E. Iron Man

time limit per test: 5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Tony Stark is playing a game with his suits (they have auto-pilot now). He lives in Malibu. Malibu has n junctions numbered from 1 to n, connected with $n - 1$ roads. One can get from a junction to any other junction using these roads (graph of Malibu forms a tree).

Tony has m suits. There's a special plan for each suit. The i-th suit will appear at the moment of time t_i in the junction v_i, and will move to junction u_i using the shortest path between v_i and u_i with the speed c_i roads per second (passing a junctions takes no time), and vanishing immediately when arriving at u_i (if it reaches u_i in time q, it's available there at moment q, but not in further moments). Also, suits move continuously (for example if $v_i \neq u_i$, at time $t_i + \frac{1}{2c_i}$ it's in the middle of a road. Please note that if $v_i = u_i$ it means the suit will be at junction number v_i only at moment t_i and then it vanishes.

An explosion happens if at any moment of time two suits share the same exact location (it may be in a junction or somewhere on a road; while appearing, vanishing or moving).

Your task is to tell Tony the moment of the the first explosion (if there will be any).

Input

The first line of the input contains two integers n and m ($1 \leq n, m \leq 100\,000$) — the number of junctions and the number of suits respectively.

The next $n - 1$ lines contain the roads descriptions. Each line contains two integers a_i and b_i — endpoints of the i-th road ($1 \leq a_i, b_i \leq n, a_i \neq b_i$).

The next m lines contain the suit descriptions. The i-th of them contains four integers t_i, c_i, v_i and u_i ($0 \leq t_i \leq 10\,000, 1 \leq c_i \leq 10\,000, 1 \leq v_i, u_i \leq n$), meaning the i-th suit will appear at moment of time t_i at the junction v_i and will move to the junction u_i with a speed c_i roads per second.

Output

If there would be no explosions at all, print -1 in the first and only line of output.

Otherwise print the moment of the first explosion.

Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-6}.

Examples

input Copy

```
6 4
2 5
6 5
3 6
4 6
4 1
27 6 1 3
9 5 1 6
27 4 3 4
11 29 2 6
```

output Copy

```
27.3
```

input Copy

```
6 4
3 1
4 5
6 4
6 1
```

```
2 6
16 4 4 5
13 20 6 2
3 16 4 5
28 5 3 5
```

output Copy

```
-1
```