

Objective

Write a program that finds solutions to the following 3 hierarchically organized constraint satisfaction problems, involving 15 variables $\{A, B, C, \dots, N, O\}$ which can take integer values in $\{1, \dots, 50\}$.

1. Problem A: Find a solution to the constraint satisfaction problem involving the six variables A, B, C, D, E, and F and constraints C1,..., C4:
 - (C1) $A=B+C+E+F$
 - (C2) $D=E+F+21$
 - (C3) $D^{**2}=E^{**}E^{**}A + 417$
 - (C4) $E+F<A$
2. Problem B: Find a solution to the constraint satisfaction problem involving ten variables A,..., J which satisfy constraints C1,..., C9:
 - (C5) $H^{**}J+E^{**}12=(G+I)^{**2}$
 - (C6) $A+D=(F-G)^{**2} -1$
 - (C7) $4^{**}J=G^{**2}+39$
 - (C8) $(I-G)^{**9}=(F-H)^{**3}$
 - (C9) $(G-C)^{**2}= F^{**}C^{**}C + 1$
3. Problem C: Find a solution to the constraint satisfaction problem involving 15 variables A,..., O which satisfy constraints C1,..., C15:
 - (C10) $2^{**}M=K^{**2} -6$
 - (C11) $(N-O)^{**3} + 7= (F-I)^{**}N$
 - (C12) $N^{**2}=M^{**2} + 291$
 - (C13) $O^{**2}=G^{**}H^{**}I^{**}B + 133$
 - (C14) $M+O=K^{**2} -10$
 - (C15) $L^{**3} + I=(L+B)^{**}K$

Remark: In the above equations the letters 'I' and 'O' were put into boldface to avoid being mistaken as numbers 0 or 1. Moreover, the letter 'J' looks somewhat similar to two-letter the letter 'I' but to better distinguish the two letters 'J' is never in boldface.

Your program should contain a counter nva ("number of variable assignments) that counts the number of times an initial integer value is assigned to a variable or the assigned integer to the particular variable is changed; in addition to outputting the solution to the CSV also report the value of this variable at the end of the run, and an interface to call your program for CSP Problems A, B, or C. Your program should return the solution or "no solution exists" and the value of nva after the program terminates.

Moreover, terminate the search as soon as you found a solution—do not search for additional solutions.