

## Problem E Cutting Tree

Tree in graph theory refers to any connected graph (of nodes and edges) which has no simple cycle, while forest corresponds to a collection of one or more trees. In this problem, you are given a forest of N nodes (of rooted trees) and K queries. Each query is in the form of:

- c x : remove the edge connecting node x and its parent.
  - If node x has no parent, then ignore this query.
- $\bigcirc a \ b$  : output YES if there is a path from node *a* to node *b* in the forest; otherwise, NO.

For example, let the initial forest is shown by Figure 1.



Let's consider the following queries (in order):

- 1) Q 5 7 : output YES.
- 2)  $c_2$  : remove edge (2, 1) the resulting forest is shown in Figure 2.
- 3) Q 5 7 : output NO, as there is no path from node 5 to node 7 in Figure 2.
- **4)** Q 4 6 : output YES.

## Input

The first line of input contains an integer T ( $T \le 50$ ) denoting the number of cases. Each case begins with two integers: N and K ( $1 \le N \le 20,000$ ;  $1 \le K \le 5,000$ ) denoting the number of nodes in the forest and the number of queries respectively. The nodes are numbered from 1 to N. The next line contains N integers  $P_i$  ( $0 \le P_i \le N$ ) denoting the parent of i<sup>th</sup> node respectively.  $P_i = 0$  means that node i does not have any parent (i.e. it's a root of a tree). You are guaranteed that the given input corresponds to a valid forest. The next K lines represent the queries. Each query is in the form of "c x" or " $Q \ a \ b$ " ( $1 \le x, a, b \le N$ ), as described in the problem statement above.

## Output

For each case, output "Case #x:" in a line, where x is the case number starts from 1. For each "Q a b" query in the input, output either "YES" or "NO" (without quotes) in a line whether there is a path from node a to node b in the forest.



Sample Input	Output for Sample Input
4   7 4   0 1 1 2 2 3   Q 5 7 2 2 2 3   Q 5 7 2 2 2 3   Q 5 7 2 2 2 3   Q 5 7 2 4 6 4 4 2 2 3 5 2 3 2 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 5 3 3 3 3 3 5 3 3 3 3 3 3 3 3 3 3 3 3 3 3 <	Case #1: YES NO YES Case #2: YES NO Case #3: NO YES Case #4: YES
Q 1 1	

Explanation for 2<sup>nd</sup> sample case

The initial forest is shown in Figure 3 below.

- 1) C = 3 : remove edge (3, 2) the resulting forest is shown in Figure 4.
- 2) Q 1 2 : output YES.
- 3)  $C_1$  : remove edge (1, 2) the resulting forest is shown in Figure 5.
- 4) Q = 1 = 2 : output NO as there is no path from node 1 to node 2 in Figure 5.

