Random Walk On Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

MianKing has a tree with n nodes. And he has one black chess and one white chess, both of the chess are initially on some nodes of the tree.

Now MianKing will do the following operation until the black chess and the white chess are on the same node: If the black chess is on node x, let S denote the set of nodes which connect to x directly. Then MainKing will choose a node of S randomly and move the black chess to it.

Let Len denote the number of operations MianKing did, now let $f(S,T)$ denote the expectation of Len^2 when the black chess is on node S and the white chess is on node T initially.

Let $Sub(x)$ denote the set of all of the nodes in the subtree of x when the root is node 1. Now MainKing wants you to answer Q questions, each question formed by two integers A,B and you need to answer $\sum_{S\in Sub(A)}\sum_{T\in Sub(B)} f(S,T)$

It's guaranteed that $Sub(x)\cap Sub(y)=\emptyset$ for each questions.

If the answer is irreducible fraction $\frac{x}{y}$, you need to output an integer d in $[0,998244352]$ which satisfies $d\times y \ mod\ 998244353 = x \ mod\ 998244353$. It's guaranteed that $y \ mod\ 998244353 \neq 0$

Input

The first line has two integers n, Q.

Then there are $n-1$ lines, each line has two integers (x,y) denotes an edge of the tree.

Then there are Q lines, the i-th line has two integers (A,B) denotes the i-th questions.

$1\leq n,Q\leq 10^5$

It's guaranteed that $Sub(A)\cap Sub(B)=\emptyset$ for each questions.

Output

There are Q lines, thee i-th line has one integer denotes the answer. If the answer is irreducible fraction $\frac{x}{y}$, you need to output an integer d in $[0,998244352]$ which satisfies $d\times y \ mod\ 998244353 = x \ mod\ 998244353$. It's guaranteed that $y \ mod\ 998244353 \neq 0$

Examples

standard input	standard output
3 1 1 2 1 3 2 3	24
7 4 1 2 1 3 2 4 2 5 3 6 3 7 2 3 4 5 2 7 4 7	6508 408 2833 960