

Problem B

A Logic Puzzle

Time Limit: 2 Seconds

Problem Description

Little Bobby Tables received his very own **Logic Gate and Wire** kit for his birthday! Unfortunately, he is below the recommended age to assemble anything and needs your help. Every wire contains a string identifier (composed of lowercase and/or uppercase letters) and can carry a 16-bit signal (a number in the range 0-65535).

A signal is provided to each wire by a gate, another wire, or some specific value. Each wire can only get a signal from one source, but can provide its signal to multiple destinations. A gate provides no signal until **all** of its inputs have a signal. The included instructions booklet describes how to connect the parts together: $x \text{ AND } y \rightarrow z$ means to connect wires x and y to an AND gate, and then connect its output to wire z . For example:

- $123 \rightarrow x$ means that the signal 123 is provided to wire x .
- $x \text{ AND } y \rightarrow z$ means that the bitwise AND of wire x and wire y is provided to wire z .
- $p \text{ LSHIFT } 2 \rightarrow q$ means that the value from wire p is left-shifted by 2 and then provided to wire q .
- $\text{NOT } e \rightarrow f$ means that the bitwise complement of the value from wire e is provided to wire f .
- Other possible gates include OR (bitwise OR) and RSHIFT (right-shift).

Input File Format

Input consists of *at least* three lines. The first line will be a string (C) which will be the wire identifier we will want to print the resulting value of as output. The second line will be a positive integer (N) which indicates the number of gate/signals in our circuit. The remaining N lines will consist of a gate/signal per line.

Output Format

Output the resulting value of the wire specified by C from the input.

Sample Input

```
h
8
123 -> x
456 -> y
x AND y -> d
x OR y -> e
x LSHIFT 2 -> f
y RSHIFT 2 -> g
NOT x -> h
NOT y -> i
```

Output for the Sample Input

65412

