These questions use the following CLP(\(\mathcal{R}\)) rules:

\[
\text{member}(X,[X|Xs]).
\]

\[
\text{member}(X,[Y|Ys]) :- \text{member}(X,Ys).
\]

\[
\text{member_cut}(X,[X|Xs]) :- !.
\]

\[
\text{member_cut}(X,[Y|Ys]) :- \text{member}(X,Ys).
\]

\[
\text{length}([],0).
\]

\[
\text{length}([_|Xs],N) :- N>0, \text{length}(Xs,N-1).
\]

1. What are all the answers that CLP(\(\mathcal{R}\)) returns for the following goals? (If there are an infinite number give the first several; if there are none, say so.)

   \[
   \text{member}(\text{squid},[\text{clam},\text{squid},\text{tuna}])
   \]

   \[
   \text{member}(\text{squid},X)
   \]

   \[
   \text{member_cut}(\text{squid},[\text{clam},\text{squid},\text{tuna}])
   \]

   \[
   \text{member_cut}(\text{squid},X)
   \]

   \[
   \text{member}(X, [a,b,c,d]), \text{member}(X, [c,d,e,f])
   \]

   \[
   \text{length}([A,B,C],N)
   \]

   \[
   \text{length}([A,B,C|Cs],N)
   \]

2. Write a CLP(\(\mathcal{R}\)) rule to find the average of a list of numbers. Fail if the list is empty.

3. Write a CLP(\(\mathcal{R}\)) rule \texttt{range}(Lo,Hi,List) that succeeds if List consists of all the numbers between Lo and Hi inclusive. (Assume that Lo and Hi are integers.) If Lo is greater than Hi, List should be empty.

4. Given your \texttt{range} rule from Question 3, what are all the results for the following goals?

   \[
   \text{range}(2,5,A)
   \]

   \[
   \text{range}(5,2,A)
   \]

   \[
   \text{range}(A,B,[2,3,4,5,6])
   \]

   \[
   \text{range}(A,B,[2,4,6])
   \]

5. Write another version of \texttt{range} that also takes a \texttt{Step} parameter: \texttt{range}(Lo,Hi,Step,List). Lo, Hi, and \texttt{Step} don’t have to be integers for this version. For example, \texttt{range}(2.2, 3.0, 0.2, L) should succeed with \(L = [2.2, 2.4, 2.8, 3.0]\).

6. Is CLP(\(\mathcal{R}\)) statically typed? Is it type safe?

7. Compare the way parameters are passed in Miranda and CLP(\(\mathcal{R}\)).