# Problem G. Grammar Path

| | |
|---|---|
| Time limit: | 2 seconds |
| Memory limit: | 512 megabytes |

You are given a context-free formal grammar in Chomsky reduced form (see Notes section for an explanation of these terms), and a directed graph with each edge labeled with a terminal of the grammar.

Find the length of the shortest path in the graph from vertex $s$ to vertex $t$ such that concatenation of the labels on this path is in the language of the grammar, or state that there is no such path.

## Input

The first line contains the number of productions in the grammar $p$ ($1 \le p \le 100$).

Each of the next $p$ lines contains a production in the form of either '`A -> BC`' or '`A -> a`'. The lowercase English letters are terminals, the uppercase English letters are nonterminals, and the uppercase letter '`S`' is the starting nonterminal. It's guaranteed that `S` appears as left hand side of at least one production.

The next line contains four integers $n$, $m$, $s$, and $t$ ($1 \le s, t \le n \le 26$; $0 \le m \le n^2$), denoting the number of vertices in the graph, the number of edges in the graph, and indices of the start and the finish.

Each of the next $m$ lines contains a description of an edge in the form '`u v x`', denoting an edge from vertex $u$ to vertex $v$ labeled with $x$ ($1 \le u, v \le n$; $x$ is a lowercase English letter). There are no multiedges in the graph, but there might be loops and different edges from $u$ to $v$ and from $v$ to $u$.

## Output

If there is no path from $s$ to $t$ with labels forming a string from the language, output '`NO`'. Otherwise, output the length of the shortest such path.

## Note

Informally speaking, a context-free formal grammar is a set of terminals (lowercase English letters in this problem), a set of nonterminals (uppercase English letters in this problem), and a set of rules of how a nonterminal can be replaced with a string of nonterminals or terminals.

Chomsky reduced form is a form where each rule is a replacement with either a single terminal or exactly two nonterminals. In fact, any context-free grammar which does not generate the empty string can be converted to Chomsky reduced form.

A string of terminals is in the language of the grammar if one can use the rules to convert a string of a single starting nonterminal into the given string. You can get some formal details at `https://en.wikipedia.org/wiki/Context-free_grammar`.

The formal grammar in the two last examples defines all non-empty correct bracket sequences, with opening brackets denoted with '`c`' and closing brackets denoted with '`j`'.

## Examples

| standard input | standard output |
|---|---|
| 5<br>S -> AB<br>A -> a<br>A -> AA<br>B -> BB<br>B -> b<br>8 8 1 4<br>1 2 a<br>2 3 b<br>3 4 a<br>1 5 a<br>5 6 a<br>6 7 a<br>7 8 b<br>8 4 b | 5 |
| 6<br>S -> SS<br>S -> LA<br>S -> LR<br>A -> SR<br>L -> c<br>R -> j<br>4 5 1 1<br>1 2 c<br>2 3 c<br>3 1 j<br>1 4 j<br>4 3 j | 12 |
| 6<br>S -> SS<br>S -> LA<br>S -> LR<br>A -> SR<br>L -> c<br>R -> j<br>4 5 1 4<br>1 2 c<br>2 1 c<br>2 3 c<br>3 4 j<br>4 3 j | NO |