Programación Competitiva

Semana i (2018) – Contest #4

Problema 1 - Kefa and Park

Kefa decided to celebrate his first big salary by going to the restaurant.

He lives by an unusual park. The park is a rooted tree consisting of n vertices with the root at vertex 1. Vertex 1 also contains Kefa's house. Unfortunaely for our hero, the park also contains cats. Kefa has already found out what are the vertices with cats in them.

The leaf vertices of the park contain restaurants. Kefa wants to choose a restaurant where he will go, but unfortunately he is very afraid of cats, so there is no way he will go to the restaurant if the path from the restaurant to his house contains more than m consecutive vertices with cats.

Your task is to help Kefa count the number of restaurants where he can go.

Input

The first line contains two integers, n and m ($2 \le n \le 10^5$, $1 \le m \le n$) — the number of vertices of the tree and the maximum number of consecutive vertices with cats that is still ok for Kefa.

The second line contains n integers $a_1, a_2, ..., a_n$, where each a_i either equals to 0 (then vertex i has no cat), or equals to 1 (then vertex i has a cat).

Next n - 1 lines contains the edges of the tree in the format "x_i y_i" (without the quotes) ($1 \le x_i, y_i \le n$, $x_i \ne y_i$), where x_i and y_i are the vertices of the tree, connected by an edge.

It is guaranteed that the given set of edges specifies a tree.

Output

A single integer — the number of distinct leaves of a tree the path to which from Kefa's home contains at most m consecutive vertices with cats.

Examples

Input

```
4 1
1 1 0 0
1 2
1 3
1 4
```

Output

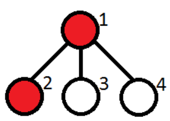
```
2
```

Input
```
7 1
1 0 1 1 0 0 0
1 2
1 3
2 4
2 5
3 6
3 7
```

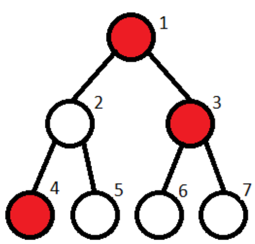
Output
```
2
```

Note

Let us remind you that a tree is a connected graph on *n* vertices and *n* - 1 edge. A rooted tree is a tree with a special vertex called root. In a rooted tree among any two vertices connected by an edge, one vertex is a parent (the one closer to the root), and the other one is a child. A vertex is called a leaf, if it has no children.



Note to the first sample test: The vertices containing cats are marked red. The restaurants are at vertices 2, 3, 4. Kefa can't go only to the restaurant located at vertex 2.



Note to the second sample test: The restaurants are located at vertices 4, 5, 6, 7. Kefa can't go to restaurants 6, 7.

Problema 2 - Two Buttons

Vasya has found a strange device. On the front panel of a device there are: a red button, a blue button and a display showing some positive integer. After clicking the red button, device multiplies the displayed number by two. After clicking the blue button, device subtracts one from the number on the display. If at some point the number stops being positive, the device breaks down. The display can show arbitrarily large numbers. Initially, the display shows number n.

Bob wants to get number m on the display. What minimum number of clicks he has to make in order to achieve this result?

Input

The first and the only line of the input contains two distinct integers n and m ($1 \le n, m \le 10^4$), separated by a space .

Output

Print a single number — the minimum number of times one needs to push the button required to get the number m out of number n.

Examples

Input
```
4 6
```
Output
```
2
```

Input
```
10 1
```
Output
```
9
```

Note

In the first example you need to push the blue button once, and then push the red button once.

In the second example, doubling the number is unnecessary, so we need to push the blue button nine times.

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Problema 3 - Destroying Roads

In some country there are exactly n cities and m bidirectional roads connecting the cities. Cities are numbered with integers from 1 to n. If cities a and b are connected by a road, then in an hour you can go along this road either from city a to city b, or from city b to city a. The road network is such that from any city you can get to any other one by moving along the roads.

You want to destroy the largest possible number of roads in the country so that the remaining roads would allow you to get from city s_1 to city t_1 in at most l_1 hours and get from city s_2 to city t_2 in at most l_2 hours.

Determine what maximum number of roads you need to destroy in order to meet the condition of your plan. If it is impossible to reach the desired result, print -1.

Input

The first line contains two integers n, m ($1 \le n \le 3000$, $n-1 \le m \le \min\{3000, \frac{n(n-1)}{2}\}$) — the number of cities and roads in the country, respectively.

Next m lines contain the descriptions of the roads as pairs of integers a_i, b_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$). It is guaranteed that the roads that are given in the description can transport you from any city to any other one. It is guaranteed that each pair of cities has at most one road between them.

The last two lines contains three integers each, s_1, t_1, l_1 and s_2, t_2, l_2, respectively ($1 \le s_i, t_i \le n$, $0 \le l_i \le n$).

Output

Print a single number — the answer to the problem. If the it is impossible to meet the conditions, print -1.

Examples

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

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

Input
```
5 4
1 2
2 3
3 4
4 5
1 3 2
3 5 1
```
Output
```
-1
```

Problema 4 - Ping-Pong (Easy Version)

In this problem at each moment you have a set of intervals. You can move from interval (a, b) from our set to interval (c, d) from our set if and only if $c < a < d$ or $c < b < d$. Also there is a path from interval I_1 from our set to interval I_2 from our set if there is a sequence of successive moves starting from I_1 so that we can reach I_2.

Your program should handle the queries of the following two types:

1. "1 x y" ($x < y$) — add the new interval (x, y) to the set of intervals. The length of the new interval is guaranteed to be strictly greater than all the previous intervals.
2. "2 a b" ($a \neq b$) — answer the question: is there a path from a-th (one-based) added interval to b-th (one-based) added interval?

Answer all the queries. Note, that initially you have an empty set of intervals.

Input

The first line of the input contains integer n denoting the number of queries, ($1 \leq n \leq 100$). Each of the following lines contains a query as described above. All numbers in the input are integers and don't exceed 10^9 by their absolute value.

It's guaranteed that all queries are correct.

Output

For each query of the second type print "YES" or "NO" on a separate line depending on the answer.

Examples

Input
```
5
1 1 5
1 5 11
2 1 2
1 2 9
2 1 2
```
Output
```
NO
YES
```

Problema 5 - Cthulhu

...Once upon a time a man came to the sea. The sea was stormy and dark. The man started to call for the little mermaid to appear but alas, he only woke up Cthulhu...

Whereas on the other end of the world Pentagon is actively collecting information trying to predict the monster's behavior and preparing the secret super weapon. Due to high seismic activity and poor weather conditions the satellites haven't yet been able to make clear shots of the monster. The analysis of the first shot resulted in an undirected graph with n vertices and m edges. Now the world's best minds are about to determine whether this graph can be regarded as Cthulhu or not.

To add simplicity, let's suppose that Cthulhu looks from the space like some spherical body with tentacles attached to it. Formally, we shall regard as Cthulhu such an undirected graph that can be represented as a set of three or more rooted trees, whose roots are connected by a simple cycle.

It is guaranteed that the graph contains no multiple edges and self-loops.

Input

The first line contains two integers — the number of vertices n and the number of edges m of the graph ($1 \le n \le 100, 0 \le m \le \frac{n \cdot (n-1)}{2}$).

Each of the following m lines contains a pair of integers x and y, that show that an edge exists between vertices x and y ($1 \le x, y \le n, x \ne y$). For each pair of vertices there will be at most one edge between them, no edge connects a vertex to itself.

Output

Print "NO", if the graph is not Cthulhu and "FHTAGN!" if it is.

Examples

Input
```
6 6
6 3
6 4
5 1
2 5
1 4
5 4
```

Output
```
FHTAGN!
```

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

Note

Let us denote as a simple cycle a set of v vertices that can be numbered so that the edges will only exist between vertices number 1 and 2, 2 and 3, ..., v - 1 and v, v and 1.

A tree is a connected undirected graph consisting of n vertices and n - 1 edges ($n > 0$).

A rooted tree is a tree where one vertex is selected to be the root.

Problema 6 - Leha and another game about graph

Leha plays a computer game, where is on each level is given a connected graph with n vertices and m edges. Graph can contain multiple edges, but can not contain self loops. Each vertex has an integer d_i, which can be equal to 0, 1 or -1. To pass the level, he needs to find a «good» subset of edges of the graph or say, that it doesn't exist. Subset is called «good», if by by leaving only edges from this subset in the original graph, we obtain the following: for every vertex i, $d_i = -1$ or it's degree modulo 2 is equal to d_i. Leha wants to pass the game as soon as possible and ask you to help him. In case of multiple correct answers, print any of them.

Input

The first line contains two integers n, m ($1 \le n \le 3 \cdot 10^5$, $n - 1 \le m \le 3 \cdot 10^5$) — number of vertices and edges.

The second line contains n integers $d_1, d_2, ..., d_n$ ($-1 \le d_i \le 1$) — numbers on the vertices.

Each of the next m lines contains two integers u and v ($1 \le u, v \le n$) — edges. It's guaranteed, that graph in the input is connected.

Output

Print -1 in a single line, if solution doesn't exist. Otherwise in the first line k — number of edges in a subset. In the next k lines indexes of edges. Edges are numerated in order as they are given in the input, starting from 1.

Examples
Input
```
1 0
1
```
Output
```
-1
```

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

Input
```
2 1
1 1
1 2
```
Output
```
1
1
```

Input

```
3 3
0 -1 1
1 2
2 3
1 3
```

Output

```
1
2
```

Note

In the first sample we have single vertex without edges. It's degree is 0 and we can not get 1.

Problema 7 - Nudist Beach

Nudist Beach is planning a military operation to attack the Life Fibers. In this operation, they will attack and capture several cities which are currently under the control of the Life Fibers.

There are n cities, labeled from 1 to n, and m bidirectional roads between them. Currently, there are Life Fibers in every city. In addition, there are k cities that are fortresses of the Life Fibers that cannot be captured under any circumstances. So, the Nudist Beach can capture an arbitrary non-empty subset of cities with no fortresses.

After the operation, Nudist Beach will have to defend the captured cities from counterattack. If they capture a city and it is connected to many Life Fiber controlled cities, it will be easily defeated. So, Nudist Beach would like to capture a set of cities such that for each captured city the ratio of Nudist Beach controlled neighbors among all neighbors of that city is as high as possible.

More formally, they would like to capture a non-empty set of cities S with no fortresses of Life Fibers. The strength of a city $x \in S$ is defined as (number of neighbors of x in S) / (total number of neighbors of x). Here, two cities are called neighbors if they are connnected with a road. The goal is to maximize the strength of the weakest city in S.

Given a description of the graph, and the cities with fortresses, find a non-empty subset that maximizes the strength of the weakest city.

Input

The first line of input contains three integers n, m, k ($2 \le n \le 100\,000$, $1 \le m \le 100\,000$, $1 \le k \le n - 1$).

The second line of input contains k integers, representing the cities with fortresses. These cities will all be distinct.

The next m lines contain the roads. The i-th of these lines will have 2 integers a_i, b_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$). Every city will have at least one road adjacent to it.

There is no more than one road between each pair of the cities.

Output

The first line should contain an integer r, denoting the size of an optimum set ($1 \le r \le n - k$).

The second line should contain r integers, denoting the cities in the set. Cities may follow in an arbitrary order. This line should not contain any of the cities with fortresses.

If there are multiple possible answers, print any of them.

Examples
Input
```
9 8 4
3 9 6 8
1 2
1 3
1 4
1 5
2 6
2 7
2 8
2 9
```
Output
```
3
1 4 5
```

Input
```
10 8 2
2 9
1 3
2 9
4 5
5 6
6 7
7 8
8 10
10 4
```
Output
```
8
1 5 4 8 10 6 3 7
```

Note

The first example case achieves a strength of 1/2. No other subset is strictly better.

The second example case achieves a strength of 1. Note that the subset doesn't necessarily have to be connected.

Problema 8 - Mr. Kitayuta's Colorful Graph

Mr. Kitayuta has just bought an undirected graph consisting of n vertices and m edges. The vertices of the graph are numbered from 1 to n. Each edge, namely edge i, has a color c_i, connecting vertex a_i and b_i.

Mr. Kitayuta wants you to process the following q queries.

In the i-th query, he gives you two integers — u_i and v_i.

Find the number of the colors that satisfy the following condition: the edges of that color connect vertex u_i and vertex v_i directly or indirectly.

Input

The first line of the input contains space-separated two integers — n and m ($2 \le n \le 100, 1 \le m \le 100$), denoting the number of the vertices and the number of the edges, respectively.

The next m lines contain space-separated three integers — a_i, b_i ($1 \le a_i < b_i \le n$) and c_i ($1 \le c_i \le m$). Note that there can be multiple edges between two vertices. However, there are no multiple edges of the same color between two vertices, that is, if $i \ne j$, $(a_i, b_i, c_i) \ne (a_j, b_j, c_j)$.

The next line contains a integer — q ($1 \le q \le 100$), denoting the number of the queries.

Then follows q lines, containing space-separated two integers — u_i and v_i ($1 \le u_i, v_i \le n$). It is guaranteed that $u_i \ne v_i$.

Output

For each query, print the answer in a separate line.

Examples
Input

```
4 5
1 2 1
1 2 2
2 3 1
2 3 3
2 4 3
3
1 2
3 4
1 4
```

Output

```
2
1
0
```

Input

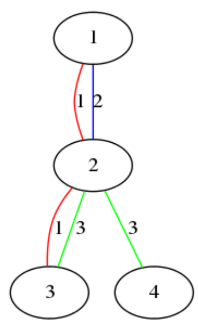
```
5 7
1 5 1
2 5 1
3 5 1
4 5 1
1 2 2
2 3 2
3 4 2
5
1 5
5 1
2 5
1 5
1 4
```

Output

```
1
1
1
1
2
```

Note

Let's consider the first sample.



The figure above shows the first sample.

- Vertex 1 and vertex 2 are connected by color 1 and 2.
- Vertex 3 and vertex 4 are connected by color 3.
- Vertex 1 and vertex 4 are not connected by any single color.