2021 Canadian Computing Olympiad
Day 1, Problem 3
Through Another Maze Darkly

Time Limit: 8 seconds

Problem Description
There is a maze that is formed by connecting N rooms via $N - 1$ corridors. The rooms are numbered 1 to N and each room has the shape of a circle. The corridors have the following constraints:

- Each corridor forms a connection between two distinct rooms.

- Every pair of rooms is connected by exactly one path of connected corridors.

One difficulty in navigating through this maze is that the lights are all out, so you cannot see where you are. To help with navigation, each room contains a laser pointer that initially points to a corridor. Consider the following strategy:

- Rotate the room's laser pointer clockwise until it points to another corridor.

- Follow the room's laser pointer and traverse the corridor.

- Repeat the previous two steps indefinitely.

You created Q queries to investigate this strategy. For each query, you are given an integer K and you start at room 1. Determine the final room after traversing exactly K corridors. All laser pointers will reset to their original orientation after each query.

Input Specification
The first line contains the integers N and Q ($2 \leq N \leq 800\,000$, $1 \leq Q \leq 800\,000$).

The next N lines describe the layout of the maze, with the ith of these lines describing room i. Specifically, it contains an integer k, the number of corridors connecting to room i, followed by k integers, $c_1\ c_2 \ldots c_k$, indicating the rooms that these k corridors lead to, in clockwise order. Lastly, room i's laser pointer initially points to the corridor leading to room c_1.

The final Q lines describe a query, with each line containing an integer K ($1 \leq K \leq 10^{15}$).

For 4 of the 25 available marks, the ith corridor forms a connection between room i and room $i + 1$.

For an additional 4 of the 25 available marks, $N \leq 2000$ and $Q \leq 2000$.

For an additional 12 of the 25 available marks, $Q = 1$.

Output Specification

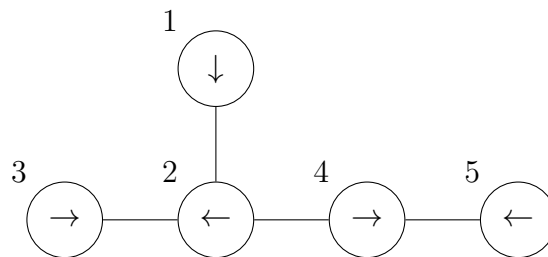Output Q lines answering the queries in order.

Sample Input

```
5 6
1 2
3 3 1 4
1 2
2 5 2
1 4
1
2
3
4
5
6
```

Output for Sample Input

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

Explanation of Output for Sample Input

This is the initial state of the maze.

The strategy will visit these rooms in order:

$$1, 2, 1, 2, 4, 2, 3, \ldots$$