



Task: Zagrade

An *expression* is a string of consisting only of properly paired brackets. For example, “()()” and “(())” are expressions, whereas “)(” and “(“(are not. We can define expressions inductively as follows:

- “()” is an expression.
- If a is an expression, then “(a)” is also an expression.
- If a and b are expressions, then “ab” is also an expression.

A *tree* is a structure consisting of n nodes denoted with numbers from 1 to n and $n - 1$ edges placed so there is a unique path between each two nodes. Additionally, a single character is written in each node. The character is either an open bracket “(” or a closed bracket “)”. For different nodes a and b , $w_{a,b}$ is a string obtained by traversing the unique path from a to b and, one by one, adding the character written in the node we’re passing through. The string $w_{a,b}$ also contains the character written in the node a (at the first position) and the character written in the node b (at the last position).

Find the total number of pairs of different nodes a and b such that $w_{a,b}$ is a correct expression.

Input

The first line of contains the an integer n — the number of nodes in the tree. The following line contains an n -character string where each character is either “)” or “(”, the j^{th} character in the string is the character written in the node j . Each of the following $n - 1$ lines contains two different positive integers x and y ($1 \leq x, y \leq n$) — the labels of nodes directly connected with an edge.

Output

Output the required number of pairs.

Scoring

Subtask	Score	Constraints
1	10	$n \leq 1\,000$
2	30	$n \leq 300\,000$, the tree is a <i>chain</i> — each node $x = 1, \dots, n - 1$ is connected to node $x + 1$.
3	60	$n \leq 300\,000$

Sample tests

input

4
 (())
 1 2
 2 3
 3 4

output

2

input

5
 ())((
 1 2
 2 3
 2 4
 3 5

output

3

input

7
)()()((
 1 2
 1 3
 1 6
 2 4
 4 5
 5 7

output

6