**Problem A**

Given a directed acyclic graph find a valid topological order.

**Input**

First line: N (0 <N <=100000), number of nodes.

Second line: M (0<N<=300000), number of edges.

Next M lines, each: U V (0<=U, V<N), defines an edge from U to V.

**Output**

Topological Order. See sample for clarification

|  |  |
| --- | --- |
| 6  5  1 3  1 2  0 1  3 4  2 5 | 0  1  2  5  3  4 |

**Problem B**

Given a directed graph find its strongly connected components.

**Input**

First line: N ( 0<N<=100000), number of nodes.

Second line: M ( 0<N<=300000), number of edges.

Next M lines, each: U V (0<=U, V<N), defines an edge from U to V.

**Output**

Strongly Connected Components. See sample for clarification

|  |  |
| --- | --- |
| 8  8  1 3  0 1  3 0  3 7  7 3  5 6  6 4  6 5 | 6 5  4  2  1 7 3 0 |

**Problem C**

You are given a tree. You start from the 0, and visit every node. What is the minimum time required? Each step takes one second.

**Input**

First line: N ( 0<N<=100000), number of nodes.

Next N-1 lines, each: U V (0<=U, V<N), defines an edge from U to V.

**Output**

Minimum Time. See sample for clarification

|  |  |
| --- | --- |
| 5  0 1  0 2  1 3  2 4 | 6 |

Explanation:

A valid path is 0 -> 1 -> 3 -> 1 -> 0 -> 2 -> 4

**Problem D**

You are playing a knockout table tennis tournament. The players cannot use their own bat in this tournament. They have to use the bats provided by the tournament committee. There are N players and N bats. Each player will choose a bat at the beginning of the tournament. Whenever a player wins a match, she gets the bat of her opponent too. In the coming matches she can use any of the bats she owns.

Its possible that for some pair of bats X and Y, you can determine the outcome of the match even before the tournament starts. These types of pairs are called “Magical Pairs”. If a game is taking place between any two players playing with the bats of Magical Pair: X Y, it is sure that the player playing with bat X will be the winner and player Y will be the loser.

Now you have a super powerful father-in-law who can set the fixture of the tournament any way you want. You can even dictate which player will play with which bat. You can understand that, its possible, if you choose your bat cleverly at the beginning of the tournament, you can surely win the tournament. How many different bats are there with this property?

**Input**

First line: N ( 0<N<=100000), number of bats.

Second line: M ( 0<N<=300000), number of Magical Pairs.

Next M lines, each: X Y (0<=X, Y<N), defines a Magical Pair, where X will always win with Y.

**Output**

Number of bats which will guarantee your win in the tournament.

|  |  |
| --- | --- |
| 3  2  0 1  1 2 | 1 |

Explanation:

If you choose bat 0, then you can win the tournament. One possible fixture is given below:

1. Bat 0 vs Bat 1, (Winner will have both Bat 0 and 1)

2. Bat 0,1 vs Bat 2.

**Problem E**

Given a directed graph (DAG), classify its edges. You should run dfs in increasing order. The graph will not contain multiple edges between a pair of nodes.

**Input**

First line: N ( 0<N<=100), number of nodes.

Second line: M ( 0<N<=4950), number of edges.

Next M lines, each: U V (0<=U, V<N), defines an edge from U to V.

**Output**

Edge classifications. Print edges in increasing order. See sample for clarification

|  |  |
| --- | --- |
| 6  7  0 1  1 2  2 0  2 3  0 3  4 5  5 1 | 0 1 (T)  0 3 (F)  1 2 (T)  2 0 (B)  2 3 (T)  4 5 (T)  5 1 (C) |

**Problem F**

Given an NxM grid, with blocked cells, find the largest connected empty area. For each empty cell, it is connected with four cells (if empty): Up, Down, Left and Right. You can never step into a blocked cell.

**Input**

First line: N (0<N<=100), M (0<M<=100).

Next N lines, each contains M characters. ‘.’ indicates empty cell. ‘#’ indicates blocked cells.

**Output**

One line with the largest connected area. See sample for more clarification.

|  |  |
| --- | --- |
| 5 3  ...  ##.  ...  .##  ... | 11 |
| 5 3  ...  ###  ...  .#.  ... | 8 |