Problem F. Birthday gift

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Askhat received from NurlashKO *rooted tree* on his birthday as a gift with n vertexes, numbered from 1 to n. *Tree* — connected unoriented graph without any cycles. The tree root is a vertex with number 1. Vertex v is an ancestor of vertex u if v lies on the minimal path from u to the root. Lowest common ancestor of sequence of vertexes $(x_1, x_2, ..., x_k)$ — farthest vertex from root, which is an ancestor of x_i for all $1 \le i \le k$ ($lca(x_1, x_2, ..., x_k)$).

In addition to the gift, NurlashKO prepared a task for Askhat. At first, he reported a sequence with length m — $(a_1, a_2, ..., a_m)$, each number in the sequence is a vertex from the tree. There may be duplicates of vertexes in the sequence. Then he started asking q queries, each query is one of the two types:

- 1 *pos* v — NurlashKO asks Askhat to change the value at position *pos* to the value v, i.e. $a_{pos} = v$.
- 2 l r v — NurlashKO asks Askhat to find a pair (x, y), such that $l \le x \le y \le r$ and $lca(a_x, a_{x+1}, ..., a_y) = v$. Or say that there is no such pair.

Askhat has spent a lot of time on researching the gift and now he wants your help.

Input

First line of input contains three positive integer numbers n, m and q — size of the tree, length of the sequence and number of queries. Next $n - 1$ lines contain edges of the tree (u_i, v_i) $(u_i \ne v_i)$. Next line contains m integer numbers, $a_1, a_2, ..., a_m$. $(1 \le a_i \le n)$ — sequence, which was gifted to Askhat by NurlashKO. Each of the next q lines describes a query. If first number of query equals to 1, then it is followed by two numbers *pos* and v $(1 \le pos \le m, 1 \le v \le n)$ — query of first type. If first number of query equals to 2, then it is followed by three numbers l, r and v $(1 \le l \le r \le m, 1 \le v \le n)$ — query of second type. It is guaranteed that among q queries at least one is of second type.

Output

Print two numbers x and y — answer to each query of second type, if there is no solution print out "-1 -1" (without quotes). If there are multiple solutions, output any of them.

Scoring

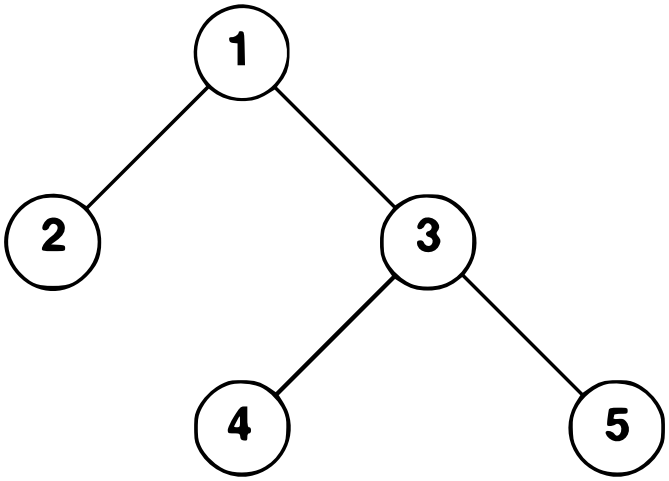
This problem consists of four subtasks, in each subtask tests satisfy constraints in statement:

1. $1 \le n, m, q \le 100$. Score 12 points.
2. $1 \le n, m, q \le 500$. Score 18 points.
3. $1 \le n, m, q \le 2000$. Score 26 points.
4. $1 \le n, m, q \le 2 \cdot 10^5$. Score 44 points.

Example

standard input	standard output
5 4 4 1 2 3 1 3 4 5 3 4 5 2 3 2 1 3 1 1 3 5 2 3 4 5 2 1 3 1	1 3 3 3 -1 -1

Note



- Sequence: $[4, 5, 2, 3]$
- Subsegment $= [4, 5, 2]$, $v = 1$. $lca(4, 5, 2) = 1$, answer: $(1, 3)$.
- Query on changing, new sequence: $[4, 5, 5, 3]$
- Subsegment $= [5, 3]$, $v = 5$. $lca(5) = 5$, answer: $(3, 3)$.
- Subsegment $= [4, 5, 5]$, $v = 1$. $lca(4) = 4$, $lca(5) = 5$, $lca(4, 5) = 3$, $lca(5, 5) = 5$, $lca(4, 5, 5) = 3$. There is no solution.