Subtree Median

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Question

Consider a binary tree with n vertices. Each vertex is represented by an index and a value. The indices range from 0 to $n - 1$. The binary tree is represented in the form of a parent array p where p_i is the parent of the vertex with index i. The parent of the root node is -1. Find out the median of values of the vertices in subtree of a given node.

Input

First line of input contains the number of nodes n. $n \leq 10^5$
The second line of input contains the parent array. $-1 \leq p[i] \leq n - 1$
The third line of input contains value array $1 \leq value[i] \leq 10^9$

Output

Output median of values of nodes in subtree of every node seperated by a space

Note

Input 1

5
-1 0 1 2 3
2 4 5 4 3

Output 1

4 4 4 3 3

Input 2

5
-1 0 0 1 1
9 4 9 9 9

Output 2

9 9 9 9 9