CSE 341, Winter 2010, Assignment 5
CLP(R) Warmup
Due: Wednesday Feb 17, 10:00pm

12 points total (3 points each question)

You can use up to 2 late days for this assignment.

1. Write a CLP(R) rule `abs` for finding the absolute value of a number. Demonstrate your rule where both arguments are constants, just one is a constant, and both are variables. In each case backtrack to find all possible solutions. For example, one of your test goals might be `abs(X,10).` You should get two solutions: `X=10` and `X=-10`.

2. Write a CLP(R) rule `doubles` that expresses a relation between two lists of numbers: that the lists should be the same length, and each element of the second list is twice the corresponding element of the first. For example, `doubles([1,4,10],D)` should succeed with `D=[2,8,20]`. Try your rule on various cases:

   - with the first argument a variable and the second argument a ground term, for example `doubles(L,[5,20])`
   - with both arguments ground, for example `doubles([1,3],[2,6])` or `doubles([1,3],[2,100])` or `doubles([],[])`
   - with lists of different lengths, for example `doubles([1,3],[2,6,10])`
   - with both arguments as variables: `doubles(Xs,Ys)`

   In each case backtrack to find more answers.

3. Write a CLP(R) rule `temperatures` that expresses a different relation between two lists of numbers: that the lists should be the same length, and each element of the second list is the Fahrenheit temperature corresponding to a Centigrade temperature in the first. For example, `temperatures([0,100],Fs)` should succeed with `Fs=[32,212]`. For full credit your rule must make use of a helper `cf` rule that expresses the Centigrade-Fahrenheit relation (you can copy this from the lecture notes). Otherwise the code will be quite similar to that for Question 2.

4. Write a CLP(R) rule to find the average of a non-empty list of numbers. (Fail on the empty list.) For example:

   - `average([1,2,3],A)` succeeds with `A=2`.
   - `average([],A)` fails.

   What happens for goals such as `average([X],10)` or `average([X1,X2],10)` or `average(Xs,10)`? Hint: you can copy and use the rules `length` and `sum` from the lecture notes if you want.

Turnin: Turn in your CLP(R) program and sample output showing it running on some well-chosen test cases. As usual, your program should be tastefully commented (i.e. put in a comment before each set of rules saying what they do).