Constraintsystem *FD*

Use your implementation from last week's exercise.

Exercise 1 (Labeling Strategies)**.**

Modify the `label/1` existing label constraint, to allow selection of both *variable strategy* and *value strategy*. The new `lab/3` constraint should take the selected strategies as inputs in the 2nd and 3rd argument.

    a) The variable strategy determines the selection of the next variable during labeling. Your implementation should allow labeling from left to right and vice versa.

    b) In the *first-fail (ff)* strategy a variable whose domain is smallest among the unlabeled variables is chosen. Implement this *dynamic* labeling strategy.

    c) The value strategy determines the selection of the next value for a variable. Your implementation should allow taking values from left to right and vice versa (w.r.t. the given representation list).

    d) Implement the *split* strategy, to halve the list of possible values until exhaustion.

    e) Implement the value selection by random.

Exercise 2 (Pyramid – Crypto-arithmetic Puzzle)**.**

Replace distinct letters by distinct digits, s.t. each number is the absolute difference of the two numbers below (e.g. $D = |G - H|$), and the numbers are the positive integers from 1 to 15.

$$
\begin{array}{ccccccccc}
 & & & & A & & & & \\
 & & & B & & C & & & \\
 & & D & & E & & F & & \\
 & G & & H & & I & & J & \\
K & & L & & M & & N & & O \\
\end{array}
$$

Create a table to compare the required times the different strategy combinations take to solve the puzzle. Differentiate between the 1st found solution, the 2nd found solution, and the complete search.

Exercise 3 (Zebra Puzzle)**.**

Five men with different nationalities live in the first five houses of a street. They practice five distinct professions, and each of them has a favorite animal and a favorite drink, all of them different. The five houses are painted in different colors.

The Englishman lives in the red house. The Spaniard owns a dog. The Japanese is a painter. The Italian drinks tea. The Norwegian lives in the first house on the left. The owner of the green house drinks coffee. The green house is next to the white and on the right of it. The sculptor breeds snails. The diplomat lives in the yellow house. Milk is drunk in the middle house. The Norwegian's house is next to the blue one. The violinist drinks fruit juice. The fox is in a house next to that of the doctor. The horse is in a house next to that of the diplomat.

Question: Who owns a Zebra, and who drinks water?