Prolog : TP5

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Questions

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/**
TP 5 Arithmetique - Prolog

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*/


/*
-------------------------------------------------------------------------------
 Definition des predicats
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*/

%%%%%%%%%% Les predicats premiers %%%%%%%%

/* QUESTION 1.1 */

add(zero,P,P).
add(P,zero,P).
add(s(X),Y,s(R)) :-
      add(X,Y,R).

/* QUESTION 1.2 */

sub(zero,_,zero).
sub(X,zero,X).
sub(s(X),s(Y),R) :-
      sub(X,Y,R).

/* QUESTION 1.3 */

prod(zero,_,zero).
prod(_,zero,zero).
prod(s(X),Y,Z) :-
      prod(X,Y,Rprod),
      add(Rprod,Y,Z).

/* QUESTION 1.4 */

fact(zero,s(zero)).
fact(s(X),R) :-
      fact(X,Temp),
      prod(s(X),Temp,R).

%%%%%%%%%% Representation binaire %%%%%%%%

/* QUESTION 1.5 */

%%%%%%%%%%%% Binary representation
add_bit(0, 0, 0, 0, 0).
```

```
add_bit(0, 0, 1, 1, 0).
add_bit(0, 1, 0, 1, 0).
add_bit(0, 1, 1, 0, 1).
add_bit(1, 0, 0, 1, 0).
add_bit(1, 0, 1, 0, 1).
add_bit(1, 1, 0, 0, 1).
add_bit(1, 1, 1, 1, 1).


add_bin(B1,B2,BR) :-
      add_bin(B1,B2,0,BR).

add_bin(B,[],0,B).

add_bin([],B,0,B).

add_bin([],[],1,Res):-
      add_bin([1],[0],0,Res).

add_bin([],B,1,Res):-
      add_bin([1],B,0,Res).

add_bin(B,[],1,Res):-
      add_bin(B,[1],0,Res).

add_bin([T1|R1],[T2|R2],C,[Res|Z]):-
      add_bit(T1,T2,C,Res,Cres),
      add_bin(R1,R2,Cres,Z).

/* QUESTION 1.6 */

/* inverse tous les bits du nombre */
inv_bin([],[]).

inv_bin([1|Q],[0|Qres]) :-
      inv_bin(Q,Qres).

inv_bin([0|Q],[1|Qres]) :-
      inv_bin(Q,Qres).

sub_bin(B1,B2,R) :-
      add_bin(R,B2,B1).

/* QUESTION 1.7 */


/*

Premiere version : marche mais stackoverflow a partir de 8.

eg_zero([0]).
eg_zero([0|Q]) :-
      eg_zero(Q).
```

```
prod_bin([B],[1],[B]).

prod_bin([_],[0],[0]).

prod_bin(_,B2,[0]):-
      eg_zero(B2).

prod_bin(B1,B2,R) :-
      sub_bin(B2,[1],Btemp),
      prod_bin(B1,Btemp,Btemp2),
      add_bin(Btemp2,B1,R).
*/

% deuxieme versions.

prod_bit(0,_,[]).
prod_bit(1,Res,Res).

prod_bin([],_,[]).
prod_bin([Tete|Rest],B,Res) :-
prod_bit(Tete,B,TmpRes),
prod_bin(Rest,B,TmpRes2),
add_bin(TmpRes,[0|TmpRes2],Res).

/* QUESTION 1.8 */

fact_bin([0],[1]).
fact_bin(B,Res) :-
      sub_bin(B,[1],Btemp),
      fact_bin(Btemp,Rtemp),
      prod_bin(B,Rtemp,Res).


/* QUESTION 1.9 */

fact_bin_is(0,1).
fact_bin_is(N,Res) :-
      N>0,
      Nmoins is N-1,
      fact_bin_is(Nmoins,Temp),
      Res is N*Temp.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%  TESTS %%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%% Q1.1 %%

/*
[eclipse 9]: add(X,Y,s(s(zero))).

X = zero
Y = s(s(zero))
Yes (0.00s cpu, solution 1, maybe more) ? ;
```

```
X = s(s(zero))
Y = zero
Yes (0.00s cpu, solution 2, maybe more) ? ;

X = s(zero)
Y = s(zero)
Yes (0.00s cpu, solution 3, maybe more) ? ;
*/

%% Q1.2 %%
/*
[eclipse 2]: sub(s(s(s(s(s(zero))))),s(zero),R).

R = s(s(s(s(zero))))
*/

%% Q1.3 %%
/*
[eclipse 8]: prod(s(s(zero)),s(s(s(zero))),Z).

Z = s(s(s(s(s(s(zero))))))
Yes (0.00s cpu, solution 1, maybe more) ?
*/

%% Q1.4 %%

/*
[eclipse 11]: fact(s(s(s(zero))),R).

R = s(s(s(s(s(s(zero))))))
*/

%% Q1.5 %%
/*
 | ?- add_bin([1,1,1,1,1,1],[1],R).

R = [0,0,0,0,0,0,1] ?

yes
| ?- add_bin([0,1],[1,1],R).

R = [1,0,1] ?
*/

%% Q1.6 %%
/*
| ?- sub_bin([0,0,0,1],[1],R).

R = [1,1,1,0] ?

yes
| ?- sub_bin([0,0,1],[0,1],R).
```

```
R = [0,1,0] ?
*/

%% Q1.7 %%
/*

| ?- prod_bin([1,1],[1,1],R).

R = [1,0,0,1] ?

yes
| ?- prod_bin([1],[0,1],R).

R = [0,1] ?

*/

%% Q1.8 %%
/*
| ?- fact_bin([1,1],R).

R = [0,1,1] ?
*/

%% Q1.9 %%
/*
| ?- fact_bin_is(3,R).

R = 6 ?
*/
```

Listing 1: tp5.pl

/newpage