Problem F. Hero's Journey

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

In the mythical realm of Bubbleonia, where the magical Bubble Cup takes place, stands the mystical Bubble Tree. This enchanted tree is not just a colossal plant: it is a vast labyrinth of chambers brimming with magical elixirs and formidable monsters. Each chamber acts like a node in a tree data structure, and all nodes are interconnected in a hierarchy rooted at the Grand Chamber, identified as node 1. Somewhere within this complex maze of wonders is our valiant hero, intent on amassing as much strength as possible.

Our hero has a specific pattern of movement within the tree: he can traverse to any adjacent chamber, but he must always be moving farther away from the Grand Chamber (node 1). Upon entering chamber i, he encounters a magic potion that can increase his strength by S_i. But beware: some chambers are guarded by fearsome monsters that the hero must first conquer! Defeating the monster at chamber i decreases the hero's strength by M_i, and this, of course, means that the strength at the start of the battle should be at least M_i.

Here's where you come in: the hero faces multiple scenarios that require him to navigate the Bubble Tree from various starting points and with differing initial strength levels. Your mission is to guide him so that he finishes with the maximum possible strength in each scenario. It is crucial to note that each scenario is independent: the potions quaffed and monsters vanquished in one journey won't carry over to the next.

Also, in each scenario, the hero begins his quest in a specified chamber A_i with initial strength X_i. He may choose to remain in the starting chamber or even exit the tree immediately, thus maintaining his starting strength. If he decides to proceed, and the starting chamber is guarded by a monster, the hero must first vanquish this guardian before drinking the magic potion. After overcoming this initial hurdle, he can move to adjacent chambers with the aim of maximizing his ending strength. He may stop at any point in his journey; however, the end goal is to maximize his final strength.

Input

The first line contains two integers N and Q: the number of nodes (chambers) in the Bubble Tree and the number of queries (scenarios), respectively ($1 \le N, Q \le 10^5$).

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

The next line contains N integers $S_1, S_2, \ldots, S_N$, where S_i indicates the strength provided by the magic potion in chamber i ($0 \le S_i \le 10^9$).

The following line contains N integers $M_1, M_2, \ldots, M_N$, where M_i indicates the strength needed to defeat the monster in chamber i ($0 \le M_i \le 10^9$; if $M_i = 0$, it means the chamber is unguarded).

Finally, Q lines follow, each containing two integers A_i and X_i, representing a query (scenario). The hero starts his journey in chamber A_i with an initial strength of X_i ($1 \le A_i \le N$, $0 \le X_i \le 10^{14}$).

Output

For each of the Q queries, output a line with a single integer representing the maximum strength the hero can accumulate by the end of his journey. Remember, the hero may choose to stop at any chamber or even exit the tree before entering the starting chamber, but the ultimate goal is to maximize his final strength.

Example

standard input	*standard output*
3 3 1 2 1 3 1 5 3 1 3 2 1 2 1 5 2 2	3 7 2

Note

Here are the optimal strategies for the example.

Strategy for Query 1 $(1, 2)$:

1. Defeat the monster at node 1 (requires 1 strength). Remaining strength: $2 - 1 = 1$.
2. Drink the potion at node 1 ($+1$ strength). Resulting strength: $1 + 1 = 2$.
3. Move to node 3.
4. Defeat the monster at node 3 (requires 2 strength). Remaining strength: $2 - 2 = 0$.
5. Drink the potion at node 3 ($+3$ strength). Resulting strength: $0 + 3 = 3$.

Strategy for Query 2 $(1, 5)$:

1. Defeat the monster at node 1 (requires 1 strength). Remaining strength: $5 - 1 = 4$.
2. Drink the potion at node 1 ($+1$ strength). Resulting strength: $4 + 1 = 5$.
3. Move to node 2.
4. Defeat the monster at node 2 (requires 3 strength). Remaining strength: $5 - 3 = 2$.
5. Drink the potion at node 2 ($+5$ strength). Resulting strength: $2 + 5 = 7$.

Strategy for Query 3 $(2, 2)$:

1. The only course of action here is for the hero to retain his starting strength. Since the strength required to defeat the monster at node 2 is 3 and the hero has only 2, he cannot defeat it. He cannot drink the potion either.