Constraint Logic Programming Mini-Exercises

CSE 505, Autumn 2001

These are a number of very small exercises that we'll do and discuss in class. You don't need to hand in anything.

1. Suppose we have an algorithm A that takes a constraint and always outputs *unknown*. Is A a solver? Is it complete? (Some other texts will have a more liberal definition of "solver," and ask whether A is sound. Is it?)

2. Suppose we have an algorithm A that takes a constraint and always outputs *true*. Is A a solver? Is it complete? (Using the more liberal definition of "solver," is A sound?)

3. For the domain of the reals, let C_1 be the constraint $X \geq 10 \wedge X + 5 = Y$. Is C_1 satisfiable? Give a valuation that is a solution for C_1, and a valuation that is not a solution. Is C_1 equivalent to the constraint C_2 $X \geq 10 \wedge Y \geq 5$?

4. For the domain of trees, consider the constraint `p(X,Y) = p(1,Z)`. Is it satisfiable? Give a valuation that is a solution.

5. Rewrite the goal `cf(F,F)` using the `cf` rule:

   ```
   cf(C,F) :-
     F = 1.8*C + 32.
   ```

6. Write CLP($\mathcal{R}$) rules to define the "max" relation. Here are some sample goals:

   ```
   ?- max(10,20,X).
      X=20

   ?- max(10,20,30).
      no
   ```

   What are the answers for the following goals? If there is more than one answer give all of them. Show the derivation tree (skipping some details of processing the primitive constraints if you wish).

   ```
   ?- max(1,2,A).

   ?- max(X,Y,20).
   ```

7. What are the outputs for the following goals? Show the derivation tree (skipping some details of processing the primitive constraints if you wish).

   ```
   ?- length([a,b,c],N).

   ?- length([X|Xs],N).

   ?- length(L,2).
   ```