Problem E: Mountain Rescue

Advanced Algorithms for Programming Contests

Restrictions

Time: 2 seconds
Memory: 512 MB

Problem description

The mountain rescue responsible for overseeing Mount Eret has a problem: As more and more people are climbing the legendary mountain, it is getting increasingly difficult for the rescue team to monitor all of their locations – but doing this is kind of necessary, as the mountain's surface is way too large to quickly find mountaineers just known to be somewhere on it in case of an emergency.

Luckily, they don't have to constantly track all mountaineers to be able to roughly determine their locations: It is known that the mountaineering routes on Mount Eret can be modeled by a tree, where the root models the peak, the internal vertices model the permanent bases used by the mountaineers, the leaves model the starting points of routes and the edges correspond available summits from starting point to base, from base to base, from base to peak or in some cases even from starting point to peak. Furthermore, each vertex has a known altitude and all routes from starting point to peak are strictly ascending (including the segments between adjacent vertices). Thus the rescue team only needs to know the starting point each mountaineer chooses for his summit and the highest ascent (height difference between start and end point) he is able to accomplish, in order to determine the route he will take (each mountaineer will start at a leaf, ascend towards the root as far as he can and then go back down on the same route). However, they are having some difficulties automating this analysis. Can you help them?

Input

The input consists of

- one line containing N ($5 \leq N \leq 10^5$) and r ($1 \leq r \leq N$) – the number of vertices in the tree model (which are numbered $1, ..., N$) and the index of the root

- one line containing N numbers $p_1, ..., p_N$ $(0 \leq p_i \leq N)$, where p_i is the index of the parent of vertex i for all vertices except the root and 0 for the root
- one line containing N numbers $a_1, ..., a_N$ $(0 \leq a_i \leq 10^9)$, where a_i is the altitude (above sea level) of the starting point / base station / peak modeled by vertex i
- one line containing M $(1 \leq M \leq 10^5)$ – the number of mountaineers
- M lines each containing numbers s_i and m_i $(1 \leq s_i \leq N, 0 \leq m_i \leq 10^9)$ – the starting point the respective mountaineer wants to use and the maximum ascent he is able to accomplish.

Output

For each mountaineer, output the index of the highest situated vertex he will reach. The rescue team will then figure out the rest.

Sample input and output

Input	**Output**
5 1 0 1 2 2 1 3980 2747 950 842 1231 5 3 1800 3 3030 5 2000 5 3000 4 1905	2 1 5 1 2