Graphs Lab I

A. Graphs Problem 1

2 seconds, 256 megabytes

There are N cities and M roads.The i_th road ($1 \le i \le M$) connects two cities a_i and b_i ($1 \le a_i, b_i \le$N) bidirectionally. There may be more than one road that connects the same pair of two cities. For each city, how many roads are connected to the city?

Input

$2 \le N, M \le 55$.

$1 \le a_i, b_i \le N$.

a_i != b_i. All input values are integers.

Output

Print the answer in N lines. In the i_th line ($1 \le i \le N$), print the number of roads connected to city i.

input
4 3 1 2 2 3 1 4

output
2 2 1 1

input
2 5 1 2 2 1 1 2 2 1 1 2

output
5 5

input
8 8 1 2 3 4 1 5 2 8 3 7 5 2 4 1 6 8

output
3 3 2 2 2 1 1 2

B. Graphs Problem 2

2 s., 256 MB

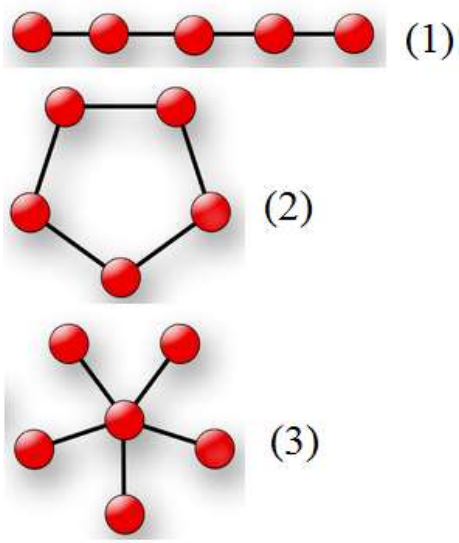
Harry Potter is on a mission to destroy You-Know-Who's Horcruxes. The first Horcrux that he encountered in the Chamber of Secrets is Tom Riddle's diary. In order to be able to destory it he needs your help in solving the following problem.

Given a $connected$ graph of n nodes and m edges where n >= 4, check if the following graph belongs to one of the following topologies which harry knows: bus, ring or star topology.

- A bus is the topology that represents a connected graph where each node is connected to two other nodes except the start and end nodes of the path.

- A $ring$ is the topology where $each$ node is connected $only$ to two other nodes.

- A $star$ is the topology where all nodes of the graph are connected to the single central node.



(1) — bus, (2) — ring, (3) — star

Input

The first line contains two space-separated integers n and m ($4 \le n \le 10^5$; $3 \le m \le 10^5$) — the number of nodes and edges in the graph, correspondingly. Next m lines contain the description of the graph's edges. The i-th line contains a space-separated pair of integers x_i, y_i ($1 \le x_i, y_i \le n$) — the numbers of nodes that are connected by the i-the edge.

It is guaranteed that the given graph is $connected$. There is at most one edge between any two nodes. No edge connects a node with itself.

Output

In a single line print the network topology name of the given graph. If the answer is the bus, print "`bus topology`" (without the quotes), if the answer is the ring, print "`ring topology`" (without the quotes), if the answer is the star, print "`star topology`" (without the quotes). If no answer fits, print "`unknown topology`" (without the quotes).

input
4 3 1 2 2 3 3 4

output

```
bus topology
```

input

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

output

```
ring topology
```

input

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

output

```
star topology
```

input

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

output

```
unknown topology
```

C. DFS

5 seconds, 256 megabytes

Given a graph consisting of n nodes and m edges, check if the graph has a cycle in it using DFS only.

$Bonus\ Problem$: if the graph has a cycle, print any cycle that goes through two or more other nodes, and finally returns to the starting node.

Input

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

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

Every edge is between two different nodes, and there is at most one edge between any two nodes.

Output

If the graph has a cycle, print YES otherwise print NO.

Note that the output is case $sensitive$.

input

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

output

```
YES
```

You can see below the representation of the graph.