COCI '21 Contest 6 #4 Palindromi

Time limit: 1.0s **Memory limit:** 512M

You are given a sequence of n characters, `0` or `1`, indexed by numbers $1, 2, \ldots, n$. Initially, every character represents a string of length one. During a *concatenation*, two words, a and b, are chosen, deleted, and replaced by the string ab such that the characters of b are written after the characters of a.

The n initial strings are concatenated to one final string using a sequence of $n-1$ concatenations. The i^{th} of those concatenation is described by a pair of indices (a_i, b_i), which denotes that the string containing a_i^{th} character and the string containing b_i^{th} character are to be concatenated. It is guaranteed that characters with indices a_i and b_i are not in the same string.

Palindromic value of some string w is defined as the total number of unique substrings of w which are palindromes. We define palindromes as strings that are the same when read left to right and right to left. A substring of a string is defined as a string obtained by erasing zero or more characters from the beginning and/or ending of the string.

For every concatenation, print the palindromic value of the resulting string.

Input Specification

The first line contains an integer n $(1 \leq n \leq 100\,000)$, number of characters.

In the second line, there is a string of n characters `0` and `1` which represent the initial strings.

The i^{th} of following $n-1$ lines contains two integers a_i, b_i $(1 \leq a_i, b_i \leq n, a_i \neq b_i)$ representing the i^{th} concatenation.

Output Specification

Print $n-1$ lines, the palindromic values of words obtained after each concatenation.

Constraints

Subtask	Points	Constraints
1	10	$1 \leq n \leq 100$
2	20	$1 \leq n \leq 1\,000$
3	30	$a_i = 1, b_i = i + 1$ for all $i = 1, 2, \ldots, n-1$.
4	50	No additional constraints.

Sample Input 1

```
3
010
1 2
2 3
```

Sample Output 1

```
2
3
```

Sample Input 2

```
5
00111
4 1
1 5
2 1
3 1
```

Sample Output 2

```
2
3
4
5
```

Sample Input 3

```
8
10010000
7 5
4 2
3 6
1 3
6 8
5 3
1 2
```

Sample Output 3

```
2
2
2
3
4
6
8
```

Explanation for Sample Output 3

Newly created strings after every concatenation are: `00`, `10`, `00`, `100`, `1000`, `001000`, and `00100010`. Their respective palindromic values are given in the example output. E.g., the palindromic value of `00100010` is 8 because the string contains 8 palindromic substrings: `0`, `00`, `000`, `10001`, `0100010`, `1`, `010`, `00100`.