

E. Monkeys

time limit per test: 4 seconds

memory limit per test: 256 megabytes

There are n monkeys hanging on a very high tree. The monkeys are enumerated from 1 to n . The first monkey (the leader) is hanging on a strong branch using his tail. Each monkey can use its hand to hang on a tail of some other monkey, or to hold another monkey by its tail. At the current moment all monkeys are hanging on the leader, in direct or indirect way, and are not falling down. One hand of a monkey can hold at most one tail (or hang on one tail), but arbitrary number of hands can hold or hang on a tail.

Each second, starting from zeroth, one of the monkeys releases one of its hands, and the configuration changes. Moreover, it can happen that one or more monkeys start falling down. The tree is extremely high, so it takes some time to fall down, and the monkeys continue to release their hands during this time.

You are given initial configuration and the schedule of hands releases. You are to write a program that calculates the second when each monkey starts its fall down.

Input

The first line contains two integers n and m ($1 \leq n \leq 2 \cdot 10^5, 0 \leq m \leq 4 \cdot 10^5$), where n is the number of monkeys, and m is the number of seconds we are interested in.

n lines follow, describing the configuration of the monkeys: the i -th line contains two integers l_i, r_i , where l_i is -1 or the number of monkey whose tail is in the left hand of the i -th monkey. Similarly, r_i equals -1 or the number of monkey whose tail is in the right hand of the i -th monkey. The value -1 denotes that the corresponding hand is empty. The first monkey is a leader and hangs on the tree using its tail.

m lines follow, describing the releases in the following m seconds: from zeroth to $(m - 1)$ -th. Each line contains two integers p_j, h_j , where p_j is the number of the monkey which releases a hand in the second, and h_j equals 1 or 2, where 1 denotes the release of the left hand, and 2 denotes the release of the right hand.

It is guaranteed that the input is valid (i. e. no monkey releases an empty hand). A monkey can use both hands to hold different, or same monkey. It can happen that a monkey holds its own tail.

Output

Print n lines, where the i -th line contains the number of second, when the i -th monkey starts its fall down. Print -1 , if the monkey does not start falling by the end of the time.

Examples

| | |
|--|------|
| input | Copy |
| 3 2 -1 3 3 -1 1 2 1 2 3 1 | |
| output | Copy |
| -1 1 1 | |

| | |
|---|------|
| input | Copy |
| 4 5 2 2 3 -1 4 -1 -1 2 1 1 2 1 3 1 1 2 4 2 | |
| output | Copy |
| -1 3 2 3 | |

→ Submit?

Language: GNU G++20 13.2 (64 bit, win

Choose file: Choose File No file chosen

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