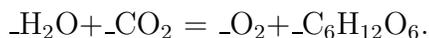
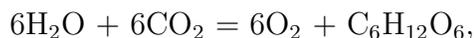


Balancing Chemical Equations

Write a program that, given an equation such as



will fill in the blanks to produce a balanced equation, such as



More specifically, an equation is input in the form of a sequence of lines, one for each molecule (e.g., H₂O or CO₂) in the formula. The k^{th} line has the following form:

$$sign_k n_k atom_{k,1} count_{k,1} \cdots atom_{k,n} count_{k,n}$$

where $sign_k$, k , $atom_{k,j}$, and $count_{k,j}$ separated by whitespace; $sign_k$ is \pm ; each $atom_{k,j}$ consists of one or two alphabetic characters, and each $count_{k,j}$ is a positive integer. After all the lines describing molecules, there is a delimiting line of the form

0 0

If there are m input lines, the problem is find m positive integer values, C_1, \dots, C_m , such that for every distinct two-character atom name, a , appearing in the input,

$$\sum sign_i \cdot C_i \cdot count_{i,j} = 0,$$

where the sum is over all i and j for which $atom_{i,j} = a$.

For example, if part of the input is "N 2", this represents two atoms of N (nitrogen). If it occurs on a line (molecule) with C_i equal to 3, it represents 6 atoms. A *sign* of +1 indicates that this molecule appears on the left of an equation, and -1 indicates that it appears on the right. The problem, then, is to get the result of adding up the number of atoms of N with a +1 *sign* and subtracting the number of atoms with -1 *sign* so as to get a total of 0. Further, the C_i must be chosen so that this happens for all atoms simultaneously. An atom may be repeated in a given line of input, as in

+1 6 C 1 H 5 C 1 O 1 O 1 H 1,

which stands for CH₅COOH.

The input for the illustrative equation at the beginning of this problem is

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+1 2 H 2 O 1
+1 2 C 1 O 2
-1 1 O 2
-1 3 C 6 H 12 O 6
00 00
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and the output is to be as shown in that example.