

Do you remember Toby? He is a very cute dog who lives in tobyland.

Toby lives in a city where any two houses are connected by exactly one path, and that path is bidirectional. All the houses are identified by an integer  $0 \leq id < N$ , and have another integer indicating its corresponding value.

Toby found on internet an interesting game called, "the subtraction game" that goes as follow:

Given a sequence of  $N$  elements:  $a_0, a_1, \dots, a_{n-1}$ :

If all the numbers are equal, the game ends.

Otherwise

Select two numbers which are unequal

Subtract the smaller number from the larger number

Replace the larger number with the result from above.

The game **always** ends and no matter how you play, it will always terminate **on the same value**. The result of the game is that value.

The game is so cool for Toby that he decides to play it as much as possible. For this reason each day Toby visits two friends who live in the houses  $u$  and  $v$  and records all the values of the houses in the path from  $u$  to  $v$  (inclusive). At the end of the day he plays the subtraction game with the sequence that he wrote.

The value of a house can change sometimes, but Toby will always know the new value.

In order to help Toby, he asks to answer the following types of queries:

1. given  $u, v$ : Find the result of the subtraction game on the path from  $u$  to  $v$  (inclusive).
2. given  $u, x$ : Change the value of the house  $u$  by  $x$ .

## Input

The input has several test cases. The first line contains an integer  $N \leq 50000$ , the number of houses. The next line contains  $N$  integers, the  $i$ -th number is the value of the  $i$ -th house  $1 \leq value \leq 10000$ .

The next  $N - 1$  lines contain two integers  $0 \leq u, v \leq N - 1$  indicating a connection between the houses  $u$  and  $v$ .

The next line contains an integer  $1 \leq q \leq 10000$  followed by  $q$  lines each containing a query. The first number of each of those lines is the query type and the rest of the line contains the query parameters.

## Output

For each query of type 1, print the result of the subtraction game in the path from  $u$  to  $v$ .

## Sample Input

```
5
5 15 20 15 9
0 2
0 3
3 1
3 4
3
1 2 1
2 3 3
1 1 4
```

## Sample Output

```
5
3
```