Problem A. Red Riding Hood and Long Journey

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	256 megabytes

Red Riding Hood lives in a small village. Today she received a letter from her grandmother, in which it is written she is ill. Therefore, Little red Riding hood, being a caring girl, wants to bring a basket of fruits and medicine for her grandmother who lives in another village. She knows a village that has medicines and a merchant who sells fresh fruits. The path can be long and therefore, she wants to come as quickly as possible. Help Red Riding Hood find the shortest way to her grandmother so that she can buy all the necessary presents along the way.

Input

In the first line you will be given two numbers N, M ($1 \leq N \leq 100000, 0 \leq M \leq min(200000, N*(N-1)/2)$), denoting the number of villages and number of paths between two neighboring villages. Next M lines contains three numbers: v, u ($1 \leq v, u \leq N$) and c ($1 \leq c \leq 1000$). First two numbers represents the path between villages v and u, the third is the distance between them. Last line contains four numbers: s, a, b, f ($1 \leq s, a, b, f \leq N$), denoting the Red Riding Hood, merchant, pharmacy, and grandmother's villages.

Subtasks

1. (20%) $n \leq 100$, merchant and pharmacy are located in the same village.
2. (20%) $n \leq 1000$
3. (20%) $n \leq 1000$, merchant and pharmacy may be located in different villages.
4. (20%) $n \leq 10000$
5. (20%) No additional constraints.

Output

Print one single number - the shortest distance to grandmother's village so that Red Riding Hood can buy all the necessary presents along the way. If there is no such path then print -1.

Examples

standard input	standard output
4 5 1 2 3 3 4 7 1 3 1 3 2 1 2 4 6 1 2 3 4	8
4 2 1 3 10 2 4 15 2 2 3 4	-1
6 9 1 2 5 1 3 6 2 4 4 2 5 1 3 4 4 3 6 6 4 5 3 4 6 2 5 6 3 1 3 3 3	6

Note

Everyone who presented in the task are not necessarily located in different villages. It is also worth to clarify that path between two neighboring villages is available for both directions and guaranteed that there is no more than one direct path between any two villages.

Problem B. Beta Tester

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Arman works as a beta tester for a game development company. Today he is testing a game that has quests, and in order to win the game, the player needs to complete all the quests. However, some quests only become available after completing certain other quests. The developers give Arman a list of requirements, which indicates which quest must be completed in order to open the next one. Help Arman determine whether is it possible to complete this game, and if possible, output one of the scenarios for the passage.

Input

The first line of input contains a pair of numbers n and m ($1 \le n \le 10^5, 0 \le m \le 10^5$), the number of quests and requirements, respectively. The next m lines contains a pair of integers i and j ($1 \le i, j \le n$), which means that in order to make quest j available, you must complete quest i.

Subtasks

1. (12%) $n \le 10^2$, the scenarios when the game is always Possible to complete.
2. (13%) $n \le 10^2$, both scenarios.
3. (13%) $n \le 10^3$, the scenarios when the game is always Possible to complete.
4. (12%) $n \le 10^3$, both scenarios.
5. (25%) $n \le 10^5$, the scenarios when the game is always Possible to complete.

Output

Determine whether it is possible to complete the game, and output 'Impossible' if not, otherwise output 'Possible' and the scenario of the passage. If there are several of them, output any.

Examples

standard input	standard output
5 5 1 2 2 3 1 3 4 5 3 4	Possible 1 2 3 4 5
6 6 4 2 4 3 2 3 1 5 6 2 6 4	Possible 1 5 6 4 2 3
8 17 8 1 2 3 7 3 5 4 1 7 4 8 1 7 3 6 2 5 7 2 8 7 5 4 5 8 2 8 2 5 2 7 4 8	Impossible
6 7 4 2 4 3 2 3 1 5 6 2 5 1 6 4	Impossible

Problem C. Fly Me to the Moon

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Giving up halfway is worse than never trying at all

— Misato Katsuragi, *Evangelion*

I think you've all heard about Keqing and her love for solving puzzles. But it's time for you to find out about her friend Ganyu, who also loves to solve various problems. Unlike Keqing, Ganyu likes graph problems more. This time she has a directed graph of n vertices and m edges. She is very interested to know if she can turn her primordial graph into an acyclic graph. Moreover, she set herself an additional condition — she can delete only one edge from the graph. Unfortunately, Ganyu has a lot to do at work, so she didn't have time to solve this problem. Therefore, she asked you to help her. Try your best for this problem because she believes in you!

Input

The first line contains n and m — the number of vertices and the number of edges. Then m lines follow. Each line contains two integers x and y denoting a directed edge going from vertex x to vertex y. Each ordered pair (x, y) is listed at most once. However, loops for the vertex itself in the graph are possible. $(2 \leq n \leq 500, 1 \leq m \leq min(n(n-1), 10^5))$

Subtasks

1. $n \leq 500, m \leq 500$ — 20%
2. $n \leq 500, m \leq 1000$ — 30%
3. $n \leq 500, m \leq 100000$ — 50%

Output

Print the answer.

YES — if it is possible.

NO — otherwise.

Examples

standard input	standard output
5 6 1 3 2 1 3 5 4 3 5 4 3 2	NO
2 2 1 2 2 1	YES
2 2 1 1 1 2	YES

Note

Acyclic graph - each edge directed from one vertex to another, such that following those directions will never form a closed loop.

Good Luck & Have Fun!

Problem D. Nugman and Graph 3

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Nugman and Olzhas are stuck in a magical world called ADS, and they want to return to KBTU. To return, they must walk together to their destination. There are n cities (numbered from 1 to n) and m two-way airlines for each pair of different cities x and y, there is a two-way road between cities x and y if and only if there is no airline between them. The trip between the cities takes exactly one hour.

Nugman is afraid of heights and therefore walks, and Olzhas knows how to fly in this world. They start their journey in city 1 and end in city n. Nugman and Olzhas **cannot intersect**, with the exception of cities 1 and n.

In what is the smallest number of hours both will get to the city n?

Input

The first line of the input contains two integers n and m ($2 \le n \le 400$, $0 \le m \le 79800$) — the number of towns and the number of railways respectively.

Each of the next m lines contains two integers u and v, denoting a railway between towns u and v ($1 \le u, v \le n$).

You may assume that there is at most one railway connecting any two towns.

Subtasks

1. (10%) $m \le 10^2$,
2. (20%) $m \le 10^3$,
3. (20%) $m \le 10^4$,
4. (20%) $m \le 5 * 10^4$,
5. (30%) $m \le 79800$,

Output

In a single line print a single integer — the answer to the problem. If it's impossible print -1

Examples

standard input	standard output
3 1 1 3	2
3 3 1 2 2 3 3 1	-1

Problem E. Nugman and Graph 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Nugman has an undirected graph, consisting of n vertices and m edges. Nugman loves playing with the graph and now he has invented a new game:

- The game consists of n steps.
- On the i-th step Nugman will remove vertex number i from the graph. As Nugman removes a vertex, he also removes all the edges that go in and out of this vertex.

Nugman wants to know the number of the connected components after deleting each vertex.

Input

In the first line you will be given two numbers N, M ($1 \leq N \leq 200000, 0 \leq M \leq min(200000, N*(N-1)/2)$), denoting the number of vertexes and number of edges. Next M lines contains two numbers: v, u ($1 \leq v, u \leq N$) which represents the edge between vertexes v and u.

Subtasks

1. (20%) $n \leq 100$
2. (30%) $n \leq 1000$
3. (50%) No additional constraints.

Output

Print the answer

Examples

standard input	standard output
8 7 7 8 3 4 5 6 5 7 5 8 6 7 6 8	3 2 2 1 1 1 1 0
5 5 1 2 1 4 1 3 4 5 2 4	2 2 1 1 0

Problem F. Nugman and Graph 1

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Nugman has a weighted directed graph, consisting of n vertices. In this graph, any vertex has a directional edge to any other vertex. Nugman loves playing with the graph and now he has invented a new game

- The game consists of n steps.
- On the i-th step Nugman will add vertex xi to the graph. As Nugman add a vertex, he also will add all the edges that go in and out of this vertex.

Nugman wants to know the **longest shortest path** in the graph after adding each vertex.

Input

The first line contains an integer n ($1 \le n \le 500$) the number of vertices in the graph. Next n lines contain n integers each — the graph adjacency matrix: the j-th number in the i-th line a_{ij} ($1 \le a_{ij} \le 100000, a_{ii} = 0$) represents the weight of the edge that goes from vertex i to vertex j.

The next line contains n distinct integers: x1, x2, ..., xn ($1 \le x_i \le n$) the vertices that Nugman deletes.

1. (50%) $n \le 100$
2. (50%) No additional constraints.

Output

Print n integers the i-th longest shortest path after adding vertex xi.

Examples

standard input	standard output
2 0 5 4 0 1 2	0 5
4 0 3 1 1 6 0 400 1 2 4 0 1 1 1 1 0 4 1 2 3	0 1 2 2