Problem G. Lexicographic Comparison

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Consider a and p, two permutations of length n. Initially, $a_i = p_i = i$ for all $1 \leq i \leq n$. Let A be a sequence of permutations such that $A_1 = a$ and $A_{i,j} = A_{i-1,p_j}$ for all $i \geq 1$ and $1 \leq j \leq n$.

There are three types of operations, where x and y are positive integers:

1. `swap_a` x y: swap a_x and a_y, where $1 \leq x, y \leq n$;

2. `swap_p` x y: swap p_x and p_y, where $1 \leq x, y \leq n$;

3. `cmp` x y: compare A_x with A_y lexicographically.

For each operation of type 3, output the relationship between A_x and A_y. A permutation s is lexicographically smaller than a permutation t if and only if there exists an index i such that $s_i < t_i$ and $s_j = t_j$ for all $1 \leq j < i$.

Input

There are multiple test cases. The first line of input contains an integer T ($1 \leq T \leq 10^5$), the number of test cases. For each test case:

The first line contains an integer n and q ($1 \leq n, q \leq 10^5$), the length of the permutations and the number of operations.

Each of the following q lines contains one string f and two integers x and y representing an operation. The string f is one of "`swap_a`", "`swap_p`", and "`cmp`". If f is "`swap_a`" or "`swap_p`" then $1 \leq x, y \leq n$. If f is "`cmp`" then $1 \leq x, y \leq 10^{18}$.

It is guaranteed that both the sum of n and the sum of q over all tests do not exceed 10^5.

Output

For each test case:

For each query, output "`<`" if A_x is lexicographically smaller than A_y; output "`>`" if A_x is lexicographically greater than A_y (in other words, A_y is lexicographically smaller than A_x); output "`=`" if $A_x = A_y$.

Example

standard input	standard output
2	=
5 5	<
cmp 1 2	>
swap_p 1 2	
cmp 1 2	
swap_a 1 2	
cmp 1 2	
1 1	
swap_a 1 1	