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 ($1 \le t \le 28$) which is the number of test cases.

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

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 4 3 1 2 1 3 1 4 2 3 3 4 2 4 4 1 1 2 2 3 3 4 1 4	3 5 7 9 1 2 3 4