

## 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

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

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  $m = 0, 1, 2, \dots, n$ , 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  $n$  ( $2 \leq n \leq 2 \times 10^3$ ), indicating the number of vertices.

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

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

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

### Output

For each test case output one line containing  $(n + 1)$  integers  $a_0, a_1, \dots, a_n$  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	29 16 9 4 1 0
5	74 47 35 25 15 11 7 3 1 0
1 2 3 4	145 115 93 73 55 42 32 22 14 8 4 1 0
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	