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# G. The Awesomest Vertex

time limit per test: 5 seconds memory limit per test: 256 megabytes input: standard input output: standard output

You are given a rooted tree on n vertices. The vertices are numbered from 1 to n; the root is the vertex number 1.

Each vertex has two integers associated with it:  $a_i$  and  $b_i$ . We denote the set of all ancestors of v (including v itself) by R(v). The awesomeness of a vertex v is defined as

$$\left| \sum_{w \in R(v)} a_w 
ight| \cdot \left| \sum_{w \in R(v)} b_w 
ight|,$$

where |x| denotes the absolute value of x.

Process *q* gueries of one of the following forms:

- 1 v x increase  $a_v$  by a positive integer x.
- 2 v report the maximum *awesomeness* in the subtree of vertex v.

# Input

The first line contains two integers n and q ( $1 \le n \le 2 \cdot 10^5$ ,  $1 \le q \le 10^5$ ) — the number of vertices in the tree and the number of queries, respectively.

The second line contains n-1 integers  $p_2, p_3, \ldots, p_n$  ( $1 \le p_i < i$ ), where  $p_i$  means that there is an edge between vertices i and  $p_i$ .

The third line contains n integers  $a_1, a_2, \ldots, a_n$  ( $-5000 \le a_i \le 5000$ ), the initial values of  $a_i$  for each vertex.

The fourth line contains n integers  $b_1, b_2, \ldots, b_n$  ( $-5000 \le b_i \le 5000$ ), the values of  $b_i$  for each vertex.

Each of the next q lines describes a query. It has one of the following forms:

- 1  $\forall$   $\times$   $(1 \le v \le n, 1 \le x \le 5000)$ .
- 2  $\forall$   $(1 \le v \le n)$ .

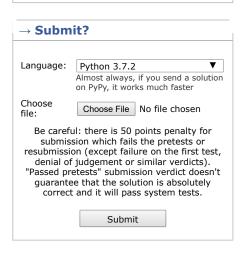
# **Output**

For each query of the second type, print a single line with the maximum *awesomeness* in the respective subtree.

# Example

input	Сору
5 6	
1 1 2 2	
10 -3 -7 -3 -10	
10 3 9 3 6	
2 1	
2 2	
1 2 6	
2 1	
1 2 5	
2 1	

# Contest is running 00:44:05 Contestant



→ Score table		
	Score	
<u>Problem A</u>	332	
<u>Problem B</u>	498	
<u>Problem C</u>	830	
<u>Problem D</u>	1162	
<u>Problem E</u>	1328	
Problem F1	996	
Problem F2	996	
<u>Problem G</u>	2158	
<u>Problem H</u>	2656	
Successful hack	100	
Unsuccessful hack	-50	
Unsuccessful submission	-50	
Resubmission	-50	
* If you solve problem on 01:45 from the	first attemnt	

<sup>\*</sup> If you solve problem on 01:45 from the first attempt

output	Сору
100 91 169 240	
91	
169	
240	

### Note

The initial awesomeness of the vertices is [100, 91, 57, 64, 57]. The most awesome vertex in the subtree of vertex 1 (the first query) is 1, and the most awesome vertex in the subtree of vertex 2 (the second query) is 2.

After the first update (the third query), the *awesomeness* changes to [100, 169, 57, 160, 57] and thus the most *awesome* vertex in the whole tree (the fourth query) is now 2.

After the second update (the fifth query), the *awesomeness* becomes [100, 221, 57, 240, 152], hence the most *awesome* vertex (the sixth query) is now 4.

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