Problem G. Legacy of the Void

After joining the Templar, Dark Templar, the Purifier and Taldarim together, Artanis's team is planing to recover Aiur (the homeland of the Protoss) and destroy Amon, the fallen XelNaga. In order to weaken Amon's force, Artanis first has to destroy the Power Structures that power the large psi-matrix under Aiur.

The Power Structure has N nodes, and they are connected by $N-1$ undirected roads, such that it is possible to use the roads to travel from any node to any other node. The nodes are numbered 1 through N. The i^{th} node has a power crystal which holds W_i units of power. When Artanis attacks the i^{th} node, he has probability P_i to successfully destroy the power crystal and make the Power Structure lose all W_i units of power that were contributed by that node. (If he does not destroy the power crystal, nothing happens to that node.)

With the help of Karax, Artanis will run some simulations on a virtual Power Structure in his warship, Spear of Adun, to help him decide on the best strategy. Artanis will run a total of Q simulations. In each simulation, he will select one of the connected blocks in the Power Structure, uniformly at random from the set of all connected blocks. (A block of nodes is connected if any node in that block can be reached from any other node in that block without traveling through any nodes not in that block. As a special case, any single node is also a connected block.) Then, he will try to attack all the nodes in this block, as described above, and the simulation will report the total amount of units of power lost by the Power Structure. (The virtual Power Structure resets between simulations.)

Artanis will have Q integers (each representing a total amount of power lost) after running all of the simulations. To analyze the data, he will sort them in nondecreasing order.

What is the expected value of the K^{th} integer in this sorted array? (K counts starting from 1.)

Input

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

Each test case has the following format, in this order:

1. One line with three integers N, Q, and K, as described above.
2. $N-1$ lines. Each of these has two integers U_i and V_i, which means there is one road between node U_i and a **different** node V_i. (All of these pairs of nodes are different.)
3. One line with N integers W_i, each of which gives the number of units of power stored in the crystal of the i^{th} node.
4. One line with N integers P_i, each of which gives the percent chance of success when Artanis attacks the i^{th} node.

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 expectation of the K^{th} number in the sorted results list. `y` will be considered correct if it is within an absolute or relative error of 10^{-6} of the correct answer.

Limits

- $1 \leq T \leq 30$.
- $1 \leq N \leq 200$.
- $1 \leq Q \leq 50$.
- $1 \leq K \leq Q$.
- $1 \leq U_i, V_i \leq N$.
- $0 \leq W_i \leq 50000$.
- $0 \leq \sum_{i=1}^{N} W_i \leq 50000$.
- $0 \leq P_i \leq 100$.

Sample input and output

Sample Input	Sample Output
3 1 2 2 1 50 3 1 1 3 2 1 2 1 1 1 100 100 100	Case #1: 0.7500000000 Case #2: 1.6666666667

Note

In Case #1, there is only one node, which holds 1 unit of power. An attack on this node will destroy it with 50% probability. Since this one node is the only connected block, every simulation will always select it. The possible outcomes of the two simulations, and the sorted lists of values, are:

- success, success: 1 1
- success, failure: 0 1
- failure, success: 0 1
- failure, failure: 0 0

All of these outcomes are equally likely in this case, so the expected value for position 2 is $\frac{1+1+1+0}{4} = 0.75$.

In Case #2, there are three nodes, connected `1-2-3`, and each holds 1 unit of power and is certain to be destroyed if Artanis attacks it. The connected blocks are: `{1}`, `{2}`, `{3}`, `{1, 2}`, `{2, 3}`, and `{1, 2, 3}`. (Note that `{1, 3}` is **NOT** a connected block since you cannot get from 1 to 3 without using a node not in the block.) The simulation will choose one of these uniformly at random. Since the numbers of units of power destroyed in each, respectively, are `1`, `1`, `1`, `2`, `2`, and `3`, the expected value of the first (and only) element of the list is $\frac{10}{6}$.