Symbolic systems of equations **P92039_en**

Examen extraordinari d'Algorísmia, FME (2014-07-07)

A *symbolic system of equations* is a set of equations $x = f(y_1, \ldots, y_k)$, where x, y_1, $\ldots$, y_k are variables and f is a *symbol* representing an arbitrary function with k arguments (we say that f has *arity* k). A *solution* of a system with n variables $x_1, \ldots, x_n$ is any assignment α of expressions to variables in such a way that for every equation $x = f(y_1, \ldots, y_k)$ it holds that $\alpha(x) = f(\alpha(y_1), \ldots, \alpha(y_k))$.

Write a program that, given a system of symbolic equations, computes its most general solution, or tells that it does not exist.

Input

Input consists of several cases, each with n, followed by n variables in lexicographical order, followed by the number of equations m, followed by m equations in the exact format of the examples. Variables and functions are words made up of lowercase letters, all different. Every variable appears at most once in the left side of an equation. Every function can occur several times, but always with the same arity, between 1 and n. All arguments of the same function are different variables. You can assume $1 \leq n \leq 40$.

Output

Print, in lexicographical order of the variables, the most general solution of the system, following the format of the examples. Print an empty line at the end of each case.

Hint

Take inspiration from a topological sort.

Sample input

```
3
x y z
2
z = f ( x y )
y = h ( x )

1
x
1
x = f ( x )

2
xx yy
2
xx = ff ( yy )
yy = ff ( xx )

2
abc z
0

6
uu uv w x y z
4
x = f ( uv )
y = gg ( x z )
w = gg ( uv y )
uu = gh ( uv )
```

Sample output

```
x -> x
y -> h ( x )
z -> f ( x h ( x ) )

No solution!

No solution!

abc -> abc
z -> z

uu -> gh ( uv )
uv -> uv
w -> gg ( uv gg ( f ( uv ) z ) )
x -> f ( uv )
y -> gg ( f ( uv ) z )
z -> z
```

Problem information

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