

## Problem Halftime Changes

Input file        `stdin`  
Output file      `stdout`

You are given a tree with  $N$  nodes, with root in node 1, and two arrays  $A$  and  $B$ , having  $N$  elements, indexed from 1 to  $N$ .

It is guaranteed that each level of the tree contains at most 100 nodes.

You have to select some nodes  $Y$  for which it is possible to choose:

- a subset  $S(Y)$  of nodes on the path from the root to  $Y$ ;  $S(Y)$  can be empty
- a node  $X(Y)$  that is a **proper ancestor** of both  $Y$  and all the nodes from  $S(Y)$ .

Such as the following condition holds:

$$A[X(Y)] - \sum_{v \in S(Y)} A[v] = B[Y]$$

A **proper ancestor** of  $V$  is any node  $U$  such that node  $U$  is an ancestor of node  $V$  and  $U$  is not the same node as  $V$ .

Before solving the problem, just like Nea' Gigi, the owner of FCSB, often makes miraculous changes at halftime, you are allowed to make changes. You can change at most  $K$  elements of the array  $A$ . The changed values are at least 1 and at most  $10^7$ .

Take note that  $K$  is not given in the input. In the description of the subtasks it is specified the value of  $K$  depending on  $N$ .

After the changes are made and the nodes are selected as specified in the above statement, let  $M$  be the number of selected nodes  $Y$ .

You will be scored based on how large the number  $M$  is. **Note:** You are not required to find the maximum possible value of  $M$ . You will get the points for a subtask if  $M$  meets the condition specified in the subtask description.

### Input

The first line contains the number  $N$ . The second line contains  $N - 1$  values, where the  $i$ -th value represents the parent of node  $i + 1$ . The third line contains  $N$  integers, representing the array  $A$ . The last line contains  $N$  integers, representing the array  $B$ .

### Output

The first line contains the elements of the array  $A$  after the changes, in order from 1 to  $N$ . The second line contains an integer  $M$ , representing the number of nodes  $Y$  that satisfy the given condition. The following  $M$  lines contains data about chosen nodes  $Y$ . Each of these  $M$  lines has the following format:

- The node  $Y$  which satisfies the condition.
- The chosen **proper ancestor** node  $X(Y)$ .
- The size of the selected subset  $S(Y)$  of nodes (can be 0).
- The nodes in the subset  $S(Y)$  (if any).

The values on the same line in the output are separated by a single space.

## Restrictions

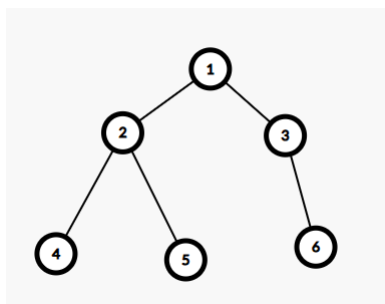
- $1 \leq N \leq 400\,000$
- $1 \leq A_i, B_i \leq N, (1 \leq i \leq N)$
- The solution is not unique and you will be scored according to the subtasks description.

#	Points	Restrictions
1	12.5	$N = 5000, K = 1500, 10 \leq M$
2	4	$N = 5000, K = 1500, 70 \leq M$
3	8.5	$N = 5000, K = 1500, 500 \leq M$
4	25	$N = 5000, K = 1500, 3500 \leq M$
5	12.5	$N = 400\,000, K = 3000, 20 \leq M$
6	4	$N = 400\,000, K = 3000, 1000 \leq M$
7	8.5	$N = 400\,000, K = 3000, 80\,000 \leq M$
8	25	$N = 400\,000, K = 3000, 397\,000 \leq M$

## Examples

Input file	Output file
6 1 1 2 2 3 3 2 1 2 3 2 1 5 2 3 2 5	10 5 1 2 3 2 3 2 1 1 2 4 2 1 4 5 1 2 2 5

## Explanations



In the array  $A$ , 3 changes were made for positions 1, 2, and 3.

The number of nodes  $Y$  that satisfy the condition after the changes is  $M = 3$ .

For example, one of the selected nodes is  $Y = 2$ ,  $X(2) = 1$  and the subset  $S(Y)$  has 1 node,  $S(2) = \{2\}$ . It can be observed that  $A[1] - A[2] = 10 - 5 = 5 = B[2]$ .

Another selected node is  $Y = 5$ ,  $X(5) = 1$  and the subset  $S(Y)$  has 2 nodes,  $S(5) = \{2, 5\}$ . It can be observed that  $A[1] - (A[2] + A[5]) = 10 - (5 + 3) = 2 = B[5]$ .