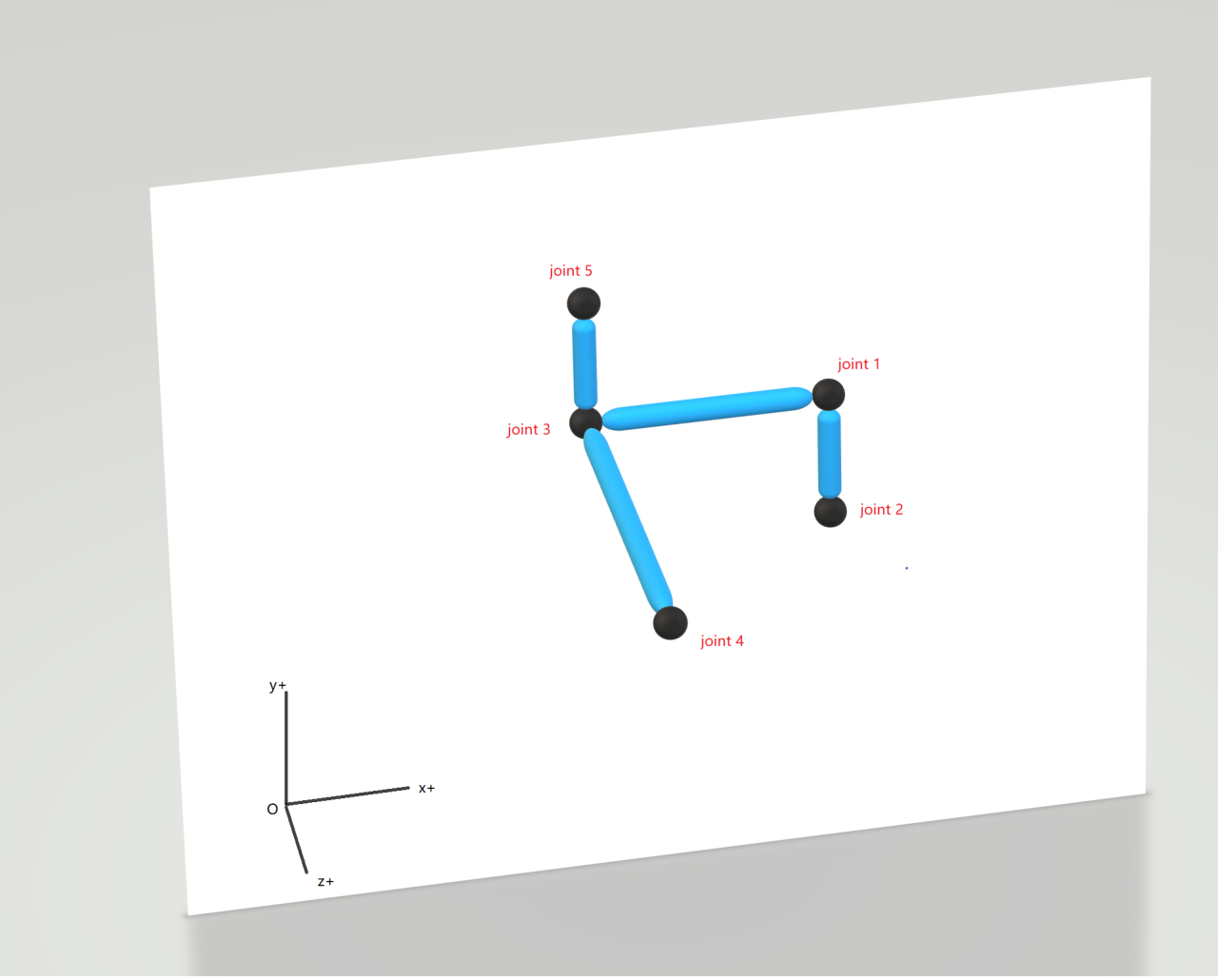
Problem A. Space Station

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	512 megabytes

"TianTing" is a huge space station. It consists of several thin cylindrical capsules. There is a joint on each end of a capsule. One joint may connect to several capsules.

If we take joints as nodes and take capsules as edges the structure of the space station can be seen as a tree.



The structure of space station corresponding to the sample input.

The shape of the space station can be shifted by rotating capsules around joints. At the beginning directions, (from one end to the other) of all the capsules are parallel to the 3D coordinate axes. A capsule can rotate around a joint of its either end as pivot arbitrarily as long as its final direction is still parallel to one of the axes. Note all the capsules which are connected to the other end (directly or indirectly) will also rotate at the same time. You do not need to worry about any collisions or overlapping of capsules. Assume they can "pass through" each other safely.

Given the shape of the space station at the beginning and a sequence of rotations afterwards can you tell the Euclidean distance between two given joints?

Input

The first line contains two integers N and Q ($2 \leq N \leq 10^5, 1 \leq Q \leq 10^5$) – the number of joints and the

number of operations.

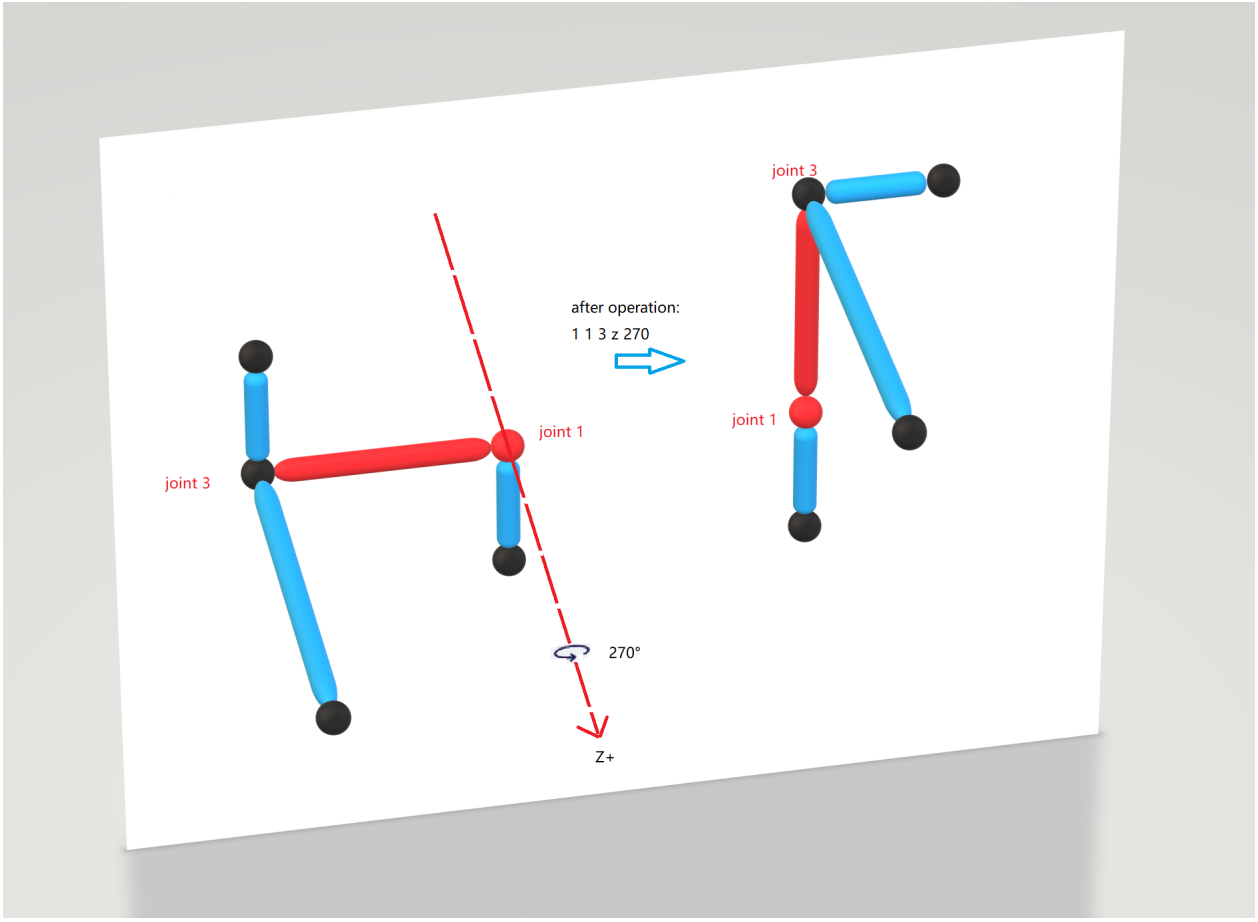
Each of the following $N-1$ lines contains three integers u, v, w ($1 \le u, v \le N, u \ne v, 1 \le w \le 10^6$) and two characters which means there is a capsule of length w between joint u and joint v. The two characters are one of "x+", "x-", "y+", "y-", "z+", "z-" which represents the direction of the capsule from joint u to joint v. It is guaranteed that the given structure is a tree.

Each of the following Q lines contains an operation. There are two types of operation: rotation of capsule and query on Euclidean distance of two given joints.

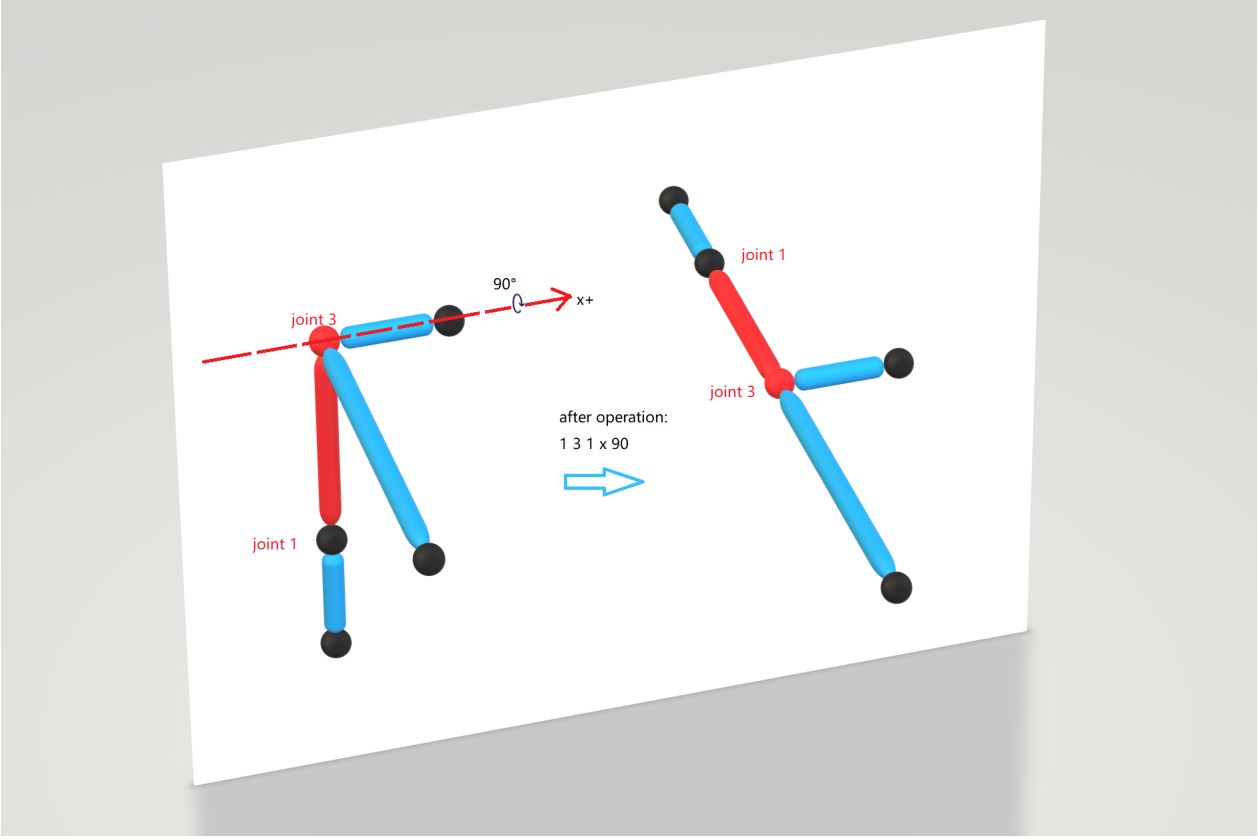
The first type is described as follows:

1 u v *axis* *degree*

Where u and v ($1 \le u, v \le N, u \ne v$) are two joints, *axis* is one of "x", "y" or "z" and *degree* is an integer either 90, 180 or 270. It means we rotate the capsule connecting joint u and joint v *degree* degrees following **right-hand rule**, using the line which points to the **positive** direction of *axis* through joint u as pivot. It is guaranteed that joint u and joint v are connected by a capsule. See the following pictures for more information about rotation.



Rotation operation: `1 1 3 z 270`



Rotation operation: `1 3 1 x 90`

The second type is described as follows:

2 u v

This means you should tell the Euclidean distance between joint u and joint v ($1 \le u, v \le N$).

Again, you do not need to worry about any collisions or overlapping of capsules. Assume they can "pass through" each other safely.

Output

For each second type operations output one line contains the distance. Your answer should have an absolute or relative error less than 10^{-9}. Namely, if your answer is a and the jury's answer is b, then your answer is accepted if $\frac{|a-b|}{\max(1,|b|)} \le 10^{-9}$.

Example

standard input	standard output
5 10 2 1 1 y+ 1 3 2 x- 3 4 3 z+ 5 3 1 y- 2 2 3 2 2 5 1 1 3 z 270 2 2 3 2 2 5 1 3 1 x 90 2 4 2 2 1 4 2 5 5 2 5 2	2.236067977499790 2.828427124746190 3.000000000000000 3.162277660168379 6.000000000000000 5.000000000000000 0.000000000000000 3.162277660168379

Note

Please read the online statement for the color figures.