Problem J. Unlimited Battery Works

Description

One day, Little Apple invented a chess game on a rooted tree and he wants to play with you. At the beginning, there is one and only one black chess piece placed on every vertex of the tree. In each turn, you can cast a magic on one vertex, which will change the chess piece on it into white piece whatever it's white or black before magic. And at the same time, chess pieces on some vertices will also be changed into white pieces. If you cast a magic on vertex i, chess piece on vertex j will also be changed into white piece if and only if vertex j is in the subtree of vertex i and the length (in edges) of the shortest path between i and j is no more than A_i.

Little Apple wants to know how many steps are neccessary in order to change the tree into a tree with all chess pieces white. However, as an excellent programmer, you think it's too easy for you. You want to calculate the expected steps needed to change all chess pieces on the tree into white if you choose a vertex to cast a magic randomly (assume that each vertex has the same probability to be chosen).

Please notice that:

1. If all chess pieces on the tree have been changed into white, you won't cast magic anymore.
2. In every turn, it's possible to choose **any** vertex of the tree.

Input

The first line of the input gives the number of test cases, T. T test cases follow.

For each test case, the first line contains an integer n ($1 \leq n \leq 50$), the number of vertices on the tree. The second line contains n integers, which represent $A_1, A_2, \ldots, A_n$ (as described above, $1 \leq A_i < 50$ for $1 \leq i \leq n$). The last line conatins $n - 1$ integers, the i-th integer represent the parent of vertex $i + 1$.

It guaranteed that the given graph is a tree and vertex 1 is always the root of the tree.

Output

For each test case, output one line containing "Case #x: y", where x is the test case number (starting from 1) and y is the expected steps needed to change all the chess pieces into white.

Your answer will be considered correct if it is within an absolute error of 10^{-6} of the correct answer.

Samples

Sample Input	Sample Output
3 6 1 0 0 0 0 0 1 1 1 1 1 6 1 0 1 0 1 0 1 2 3 4 5 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 4 3 1 2 7 6 9 6 8 10 9 13 16 15 13 18 14 15 19 22 18 24 26 27 25 27 28 25 28 30 34 34 33 34 34 33 36 36 36 37 42 42 44 43 46 48	Case #1: 6.000000000000 Case #2: 11.000000000000 Case #3: 224.960266916471