

# COMPARISON



SEASON 2021/2022 – SIXTH ROUND

The end of the school year is approaching and Harry has a lot of work to do. Instead he's trying to win the new game *String Comparison: Graph Edition*.

The rules of the game are relatively simple. You are given a tree with a letter of the English alphabet at each node. You should be able to answer queries of the following type: compare lexicographically the string that is obtained from the path between vertices  $a$  and  $b$  with the string that is obtained from the path between vertices  $c$  and  $d$ . A string from a path between given vertices  $v$  and  $u$  is obtained by concatenating all letters of the path from  $v$  to  $u$  in the order in which they occur. The last update of the game added another query type: change the letter in vertex  $v$  to letter  $c$ .

Harry really wants to win the game, so he decided to make a program that would answer the queries for him. I guess you know how that endeavor of his ended. Now you have to make a `comparison.cpp` program that answers the queries for him.

## Input

The first line of `comparison.in` gives the numbers  $N$  and  $Q$ , the number of vertices and queries, respectively. The second line gives the  $N$  characters, which are the initial letters written in the nodes, where the  $i$ -th of them, numbered from 1, corresponds to node number  $i$ . The next  $N - 1$  rows give the edges of the tree. From the last  $Q$ , the queries are given in the following form: 1,  $v$ ,  $c$  for a change query and 2,  $a$ ,  $b$ ,  $c$ ,  $d$  for a comparison query.

## Output

For each comparison query, you must output the answer on a new line. Let the path string from  $a$  to  $b$  be  $s_1$  and the path string from  $c$  to  $d$  be  $s_2$ . Then if  $s_1 < s_2$  output 0, if  $s_1 > s_2$  output 1, if  $s_1 = s_2$  output 2.

## Constraints

$$1 \leq N, Q \leq 10^5$$

$$1 \leq a, b, c, d, v \leq N$$

*All symbols are letters of the English alphabet.*

**Time limit: 4.0 sec.**

**Memory limit: 256 MB.**

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## Sample testcases

Input (comparison.in)	Output (comparison.out)
6 6	0
adcbcb	1
1 6	2
3 6	0
2 4	
4 3	
5 3	
2 6 4 4 5	
2 1 5 1 2	
1 4 c	
2 6 4 6 5	
1 5 d	
2 5 1 2 3	