

# Dynamically-Rooted Tree

You are given a rooted tree with  $N$  nodes, numbered from 1 to  $N$ . Initially node 1 is the root. Each node  $i$  has a weight  $W[i]$ . You have to perform two types of operations:

"S  $a$ " - Find the sum of weights of node  $a$ 's sub-tree nodes (including node  $a$ ).

"R  $a$ " - Change root of the tree to  $a$ .

## Input

**Line 1:**  $N$  ( $1 \leq N \leq 10^5$ ), number of nodes.

**Line 2:**  $N$  space-separated integers, weights of nodes from 1 to  $N$ .  $i$ 'th integer is  $W[i]$  ( $1 \leq W[i] \leq 10^9$ ).

**Line 3:**  $N-1$  space-separated integers,  $i$ 'th integer is the parent of node  $i+1$ .

**Line 4:**  $Q$ , the number of operations ( $1 \leq Q \leq 10^5$ ).

**Lines 5 .. 5+Q-1:** Every line contains a space separated character and an integer. Character describes the type of the operation, and integer is the node number.

## Output

For each operation of type 'S', output the operations result in a separate line.

## Example

### Input:

```
5
2 1 1 1 2
1 1 2 2
3
S 2
R 2
S 1
```

### Output:

```
4
3
```