Balancing Chemical Equations

$$\mathrm{CH_4 + O_2 \rightarrow CO_2 + H_2O}$$

Parsing

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ElemS = [['C'], ['H'], ['O'], ['C'], ['O'], ['H'], ['O']]
FormulaS = [[['C'], 1], [['H'], 4]], [[['O'], 2]], [[['C'], 1], [['O'], 2]], [[['H'], 2], [['O'], 1]]]
ElementSideSet = [[['C'], ['H'], ['O']], [['C'], ['O'], ['H'], ['O']]]
Equation = [[[[['C'], 1], [['H'], 4]], [[['O'], 2]]], [[[['C'], 1], [['O'], 2]], [[['H'], 2], [['O'], 1]]]]
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Matrix Tabulation

	$\mathrm{CH_4}$	$\mathrm{O_2}$	$-\mathrm{CO_2}$	$-\mathrm{H_2O}$
C	1	0	-1	0
H	4	0	0	-2
O	0	2	-2	-1

System of Linear Equations

$$\begin{cases} 1a + 0b - 1c - 0d &= 0 \\ 4a + 0b - 0c - 2d &= 0 \\ 0a + 2b - 2c - 1d &= 0 \end{cases}$$

Solving

$$a = 1,\ b = 2,\ c = 1,\ d = 2$$

Reverse Parsing

$$\mathrm{CH_4 + \mathit{2}O_2 \rightarrow CO_2 + \mathit{2}H_2O}$$