

There is nothing that Toby, as a dog, enjoys more than bones. That's why he has been studying the skeleton of certain species to figure out how much fun he could have with their bones.

Toby models a skeleton as a weighted tree whose edges represent the bones and their weights denote the lengths of the bones. Thus, the nodes are simply the joints connecting different bones. For Toby it is quite hard to play with an entire skeleton, so he prefers to take a chain of connected bones instead, or, in other words, a simple path connecting two nodes in the skeleton tree. Moreover, since Toby is a greedy dog, his happiness with a particular chain of bones doesn't depend only on the chain's size but on the length of the largest bone present in the chain as well, and here is where Toby needs some help from you.

It turns out that even for members of the same species there are variations on the length of the bones that make up the skeleton (the skeleton itself keeps fixed across members). Therefore, Toby decided to model the bone lengths (i.e. edge weights) as discrete uniform random variables. This means that the weight w_i associated with the i -th edge takes integer values in the closed interval $[a_i, b_i]$.

Toby has Q queries for you. Given a description of the tree and the weight random variables, for each query Toby wants to know the expected value over the length of the largest bone present in a bones chain from joint x_q to join y_q . Formally, if w_1, w_2, \dots, w_s are the random variables denoting the edge's weights in the simple path from x_q to y_q , you are required to compute $E[\max(w_1, w_2, \dots, w_s)]$.

Input

The input contains multiple test cases. For each test case the first line contains an integer N ($2 \leq N \leq 50000$) denoting the number of nodes in the tree of bones. Each of the following $N - 1$ lines describes an edge with 4 integers: x_i, y_i, a_i, b_i ($x_i \neq y_i, 1 \leq x_i, y_i \leq N, 0 \leq a_i \leq b_i \leq 100$) where x_i and y_i represent two different nodes connected by the edge whose weight can take discrete values uniformly in $[a_i, b_i]$ (It's guaranteed that the given graph is a tree). Next, the number of queries Q is given and then, Q ($1 \leq Q \leq 100000$) more lines follow describing each query with two different nodes x_q and y_q ($x_q \neq y_q, 1 \leq x_q, y_q \leq N$) which represent both ends in a bones chain of interest for Toby. The input specification ends with EOF.

Output

For each test case there must be Q output lines answering the Q test case queries. For each of these queries print in a single line the expected value of the largest edge weight in the simple path connecting the queried nodes. Your answer will be considered correct if the absolute difference with the jury's answer is less than 10^{-5} .

Sample Input

```
6
1 2 0 50
2 3 30 40
2 4 10 80
4 5 50 90
4 6 95 100
3
1 6
3 5
2 4
2
1 2 0 100
1
2 1
```

Sample Output

```
97.5
71.70388182755067
45.00000000000014
49.99999999999986
```