Game of Votes

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

There are n people, numbered from 1 to n. The i-th person, for $2 \leq i \leq n$, dislikes one person f_i ($1 \leq f_i < i$), while the first person dislikes no one.

One day, the n people participate in a voting game, which consists of n rounds. At the start of the game, no one has been voted out. In each round of the game, the following process occurs:

1. Each person i who has not been voted out starts with a_i votes.
2. Then, for each person i who has not been voted out and dislikes someone whose disliked person f_i has not been voted out, i will cast b_i votes for f_i.
3. Finally, the person among those not yet voted out who has the highest number of votes is voted out. If there are multiple people with the highest number of votes, the one with the largest number is voted out.

Votes are tallied independently in each of the n rounds of the game.

Before the game starts, q events occur, which are of the following two types:

1. Given p, x, y, modify (a_p, b_p) to (x, y);
2. Xiao Ming wants to know, given two people c, d, if a game were to be played at this moment, which of the two would be voted out first.

As Xiao Ming's friend, can you help him?

Input

The first line contains two positive integers n and q ($1 \leq n, q \leq 2 \times 10^5$), representing the number of people and the number of events that occurred.

The second line contains $(n-1)$ integers $f_2, f_3, \cdots, f_n$ ($1 \leq f_i < i$).

The third line contains n integers $a_1, a_2, \cdots, a_n$ ($0 \leq a_i \leq 10^8$).

The fourth line contains n integers $b_1, b_2, \cdots, b_n$ ($0 \leq b_i \leq 10^8$).

The following q lines, each line contains three or four integers describing an event. The first positive integer op indicates the type of event.

- If $op = 1$, then the next three integers p, x, y follow ($0 \leq x, y \leq 10^8$, $1 \leq p \leq n$), indicating that (a_p, b_p) is modified to (x, y).
- If $op = 2$, then the next two positive integers c, d follow ($1 \leq c, d \leq n$, $c \neq d$), and you need to determine if a game were played at this moment, who among c and d would be voted out first.

Output

For each event with $op = 2$, output one line with a single character. Output "0" if c is voted out first, otherwise output "1".

Example

standard input	standard output
5 8 1 2 3 2 1 3 2 1 0 0 4 1 0 0 2 1 3 1 1 0 3 2 2 5 1 1 2 2 2 4 3 2 5 4 2 5 1 2 2 1	0 0 1 1 1 1