Islamic University of Technology
Department of Computer Science and Engineering

Lab 3: Graph Traversal

CSE 4404: Algorithms Lab
Summer 2023-24

Task A. Building Roads

Time Limit: 1 second | *Memory Limit: 256 MB*

Byteland has n ($1 \leq n \leq 10^5$) cities and m ($1 \leq m \leq 2 \cdot 10^5$) roads between them. The goal is to construct new roads so that there is a route between any two cities.
Your task is to find out the minimum number of roads required, and also determine which roads should be built.

Input Format

The first input line has two integers n and m: the number of cities and roads. The cities are numbered $1, 2, \ldots, n$.

After that, there are m lines describing the roads. Each line has two integers a and b: ($1 \leq a, b \leq n$) there is a road between those cities.

- A road always connects two different cities.
- There is at most one road between any two cities.

Output Format

First, print an integer k: the number of required roads. Then, print k lines that describe the new roads. You can print any valid solution.

Examples

Sample Input	Sample Output
4 2 1 2 3 4	1 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%