Islamic University of Technology

Department of Computer Science and Engineering

Lab 3: Graph Traversal

CSE 4404: Algorithms Lab
Summer 2023-24

Task A. Equalizing Money

Time Limit: 1 second | Memory Limit: 256 MB

There are n people in a certain village. Each of them contains some amount of money. One day, a wise person told them to distribute the money such that everyone has an equal amount. If they can do so, they will be favored by their fortunes.

You are given the information about the money of each person and some relations. Each relation is of the form u v. That means person u and person v are capable of making money transactions. They are allowed to use transactions any number of times, but they have to do integer transactions only.

Now your task is to answer whether they can redistribute the money such that each of them contains exactly the same amount of money.

Input Format

Input starts with an integer T $(1 \leq T \leq 100)$, denoting the number of test cases.

For each test case:

- The first line contains two integers n and m $(2 \leq n \leq 1000,\ 0 \leq m \leq 10000)$, where n denotes the number of people and m denotes the number of relations.

- The second line contains n space-separated integers, where the ith integer denotes the money for the ith person.

- The next m lines each contain two integers u and v $(1 \leq u, v \leq n,\ u \neq v)$ indicating that person u and person v can make transactions. No relation is reported more than once.

Output Format

For each test case, print the case number and "Yes" if they can equalize their money, or "No" otherwise.

Examples

Sample Input	Sample Output
3	Case 1: Yes
5 4	Case 2: No
1 0 1 1 2	Case 3: No
1 2	
2 3	
3 4	
4 5	
2 1	
5 10	
1 2	
4 2	
1 1 0 2	
1 2	
2 3	

Task B. Journey To The Moon
Time Limit: 1 second | Memory Limit: 256 MB

The member states of the UN are planning to send two people to the moon. They want them to be from different countries. You are given a list of pairs of astronaut IDs. Each pair consists of astronauts from the same country. Determine how many pairs of astronauts from different countries can be chosen.

Input Format

The first line contains two integers, n ($2 \leq n \leq 10^5$) and p ($1 \leq p \leq 10^4$), the number of astronauts and the number of pairs. Each of the next p lines contains two space-separated integers denoting astronaut IDs of two who share the same nationality.

Output Format

Print one integer indicating the number of valid pairs

Examples

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

Explanation for Test Case 1

Persons numbered 0, 1, and 4 belong to one country, and those numbered 2 and 3 belong to another. The UN has 6 ways of choosing a pair: $(0, 2)$, $(0, 3)$, $(1, 2)$, $(1, 3)$, $(4, 2)$, and $(4, 3)$.

Explanation for Test Case 2

Persons numbered 0 and 2 belong to the same country, but persons 1 and 3 don't share countries with anyone else. The UN has 5 ways of choosing a pair: $(0, 1)$, $(0, 3)$, $(1, 2)$, $(2, 3)$, and $(1, 3)$.

Marks Distribution

Task	Marks
Task A	50%
Task B	50%

Practice Problems

Problem	Links
Message Route	CSES: https://cses.fi/problemset/task/1667
	Vjudge: https://vjudge.net/problem/CSES-1667
Rumor	Codeforces: https://codeforces.com/problemset/problem/893/C
	Vjudge: https://vjudge.net/problem/CodeForces-893C
Plant Trees, Save Life	Toph: https://toph.co/p/plant-tree-save-life
	Vjudge: https://vjudge.net/problem/Toph-plant-tree-save-life
Biridian Forest	Codeforces: https://codeforces.com/problemset/problem/329/B
	Vjudge: https://vjudge.net/problem/CodeForces-329B