Problem K. Two Paths

Input file:	*standard input*
Output file:	*standard output*
Time limit:	7 seconds
Memory limit:	1024 mebibytes

You are given a tree T consisting of N vertices. Each edge has a positive integer weight. The weight of a path P in T is defined as the sum of weights of edges in P, denoted by $W(P)$.

You are given a total of Q queries, each containing two vertices, u and v, and two integers, A and B. For each query, you are to find two simple paths P_1 and P_2 in T satisfying the following requirements.

- P_1 and P_2 don't share a vertex.
- P_1 starts from u, and P_2 starts from v.
- Among all P_1 and P_2 satisfying the conditions above, the value of $A \cdot W(P_1) + B \cdot W(P_2)$ should be maximized.

You should output the value of $A \cdot W(P_1) + B \cdot W(P_2)$ for each query.

Input

The first line contains two space-separated integers N and Q.

Each of the following $N-1$ lines contains three space-separated integers u, v, w. This means that there is an edge in T connecting vertices u and v with weight w. Together these edges form a tree.

Each of the following Q lines contains four space-separated integers u, v, A, B, denoting a single query.

- $2 \le N \le 200\,000$
- $1 \le Q \le 500\,000$
- $1 \le u < v \le N$ for both edges and queries
- $1 \le w \le 10\,000$
- $1 \le A, B \le 2 \cdot 10^9$

Output

For each query, output a single line with an integer: the maximum possible value of $A \cdot W(P_1) + B \cdot W(P_2)$.

Example

standard input	*standard output*
6 4 1 2 4 2 5 5 2 3 7 3 6 5 3 4 4 1 4 1 1 1 4 2 1 5 6 1 1 5 6 1 10	18 32 18 160