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csc600-02  
homework 3

**QUESTION 1**

%Facts

m([sam,ray,ronald,ali,nick,jack,jacob,troy,edvin,

dan,ben,harris]).

f([jade,kathy,tina,nishi,sarah,julie,mia,illy]).

family([troy,illy,[ben]]).

family([\_,kathy,[mia,jacob,illy]]).

family([edvin,jade,[harris]]).

family([ronald,\_,[sam,edvin]]).

family([jack,julie,[dan]]).

family([\_,jade,[jack]]).

family([ray,\_,[tina,sarah]]).

family([ali,\_,[sam]]).

family([nick,\_,[nishi,jacob]]).

family([\_,\_,[kathy,ali,nick]]).

family([sam,\_,[jade,dan,ray]]).

%Rules

male(X) :- m(M), member(X,M).

female(X) :- f(F), member(X,F).

father(X,C) :- family([X,\_,L]), member(C,L).

mother(X,C) :- family([\_,X,L]), member(C,L).

parent(X,C) :- family([\_,X,L]), member(C,L).

parent(X,C) :- family([X,\_,L]), member(C,L).

siblings1(X,Y) :- parent(A,X), parent(B,Y), A==B, X\=Y.

siblings2(X,Y) :- family([\_,\_,L]), member(X,L), member(Y,L), X\=Y.

brother1(X,Y) :- siblings1(X,Y), male(X), male(Y).

brother2(X,Y) :- siblings2(X,Y), male(X), male(Y).

sister1(X,Y) :- siblings1(X,Y), female(X), female(Y).

sister2(X,Y) :- siblings2(X,Y), female(X), female(Y).

cousins(X,Y) :- siblings1(A,B), parent(C,X), parent(D,Y), A==C, B==D.

uncle(U,C) :- parent(X,C), siblings1(Y,U), male(U), X==Y.

aunt(A,C) :- parent(X,C), siblings1(Y,A), female(A), X==Y.

grandmother(G,C) :- grandparent(X,C), female(G), X==G.

grandfather(G,C) :- grandparent(X,C), male(G), X==G.

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grandparent(G,C) :- parent(X,C), parent(G,Y), X==Y.

grandchild(C,G) :- grandparent(G,C)

greatgrandparent(G,C) :- parent(G,X), grandparent(Y,C), X==Y.

ancestor(A,C) :- greatgrandparent(A,C).

ancestor(A,C) :- parent(P,C), ancestor(A,P).

**QUESTION 2**

%Facts

demolist([a,b,c,d,e]).

%Rules

member1(X,[X|\_]).

member1(X,[\_|T]) :- member1(X,T).

firstelement(X,[X|\_]).

lastelement(X,[X]).

lastelement(X,[\_|T]) :- lastelement(X,T).

adjacent(X,Y,[X,Y|\_]).

adjecent(X,Y,[\_|T]) :- adjecent(X,Y,T).

append1([],L2,L2).

append1([X|T1],L2,[X|T3]) :- append1(T1,L2,T3).

delete(X,[X|T],T).

delete(X,[H|T],[H|T1]) :- delete(X,T,T1).

insert(X,L,XL) :- delete(X,XL,L).

len([], 0).

len([\_|T],N) :- len(T, N1), N is 1 + N1.

reverse([],[]).

reverse([H|T], Rev) :- reverse(T, RT), append1(RT,[H],Rev).

palindrome(L1) :- reverse(L1, Rev), Rev == L1.

display([]).

display([X|T]) :- write(X), write(' '), display(T).

**QUESTION 3**

queens([]).

queens([X/Y|Others]) :-

queens(Others),

member(Y, [1,2,3,4,5,6,7,8]),

safe(X/Y, Others).

safe(\_,[]).

safe(X/Y,[X1/Y1|Others]) :-

Y =\= Y1,

Y1 - Y =\= X1 - X,

Y1 - Y =\= X - X1,

safe(X/Y,Others).

cboard([1/Y1,2/Y2,3/Y3,4/Y4,5/Y5,6/Y6,7/Y7,8/Y8]).