

F. Juan's Colorful Tree

time limit per test: 3 seconds

memory limit per test: 1024 megabytes

Juan has a beautiful tree with n nodes numbered from 1 to n . There are also k distinct colors numbered from 1 to k . Each node u in the tree has its own set C_u which contains colors. Let's denote with s the quantity $\sum_{i=1}^n |C_i|$.

There are q queries where you will be given nodes u and v . Let P denote the set of all nodes in the simple path between u and v , inclusive. You are asked to calculate for each query the following quantity:

$$\left| \bigcap_{w \in P} C_w \right|$$

That is, the cardinality of the intersection of the sets of all the nodes in the path from u to v . In other words, calculate how many colors appear in every set on the path from u to v .

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \leq t \leq 10^4$). The description of the test cases follows.

The first line of each test case contains four integers n , k , s , and q ($1 \leq n, k, q \leq 3 \cdot 10^5, 1 \leq s \leq \min(nk, 3 \cdot 10^5)$) — the number of nodes in the tree, the number of distinct colors, the sum of the cardinalities of all sets of colors, and the number of queries, respectively.

The next $n - 1$ lines each contain two integers u, v ($1 \leq u, v \leq n$), indicating that there's an edge between nodes u and v .

The next s lines each contain two integers v and x ($1 \leq v \leq n, 1 \leq x \leq k$) indicating that color x is in C_v . All s lines are pairwise distinct.

The next q lines each contain two integers u and v ($1 \leq u, v \leq n$), indicating a query between nodes u and v .

It is guaranteed that the sum of n over all test cases does not exceed $3 \cdot 10^5$.

It is guaranteed that the sum of k over all test cases does not exceed $3 \cdot 10^5$.

It is guaranteed that the sum of s over all test cases does not exceed $3 \cdot 10^5$.

It is guaranteed that the sum of q over all test cases does not exceed $3 \cdot 10^5$.

Output

For each test case, output a line: the answer to all queries in the order they appear in the input, separated by spaces.

Example

input

Copy

```

2
3 5 10 4
1 3
2 1
1 1
1 2
1 3
1 4
1 5
2 1
2 2
2 5
3 1
3 2
1 3

```

Codeforces Round 1056 (Div. 2)


Contest is running

00:36:15

Contestant



→ Submit?

Language: GNU G++20 13.2 (64 bit, v 

Choose file:

选择文件

 未选择文件

Be careful: there is 50 points penalty for submission which fails the pretests or resubmission (except failure on the first test, denial of judgement or similar verdicts). "Passed pretests" submission verdict doesn't guarantee that the solution is absolutely correct and it will pass system tests.

Submit

→ Score table

	Score
Problem A	334
Problem B	668
Problem C	1169
Problem D	1336
Problem E	1503
Problem F	2004
Successful hack	100
Unsuccessful hack	-50
Unsuccessful submission	-50
Resubmission	-50

* If you solve problem on 01:23 from the first attempt

```

2 3
1 2
1 1
9 3 12 10
7 2
2 4
6 8
9 6
2 1
5 8
2 5
3 9
1 3
6 1
9 3
9 1
5 1
2 3
8 1
4 3
5 3
8 3
7 3
3 1
4 7
1 4
4 5
5 5
4 2
9 9
2 2
2 2
5 2
7 3

```

output

Copy

```

2 2 3 5
1 1 1 2 1 2 1 1 1 0

```

Note

In the first test case, there is a tree of 3 nodes with edges $(1, 3)$ and $(2, 1)$. The colors in the sets of each node are:

- $C_1 = \{1, 2, 3, 4, 5\}$
- $C_2 = \{1, 2, 5\}$
- $C_3 = \{1, 2\}$

The 4 queries are between the pairs of nodes $(1, 3)$, $(2, 3)$, $(1, 2)$, $(1, 1)$ and correspond to calculating the following quantities respectively:

- $|C_1 \cap C_3| = |\{1, 2\}| = 2$
- $|C_2 \cap C_1 \cap C_3| = |\{1, 2\}| = 2$
- $|C_2 \cap C_1| = |\{1, 2, 5\}| = 3$
- $|C_1| = |\{1, 2, 3, 4, 5\}| = 5$

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