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## Problem E <br> 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:

- с $x \quad$ : remove the edge connecting node $x$ and its parent.

If node $x$ has no parent, then ignore this query.

- $Q a b$ : 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.


Figure 1.


Figure 2.

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

1) $Q 57$ : output YES.
2) C 2 : remove edge $(2,1)$ - the resulting forest is shown in Figure 2.
3) $Q 57$ : output NO, as there is no path from node 5 to node 7 in Figure 2.
4) $Q 46$ : output YES.

## Input

The first line of input contains an integer $T(T \leq 50)$ denoting the number of cases. Each case begins with two integers: $N$ and $K(1 \leq N \leq 20,000 ; 1 \leq K \leq 5,000)$ 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 $P_{i}\left(0 \leq P_{i} \leq N\right)$ denoting the parent of $\mathrm{i}^{\text {th }}$ 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 " $2 a b$ " $(1 \leq x, a, b \leq N)$, 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.
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| Sample Input | Output for Sample Input |
| :---: | :---: |
| $\begin{array}{lllllllll} 4 & & & & & & \\ 7 & 4 & & & & & \\ 0 & 1 & 1 & 2 & 2 & 2 & 3 \\ Q & 5 & 7 & & & & & \\ C & 2 & & & & & \\ Q & 5 & 7 & & & & \\ Q & 4 & 6 & & & & \\ 4 & 4 & & & & & \\ 2 & 0 & 2 & 3 & & & \\ C & 3 & & & & \\ Q & 1 & 2 & & & & \\ C & 1 & & & & & \\ Q & 1 & 2 & & & & \\ 3 & 5 & & & & & \\ 0 & 3 & 0 & & & & \\ C & 1 & & & & & \\ Q & 1 & 2 & & & & \\ C & 3 & & & & & \\ C & 1 & & & & & \\ Q & 2 & 3 & & & & \\ 1 & 1 & & & & \\ 0 & & & & & \\ Q & 1 & 1 & & & & & & \end{array}$ | ```Case #1: YES NO YES Case #2: YES NO Case #3: NO YES Case #4: YES``` |

## Explanation for $2^{\text {nd }}$ sample case

The initial forest is shown in Figure 3 below.

1) $\subset 3$ : remove edge $(3,2)$ - the resulting forest is shown in Figure 4.
2) $Q 12$ : output YES.
3) $\quad 1 \quad$ : remove edge $(1,2)-$ the resulting forest is shown in Figure 5.
4) Q 12 : output NO as there is no path from node 1 to node 2 in Figure 5.

(3)

(3)
(4)
(2)

(1)

Figure 3.
Figure 4.
Figure 5.

