% Problem 1

nbd --> h(Col1, Nat1, Pet1), h(Col2, Nat2, Pet2), h(Col3, Nat3, Pet3),

{Col1\=Col2, Col1\=Col3, Col2\=Col3,

Nat1\=Nat2, Nat1\=Nat3, Nat2\=Nat3,

Pet1\=Pet2, Pet1\=Pet3, Pet2\=Pet3}.

h(Col, Nat, Pet) --> [h(Col, Nat, Pet)],

{(Col = red; Col = blue; Col = green),

(Nat = english; Nat = spanish; Nat = japanese),

(Pet = jaguar; Pet = snail; Pet = zebra)}.

% Problem 2

fib --> [0, 1], fibs(0, 1).

fibs(\_, \_) --> [].

fibs(N2, N1) --> {N is N2 + N1}, [N], fibs(N1, N).

% Problem 3 a

accept(N,String) :- steps(N,q0,String,Q), final(N,Q).

steps(\_,Q,[],Q).

steps(N,Q1,[H|T],Q2) :- tran(N,Q1,H,Q), steps(N,Q,T,Q2).

tran(\_, q0, 1, 1).

tran(\_, q0, 0, q0).

tran(\_, q0, 1, q0).

tran(N, M, 0, M1) :- M1 is M + 1, M < N.

tran(N, M, 1, M1) :- M1 is M + 1, M < N.

final(N, N).

% Problem 3 b

s(N) --> a, [1], z(N).

a --> [].

a --> [0], a.

a --> [1], a.

z(N) --> {N == 1}, [].

z(N) --> {N > 1}, {M is N - 1}, [0], z(M).

z(N) --> {N > 1}, {M is N - 1}, [1], z(M).

% Problem 3 c

s(N) --> a, [1], z(N).

a --> [].

a --> [0], a.

a --> [1], a.

z(N) --> {N == 1}, [].

z(N) --> {N > 1}, {M is N - 1}, [0], z(M).

z(N) --> {N > 1}, {M is N - 1}, [1], z(M).

initial(N, M, L) :- findnsols(N, X, s(M, X, []), L1), reverse(L1, L), !.

ith(N, M, A) :- initial(N, M, L), nth1(1, L, A).