Problem D
GUID Generator

Time Limit: 5 seconds Memory Limit: 2GB

Anna is preparing a new database for her web application, in which a Globally Unique Identifier (GUID) is assigned to each table row. Getting tired of the traditional random GUID generation method, Anna decides to try something new this time.

Anna finds a tree with n nodes, where between each pair of nodes there exists one unique simple path (A simple path visits each node at most once). She assigns each node one hexadecimal character (`0-9` or `a-f`). To generate a GUID, she selects two nodes s and t (not necessarily distinct), and constructs a string by concatenating all the hexadecimal characters along the simple path from s to t. This resulting hexadecimal string is then used as a GUID. Note that the GUIDs generated by this method do not have a fixed length. Besides, the GUID produced by the path from s to t may not be the same as the GUID produced by the path from t to s.

Anna can generate different GUIDs by choosing different nodes s and t. To ensure the quality of her GUID generation method, she wants to know how many unique GUIDs can be generated from the given tree.

Input

The first line of input has a single integer n ($2 \leq n \leq 2\,000$), the number of nodes in the tree. The nodes are numbered from 1 to n. The next line contains a string of n hexadecimal characters (`0-9` or `a-f`), where the ith character is the hexadecimal character assigned to node i.

The following $n-1$ lines each contain two integers u and v ($1 \leq u, v \leq n$, $u \neq v$), indicating that there is an edge between nodes u and v. It is guaranteed that the given edges form a tree.

Output

Output a single integer, the number of unique GUIDs that can be generated from the given tree.

Explanation of Sample Case 1

Starting from node 1 or node 3, you can obtain 4 unique GUIDs: `a`, `ab`, `aba`, and `abb`. Starting from node 2, you can obtain 3 unique GUIDs: `b`, `ba`, and `bb`. Starting from node 4, you can obtain 3 unique GUIDs: `b`, `bb`, and `bba`. In total, there are 8 unique GUIDs that can be obtained.

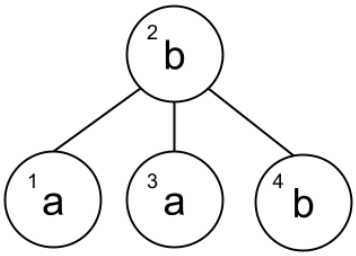


Figure D.1: Illustration of the first sample case. The node numbers are marked at the top-left of each node, and the hexadecimal characters are shown in the center.

Sample Input 1	Sample Output 1
4 abab 1 2 3 2 2 4	8

Sample Input 2	Sample Output 2
6 01aa10 1 2 2 3 2 4 4 5 5 6	18