**Problem A**

Given an unweighted undirected graph, run dfs and find the components with discovery time and finishing time. Assume that you are running dfs in increasing order.

**Input**

First line: N ( 0<N<=1000), number of nodes.

Second line: M (0<M<=20000), number of edges.

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

**Output**

Total N lines, each for one node. Print the discovery time and finishing time for each node. See sample for more clarification.

|  |  |
| --- | --- |
| 6  6  1 2  1 3  0 4  2 3  5 4  5 0 | 0: 1 6  1: 7 12  2: 8 11  3: 9 10  4: 2 5  5: 3 4 |

**Problem B**

Given an undirected graph find all of its articulation points.

**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 between U and V.

**Output**

List all the articulation points in increasing order. See sample for clarification

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

**Problem C**

Given an undirected graph find all of its bridges.

**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 between U and V.

**Output**

List all the bridges in increasing order. For each edge the first node should be smaller than the second. When sorting, edges with smaller first should come first. If two edge has the same first node, then the edge with smaller second node should come first. See sample for clarification

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

**Problem D**

Given an NxM grid, with blocked cells, find the number of connected empty areas. 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 number of different connected areas. See sample for more clarification.

|  |  |
| --- | --- |
| 5 3  ...  ##.  ...  .##  ... | 1 |
| 5 3  ...  ###  ...  .#.  ... | 2 |