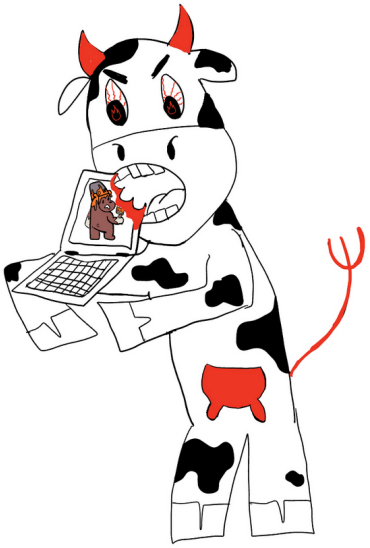
Problem 9: Bessie the Cowmputer Eater
6+2+2+1=11 Points

Problem ID: `judgehosts`
Rank: `3+3+3+3`

Introduction



After last contest's impressive turnout, the CALICO Team decided to upgrade their network by hiring the UCM (United Computing of Mañusgo) to handle the servers connecting the contestants to the judgehosts at the OCF (Open Computing Facility).

Bessie the Cow wants to sabotage CALICO as she is worried that CALICO will one day usurp USACO by becoming the more popular contest! Because the OCF servers are well protected, she travels all the way to Mañusgo to infiltrate the UCM and eat their server computers! (She loves the taste of microchips.) However, she has a limited number of stomachs and each stomach can only fit one computer. Will she successfuly sabotage the contest?

Problem Statement

CALICO has a network of $\mathbf{N}$ computers and $\mathbf{M}$ one-way connections between them. Computers are numbered from 1 to $\mathbf{N}$. *Contestant* computers are computers with no incoming connections. *Judgehost* computers are computers with no outgoing connections. Note that no computer is a contestant and a judgehost at the same time. The network is set up so that there are no connection cycles (e.g. $1 \to 2 \to 3 \to 1$ would not be allowed).

The network is considered *bridged* if there exists a sequence of connections between computers starting from a contestant computer and ending at a judgehost computer. Find up to $\mathbf{S}$ computers that Bessie can eat (remove) so that the network becomes no longer bridged. **Bessie can only eat computers that are not contestant computers nor judgehost computers.** If it's impossible for Bessie to do so, output `IMPOSSIBLE`

Note that for the main test set and bonus test set A, $\mathbf{S} = 1$.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains three space-separated integers $\mathbf{N}$ $\mathbf{M}$ $\mathbf{S}$, where:
  - $\mathbf{N}$ denotes the number of computers.
  - $\mathbf{M}$ denotes the number of connections between the computers.
  - $\mathbf{S}$ denotes the number of computers Bessie can eat.
- For each of the next $\mathbf{M}$ lines, the i^{th} line contains two space-separated integers $\mathbf{U_i}, \mathbf{V_i}$, denoting that a connection exists from computer $\mathbf{U_i}$ to computer $\mathbf{V_i}$.

Output Format

For each test case, output a space-separated list of $x \leq \mathbf{S}$ computers $s_1\ s_2\ \cdots\ s_x$ Bessie can eat such that the network is no longer bridged afterwards. If there are multiple solutions, output any of them. If it's impossible for Bessie to do so, output `IMPOSSIBLE`

Constraints

*Note: The test sets for this problem are **not necessarily cumulative**—that is, a solution that passes a test set may not necessarily solve all test sets before it! We encourage you to submit your solution to any test set you believe you can pass.*

Main Test Set

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$
$\mathbf{S} = 1$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 1000.

Bonus Test Set A

$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$
$\mathbf{S} = 1$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 10^5.

Bonus Test Set B

$1 \leq \mathbf{N}, \mathbf{M} \leq 1000$
$1 \leq \mathbf{S} \leq \mathbf{N}$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 1000.

Bonus Test Set C

Time limit: 2 seconds.
$1 \leq \mathbf{N}, \mathbf{M} \leq 10^5$
$1 \leq \mathbf{S} \leq \mathbf{N}$
The sum of $\mathbf{N}$ and $\mathbf{M}$, separately, across all test cases in an input does not exceed 10^5.

Sample Test Cases

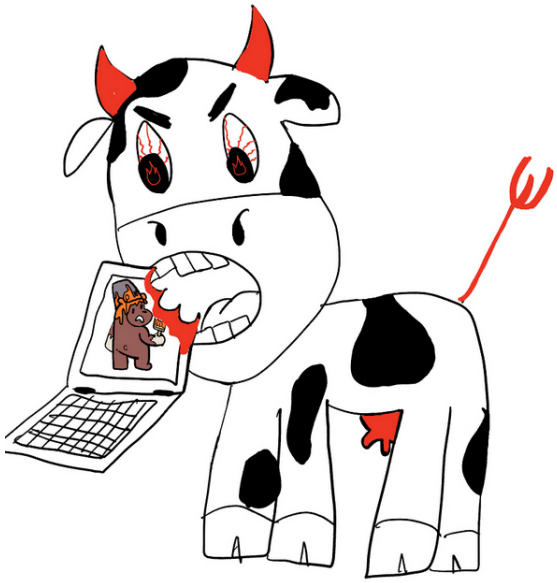
Main/Bonus A Sample Input Download

```
4
7 8 1
5 1
7 1
7 2
1 2
1 3
2 4
3 4
3 6
5 4 1
1 3
2 3
3 4
3 5
9 10 1
1 6
2 6
2 3
2 4
8 4
4 3
6 3
3 9
9 5
9 7
6 4 1
1 2
2 3
4 5
5 6
```

Main/Bonus A Sample Output Download

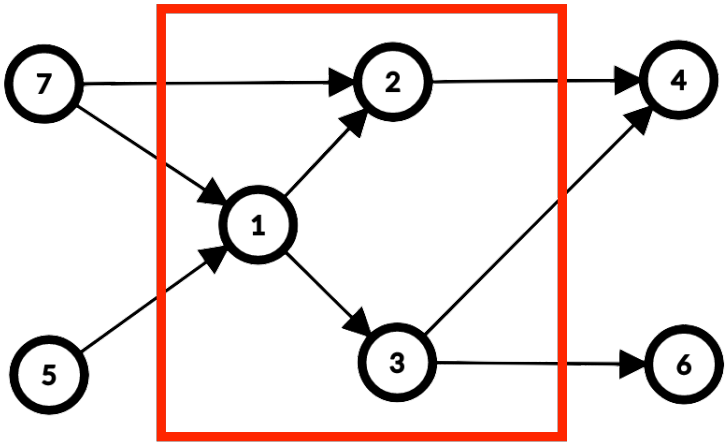
```
IMPOSSIBLE
3
9
IMPOSSIBLE
```

Note that this is one of many possible correct outputs. If there are multiple solutions, you may output any of them.

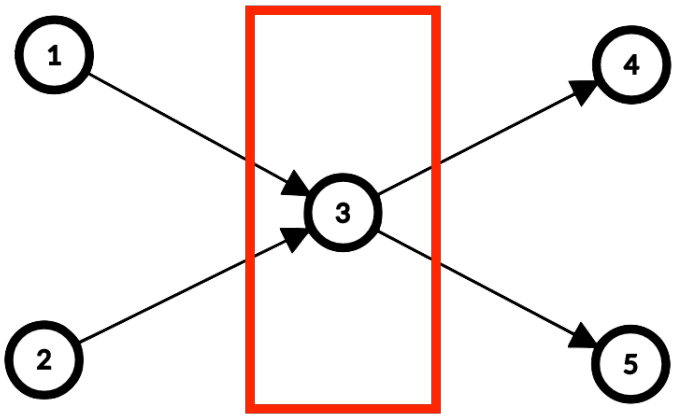


Main/Bonus A Sample Explanations

For test case #1, the contestant computers are 5 and 7, while the judgehost computers are 4 and 6. This means that Bessie can only eat computers 1, 2 and 3. Note that if Bessie tried to eat only computer 1 or only computer 3, then the network is still bridged by $7 \to 2 \to 4$. If she tried to eat only computer 2, then the same can be said for $5 \to 1 \to 3 \to 6$. Hence, it's `IMPOSSIBLE` for Bessie achieve it by just eating one computer.



For test case #2, the only computer Bessie can eat is computer 3. After eating that computer, the network is not bridged anymore.



Bonus B/C Sample Input Download

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

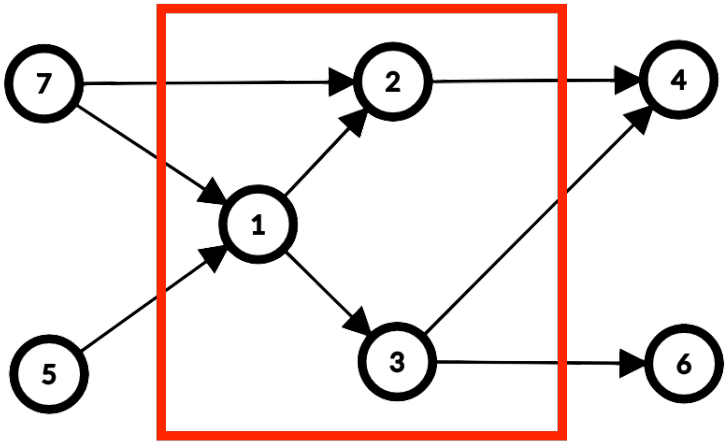
Bonus B/C Sample Output Download

```
3 2
2 3
```

Note that this is one of many possible correct outputs. If there are multiple solutions, you may output any of them.

Bonus B/C Sample Explanations

For test case #1, Bessie can eat computers $1\ 2$ so that the network is not bridged anymore. Observe that she can also eat computers $2\ 3$ to get the same result.



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