

2025 Canadian Computing Olympiad
Day 1, Problem 2
Tree Decorations

Time Limit: 2 seconds

Problem Description

Mateo recently found the perfect decorations for his Christmas tree — more trees!

Specifically, his Christmas tree is a rooted tree T initially with M nodes, all painted green. He has another rooted tree D that he uses as a reference for his decorations. Mateo uses the following process to put on all of his decorations:

- For each node i in D , he creates a **copy** of the subtree rooted at i . Let this copy be C_i . Then, he paints the nodes of C_i red. Finally, he chooses some green node in T to be the parent of the root of C_i by connecting them with an edge.

After applying all the decorations, T ends up containing N nodes. Unfortunately, he realized that he had forgotten to record what D is! To make things worse, he accidentally spilled water on T , washing off all the colour from the nodes. After all that, he labels the root of T as 1, and then labels the rest of the nodes from 2 to N .

The only information he currently has is the final state of T , as well as M . Help him find the number of possible D that he could have started with, where two possibilities are considered different if they are structurally distinct.

Rooted trees A and B are said to be structurally identical if and only if they have the same number of nodes S , and there is a way to label A 's nodes from 1 to S and B 's nodes from 1 to S such that:

- Their roots are labeled the same.
- Nodes labeled x and y in A are connected by an edge if and only if nodes labeled x and y in B are connected by an edge.

Otherwise, A and B are considered structurally distinct.

Input Specification

The first line of input contains two space-separated integers N and M .

The next $N - 1$ lines each contain two space-separated integers u_i and v_i ($1 \leq u_i, v_i \leq N, u_i \neq v_i$), describing an edge in T connecting nodes u_i and v_i . **Note that T is rooted at node 1.**

The following table shows how the available 25 marks are distributed:

Marks Awarded	Bounds on N	Bounds on M
2 marks	$2 \leq N \leq 10$	$M = 1$
3 marks	$2 \leq N \leq 200$	$M = 1$
2 marks	$2 \leq N \leq 500\,000$	$M = 1$
6 marks	$2 \leq N \leq 200$	$1 \leq M < N$
4 marks	$2 \leq N \leq 2\,000$	$1 \leq M < N$
8 marks	$2 \leq N \leq 500\,000$	$1 \leq M < N$

Output Specification

Output the number of possible D that he could have started with, where two possibilities are considered different if they are structurally distinct.

Sample Input 1

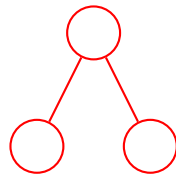
```
8 3
1 2
1 3
1 4
2 5
2 6
3 7
3 8
```

Output for Sample Input 1

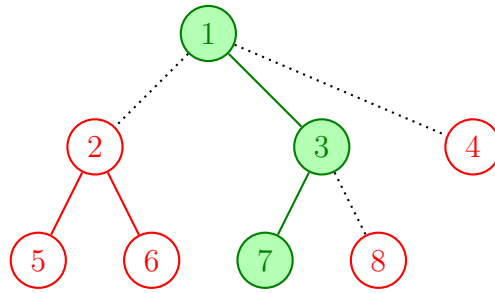
```
1
```

Explanation of Output for Sample Input 1

It is provable that the only possible D is:



We can get T the following way:



In the diagram above, the red parts are added as decorations, while the green, filled-in part represents the initial state of T . The dotted lines represent the edges connecting the decorations to the tree.

Sample Input 2

```

14 5
1 2
1 3
3 4
3 5
1 6
6 7
7 8
7 9
2 10
10 11
10 12
10 13
10 14

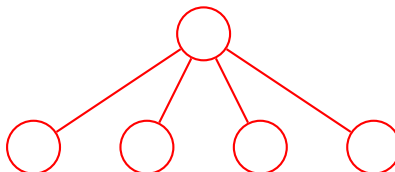
```

Output for Sample Input 2

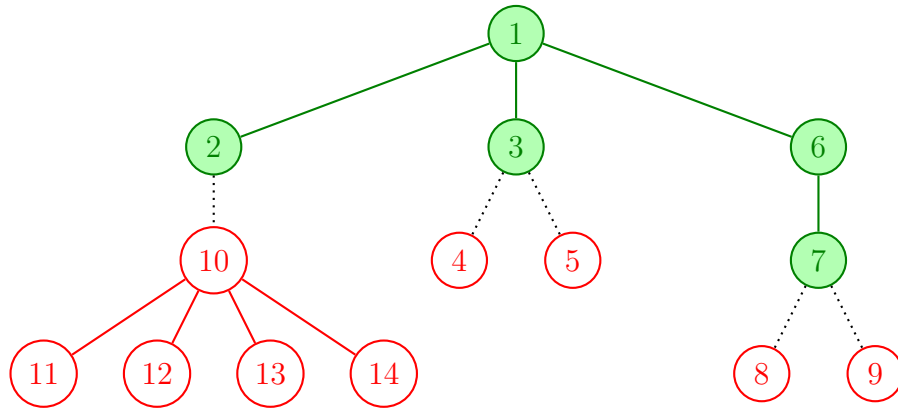
2

Explanation of Output for Sample Input 2

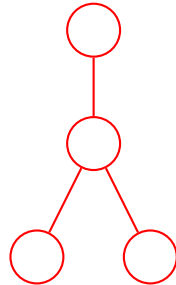
The first possibility for D is:



Using this, we can get T the following way:



The second possibility for D is:



Using this, we can get T the following way:

