



5

Unique Cities

There are N cities in JOI Country, numbered from 1 through N . The cities are connected by $N - 1$ roads. The i -th road ($1 \leq i \leq N - 1$) connects the cities A_i and B_i bidirectionally. From any city to any city, it is possible to travel using some roads.

JOI Country has some local specialities. Each kind of speciality is assigned an integer between 1 and M , inclusive (some integer may not correspond to any speciality in JOI Country). Each city produces one kind of speciality. The city j ($1 \leq j \leq N$) produces the speciality C_j . Multiple cities may produce the same kind of speciality.

We define the distance between two cities as the minimum number of roads needed to pass to travel from one to the other. For the city x ($1 \leq x \leq N$), we say the city y ($1 \leq y \leq N$, $y \neq x$) is a **unique city** if for any city z ($1 \leq z \leq N$, $z \neq x$, $z \neq y$) the distance between the cities x and y is different from the distance between the cities x and z .

Mr. K, the Minister of Transport in JOI Country, wants to know for each j ($1 \leq j \leq N$), the number of kinds of specialities produced in the unique cities for the city j .

Write a program which, given the information of roads in JOI Country and the kind of specialities produced in each city, calculates for each city, the number of kinds of specialities produced in the unique cities for it.

Input

Read the following data from the standard input.

```
 $N$   $M$   
 $A_1$   $B_1$   
:  
 $A_{N-1}$   $B_{N-1}$   
 $C_1 \cdots C_N$ 
```

Output

Write N lines to the standard output. The j -th line ($1 \leq j \leq N$) should contain the number of kinds of specialities produced in the unique cities for the city j .

Constraints

- $2 \leq N \leq 200\,000$.
- $1 \leq M \leq N$.



- $1 \leq A_i \leq N$ ($1 \leq i \leq N - 1$), $1 \leq B_i \leq N$ ($1 \leq i \leq N - 1$).
- $A_i \neq B_i$ ($1 \leq i \leq N - 1$).
- From any city to any city, it is possible to travel using some roads.
- $1 \leq C_j \leq M$ ($1 \leq j \leq N$).

Subtasks

1. (4 points) $N \leq 2000$.
2. (32 points) $M = 1$.
3. (32 points) $M = N$, $C_j = j$ ($1 \leq j \leq N$).
4. (32 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
5 4	2
1 2	0
2 3	1
3 4	1
3 5	1
1 2 1 2 4	

The unique cities for the city 1 are the cities 2 and 3, in which the specialities 2 and 1 are produced, so the answer is 2.

There are no unique cities for the city 2, so the answer is 0.

The unique city for the city is the city 1, in which the speciality 1 is produced, so the answer is 1.

The unique cities for the city 4 are the cities 1 and 3, in both of which the speciality 1 is produced, so the answer is 1.

The unique cities for the city 5 are the cities 1 and 3, in both of which the speciality 1 is produced, so the answer is 1.

Note that there does not exist a speciality 3.



Sample Input 2	Sample Output 2
7 1	1
1 2	1
2 3	1
3 4	0
4 5	1
5 6	1
6 7	1
1 1 1 1 1 1 1	

This sample input satisfies the constraints for the subtask 2.

Sample Input 3	Sample Output 3
10 10	4
2 6	3
5 8	4
10 8	2
1 4	0
10 6	2
4 5	2
10 7	0
6 9	3
3 7	2
1 2 3 4 5 6 7 8 9 10	

This sample input satisfies the constraints for the subtask 3.



Sample Input 4	Sample Output 4
22 12	2
9 6	0
12 13	1
4 20	1
21 22	1
3 19	1
2 9	1
6 18	0
18 11	0
18 3	1
16 2	2
6 4	0
3 17	1
16 10	1
8 16	2
22 1	0
16 14	2
15 8	1
9 21	2
2 12	3
21 5	0
12 7	0
1 1 4 8 4 11 7 6 7 11 6 11 10 4 7 5 3 12 9 6 12 2	