Problem C. Goldberg Machine

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

Rube has constructed a brand new obscure contraption and is now testing it. The machine has n nodes numbered from 1 to n that can accomodate a marble, and $n-1$ tracks connecting the nodes. It is possible to get from any node to any other by following the tracks, that is, the tracks form an undirected tree.

For every node, the tracks adjacent to it are ordered: if a node v has k_v tracks adjacent to it, we will write $e_{v,0}, \ldots, e_{v,k_v-1}$ for the order in question. Further, every node has an *active* adjacent track selected: we will write $t_v \in \{0, \ldots, k_v - 1\}$ to denote that the track e_{t_v} is active for the node v.

Here's how the machine operates. First, a marble is placed at the node 1. Then, one or more *steps* take place. Each step proceeds as follows:

- If the marble is currently in a node v, it moves to the other endpoint of the track e_{v,t_v} (the currently active track for the node v).
- After the ball has moved to the new node, t_v becomes equal to $(t_v + 1) \bmod k_v$ (that is, the node that contained the marble **at the start of the step** changes its active track to the next one in the cyclic ordering of its tracks).

Rube wants you to process several queries of two kinds:

- "`C` v t" ($1 \le v \le n$, $0 \le t \le k_v - 1$): set $t_v = t$;
- "`Q` x" ($1 \le x \le 10^{18}$): determine the index of the node that will contain the marble after taking exactly x steps from the node 1 starting from the current configuration. Note that this query **does not** affect the starting configuration for any further queries.

Rube is very busy tinkering with his device, so he wants to you answer fast!

Input

The first line contains a single integer n ($2 \le n \le 10^5$): the number of nodes in the machine.

The following n lines describe the tracks. The i-th of these lines contains two integers k_i and t_i ($0 \le t_i \le k_i - 1$), followed by k_i distinct integers $u_{i,0}, \ldots, u_{v,k_v-1}$ ($u_{i,j} \ne i$). This denotes:

- there are k_i tracks adjacent to the node i;
- for any $j \in \{0, \ldots, k_i - 1\}$ the track $e_{i,j}$ leads from i to $u_{i,j}$;
- the track e_{i,t_i} is currently active for the node i.

It is guaranteed that the described tracks form an undirected tree, that is:

- for any pair of distinct nodes (u, v), the node u is an endpoint of a track adjacent to v if and only if v is an endpoint of a track adjacent to u;
- there are $n-1$ distinct undirected tracks, that is, $\sum_{i=1}^{n} k_i = 2(n-1)$;
- it is possible to get from any node to any other by following the tracks.

The following line contains a single integer q ($1 \le q \le 10^5$): the number of queries.

The following q lines describe the queries in the format described above, one per line.

Output

Print answers for all "`Q` x" queries in the order asked, one per line.

Example

standard input	standard output
7 2 0 2 3 3 0 1 4 5 3 0 1 6 7 1 0 2 1 0 2 1 0 3 1 0 3 5 Q 10 C 2 1 Q 10 C 3 2 Q 10	1 4 1

Note

Here are the paths of the marbles in the sample case:

1. $1 \to 2 \to 1 \to 3 \to 1 \to 2 \to 4 \to 2 \to 5 \to 2 \to 1$
2. $1 \to 2 \to 4 \to 2 \to 5 \to 2 \to 1 \to 3 \to 1 \to 2 \to 4$
3. $1 \to 2 \to 4 \to 2 \to 5 \to 2 \to 1 \to 3 \to 7 \to 3 \to 1$