DMPG '18 G3 - Lonely Carrot's Anguish

The land of carrot trees is a magical ~~land~~ tree with N nodes and $N-1$ edges, rooted at node 1. One day, a lonely carrot decides to ask Q queries of the form `n d`: the number of unordered pairs of nodes that have a depth between $\text{depth}(n)$ and $\text{depth}(n)+d$ have node n as their **lowest common ancestor**. Note that these pairs may include the node n itself and the pair may be two of the same node. Also note that this d can be larger than the height of the subtree from n. Can you help the poor carrot with these queries?

Note: The **lowest common ancestor** of nodes u and v is the furthest node from the root that is on the path from u to the root *and* on the path from v to the root.

Constraints

For all subtasks, $1 \leq a_i, b_i \leq N$ and $1 \leq n_i \leq N$.

Subtask 1 [10%]

$1 \leq N \leq 200\,000$
$1 \leq Q \leq 200\,000$
$d_i = N$

Subtask 2 [20%]

$1 \leq N \leq 2\,000$
$1 \leq Q \leq 2\,000$
$0 \leq d_i \leq N$

Subtask 3 [70%]

$1 \leq N \leq 200\,000$
$1 \leq Q \leq 200\,000$
$0 \leq d_i \leq N$

Input Specification

The first line will have N, the number of nodes.
The next $N-1$ lines will have two integers, a_i and b_i, indicating that there is an edge from a_i to b_i.
The next line will have Q, the number of queries that follow.
The next Q lines will have two space separated integers, n_i and d_i, the n and d values for the i^{th} query.

Output Specification

The answer to each query, each on a new line.

Sample Input

```
10
1 2
1 3
4 2
5 2
6 2
7 3
8 3
9 5
10 6
5
1 4
1 3
2 1
2 2
1 2
```

Sample Output

```
28
28
7
14
20
```

Explanation for Sample

For the third query for example, the 7 unordered pairs are $(2,2),(2,4),(2,5),(2,6),(4,5),(4,6),(5,6)$.