IOITC 2020 TST 3

Beautiful Trees

You are given a tree with n nodes, which are numbered from 1 to n. You want to choose the most beautiful subset of nodes from this tree. The beauty of a subset is defined as follows:

For each **unordered** pair of nodes (x, y) in the subset add $dist(x, y)^k$ to the beauty if there are no nodes other than (x, y) belonging to the subset in the path from x to y. Note that $dist(x, y)$ is the number of edges in the shortest path between x and y.

Find the maximum beauty of a subset of this tree, and the number of subsets which give this optimal beauty. Since the beauty and the number of subsets can be big, find them modulo $10^9 + 7$.

Input

- The first line contains t, the number of testcases.
- The first line of each testcase contains n and k
- Each of the next $(n - 1)$ lines contain two integers u, v - the indices of vertices connected by an edge.

Output

For every testcase, print 2 integers seperated by a space, the optimal beauty modulo $10^9 + 7$ and the number of ways to achieve this beauty modulo $10^9 + 7$.

Test Data

In all inputs,

- $2 \leq n$
- $1 \leq k \leq 10$
- The sum of n across all testcases is atmost 500000.
- $1 \leq u, v \leq n$
- $u \neq v$

Subtask 1 (11 Points): $2 \leq$ sum of n across all testcases ≤ 18

Subtask 2 (38 Points): $2 \leq$ sum of n across all testcases ≤ 1000

Subtask 3 (51 Points): No additional constraints

Sample Input

```
1
4 1
1 2
1 3
3 4
```

Sample Output

```
3 4
```

Explanation

Choosing the subset $\{1, 2, 3, 4\}$ gives a beauty of 3, which is optimal. In this graph there are three other subsets with a beauty of 3.

Limits

Time: 2 seconds

Memory: 256 MB