Constraint Programming
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assignment #7

Constraint System *FD*

Exercise 1 (Extension of *FD*-solver)**.**
Extend the contraints solver `fd-ex7.pl`.

a) Implement rules to let the `leq`, `eq`, and `neq` constraints interact with the given solver. Tests should include `X leq Y, Y leq Z, X in [0,3], Y in [-1,2], Z in [0,1,2,3]`.
b) Introduce the `maximum(X,Y,Z)` constraint to the given solver, where `Z` is the maximum of `X` and `Y`. Use the rules for addition from the lecture as sample and propagate into the direction of `Z` only. Tests should include `maximum(X,Y,Z), X in [0,1], Y in [2,4], Z in [3,5]`.
c) The constraint `allneq(List)` succeeds, iff the variables in `List` are (pairwise) distinct. Test your implementation `allneq` with three variables, s.t. the answer is `no` for one and `yes` for a second query.
d) Implement a `label(List)`-constraint to bind the variables in `List`. An easy test case is, e.g., `X in [0,1], Y in [0,1], X leq Y, label([X])`.

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.

```
        A
      B   C
    D   E   F
  G   H   I   J
K   L   M   N   O
```

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?