Problem A. Nearest Shops

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and m roads. Each road is bidirectional and connects two cities. It is also known that k cities have an anime shop.

If you live in a city, you of course know the local anime shop well if there is one. You would like to find the nearest anime shop that is not in your city.

For each city, determine the minimum distance to another city that has an anime shop.

Input

The first line has three integers n, m and k: the number of cities, roads and anime shops. The cities are numbered $1, 2, \ldots, n$.

The next line contains k integers: the cities that have an anime shop.

Finally, there are m lines that describe the roads. Each line has two integers a and b: there is a road between cities a and b.

Output

Print n integers: for each city, the minimum distance to another city with an anime shop. If there is no such city, print -1 instead.

Constraints

- $1 \le k \le n \le 10^5$
- $0 \le m \le 2 \cdot 10^5$

Example

Input	Output
9 6 4 2 4 5 7 1 2 1 3 1 8 2 4 3 4 5 6	1 1 1 1 -1 1 -1 2 -1

Problem B. Prüfer Code

Time Limit 1000 ms
Mem Limit 524288 kB

A *Prüfer code* of a tree of n nodes is a sequence of $n - 2$ integers that uniquely specifies the structure of the tree.

The code is constructed as follows: As long as there are at least three nodes left, find a leaf with the smallest label, add the label of its only neighbor to the code, and remove the leaf from the tree.

Given a Prüfer code of a tree, your task is to construct the original tree.

Input

The first input line contains an integer n: the number of nodes. The nodes are numbered $1, 2, \ldots, n$.

The second line contains $n - 2$ integers: the Prüfer code.

Output

Print $n - 1$ lines describing the edges of the tree. Each line has to contain two integers a and b: there is an edge between nodes a and b. You can print the edges in any order.

Constraints

- $3 \le n \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

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

Problem C. Tree Traversals

Time Limit 1000 ms
Mem Limit 524288 kB

There are three common ways to traverse the nodes of a binary tree:

- *Preorder*: First process the root, then the left subtree, and finally the right subtree.
- *Inorder*: First process the left subtree, then the root, and finally the right subtree.
- *Postorder*: First process the left subtree, then the right subtree, and finally the root.

There is a binary tree of n nodes with distinct labels. You are given the preorder and inorder traversals of the tree, and your task is to determine its postorder traversal.

Input

The first input line has an integer n: the number of nodes. The nodes are numbered $1, 2, \ldots, n$.

After this, there are two lines describing the preorder and inorder traversals of the tree. Both lines consist of n integers.

You can assume that the input corresponds to a binary tree.

Output

Print the postorder traversal of the tree.

Constraints

- $1 \leq n \leq 10^5$

Example

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

Problem D. Course Schedule II

Time Limit 1000 ms
Mem Limit 524288 kB

You want to complete n courses that have requirements of the form "course a has to be completed before course b".

You want to complete course 1 as soon as possible. If there are several ways to do this, you want then to complete course 2 as soon as possible, and so on.

Your task is to determine the order in which you complete the courses.

Input

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

Then, there are m lines describing the requirements. Each line has two integers a and b: course a has to be completed before course b.

You can assume that there is at least one valid schedule.

Output

Print one line having n integers: the order in which you complete the courses.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

Input	Output
4 2 2 1 2 3	2 1 3 4

Problem E. Acyclic Graph Edges

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected graph, your task is to choose a direction for each edge so that the resulting directed graph is acyclic.

Input

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

After this, there are m lines describing the edges. Each line has two distinct integers a and b: there is an edge between nodes a and b.

Output

Print m lines describing the directions of the edges. Each line has two integers a and b: there is an edge from node a to node b. You can print any valid solution.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

Input	Output
3 3 1 2 2 3 3 1	1 2 3 2 3 1

Problem F. Strongly Connected Edges

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected graph, your task is to choose a direction for each edge so that the resulting directed graph is strongly connected.

Input

The first input line has two integers n and m: the number of nodes and edges. The nodes are numbered $1, 2, \dots, n$.

After this, there are m lines describing the edges. Each line has two integers a and b: there is an edge between nodes a and b.

You may assume that the graph is simple, i.e., there are at most one edge between two nodes and every edge connects two distinct nodes.

Output

Print m lines describing the directions of the edges. Each line has two integers a and b: there is an edge from node a to node b. You can print any valid solution.

If there are no solutions, only print `IMPOSSIBLE`.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

Input	Output
3 3 1 2 1 3 2 3	1 2 2 3 3 1

Problem G. Even Outdegree Edges

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected graph, your task is to choose a direction for each edge so that in the resulting directed graph each node has an even outdegree. The outdegree of a node is the number of edges coming out of that node.

Input

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

After this, there are m lines describing the edges. Each line has two integers a and b: there is an edge between nodes a and b.

You may assume that the graph is simple, i.e., there is at most one edge between any two nodes and every edge connects two distinct nodes.

Output

Print m lines describing the directions of the edges. Each line has two integers a and b: there is an edge from node a to node b. You can print any valid solution.

If there are no solutions, only print `IMPOSSIBLE`.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

Input	Output
4 4 1 2 2 3 3 4 1 4	1 2 3 2 3 4 1 4

Problem H. Graph Girth

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected graph, your task is to determine its *girth*, i.e., the length of its shortest cycle.

Input

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

After this, there are m lines describing the edges. Each line has two integers a and b: there is an edge between nodes a and b.

You may assume that there is at most one edge between each two nodes.

Output

Print one integer: the girth of the graph. If there are no cycles, print -1.

Constraints

- $1 \leq n \leq 2500$
- $1 \leq m \leq 5000$

Example

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

Problem I. Fixed Length Walk Queries

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an undirected graph with n nodes and m edges. The graph is simple and connected.

You start at a specific node, and on each turn you must move through an edge to another node.

Your task is to answer q queries of the form: "is it possible to start at node a and end up on node b after exactly x turns?"

Input

The first line contains three integers n, m and q: the number of nodes, edges and queries. The nodes are numbered $1, 2, \ldots, n$.

After this, there are m lines which describe the edges. Each line contains two integers a and b: there is an edge between nodes a and b.

Finally, there are q lines, each describing a query. Each line contains three integers a, b and x.

Output

For each query, print the answer (`YES` or `NO`) on its own line.

Constraints

- $2 \leq n \leq 2500$
- $1 \leq m \leq 5000$
- $1 \leq q \leq 10^5$
- $0 \leq x \leq 10^9$

Example

Input	Output
4 5 6 1 2 2 3 1 3 2 4 3 4 1 2 2 1 4 1 1 4 5 2 2 1 2 2 2 3 4 8	YES NO YES NO YES YES

Explanation:

- In query 1, a possible route is $1 \to 3 \to 2$.
- In query 3, a possible route is $1 \to 3 \to 2 \to 1 \to 3 \to 4$.
- In query 6, a possible route is $3 \to 4 \to 2 \to 3 \to 4 \to 2 \to 1 \to 3 \to 4$.

Problem J. Transfer Speeds Sum

Time Limit 1000 ms
Mem Limit 524288 kB

A computer network has n computers and $n-1$ connections between two computers. Information can be exchanged between every pair of computers using the connections.

Each connection has a certain transfer speed. Let $d(a, b)$ denote the transfer speed between computers a and b, which is the speed of the slowest connection on the route between a and b. Your task is to compute the sum of transfer speeds between all pairs of computers.

Input

The first line contains the integer n: the number of computers. The computers are numbered $1, 2, \ldots, n$.

After this, there are $n-1$ lines, which describe the connections. Each line has three integers a, b and x: there is a connection between computers a and b with transfer speed x.

Output

Print one integer: the sum of transfer speeds.

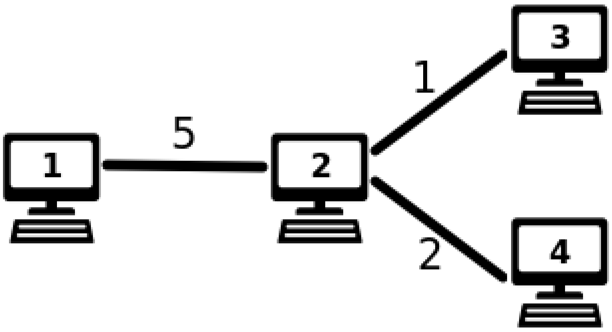
Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x \le 10^6$

Example

Input	Output
4 1 2 5 2 3 1 2 4 2	12

Explanation: The following figure corresponds to the sample input:



Here $d(1,2) = 5$, $d(1,3) = 1$, $d(1,4) = 2$, $d(2,3) = 1$, $d(2,4) = 2$, and $d(3,4) = 1$, so the sum of transfer speeds is 12.

Problem K. MST Edge Check

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected weighted graph, determine for each edge if it can be included in a minimum spanning tree.

Input

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

The following m lines describe the edges. Each line has three integers a, b, w: there is an edge between nodes a and b with weight w.

You can assume that the graph is connected and simple and each edge appears at most once in the graph.

Output

For each edge in the input order, print `YES` if it can be included in the minimum spanning tree and `NO` otherwise.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$
- $1 \leq w \leq 10^9$

Example

Input	Output
5 6 1 2 4 1 3 2 2 4 2 3 4 1 3 5 3 4 5 3	NO YES YES YES YES YES

Problem L. MST Edge Set Check

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected weighted graph and edge sets, determine for each set if the edges can be included in a minimum spanning tree.

Input

The first line has three integers n, m and q: the number of nodes, edges and edge sets. The nodes are numbered $1, 2, \ldots, n$.

The following m lines describe the edges. Each line has three integers a, b, w: there is an edge between nodes a and b with weight w. The edges are numbered $1, 2, \ldots, m$ in the input order.

The following $2q$ lines describe the edge sets. For each set, the first line contains its size and the second line contains its edges. The total number of edges in all sets is at most m.

You can assume that the graph is connected and simple and each edge appears at most once in the graph.

Output

For each edge set, print `YES` if the edges can be included in the minimum spanning tree and `NO` otherwise.

Constraints

- $1 \le n \le 10^5$
- $1 \le m, q \le 2 \cdot 10^5$
- $1 \le a, b \le n$
- $1 \le w \le 10^9$

Example

Input	Output
5 6 4 1 2 4 1 3 2 2 4 2 3 4 1 3 5 3 4 5 3 3 2 3 4 1 1 2 2 6 2 5 6	YES NO YES NO

Problem M. MST Edge Cost

Time Limit 1000 ms
Mem Limit 524288 kB

Given an undirected weighted graph, determine for each edge the minimum spanning tree cost if the edge must be included in the spanning tree.

Input

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

The following m lines describe the edges. Each line has three integers a, b, w: there is an edge between nodes a and b with weight w.

You can assume that the graph is connected and simple and each edge appears at most once in the graph.

Output

For each edge in the input order, print the minimum spanning tree cost when the edge is included.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$
- $1 \le w \le 10^9$

Example

Input	Output
5 6 1 2 4 1 3 2 2 4 2 3 4 1 3 5 4 4 5 3	10 8 8 8 9 8

Problem N. Network Breakdown

Time Limit 1000 ms
Mem Limit 524288 kB

Syrjälä's network has n computers and m connections between them. The network consists of components of computers that can send messages to each other.

Nobody in Syrjälä understands how the network works. For this reason, if a connection breaks down, nobody will repair it. In this situation a component may be divided into two components.

Your task is to calculate the number of components after each connection breakdown.

Input

The first input line has three integers n, m and k: the number of computers, connections and breakdowns. The computers are numbered $1, 2, \dots, n$.

Then, there are m lines describing the connections. Each line has two integers a and b: there is a connection between computers a and b. Each connection is between two different computers, and there is at most one connection between two computers.

Finally, there are k lines describing the breakdowns. Each line has two integers a and b: the connection between computers a and b breaks down.

Output

After each breakdown, print the number of components.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le k \le m$
- $1 \le a, b \le n$

Example

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

Problem O. Tree Coin Collecting I

Time Limit 1000 ms

Mem Limit 524288 kB

You are given a tree with n nodes. Some nodes contain a coin.

Your task is to answer q queries of the form: what is the shortest length of a path from node a to node b that visits a node with a coin?

Input

The first line contains two integers n and q: the number of nodes and queries. The nodes are numbered $1, 2, \ldots, n$.

The second line contains n integers $c_1, c_2, \ldots, c_n$. If $c_i = 1$, node i has a coin. If $c_i = 0$, node i doesn't have a coin. You can assume at least one node has a coin.

Then there are $n - 1$ lines describing the edges. Each line contains two integers a and b: there is an edge between nodes a and b.

Finally, there are q lines describing the queries. Each line contains two integers a and b: the start and end nodes.

Output

Print q integers: the answers to the queries.

Constraints

- $1 \le n, q \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td><pre>5 4
1 0 0 1 0
2 4
2 3
1 3
3 5
1 5
3 2
4 4
5 5</pre></td><td><pre>2
3
0
4</pre></td></tr>
</table>

Problem P. Tree Coin Collecting II

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a tree with n nodes. Some nodes contain a coin.

Your task is to answer q queries of the form: what is the shortest length of a path from node a to node b that visits all nodes with coins?

Input

The first line contains two integers n and q: the number of nodes and queries. The nodes are numbered $1, 2, \ldots, n$.

The second line contains n integers $c_1, c_2, \ldots, c_n$. If $c_i = 1$, node i has a coin. If $c_i = 0$, node i doesn't have a coin. You can assume at least one node has a coin.

Then there are $n - 1$ lines describing the edges. Each line contains two integers a and b: there is an edge between nodes a and b.

Finally, there are q lines describing the queries. Each line contains two integers a and b: the start and end nodes.

Output

Print q integers: the answers to the queries.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

Input	Output
5 4 1 0 0 1 0 2 4 2 3 1 3 3 5 1 5 3 2 4 4 5 5	6 5 6 8

Problem Q. Tree Isomorphism I

Time Limit 1000 ms
Mem Limit 524288 kB

Given two rooted trees, your task is to find out if they are *isomorphic*, i.e., it is possible to draw them so that they look the same.

Input

The first input line has an integer t: the number of tests. Then, there are t tests described as follows:

The first line has an integer n: the number of nodes in both trees. The nodes are numbered $1, 2, \ldots, n$, and node 1 is the root.

Then, there are $n - 1$ lines describing the edges of the first tree, and finally $n - 1$ lines describing the edges of the second tree.

Output

For each test, print "YES", if the trees are isomorphic, and "NO" otherwise.

Constraints

- $1 \leq t \leq 1000$
- $2 \leq n \leq 10^5$
- the sum of all values of n is at most 10^5

Example

Input	Output
2 3 1 2 2 3 1 2 1 3 3 1 2 2 3 1 3 3 2	NO YES

Problem R. Tree Isomorphism II

Time Limit 1000 ms
Mem Limit 524288 kB

Given two (not rooted) trees, your task is to find out if they are *isomorphic*, i.e., it is possible to draw them so that they look the same.

Input

The first input line has an integer t: the number of tests. Then, there are t tests described as follows:

The first line has an integer n: the number of nodes in both trees. The nodes are numbered $1, 2, \dots, n$.

Then, there are $n-1$ lines describing the edges of the first tree, and finally $n-1$ lines describing the edges of the second tree.

Output

For each test, print "YES", if the trees are isomorphic, and "NO" otherwise.

Constraints

- $1 \le t \le 1000$
- $2 \le n \le 10^5$
- the sum of all values of n is at most 10^5

Example

Input	Output
2 3 1 2 2 3 1 2 1 3 3 1 2 2 3 1 3 3 2	YES YES

Problem S. Flight Route Requests

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities with airports but no flight connections. You are given m requests which routes should be possible to travel.

Your task is to determine the minimum number of one-way flight connections which makes it possible to fulfil all requests.

Input

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

After this, there are m lines describing the requests. Each line has two integers a and b: there has to be a route from city a to city b. Each request is unique.

Output

Print one integer: the minimum number of flight connections.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

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

Explanation: You can create the connections $1 \to 2$, $2 \to 3$, $2 \to 4$ and $3 \to 1$. Then you can also fly from city 3 to city 4 using the route $3 \to 1 \to 2 \to 4$.

Problem T. Critical Cities

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and m flight connections between them. A city is called a *critical city* if it appears on every route from a city to another city.

Your task is to find all critical cities from Syrjälä to Lehmälä.

Input

The first input line has two integers n and m: the number of cities and flights. The cities are numbered $1, 2, \ldots, n$. City 1 is Syrjälä, and city n is Lehmälä.

Then, there are m lines describing the connections. Each line has two integers a and b: there is a flight from city a to city b. All flights are one-way.

You may assume that there is a route from Syrjälä to Lehmälä.

Output

First print an integer k: the number of critical cities. After this, print k integers: the critical cities in increasing order.

Constraints

- $2 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

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

Problem U. Visiting Cities

Time Limit 1000 ms
Mem Limit 524288 kB

You want to travel from Syrjälä to Lehmälä by plane using a minimum-price route. Which cities will you certainly visit?

Input

The first input line contains two integers n and m: the number of cities and the number of flights. The cities are numbered $1, 2, \ldots, n$. City 1 is Syrjälä, and city n is Lehmälä.

After this, there are m lines describing the flights. Each line has three integers a, b, and c: there is a flight from city a to city b with price c. All flights are one-way flights.

You may assume that there is a route from Syrjälä to Lehmälä.

Output

First print an integer k: the number of cities that are certainly in the route. After this, print the k cities sorted in increasing order.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$
- $1 \le c \le 10^9$

Example

Input	Output
5 6 1 2 3 1 3 4 2 3 1 2 4 5 3 4 1 4 5 8	4 1 3 4 5

Problem V. Graph Coloring

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a simple graph with n nodes and m edges. Your task is to use the minimum possible number of colors to color each node such that no edge connects two nodes of the same color.

Input

The first line has two integers n and m: the number of nodes and edges. The nodes are numbered $1, 2, \dots, n$.

Then there are m lines describing the edges. Each line has two integers a and b: there is an edge connecting nodes a and b.

Output

First, print an integer k: the minimum number of colors.

After this, print n integers $c_1, c_2, \dots, c_n$: the colors of the nodes. The colors should satisfy $1 \le c_i \le k$.

You may print any valid solution.

Constraints

- $1 \le n \le 16$
- $0 \le m \le \frac{n(n-1)}{2}$

Example

Input	Output
4 4 1 2 2 3 3 4 4 1	2 1 2 1 2

Problem W. Bus Companies

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and m bus companies. Each bus company operates in specific cities and sells tickets for a specific price. Buying a ticket from a bus company allows you to travel between any two cities that the company operates in.

Determine the cost of the cheapest route from Syrjälä to every city.

Input

The first line has two integers n and m: the number of cities and bus companies. The cities are numbered $1, 2, \ldots, n$, and city 1 is Syrjälä.

The next line has m integers $c_1, c_2, \ldots, c_m$: the ticket costs for each bus company.

After that, there are m pairs of lines describing the cities for each bus company.

The first line of each pair has a single integer k: the number of cities the bus company operates in.

The second line of each pair has k distinct integers $a_1, a_2, \ldots, a_k$: the cities the bus company operates in.

You can assume that it is possible to travel from Syrjälä to all other cities.

Output

Print n integers: the cheapest route costs from Syrjälä to cities $1, 2, \ldots, n$.

Constraints

- $1 \le n, m \le 10^5$
- $1 \le c \le 10^9$
- $2 \le k \le n$
- $1 \le a \le n$
- the sum of all k is at most $2 \cdot 10^5$

Example

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

Problem X. Split into Two Paths

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an acyclic directed graph with n nodes and m edges.

Determine whether two paths can be formed in the graph such that each node of the graph appears in exactly one of the paths. Note that all edges of the graph do not need to appear in the paths.

Input

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

After this, there are m lines which describe the edges. Each line has two integers a and b: there is an edge in the graph from node a to node b.

Output

First print the line `YES` if the paths can be formed, or `NO` otherwise.

If the paths can be formed, print them on the following two lines.

At the beginning of both lines, print the amount of nodes in the path and then the nodes of the path in order. There must be an edge in the graph between subsequent nodes. One of the paths may contain zero nodes.

If there exist multiple solutions, you can print any solution.

Constraints

- $2 \le n \le 2 \cdot 10^5$
- $0 \le m \le 5 \cdot 10^5$

Example 1

Input	Output
5 4 1 2 1 4 3 4 4 5	YES 2 1 2 3 3 4 5

Example 2

Input	Output
5 4 1 2 1 3 1 4 1 5	NO

Problem Y. Network Renovation

Time Limit 1000 ms

Mem Limit 524288 kB

Syrjälä's network consists of n computers and $n-1$ connections between them. It is possible to send data between any two computers.

However, if any connection breaks down, it will no longer be possible to send data between some computers. Your task is to add the minimum number of new connections in such a way that you can still send data between any two computers even if any single connection breaks down.

Input

The first input line has an integer n: the number of computers. The computers are numbered $1, 2, \ldots, n$.

After this, there are $n-1$ lines describing the connections. Each line has two integers a and b: there is a connection between computers a and b.

Output

First print an integer k: the minimum number of new connections. After this, print k lines describing the connections. You can print any valid solution.

Constraints

- $3 \leq n \leq 10^5$
- $1 \leq a, b \leq n$

Example

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

Problem Z. Forbidden Cities

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and m roads between them. Kaaleppi is currently in city a and wants to travel to city b.

However, there is a problem: Kaaleppi has recently robbed a bank in city c and can't enter the city, because the local police would catch him. Your task is to find out if there is a route from city a to city b that does not visit city c.

As an additional challenge, you have to process q queries where a, b and c vary.

Input

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

Then, there are m lines describing the roads. Each line has two integers a and b: there is a road between cities a and b. Each road is bidirectional.

Finally, there are q lines describing the queries. Each line has three integers a, b and c: is there a route from city a to city b that does not visit city c?

You can assume that there is a route between any two cities.

Output

For each query, print "YES", if there is such a route, and "NO" otherwise.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq q \leq 10^5$
- $1 \leq a, b, c \leq n$

Example

Input	Output
5 6 3 1 2 1 3 2 3 2 4 3 4 4 5 1 4 2 3 5 4 3 5 2	YES NO YES

Problem AA. Creating Offices

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and $n-1$ roads between them. There is a unique route between any two cities, and their distance is the number of roads on that route.

A company wants to have offices in some cities, but the distance between any two offices has to be at least d. What is the maximum number of offices they can have?

Input

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

After this, there are $n-1$ lines describing the roads. Each line has two integers a and b: there is a road between cities a and b.

Output

First print an integer k: the maximum number of offices. After that, print the cities which will have offices. You can print any valid solution.

Constraints

- $1 \leq n, d \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

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

Problem AB. New Flight Routes

Time Limit 1000 ms
Mem Limit 524288 kB

There are n cities and m flight connections between them. Your task is to add new flights so that it will be possible to travel from any city to any other city. What is the minimum number of new flights required?

Input

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

After this, there are m lines describing the flights. Each line has two integers a and b: there is a flight from city a to city b. All flights are one-way flights.

Output

First print an integer k: the required number of new flights. After this, print k lines describing the new flights. You can print any valid solution.

Constraints

- $1 \le n \le 10^5$
- $1 \le m \le 2 \cdot 10^5$
- $1 \le a, b \le n$

Example

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