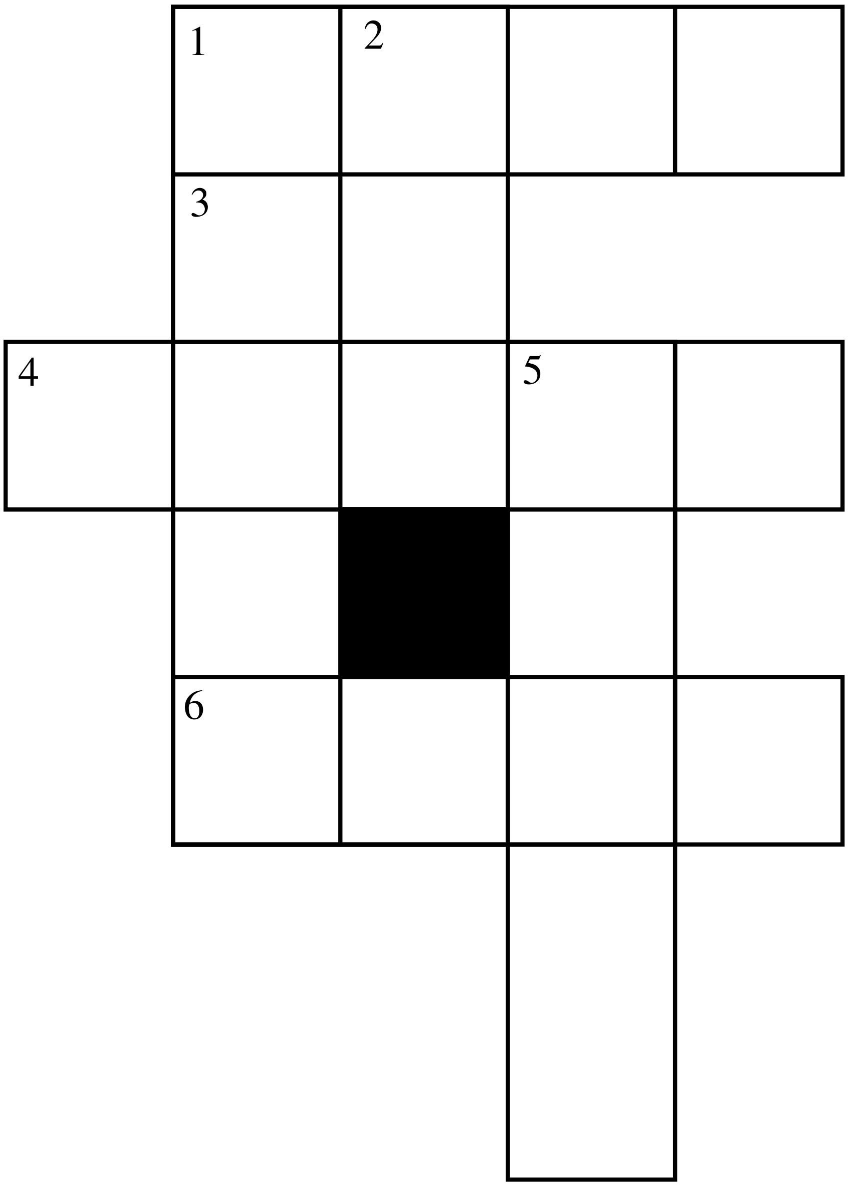
Try to fill the crossword with the words by hand:

Words:

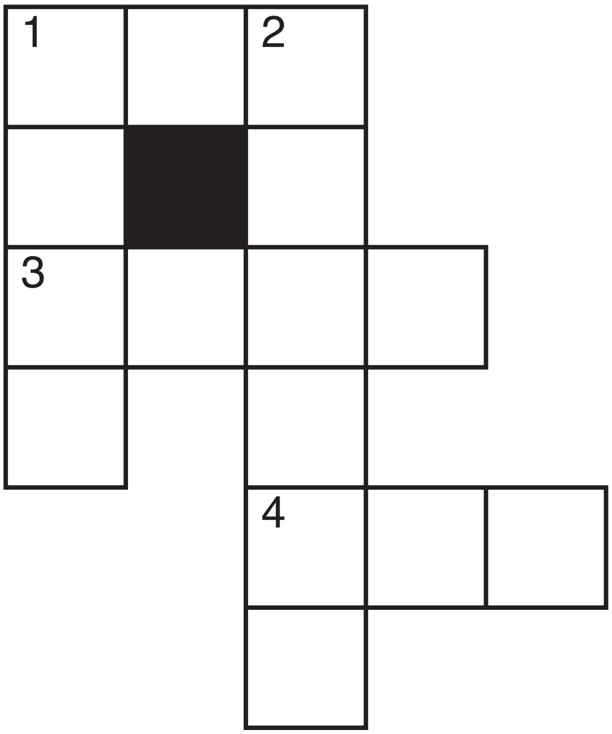
at, eta, be, hat, he, her, it, him, on, one, desk, dance, usage, easy, dove, first, else, loses, fuels, help, haste, given, kind, sense, soon, sound, this, think



Try to fill the crossword with the words using AC-3:

Words:

ant, big, bus, car, has, book, buys, hold, lane, year, beast, ginger, search, symbol, syntax




- **Variables**: let $W_{ix}$ be the word at position $ix$ where $i \in \{1, 2, \ldots\}$ and $x \in \{a, d\}$. Thus, for the small example above, the list of variables is $\{W_{1a}, W_{2d}, W_{1d}, W_{3a}, W_{4a}\}$. Also, let $W_{ix_j}$ be the $j^{th}$ letter of word $W_{ix}$, e.g. $W_{1a_2}$ is the second letter of word 1-across. We could also use a predicate $letter(W_{ix}, j)$ that returns the $j^{th}$ letter of word $W_{ix}$.
- **Domains**: Dictionary of words $\{w_1, w_2, w_3, \ldots, w_{15}\}$ in the order above (e.g. $w_1 = ant, w_2 = big, \ldots$).
- **Constraints**:
  - **domain:** $W_{ix} \neq w_j \quad \forall\, j \quad \text{s.t.} \quad |w_j| \neq |W_{ix}|$ (eliminate all words that are not the correct length). For the example above, the domain of $W_{1a}$ is therefore only the 3-letter words $\{ant, big, bus, car, has\}$
  - **binary:** $W_{ia_j} = W_{kd_l} \quad \forall\, i, k \quad \text{that intersect at} \quad j, l$. For the example above, $W_{1a_1} = W_{1d_1}$ and $W_{1a_3} = W_{2d_1}$. Using the predicate this would be $letter(W_{ix}, j) = letter(W_{kd}, l)$.