

Problem F. Flower's Land

Input file: *standard input*
Output file: *standard output*
Time limit: 8 seconds
Memory limit: 2048 mebibytes

The Kingdom of Flowers consists of n cities, and the i -th city grows a_i flowers. There are $n - 1$ roads, where the i -th road connects cities u_i and v_i . It is guaranteed that for any two cities there is a path connecting them.

Now, the Kingdom of Flowers wants to hold a flower exhibition. To do that, you need to first choose a city z to build an exhibition hall, and then select exactly k cities $x_1, x_2, \dots, x_k$ and transport the flowers from those k cities to the city z .

To avoid upsetting people in cities along the path, the organizers stipulated that if city x was selected, then all cities on the path from x to z had to be selected as well. In particular, this means that city z must be selected.

For each $z = 1, 2, \dots, n$, find the maximum number of flowers that can be transported if city z is chosen to build the exhibition hall.

Input

The first line of the input contains two integers n and k ($1 \leq n \leq 40\,000$, $1 \leq k \leq \min(n, 3000)$).

The next line of the input contains n integers $a_1, a_2, \dots, a_n$ ($1 \leq a_i \leq 5 \cdot 10^5$).

Each of the next $n - 1$ lines contains two integers x and y ($1 \leq x, y \leq n$, $x \neq y$), indicating that there is an edge between vertices x and y . It is guaranteed that the given graph is a tree.

Output

Output a single line containing n integers $f_1, f_2, \dots, f_n$, where f_i denotes the answer for $z = i$.

Examples

standard input	standard output
5 3 6 10 4 3 4 3 4 4 2 2 5 5 1	20 20 17 17 20
7 4 1 3 2 1 7 12 17 4 6 1 4 5 1 2 5 7 6 3 2	31 13 13 31 21 31 31