Problem A. Ancestor

Input filename:	`ancestor.in`
Output filename:	`ancestor.out`
Time limit:	1 seconds
Memory limit:	128 Mb

Write a program that can (quickly) answer queries of the form "Is u an ancestor of v?", where u and v are the vertices of a given tree.

Input file format

The first line contains a positive integer $1 \le n \le 100\ 000$, the number of vertices in a tree. The second line contains n values, i-th of which is the parent of the vertex number i. If the parent is 0 then a vertex is the root.

The third line contains a positive integer $1 \le m \le 100\ 000$, the number of queries. The following m lines contain queries of the form $1 \le a, b \le n$ $(a \ne b)$.

Output file format

For every query, print 1 on a separate line if vertex a is an ancestor of vertex b and 0 otherwise.

Sample tests

ancestor.in	ancestor.out
6 0 1 1 2 3 3 5 4 1 1 4 3 6 2 6 6 5	0 1 1 0 0

Problem B. Find Cycle

Input filename:	`cycle2.in`
Output filename:	`cycle2.out`
Time limit:	1 seconds
Memory limit:	128 Mb

You are given a directed graph without multiple edges. Determine, whether it contains a cycle and if so output any of them.

Input file format

The first line contains two integers $1 \le n \le 100\ 000$ and $m \le 100\ 000$, the number of vertices and the number of edges in the graph. The following m lines contain edges in the form $1 \le b_i, e_i \le n$, where b_i is the source, and e_i is the destination.

Output file format

If the is no cycle print `"NO"`, otherwise print `"YES"` and the indices of the vertices in a cycle on the next line (indices should be printed in the order they appear in the cycle).

Sample tests

cycle2.in	cycle2.out
2 2 1 2 2 1	YES 1 2
2 1 1 2	NO

Problem C. Bridges

Input filename:	`bridges.in`
Output filename:	`bridges.out`
Time limit:	1 seconds
Memory limit:	128 Mb

Find all bridges in an undirected graph.

Input file format

The first line contains two integers $n \leq 20\,000$ and $m \leq 200\,000$, the number of vertices and the number of edges in the graph. The following m lines contain edges in the form $1 \leq b_i, e_i \leq n$.

Output file format

On the first line of the output file, print the number b of bridges. On the second line print b integers, the indices of the bridges in the sorted order (bridges are indexed 1 to n in the input order).

Sample tests

bridges.in	bridges.out
6 7 1 2 2 3 3 4 1 3 4 5 4 6 5 6	1 3

Problem D. Cutpoints

Input filename:	`points.in`
Output filename:	`points.out`
Time limit:	1 seconds
Memory limit:	128 Mb

Find all cutpoints in an undirected graph.

Input file format

The first line contains two integers $n \leq 20\,000$ and $m \leq 200\,000$, the number of vertices and the number of edges in the graph. The following m lines contain edges in the form $1 \leq b_i, e_i \leq n$.

Output file format

On the first line of the output file, print the number b of cutpoints. On the second line print b integers, the indices of the cutpoints in the sorted order.

Sample tests

points.in	points.out
9 12 1 2 2 3 4 5 2 6 2 7 8 9 1 3 1 4 1 5 6 7 3 8 3 9	3 1 2 3

Problem E. Fire Safety

Input filename:	`firesafe.in`
Output filename:	`firesafe.out`
Time limit:	1 seconds
Memory limit:	128 Mb

There are n houses in Sudislavl. Some of them are connected by the roads with one-way movement.

Recently, the number of fires in Sudislavl increased. To address this issue, citizens decided to build several fire stations. However, there is one problem: when a fire engine moves towards the fire, it can ignore the road movement rules (to get to the fire quicker), but a fire engine coming back after a successful operation must obey the road movement rules.

No matter where the fire engine ends, it must be able to come back to its home fire station. However, the citizens don't have much money, so they would like to minimize the number of fire stations to build. To cut costs even further, they will build fire stations directly adjacent to the existing houses (to share a wall).

Write a program to compute the optimal number of fire stations.

Input file format

The first line contains an integer $1 \le n \le 3\ 000$, the number of houses. The second line contains an integer $m \le 100\ 000$, the number of roads. The following m lines contain roads in the form $1 \le b_i, e_i \le n$, where b_i is the source, and e_i is the destination.

Output file format

On the first line, print the minimum number K of necessary fire stations. On the second line print K integers (in any order), the numbers of houses to build the fire stations adjacent to. If there are multiple optimal solutions then you may print any.

Sample tests

firesafe.in	firesafe.out
5 7 1 2 2 3 3 1 2 1 2 3 3 4 2 5	2 4 5

Problem F. Condensation Graph

Input filename:	`condense2.in`
Output filename:	`condense2.out`
Time limit:	1 seconds
Memory limit:	128 Mb

Find the number of edges in the condensation graph. *Note*: the condensation graph does not contain multiple edge and self-loops.

Input file format

The first line contains two integers $n \leq 10\,000$ and $m \leq 100\,000$, the number of vertices and the number of edges in the graph. The following m lines contain edges in the form $1 \leq b_i, e_i \leq n$, where b_i is the source, and e_i is the destination.

Output file format

The first and only line of the output file should contain one integer, the number of edges in the condensation graph.

Sample tests

condense2.in	condense2.out
4 4 2 1 3 2 2 3 4 3	2