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# Kitty's Calculations on a Tree ■

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Problem

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Kitty has a tree, T, consisting of n nodes where each node is uniquely labeled from 1 to n. Her friend Alex gave her q sets, where each set contains k distinct nodes. Kitty needs to calculate the following expression on each set:

$$\left(\sum_{\{u,v\}} u \cdot v \cdot dist(u,v)\right) \bmod (10^9 + 7)$$

#### where:

- $\{u, v\}$  denotes an unordered pair of nodes belonging to the set.
- dist(u, v) denotes the number of edges on the unique path between nodes u and v.

Given T and q sets of k distinct nodes, can you help her calculate the expression for each set? For each set of nodes, print the value of the expression modulo  $10^9 + 7$  on a new line.

## **Input Format**

The first line contains two space-separated integers describing the respective values of n (the number of nodes in tree T) and q (the number of sets). Each of the n-1 subsequent lines contains two space-separated integers, a and b, describing an *undirected* edge between nodes a and b. The  $a \cdot q$  subsequent lines define each set over two lines in the following format:

- 1. The first line contains an integer, k, denoting the size of the set.
- 2. The second line contains  ${m k}$  space-separated integers describing the set's elements.

# Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le a, b \le n$
- $1 \le q \le 10^5$
- $1 \le k_i \le 10^5$
- The sum of  $k_i$  over all q does not exceed  $2 \cdot 10^5$ .
- All elements in each set are distinct.

#### Subtasks

- $1 \le n \le 2000$  for 24% of the maximum score.
- $1 \le n \le 5 \cdot 10^4$  for 45% of the maximum score.
- $1 \le n \le 2 \cdot 10^5$  for 100% of the maximum score.

## **Output Format**

Print q lines of output where each line i contains the expression for the  $i^{th}$  query, modulo  $10^9 + 7$ .

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### Sample Input 0

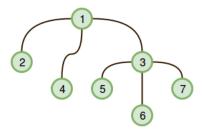
2 4 5

# Sample Output 0

16 106

## **Explanation 0**

Tree  $oldsymbol{T}$  looks like this:



We perform the following calculations for  ${\it q}={\it 3}$  sets:

• Set 0: Given set  $\{2,4\}$ , the only pair we can form is (u,v)=(2,4), where dist(2,4)=2. We then calculate the following answer and print it on a new line:

$$(2 \cdot 4 \cdot dist(2,4)) \mod (10^9 + 7)$$
  
 $\Rightarrow (2 \cdot 4 \cdot 2) \mod (10^9 + 7)$   
 $\Rightarrow 16$ 

- Set 1: Given set {5}, we cannot form any pairs because we don't have at least two elements. Thus, we print 0 on a new line.
- Set 2: Given set  $\{2,4,5\}$ , we can form the pairs (2,4), (2,5), and (4,5). We then calculate the following answer and print it on a new line:

$$(2 \cdot 4 \cdot dist(2,4) + 2 \cdot 5 \cdot dist(2,5) + 4 \cdot 5 \cdot dist(4,5)) \bmod (10^9 + 7)$$

$$\Rightarrow (2 \cdot 4 \cdot 2 + 2 \cdot 5 \cdot 3 + 4 \cdot 5 \cdot 3) \bmod (10^9 + 7)$$

$$\Rightarrow 106$$

Submissions:616 Max Score:80 Difficulty: Advanced Rate This Challenge: 

More

C++ Current Buffer (saved locally, editable) & 1 ▼ #include <cmath>

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```
2 #include <cstdio>
 3 #include <vector>
 4 #include <iostream>
 5 #include <algorithm>
 6 using namespace std;
 8
 9 ▼ int main() {
10 ▼
        /* Enter your code here. Read input from STDIN. Print output to STDOUT */
11
         return 0;
12 }
13
                                                                                                                  Line: 1 Col: 1
<u>Upload Code as File</u> Test against custom input
                                                                                                      Run Code
                                                                                                                   Submit Code
```

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