Wesley's Anger Contest 1 Problem 4 (Hard Version) - A Red-Black Tree Problem

Time limit: 0.6s **Memory limit:** 512M

It is well known that Wesley is bad at dynamic programming. Six months after the contest, Wesley learned that you can solve the original problem with a significantly better time complexity. He decided to create a new problem with tighter constraints. **The only differences between this problem and the original are the bounds on N and K, as well as the time and memory limits. In addition, there will not be language specific time limits.**

You are given a tree with N vertices. Recall that a tree is a connected graph where there is exactly one path between any two vertices. Each vertex in this tree is assigned a colour, red or black. You are asked to determine the number of balanced subgraphs with exactly K vertices. A subgraph is considered to be balanced if all vertices are connected and there are at least 2 red vertices and 2 black vertices.

Wesley originally wanted you to output the full answer, but he decided to be nice and only ask you to output it modulo $998\,244\,353$. It may be helpful to know that $998\,244\,353$ is prime and $998\,244\,353 = 119 \times 2^{23} + 1$.

For this question, a connected subgraph is a subset of the original vertices and edges that form a tree.

Constraints

$1 \leq K \leq N \leq 1\,000$

$1 \leq u_i, v_i \leq N$

The graph is a tree.

Input Specification

The first line contains 2 integers, N and K.

The next line contains a string of N characters, describing the colouring of the tree. Each character is either `R` or `B`. If the ith character is `R`, then vertex i is red. Otherwise, it is black.

The next $N-1$ lines describe the edges of the tree. Each line contains 2 integers, u_i, v_i, indicating an edge between u_i and v_i.

Output Specification

This problem is graded with an `identical` checker. This includes whitespace characters. Ensure that every line of output is terminated with a `\n` character and that there are no trailing spaces.

Output a single integer, the number of balanced subgraphs with exactly K vertices, modulo $998\,244\,353$.

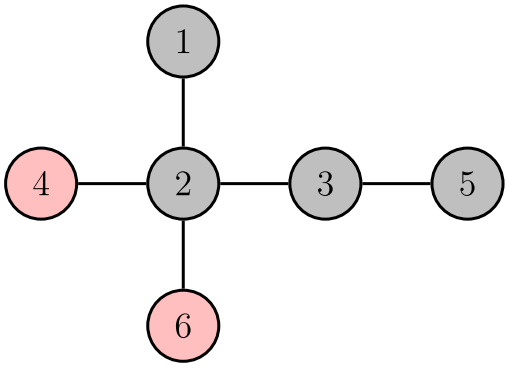
Sample Input 1

```
6 5
BBBRBR
1 2
2 3
2 4
3 5
2 6
```

Sample Output 1

```
2
```

Sample Explanation 1



The two balanced subgraphs of size 5 are $\{1, 2, 3, 4, 6\}$ and $\{2, 3, 4, 5, 6\}$.

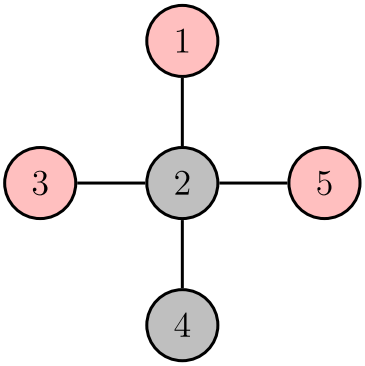
Sample Input 2

```
5 4
RBRBR
1 2
2 3
2 4
2 5
```

Sample Output 2

```
3
```

Sample Explanation 2



The three balanced subgraphs of size 4 are $\{1, 2, 3, 4\}$, $\{1, 2, 4, 5\}$, and $\{2, 3, 4, 5\}$.