectional, and each connects two different data centers. There is at most one cable between any two data centers.

Output Format

Print one integer — the minimum total cost to repair enough cables so that every data center is reachable from every other, directly or indirectly.

If it is impossible to connect all data centers, print `IMPOSSIBLE`.

Examples

Sample Input	Sample Output
5 6 1 2 3 2 3 5 2 4 2 3 4 8 5 1 7 5 4 4	14

Notes

For this task, make 2 submissions with 2 different minimum spanning tree algorithms:

1. Prim's Algorithm
2. Kruskal's Algorithm

Task B. Wiring the Street

Time Limit: 0.5 second | Memory Limit: 512 MB

Tasnim sometimes regrets leaving BUET URP to pursue CSE at IUT. Today, however, he got an unexpected chance to use his long-lost urban planning dreams.

His friend, now a city planner, asked him to help plan the electrical grid for a new neighborhood. The area consists of n apartment buildings aligned along a straight street, numbered from 1 to n from left to right.

Some buildings are already connected to the city's main power supply, while others are not.

To save costs, underground power cables can only be placed along the street — that is, only between buildings with different x-coordinates, and in straight horizontal lines.

The task is simple: every unpowered building must be connected to at least one already powered (through main power supply or street cables) building. A cable's cost is equal to the horizontal distance between the two buildings it connects.

Tasnim must help determine the **minimum total cable length** required to power up the entire street.

Input Format

The first line contains an integer T ($1 \leq T \leq 10$) — the number of test cases.

The first line of each test case contains an integer n ($1 \leq n \leq 10^5$) — the number of buildings.

The second line of each test case contains a binary string of length n, where a character '1' indicates that the corresponding building is already powered, and '0' indicates that it is not.

The third line of each test case contains n space-separated integers $x_1, x_2, \ldots, x_n$ ($1 \leq x_1 < x_2 < \cdots < x_n \leq 10^9$) — the x-coordinates of the buildings along the street.

It is guaranteed that each test case has at least one powered building.

Output Format

For each test case, print a single integer: the minimum total length of cables required to power all buildings.

Examples

Sample Input	Sample Output
2 5 10010 1 2 3 4 5 3 111 10 20 30	3 0

Marks Distribution

Task	**Marks**
Task A	60%
Task B	40%