Problem L: Watermelon park

Time limit: 4s; Memory limit: 512 MB

As the Graw city is in need of financial support, they decided to put their watermelon park on sale. Fortunately, Mr. Schuyler, the only one that can afford the park, is willing to buy it.

Schuyler was informed that the park has n watermelons of multifarious sizes, and for any pair of watermelons, there exists only one route between them. In other words, when viewing the map of the park, we can see that it has the structure of a Tree.

Schuyler is satisfied with the park's infrastructure. However, he finds the idea of a "Watermelon park" quite peculiar, therefore, he wants the park to be as astonishing as possible. He decided to try to take his friends on a tour around the park through different paths that connect two watermelons. A tour is made by a pair of watermelons (s, t), meaning that this tour starts from **watermelon** s and ends at **watermelon** t.

Schuyler notices that his friends get surprised everytime they see a watermelon bigger than all the ones they saw before. With a blueprint already in hand, he gave the President of Graw, Keanu, some questions in order to decide whether he will buy the park or not.

Schuyler gives Keanu the blueprint, showing how he wants the park to be structured. Then, he lists several pairs of watermelons, demonstrating the tours he wants to take his friends on, and asks Keanu: for each pair, how many times will Schuyler's friends get surprised?

Your mission is to assist Keanu in answering these questions to help his city.

Input

- The first line consists of two numbers n and q, meaning the number of watermelons in the park and the number of questions. ($1 \leq n, q \leq 2 \cdot 10^5$)
- The second line consists of n numbers a_i showing the sizes of n watermelons. ($1 \leq a_i \leq 10^9$)
- The next $n - 1$ lines, each of which consisting of two numbers u and v ($1 \leq u, v \leq n$, $u \neq v$) demonstrates that watermelons u and v have a path between them.
- For the next q lines, you are given the encoded tours in the form of two numbers x_i and y_i ($0 \leq x_i, y_i \leq n$). In order to decode these questions, you will need to find s_i and t_i, the original tour.
  - $s_i = (x_i + p) \bmod n + 1$
  - $t_i = (y_i + p) \bmod n + 1$
  - p is the answer to the question before. For the first question, $p = 0$

Output

Print each answer to the questions in one single line.

Sample

Input	Output
6 3 2 4 2 1 3 1 1 3 2 3 3 4 5 3 6 5 5 1 0 3 5 1	2 3 1