Task 4

The Worst Journalist

Task

You are a journalist of the JOI Newspaper Company writing sports articles.

Until yesterday, a soccer league competition was held in Croatia. There were n soccer teams playing against each other in a round-robin system. According to the results of the matches and the regulations of the competition, the executive committee of the competition determined rankings of the teams which are integers between 1 and n.

Partial results of the matches and the following information were given to you.

Information 1 There was no draw.

Information 2 Different teams were given different rankings.

Information 3 For all $1 \leq a < b \leq n$, the team in a-th place beat the team in b-th place.

You decided to infer the rankings of the teams from partial results of the matches and the given information (Information 1–3).

Write a program which, given partial results of the matches, finds a set of rankings of the teams which suits the given information, and determines whether there exists another set of rankings which suits the given information.

Here, a set of rankings is a list of teams from first place to last place.

Example 1 — The case where there is only one set of rankings which suits the given information.

There are four teams numbered from 1 to 4, and the results are given in the following table.

$i \backslash j$	1	2	3	4
1	—	○	×	×
2	×	—	×	?
3	○	○	—	○
4	○	?	×	—

If the item at the i-th row and the j-th column is ○, the team i beat the team j. If it is ×, the team j beat the team i. Also, ? means the result was not given.

In this case, there is only one set of rankings which suits the given information.

Ranking	Team Number
1st	3
2nd	4
3rd	1
4th	2

Example 2 — The case where there are more than one sets of rankings which suit the given information.

There are three teams numbered from 1 to 3, and the results are given in the following table.

$i\backslash j$	1	2	3
1	—	×	?
2	○	—	○
3	?	×	—

In this case, there are two sets of rankings which suit the given information.

Ranking	Team Number		Ranking	Team Number
1st	2		1st	2
2nd	1		2nd	3
3rd	3		3rd	1

Input

The input file is named `input.txt`.

The first line contains the number n of soccer teams. The teams are numbered from 1 to n.

The second line contains the number m of the given results of the matches.

The $(2 + i)$-th line $(1 \le i \le m)$ describes the result of a match, and contains 2 space separated integers x_i, y_i. This means the team x_i beat the team y_i.

The integers n, m satisfy $1 \le n \le 5000,\ 1 \le m \le 100000$.

30% of the mark is given for test cases with $1 \le n \le 7,\ 1 \le m \le 15$ and 60% of the mark is given for test cases with $1 \le n \le 100,\ 1 \le m \le 2000$.

Output

The output file is named `output.txt`.

The output file should consist of $n + 1$ lines.

The first n lines should describe a set of rankings of the teams. The i-th line $(1 \le i \le n)$ should contain the team number of the team in i-th place.

The $(1 + n)$-th line should contain an integer which describes whether there exists another set of rankings which suits the given information. If it exists, this line should contain 1. Otherwise, this line should contain 0.

Sample input and output 1

The following are the input and the output corresponding to Example 1.
`input.txt`

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

`output.txt`

```
3
4
1
2
0
```

Sample input and output 2

The following is the input corresponding to Example 2.
`input.txt`

```
3
2
2 1
2 3
```

In this case, there are two possible outputs. Your program should output one of the following.
`output.txt`

```
2
1
3
1
```

`output.txt`

```
2
3
1
1
```