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Algorithms Lab

Exercise – *Satellites*

The Euclidean Satellite Academy (ESA) has satellites in orbit and radio stations on the ground. Each satellite is connected to a few ground stations by wireless links. ESA plans to monitor the performance of the wireless links. It does this with software that can be installed on a satellite or a ground station and monitors all links connected to the entity. Where should they install the monitoring software if they want to install it in as few places as possible?

Given a set of satellites, ground stations, and the links between them, decide which nodes in the system (by nodes we mean satellites and ground stations) must install the monitoring software if all links need to be monitored by at least one of their end-points but the number of nodes with the software should be minimized. If there are multiple solutions, output any single one of them.

Input The first line of the input contains $1 \leq t \leq 100$, the number of test cases. Each of the t test cases is described as follows.

- It starts with a line containing three integers: $0 \leq g \leq 10^2$, $0 \leq s \leq 10^2$, and $0 \leq l \leq 10^4$, denoting the number of ground stations, satellites, and links respectively. Ground stations are given labels from 0 to $g-1$ and satellites from 0 to $s-1$.
- The following l pairs of numbers, each given on a separate line, denote the (ground station, satellite) pairs defining each link.

Output For each test case output two lines.

- The first one should contain two integers, g' and s'.
- The second line should contain g' numbers with ground station labels followed by s' numbers with satellite labels which denote the labels of the end-points with the monitoring software installed.

Points There are three groups of test sets, worth 100 points in total.

1. For the first group of test sets, worth 30 points, you may assume that each ground station and each satellite maintains at most 2 wireless links.
2. For the second group of test sets, worth 20 points, you may assume that there are at most 13 ground stations ($g \leq 13$).
3. For the third group of test sets, worth 50 points, there are no additional assumptions.

Corresponding sample test sets are contained in `testi.in/out`, for $i \in \{1, 2, 3\}$.

Sample Input

```
2
3 3 5
0 1
1 0
1 2
2 1
2 2
5 4 8
0 0
1 0
2 0
3 0
4 0
3 1
3 2
3 3
```

Sample Output

```
3 0
0 1 2
1 1
3 0
```