Problem M. Monster Hunter

There is a rooted tree with n vertices and the root vertex is 1. In each vertex, there is a monster. The hit points of the monster in the i-th vertex is hp_i.

Kotori would like to kill all the monsters. The monster in the i-th vertex could be killed if the monster in the direct parent of the i-th vertex has been killed. The power needed to kill the i-th monster is the sum of hp_i and the hit points of all other living monsters who lives in a vertex j whose direct parent is i. Formally, the power equals to

$$hp_i + \sum_{\substack{\text{the monster in vertex } j \text{ is } \textbf{alive} \\ \text{and } i \text{ is the direct parent of } j}} hp_j$$

In addition, Kotori can use some magic spells. If she uses one magic spell, she can kill any monster using 0 power without any restriction. That is, she can choose a monster even if the monster in the direct parent is alive.

For each $m = 0, 1, 2, \cdots, n$, Kotori would like to know, respectively, the minimum total power needed to kill all the monsters if she can use m magic spells.

Input

There are multiple test cases. The first line of input contains an integer T indicating the number of test cases. For each test case:

The first line contains an integer n ($2 \le n \le 2 \times 10^3$), indicating the number of vertices.

The second line contains $(n-1)$ integers $p_2, p_3, \cdots, p_n$ ($1 \le p_i < i$), where p_i means the direct parent of vertex i.

The third line contains n integers $hp_1, hp_2, \cdots, hp_n$ ($1 \le hp_i \le 10^9$) indicating the hit points of each monster.

It's guaranteed that the sum of n of all test cases will not exceed 2×10^3.

Output

For each test case output one line containing $(n+1)$ integers $a_0, a_1, \cdots, a_n$ separated by a space, where a_m indicates the minimum total power needed to kill all the monsters if Kotori can use m magic spells.

Please, DO NOT output extra spaces at the end of each line, otherwise your answer may be considered incorrect!

Example

standard input	standard output
3 5 1 2 3 4 1 2 3 4 5 9 1 2 3 4 3 4 6 6 8 4 9 4 4 5 2 4 1 12 1 2 2 4 5 3 4 3 8 10 11 9 1 3 5 10 10 7 3 7 9 4 9	29 16 9 4 1 0 74 47 35 25 15 11 7 3 1 0 145 115 93 73 55 42 32 22 14 8 4 1 0