Problem H. Deep Dive into Bubbletopia

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

In the mystical underwater realm of Bubbletopia, cities are built within giant bubbles interconnected by shimmering tunnels. These bubbles, numbered from 1 to N, form a magnificent tree structure rooted at the Grand Bubble 1. The residents of Bubbletopia thrive in harmony, with each bubble i sheltering P_i inhabitants.

The bubbles are connected by $N - 1$ tunnels that allow one to get from any bubble to any other bubble. Citizens travel through these tunnels to explore the depths of their world.

One fateful day, the royal family discovers that the heir to the throne has gone missing! The last sighting places the heir somewhere within the depths of the subtree rooted at bubble X. A subtree rooted at bubble X includes bubble X and all bubbles that can be reached by moving away from the Grand Bubble starting from X. Time is of the essence, and the royal guards must act swiftly.

As the chief of security, you have been assigned K elite search teams. Each team can embark on a mission starting from bubble X, traversing any path moving away from the Grand Bubble. Each mission involves moving through a sequence of bubbles, examining the inhabitants in each bubble along the way to locate the heir.

Your mission is to devise a search strategy that maximizes the probability of finding the heir using the K search teams. The heir remains in the same bubble during your search efforts.

Since the heir could be hiding anywhere, they are equally likely to be any one of the inhabitants within this subtree. Thus, the probability that the heir is in a particular bubble is proportional to the number of inhabitants in that bubble.

Note that visiting the same bubble multiple times does not increase the chance of finding the heir, as they do not move between bubbles during the search.

There are Q such scenarios. Each scenario is independent, and for each one, you are given the starting bubble X and the number of search teams K. Can you calculate the highest probability of finding the heir with your optimal search strategy for each scenario?

Input

The first line contains two integers N and Q: the number of bubbles and the number of scenarios ($1 \le N, Q \le 3 \cdot 10^5$).

The second line contains N integers $P_1, P_2, \ldots, P_N$: the number of inhabitants in each bubble ($1 \le P_i \le 10^6$).

Each of the next $N - 1$ lines contains two integers U and V: two nodes connected by a tunnel ($1 \le U, V \le N$, $U \ne V$). The resulting graph will be a tree: connected and containing no cycles, loops, or duplicate edges.

Each of the next Q lines contains two integers X and K: the starting bubble for the search and the number of search teams available ($1 \le X, K \le N$).

Output

For each scenario, output a single real number between 0 and 1, representing the highest probability of finding the heir with optimal search paths. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-9}.

Example

standard input	*standard output*
6 6 1 10 10 10 5 6 5 6 1 2 3 2 5 1 2 4 1 1 1 2 1 3 2 2 5 1 4 6	0.5000000000 0.7619047619 1.0000000000 1.0000000000 1.0000000000 1.0000000000

Note

Here is an explanation for the example.

- During the first scenario, a search crew can be sent on the path $1 \to 2 \to 3$, searching a total of 21 people out of the 42 people living in the tree, making the probability of finding the heir equal to 50%.
- During the second scenario, one search crew can be sent on the path $1 \to 2 \to 3$, while the second crew can be sent on the path $1 \to 5 \to 6$, searching a total of 32 people out of the 42 people living in the tree, making the probability of finding the heir approximately 76%.
- During the third scenario, all 42 people can be searched using 3 search crews.
- During the fourth scenario, all 30 people can be searched using 2 search crews.
- During the fifth scenario, all 11 people can be searched using the single search crew provided.
- During the sixth scenario, all 10 people can be searched using a single search crew, leaving the other 5 search crews with nothing to do.