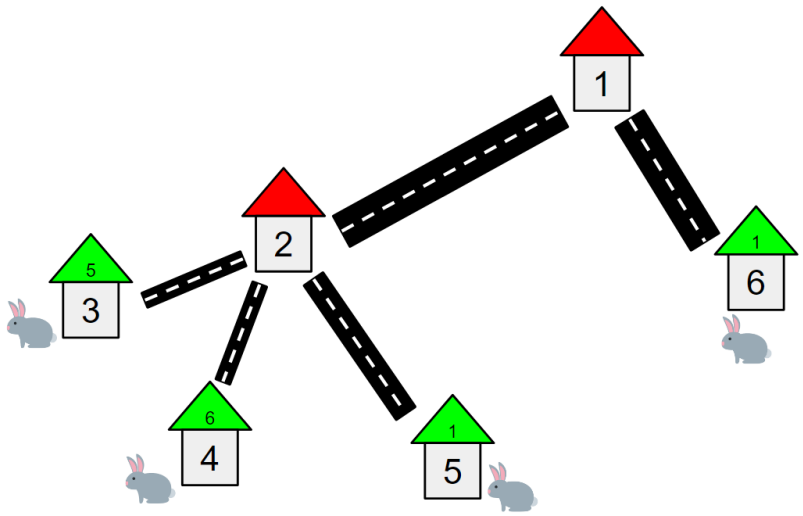
5 Yabbit Meetup

Time Limit: 2.0s
Memory Limit: 1024MB

5.1 Problem Description

The $N + Y$ Wabbits in Bunnyland have a very peculiar family tree. For simplicity, they are named Wabbit 1 to Wabbit $N + Y$. At first, there was the original Wabbit, designated as Wabbit 1. Wabbit 1 has no parent; they simply appeared all of a sudden for no apparent reason. Each Wabbit also has a house that belongs to them. For each Wabbit i, they have a single direct ancestor Wabbit P_i where $P_i < i$ and a road connecting Wabbit i's house to Wabbit P_i's house which takes any Wabbit T_i seconds to walk in either direction. Note that since Wabbit 1 has no parent, $P_1 = -1$ and $T_1 = 0$.

Among the $N + Y$ Wabbits are Y Young Wabbits known as Yabbits numbered from 1 to Y. Yabbit j is the same as Wabbit $N + j$, and these Yabbits are the Wabbits that have no descendents yet. Because of their isolation from the rest of the Wabbit community, none of the Yabbits know about any other Yabbit other than themselves. Additionally, the house of each Yabbit j has a messiness level M_j, as Yabbits don't like cleaning. Whiterabbit has been observing the Yabbits for some time, and wants them to know each other so that all of them can become better friends. As such, he has designed a plan for all of the Yabbits to eventually become friends.



For each Wabbit X that is not a Yabbit, Whiterabbit will get every single Yabbit which is a direct or indirect descendant of X to travel from their houses to the house of Wabbit X to pay respects to Wabbit X. Then, all of the Yabbits will travel to exactly one of their houses to have a big Yabbit party, before all teleporting back home using Whiterabbit's warp pads. Do note that all of the travelling is done using the roads, except when they are going back home as they are too tired to walk back.

Travelling takes time, and Yabbits don't like wasting time. As such, one second of travel for a Yabbit increases his inconvenience by 1. Additionally, when a group of Yabbits choose the house of Yabbit Y to be the party location (note that Yabbit Y must be among those Yabbits), Yabbit Y will become embarassed that their house is very messy. Thus, his inconvenience will increase by the messiness of his house.

To ensure that the Yabbits are as happy as possible, Whiterabbit wants all of the meetups to be done such that the sum of inconvenience across all of the Yabbits is minimized in each meeting. Help Whiterabbit compute the minimum total amount of inconvenience across all Yabbits for each of the N meetings.

5.2 Input Format

The input format is as follows:

- The first line of input will contain 2 spaced integers N and Y.
- The next $N + Y$ lines of input will contain 2 spaced integers, the i^{th} one containing P_i and T_i respectively.
- The next line of input will contain Y spaced integers, the j^{th} one representing M_j.

5.3 Output Format

The output format is as follows:

- Output N spaced integers, the i^{th} one being the minimum total inconvenience of the meet up for Wabbit i.
- Do note that the answers may not fit in a 32-bit integer, but they will be guaranteed to fit in a 64-bit integer.

5.4 Subtasks

Subtask	Score	N	Y	Extra Constraints
1	4	$N = 1$	$1 \leq Y \leq 500000$	
2	5	$1 \leq N \leq 500000$	$Y = 1$	
3	17	$1 \leq N \leq 500000$	$1 \leq Y \leq 500000$	$M_i = M_j$ for all i, j
4	12	$1 \leq N \leq 200$	$1 \leq Y \leq 200$	
5	14	$1 \leq N \leq 2000$	$1 \leq Y \leq 2000$	
6	27	$1 \leq N \leq 100000$	$1 \leq Y \leq 100000$	
7	21	$1 \leq N \leq 500000$	$1 \leq Y \leq 500000$	
8	0	Sample Testcases		

For all subtasks:
$1 \leq N \leq 500000, 1 \leq Y \leq 500000, 0 \leq P_i < i$
$0 \leq T_i \leq 10^6, 0 \leq M_i \leq 10^{12}$
For every $1 \leq X \leq N$, there is at least 1 i such that $P_i = X$.
For every $N < X \leq N + Y$, there is no i such that $P_i = X$.

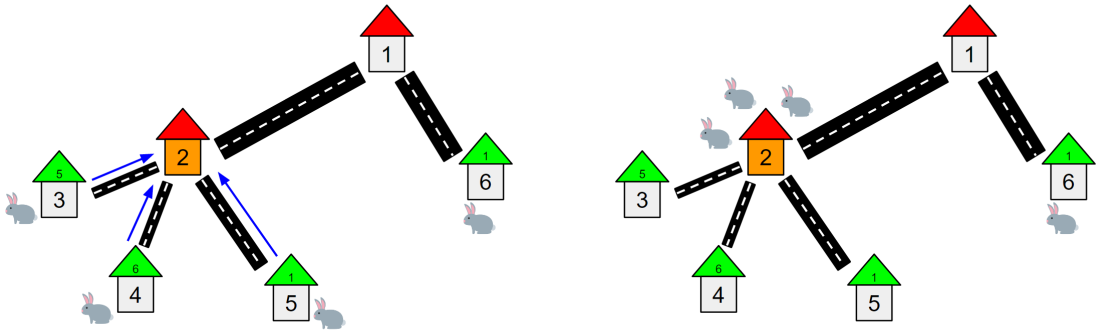
5.5 Sample Testcases

standard input	standard output
2 4 -1 0 1 3 2 1 2 1 2 2 1 1 5 6 1 1	19 11
4 5 -1 0 1 1 1 5 2 3 2 7 4 2 4 0 3 1 3 2 2 9 20 8 9	69 38 13 15

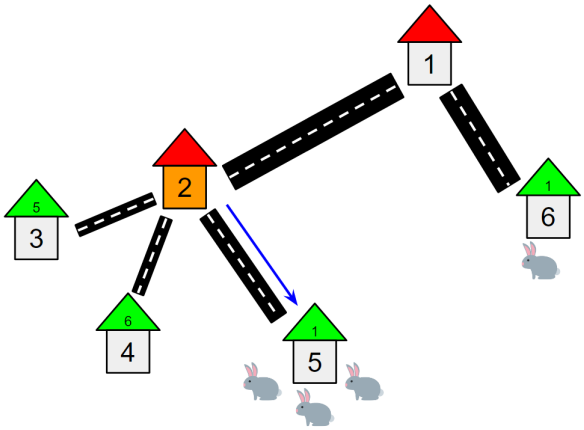
5.6 Sample Testcase Explanation

In the first sample testcase, the network is the one in the problem statement. Houses with green roofs are those belonging to the Y Yabbits, and the rest belong to the other N Wabbits.

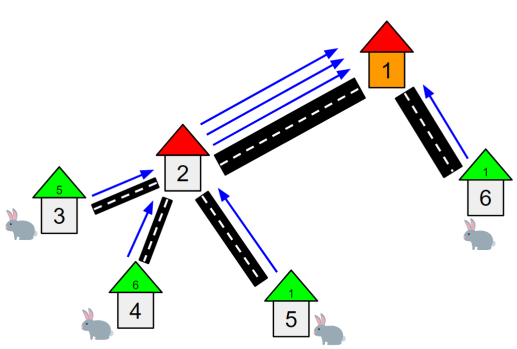
When organising the meetup at Wabbit 2's house, Yabbits 1, 2 and 3 (which are also Wabbits 3, 4 and 5) travel to Wabbit 2's house, increasing their total inconvenience by $1 + 1 + 2 = 4$.

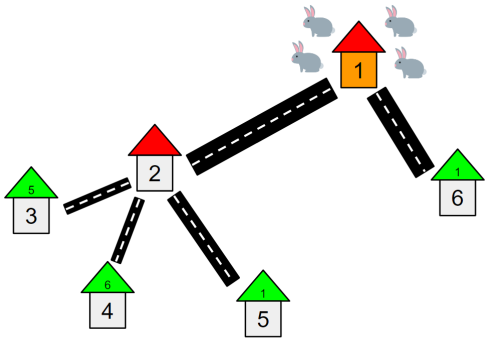


The optimal house to party at is house 5, increasing the inconvenience by $2+2+2+1 = 7$. The total here is $4 + 7 = 11$.



When organising the meetup at Wabbit 1's house, all Yabbits travel to Wabbit 1's house, increasing their total inconvenience by $1+1+2+3+3+3+1=14$.





The optimal house to party at here is house 6, increasing their total inconvenience by $1+1+1+1+1=5$. The total here is $14+5=19$.