

Problem J. Lowest Common Ancestors

In graph theory the lowest common ancestor (LCA) of two nodes v and w in a rooted tree T is the deepest node that has both v and w as descendants. Here we define each node to be a descendant of itself. The LCA of two nodes in T is the shared ancestor of them that is located farthest from the root.

But how about an un-rooted tree?

In this problem you are given an un-rooted tree T with n nodes labelled from 1 to n and several pairs of nodes (v_i, w_i) .

For each node x of T , consider the tree rooted by x which becomes a rooted tree; and calculate the summation $\sum_i LCA(v_i, w_i)$.

Input

The input has several test cases and the first line contains an integer t ($1 \leq t \leq 28$) which is the number of test cases.

For each test case, the first line contains two integers n and q ($1 \leq n, q \leq 100000$). Each of the following $n - 1$ lines describes an edge with two integers v and w ($1 \leq v, w \leq n$). Then following q lines contains q pairs of nodes (v_i, w_i) described as above ($1 \leq v_i, w_i \leq n$).

Both of the sum of n and the sum of q in input are smaller than 1000000.

Output

For each test case, output a line with n integers.

The i -th one is the value of $\sum_i LCA(v_i, w_i)$ corresponding to the tree rooted by the i -th node.

Example

standard input	standard output
2	3 5 7 9
4 3	1 2 3 4
1 2	
1 3	
1 4	
2 3	
3 4	
2 4	
4 1	
1 2	
2 3	
3 4	
1 4	