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 ($1 <= N <= 10^5$), number of nodes.

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

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

Line 4: Q, the number of operations ($1 <= Q <= 10^5$).

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
```