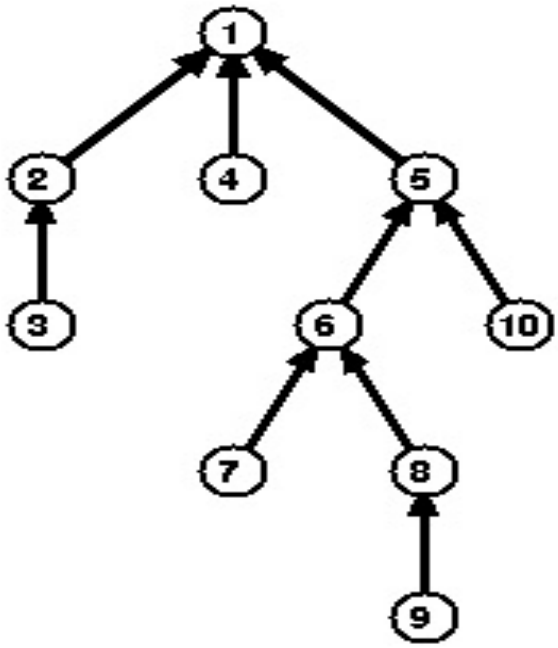
IIUPC 2014

Problem F: Light Combat Aircraft

In graph theory. the **lowest common ancestor** (**LCA**) of two distinct nodes ***v*** and ***w*** in a rooted tree is the lowest (i.e. deepest) node that has both ***v*** and ***w*** as descendants, where we define each node to be a descendant of itself (so if ***v*** has a direct connection from ***w***, ***w*** is the lowest common ancestor).



For example, on the above tree (depicted from case 1) **LCA(3,5)** = **1**, **LCA(7,10)** = **5**, **LCA(6,5)** = **5** etc.

In this problem, given a Forest, i.e. a disjoint union of rooted trees, you have to find out for each node **u** how many distinct pair of nodes **(*v*,*w*)** exist such that **LCA(v,w)** would be **u**. You should assume that both **(*v*,*w*)** and **(*w*,*v*)** are same pair.

Input

First line of input file contains number of test cases, **T ≤ 100** and **T** cases follow. Each case starts with an integer **N (1≤ N≤ 10000)**, number of nodes in the forest. Next line contains **N** integers, $p_1, p_2, \ldots p_N$ **(0≤ p_i≤ N),** where p_i is the parent of i^{th} **(1≤ i≤ N)** node in a rooted tree of the forest , If $p_i = 0$ then node **i** is a root in rooted tree.

Output

For each case, print the forest number starting from **1** and number of LCA pair for each node (ordered by node number) separated by space. See the sample output for exact formatting.

Sample Input	Output for Sample Input
4 10 0 1 2 1 1 5 6 6 8 5 3 2 0 0 4 0 1 2 1 4 0 1 0 3	Forest#1: 29 1 0 0 9 5 0 1 0 0 Forest#2: 0 1 0 Forest#3: 5 1 0 0 Forest#4: 1 0 1 0

Problem Setter: Prasanjit Barua
Alternate Solution: Kayser Abdullah

Output Explanation

In **case 2**, in the given forest among the two trees rooted at **2** and **3**, there is no pair for which LCA is **1** or **3**. For pair **(1, 2)** LCA is **2**. So, total pair for **2** is **1**.
In **case 3**, for pair **(1,2), (1,3), (1,4), (2,4), (3,4)** LCA is **1**. For only pair **(2,3)** LCA is **2**. There is no pair for which LCA is **3** or **4**.

Note: Dataset is huge, so use faster I/O methods.