2024/2025 SOUTHERN CALIFORNIA REGIONAL INTERNATIONAL COLLEGIATE PROGRAMMING CONTEST

Problem 4
Unit Conversion

Your younger brother is learning about unit conversions at school. Each day, he comes back with either new knowledge or a homework assignment.

When he gains new knowledge, he learns a conversion rate between two units. The conversion rate will be given by a linear function. Examples include:

- degrees Fahrenheit = 1.8 × degrees Celsius + 32
- Kelvins = degrees Celsius + 273.15
- B = 1024 × kB

When he gets homework, he has to answer unit conversion questions. For example, "How many Kelvins are equal to 36.6 degrees Fahrenheit?" Note that even if he has no direct rule for converting the units, he still may be able to figure out the solution, as in the given example. Sometimes the homework is tricky and the answer cannot be deduced from his current knowledge—he should then say the question is too hard.

As his older brother, you have to help him by checking the correctness of his solutions. That means for every homework question, you have to prepare an answer so he can validate the correctness of his result. That is your task: given the knowledge he learns and the homework he has to solve, output the answers to all the homework questions.

The input consists of at most 2×10^5 lines of knowledge and homework questions. For a new piece of knowledge, the input line contains the following:

`K` *name1* = *a* *name2* $\{+/-o\}$

This specifies a piece of new knowledge: unit *name1* is equal to $a \times$ *name2* $\pm o$. The braces indicate that the part "$+/-o$" can be omitted.

When a homework question is given, the input line contains the following:

`H` *x* *name1* = ? *name2*

The homework question asks how much of the unit *name2* is equal to x of unit *name1*. The names *name1* and *name2* are not necessarily distinct from each other.

Input ends with a line containing a single character "`G`" (for "Graduated!"—a reward for your help with the homework).

It is guaranteed that:

- Each unit name consists of between 1 and 20 upper-case and lower-case letters, digits, and underscores. Case is significant.
- Each value (a, o or x) is a floating point number in the interval [0, 1000], given with three decimal places. Additionally, a will never be equal to 0.
- A new piece of knowledge will never contain a correlation between two units we can already convert based on current knowledge.

At no point in time will there exist a unit that can be converted to over 10^5 in absolute value of a different unit (so we will never know that 1 metric ton can be converted to 10^6 grams).

For each line describing homework, output a line with a single floating-point number, which would make the equation true after replacing the question mark. Your answer will be considered correct if the relative or absolute error does not exceed 10^{-4}. If the answer cannot be provided with the knowledge acquired up to that point, output a line containing only the string "`Too hard!`".

Problem 4
Unit Conversion (continued)

Sample Input

```
K F = 1.800 C + 32.000
K K = 1.000 C + 273.150
H 0.000 C = ? F
H 36.600 F = ? K
K kB = 0.100 kB_by_10
K B = 102.400 kB_by_10
H 1.000 kB = ? b
K b = 8.000 B
H 1.000 kB = ? b
K kilogram = 1000.000 ton
H 1.000 kilogram = ? ton
H 1.000 kg = ? ton
H 1.000 F = ? ton
K 2kg = 2.000 _one_kilogram + 0.000
K pounds_per_inch2 = 14.504 bar
G
```

Output for the Sample Input

```
32.0
275.7055555556
Too hard!
8192.000
0.001
Too hard!
Too hard!
```