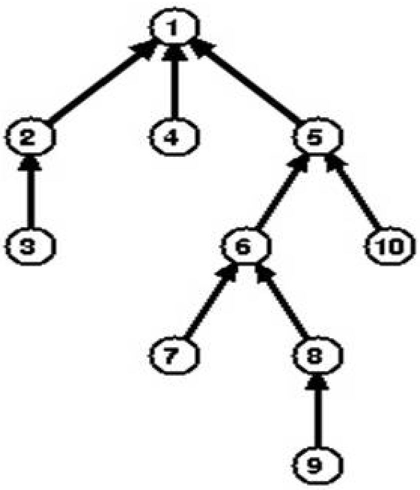
In graph theory. the **lowest common ancestor** (**LCA**) of two distinct nodes v and w in a rooted tree is the lowest (i.e. deepest) node that has both v and w as descendants, where we define each node to be a descendant of itself (so if v has a direct connection from w, w is the lowest common ancestor).



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, $T \leq 100$ and T cases follow. Each case starts with an integer N $(1 \leq N \leq 10000)$, number of nodes in the forest. Next line contains N integers, p_1, p_2, $\ldots$, p_N $(0 \leq p_i \leq N)$, where p_i is the parent of i-th $(1 \leq i \leq N)$ 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.

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.

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
```

Sample Output

```
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
```