

Problem F. Birthday gift

Input file: standard input
Output file: standard output
Time limit: ~~2 seconds~~ 4 seconds (because of slow server)
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, \dots, x_k) — farthest vertex from root, which is an ancestor of x_i for all $1 \leq i \leq k$ ($\text{lca}(x_1, x_2, \dots, x_k)$).

In addition to the gift, NurlashKO prepared a task for Askhat. At first, he reported a sequence with length m — (a_1, a_2, \dots, 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 $l \leq x \leq y \leq r$ and $\text{lca}(a_x, a_{x+1}, \dots, a_y) = v$. 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) ($u_i \neq v_i$). Next line contains m integer numbers, a_1, a_2, \dots, a_m . ($1 \leq a_i \leq n$) — 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 ($1 \leq pos \leq m$, $1 \leq v \leq n$) — query of first type. If first number of query equals to 2, then it is followed by three numbers l , r and v ($1 \leq l \leq r \leq m$, $1 \leq v \leq n$) — 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

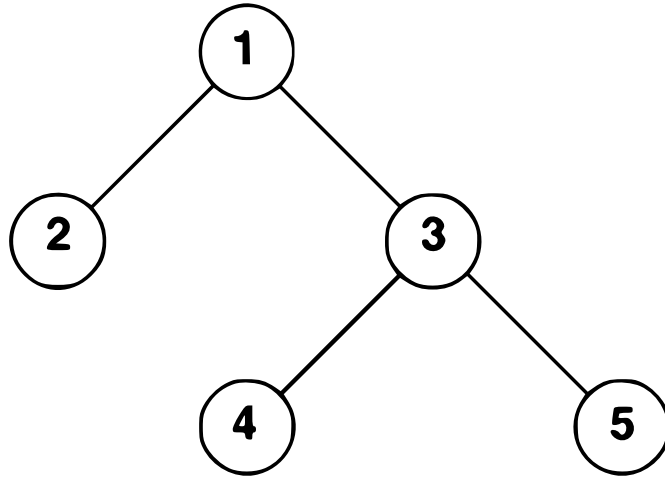
This problem consists of four subtasks, in each subtask tests satisfy constraints in statement:

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

Example

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