1. Family Prolog

%!Facts!%

%Male & Female

m([soe,ye,naing,min,thaung,own,win,kyi,myat,pyae,kyaw,thant,zaw,aung]).

f([than,khin,san,anno,kywae,wan,shan,thet,chu,thae,thu,mon]).

%Family

family([soe,than,[ye,naing,anno]]).

family([ye,khin,[myat]]).

family([naing,san,[chu]]).

family([min,anno,[thae,pyae]]).

family([thaung,kywae,[wan,win,kyi,khin]]).

family([own,wan,[kyaw,thant]]).

family([win,shan,[mon]]).

family([kyi,thet,[zaw]]).

family([aung,thet,[thu]]).

%!Rules!%

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

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

father(F,C):- male(F), family([F,\_ |[Children]]), member(C,Children).

mother(M,C):- female(M), family([\_,M |[Children]]), member(C,Children).

parent(P,C):- father(P,C); mother(P,C).

sibling1(X,Y):- father(F,X), father(F,Y), mother(M,X), mother(M,Y), X\=Y.

sibling2(X,Y):- father(Fi,X), father(Fj,Y), mother(M,X), mother(M,Y), X\=Y, Fi\=Fj.

brother1(X,Y):- male(X), sibling1(X,Y).

brother2(X,Y):- male(X), sibling2(X,Y).

sister1(X,Y):- female(X), sibling1(X,Y).

sister2(X,Y):- female(X), sibling2(X,Y).

cousins(X,Y):- parent(Pi,X), parent(Pj,Y), sibling1(Pi,Pj), X\=Y.

cousins(X,Y):- parent(Pi,X), parent(Pj,Y), sibling2(Pi,Pj), X\=Y.

uncle(U,C):- male(U), father(U,Ci), cousins(C,Ci).

aunt(A,C):- female(A), mother(A,Ci), cousins(C,Ci).

grandchild(X,Y):- parent(P,X), parent(Y,P).

grandson(X,Y):- male(X), grandchild(X,Y).

granddaughter(X,Y):- female(X), grandchild(X,Y).

greatgrandparent(X,Y):- grandchild(Y,G), parent(X,G).

ancestor(Anc,C):- parent(Anc,C).

ancestor(Anc,C):- parent(Anc,Desc), ancestor(Desc,C).

Output

1 ?- male(X).

X = soe ;

X = ye ;

X = naing ;

X = min ;

X = thaung ;

X = own ;

X = win ;

X = kyi ;

X = myat ;

X = pyae ;

X = kyaw ;

X = thant ;

X = zaw.

2 ?- female(X).

X = than ;

X = khin ;

X = san ;

X = anno ;

X = kywae ;

X = wan ;

X = shan ;

X = thet ;

X = chu ;

X = thae ;

X = thu ;

X = mon.

3 ?- father(F,C).

F = soe,

C = ye ;

F = soe,

C = naing ;

F = soe,

C = anno ;

F = ye,

C = myat ;

F = naing,

C = chu ;

F = min,

C = thae ;

F = min,

C = pyae ;

F = thaung,

C = wan ;

F = thaung,

C = win ;

F = thaung,

C = kyi ;

F = thaung,

C = khin ;

F = own,

C = kyaw ;

F = own,

C = thant ;

F = win,

C = mon ;

F = kyi,

C = zaw ;

false.

4 ?- mother(M,C).

M = than,

C = ye ;

M = than,

C = naing ;

M = than,

C = anno ;

M = khin,

C = myat ;

M = san,

C = chu ;

M = anno,

C = thae ;

M = anno,

C = pyae ;

M = kywae,

C = wan ;

M = kywae,

C = win ;

M = kywae,

C = kyi ;

M = kywae,

C = khin ;

M = wan,

C = kyaw ;

M = wan,

C = thant ;

M = shan,

C = mon ;

M = thet,

C = zaw ;

M = thet,

C = thu ;

false.

5 ?- parent(P,C).

P = soe,

C = ye ;

P = soe,

C = naing ;

P = soe,

C = anno ;

P = ye,

C = myat ;

P = naing,

C = chu ;

P = min,

C = thae ;

P = min,

C = pyae ;

P = thaung,

C = wan ;

P = thaung,

C = win ;

P = thaung,

C = kyi ;

P = thaung,

C = khin ;

P = own,

C = kyaw ;

P = own,

C = thant ;

P = win,

C = mon ;

P = kyi,

C = zaw ;

P = than,

C = ye ;

P = than,

C = naing ;

P = than,

C = anno ;

P = khin,

C = myat ;

P = san,

C = chu ;

P = anno,

C = thae ;

P = anno,

C = pyae ;

P = kywae,

C = wan ;

P = kywae,

C = win ;

P = kywae,

C = kyi ;

P = kywae,

C = khin ;

P = wan,

C = kyaw ;

P = wan,

C = thant ;

P = shan,

C = mon ;

P = thet,

C = zaw ;

P = thet,

C = thu ;

false.

7 ?- sibling1(X,Y).

X = ye,

Y = naing ;

X = ye,

Y = anno ;

X = naing,

Y = ye ;

X = naing,

Y = anno ;

X = anno,

Y = ye ;

X = anno,

Y = naing ;

X = thae,

Y = pyae ;

X = pyae,

Y = thae ;

X = wan,

Y = win ;

X = wan,

Y = kyi ;

X = wan,

Y = khin ;

X = win,

Y = wan ;

X = win,

Y = kyi ;

X = win,

Y = khin ;

X = kyi,

Y = wan ;

X = kyi,

Y = win ;

X = kyi,

Y = khin ;

X = khin,

Y = wan ;

X = khin,

Y = win ;

X = khin,

Y = kyi ;

X = kyaw,

Y = thant ;

X = thant,

Y = kyaw ;

false.

8 ?- sibling2(X,Y).

X = zaw,

Y = thu ;

X = thu,

Y = zaw ;

false.

9 ?- brother1(X,Y).

X = ye,

Y = naing ;

X = ye,

Y = anno ;

X = naing,

Y = ye ;

X = naing,

Y = anno ;

X = win,

Y = wan ;

X = win,

Y = kyi ;

X = win,

Y = khin ;

X = kyi,

Y = wan ;

X = kyi,

Y = win ;

X = kyi,

Y = khin ;

X = pyae,

Y = thae ;

X = kyaw,

Y = thant ;

X = thant,

Y = kyaw ;

false.

10 ?- brother2(X,Y).

X = zaw,

Y = thu ;

false.

11 ?- sister1(X,Y).

X = khin,

Y = wan ;

X = khin,

Y = win ;

X = khin,

Y = kyi ;

X = anno,

Y = ye ;

X = anno,

Y = naing ;

X = wan,

Y = win ;

X = wan,

Y = kyi ;

X = wan,

Y = khin ;

X = thae,

Y = pyae ;

false.

12 ?- sister2(X,Y).

X = thu,

Y = zaw ;

false.13 ?- cousins(X,Y).

X = myat,

Y = chu ;

X = myat,

Y = thae ;

X = myat,

Y = pyae ;

X = chu,

Y = myat ;

X = chu,

Y = thae ;

X = chu,

Y = pyae ;

X = mon,

Y = zaw ;

X = mon,

Y = myat ;

X = mon,

Y = kyaw ;

X = mon,

Y = thant ;

X = zaw,

Y = mon ;

X = zaw,

Y = myat ;

X = zaw,

Y = kyaw ;

X = zaw,

Y = thant ;

X = myat,

Y = mon ;

X = myat,

Y = zaw ;

X = myat,

Y = kyaw ;

X = myat,

Y = thant ;

X = thae,

Y = myat ;

X = thae,

Y = chu ;

X = pyae,

Y = myat ;

X = pyae,

Y = chu ;

X = kyaw,

Y = mon ;

X = kyaw,

Y = zaw ;

X = kyaw,

Y = myat ;

X = thant,

Y = mon ;

X = thant,

Y = zaw ;

X = thant,

Y = myat ;

false.

14 ?- uncle(U,C).

U = ye,

C = chu ;

U = ye,

C = mon ;

U = ye,

C = zaw ;

U = ye,

C = thae ;

U = ye,

C = pyae ;

U = ye,

C = kyaw ;

U = ye,

C = thant ;

U = naing,

C = myat ;

U = naing,

C = thae ;

U = naing,

C = pyae ;

U = min,

C = myat ;

U = min,

C = chu ;

U = min,

C = myat ;

U = min,

C = chu ;

U = own,

C = mon ;

U = own,

C = zaw ;

U = own,

C = myat ;

U = own,

C = mon ;

U = own,

C = zaw ;

U = own,

C = myat ;

U = win,

C = zaw ;

U = win,

C = myat ;

U = win,

C = kyaw ;

U = win,

C = thant ;

U = kyi,

C = mon ;

U = kyi,

C = myat ;

U = kyi,

C = kyaw ;

U = kyi,

C = thant ;

false.

15 ?- aunt(X,Y).

X = khin,

Y = chu ;

X = khin,

Y = mon ;

X = khin,

Y = zaw ;

X = khin,

Y = thae ;

X = khin,

Y = pyae ;

X = khin,

Y = kyaw ;

X = khin,

Y = thant ;

X = san,

Y = myat ;

X = san,

Y = thae ;

X = san,

Y = pyae ;

X = anno,

Y = myat ;

X = anno,

Y = chu ;

X = anno,

Y = myat ;

X = anno,

Y = chu ;

X = wan,

Y = mon ;

X = wan,

Y = zaw ;

X = wan,

Y = myat ;

X = wan,

Y = mon ;

X = wan,

Y = zaw ;

X = wan,

Y = myat ;

X = shan,

Y = zaw ;

X = shan,

Y = myat ;

X = shan,

Y = kyaw ;

X = shan,

Y = thant ;

X = thet,

Y = mon ;

X = thet,

Y = myat ;

X = thet,

Y = kyaw ;

X = thet,

Y = thant ;

false.

16 ?- grandchild(X,Y).

X = myat,

Y = soe ;

X = myat,

Y = than ;

X = chu,

Y = soe ;

X = chu,

Y = than ;

X = mon,

Y = thaung ;

X = mon,

Y = kywae ;

X = zaw,

Y = thaung ;

X = zaw,

Y = kywae ;

X = myat,

Y = thaung ;

X = myat,

Y = kywae ;

X = thae,

Y = soe ;

X = thae,

Y = than ;

X = pyae,

Y = soe ;

X = pyae,

Y = than ;

X = kyaw,

Y = thaung ;

X = kyaw,

Y = kywae ;

X = thant,

Y = thaung ;

X = thant,

Y = kywae ;

false.

18 ?- grandson(X,Y).

X = myat,

Y = soe ;

X = myat,

Y = than ;

X = myat,

Y = thaung ;

X = myat,

Y = kywae ;

X = pyae,

Y = soe ;

X = pyae,

Y = than ;

X = kyaw,

Y = thaung ;

X = kyaw,

Y = kywae ;

X = thant,

Y = thaung ;

X = thant,

Y = kywae ;

X = zaw,

Y = thaung ;

X = zaw,

Y = kywae ;

false.

19 ?- granddaughter(X,Y).

X = chu,

Y = soe ;

X = chu,

Y = than ;

X = thae,

Y = soe ;

X = thae,

Y = than ;

X = mon,

Y = thaung ;

X = mon,

Y = kywae ;

false.

20 ?- greatgrandparent(X,Y).

false.

21 ?- ancestor(X,Y).

X = soe,

Y = ye ;

X = soe,

Y = naing ;

X = soe,

Y = anno ;

X = ye,

Y = myat ;

X = naing,

Y = chu ;

X = min,

Y = thae ;

X = min,

Y = pyae ;

X = thaung,

Y = wan ;

X = thaung,

Y = win ;

X = thaung,

Y = kyi ;

X = thaung,

Y = khin ;

X = own,

Y = kyaw ;

X = own,

Y = thant ;

X = win,

Y = mon ;

X = kyi,

Y = zaw ;

X = than,

Y = ye ;

X = than,

Y = naing ;

X = than,

Y = anno ;

X = khin,

Y = myat ;

X = san,

Y = chu ;

X = anno,

Y = thae ;

X = anno,

Y = pyae ;

X = kywae,

Y = wan ;

X = kywae,

Y = win ;

X = kywae,

Y = kyi ;

X = kywae,

Y = khin ;

X = wan,

Y = kyaw ;

X = wan,

Y = thant ;

X = shan,

Y = mon ;

X = thet,

Y = zaw ;

X = thet,

Y = thu ;

X = soe,

Y = myat ;

X = soe,

Y = chu ;

X = soe,

Y = thae ;

X = soe,

Y = pyae ;

X = thaung,

Y = kyaw ;

X = thaung,

Y = thant ;

X = thaung,

Y = mon ;

X = thaung,

Y = zaw ;

X = thaung,

Y = myat ;

X = than,

Y = myat ;

X = than,

Y = chu ;

X = than,

Y = thae ;

X = than,

Y = pyae ;

X = kywae,

Y = kyaw ;

X = kywae,

Y = thant ;

X = kywae,

Y = mon ;

X = kywae,

Y = zaw ;

X = kywae,

Y = myat ;

false.

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2. Function

%!Rules!%

%Member

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

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

%Element position

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

lastelem([X],X).

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

%Adjacency

adjacentof2(X,Y,[X,Y|\_]).

adjacentof2(X,Y,[\_|T]):- adjacentof2(X,Y,T).

adjacentof3(X,Y,Z,[X,Y,Z|\_]).

adjacentof3(X,Y,Z,[\_|T]):- adjacentof3(X,Y,Z,T).

%Append LIST

appendlis([],L,L).

appendlis([X|T1],L,[X|T3]):- appendlis(T1,L,T3).

%Delete

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

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

%Append ELEMENT

appendelem([],L,L).

appendelem([X|T1],L,[X|T3]):- appendelem(T1,L,T3).

%Insert

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

%Length of list

lengthlis([],0).

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

%Reverse list

reverselis(X,Y):- reverse(X,[],Y).

reverse([],Tem,Tem).

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

%Palindrone

palindrone(X):- reverselis(X,X).

%Display

display([]):- nl.

display([H|T]):- write(H), tab(1), display(T).

Output

7 ?- memberof(X,[1,2,3,4,5]).

X = 1 ;

X = 2 ;

X = 3 ;

X = 4 ;

X = 5 ;

false.

8 ?- firstelem([3,2,5,9,4], X).

X = 3.

9 ?- lastelem([1,2,3,4,5],X).

X = 5 ;

false.

12 ?- adjacentof2(X,Y,[1,2,3,4,5,6]).

X = 1,

Y = 2 ;

X = 2,

Y = 3 ;

X = 3,

Y = 4 ;

X = 4,

Y = 5 ;

X = 5,

Y = 6 ;

false.

13 ?- adjacentof3(X,Y,Z,[1,2,3,4,5,6,7,8,9]).

X = 1,

Y = 2,

Z = 3 ;

X = 2,

Y = 3,

Z = 4 ;

X = 3,

Y = 4,

Z = 5 ;

X = 4,

Y = 5,

Z = 6 ;

X = 5,

Y = 6,

Z = 7 ;

X = 6,

Y = 7,

Z = 8 ;

X = 7,

Y = 8,

Z = 9 ;

false.

15 ?- appendlis([1,2],[3,4],L).

L = [1, 2, 3, 4].

16 ?- delete(4,[1,2,3,4,5],T).

T = [1, 2, 3, 5]

17 ?- appendelem([1,2,3,4,5],[6],L).

L = [1, 2, 3, 4, 5, 6].

18 ?- insertelem(1,[4,5,6,7],XL).

XL = [1, 4, 5, 6, 7]

19 ?- lengthlis([1,2,3,4,5,6,7],N).

N = 7.

20 ?- reverselis([1,2,3,4,5,6],Y).

Y = [6, 5, 4, 3, 2, 1].

21 ?- palindrone([1,2,2,1]).

true.

22 ?- palindrone([1,2,3,1]).

false.

26 ?- display([1,2,3,4]).

1 2 3 4

true.

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3.8Queens

queens\_in\_peace(X):- X= [1/\_,2/\_,3/\_,4/\_,5/\_,6/\_,7/\_,8/\_],in\_peace(X).

non\_check(\_,[]).

non\_check(X/Y, [Xi/Yi|Rest]):-

Y=\=Yi,

abs(Yi-Y)=\=abs(Xi-X),

non\_check(X/Y,Rest).

in\_peace([]).

in\_peace([X/Y| Rest]):-

in\_peace(Rest),

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

non\_check(X/Y, Rest).

Output

32 ?- queens\_in\_peace(X).

X = [1/4, 2/2, 3/7, 4/3, 5/6, 6/8, 7/5, 8/1] ;

X = [1/5, 2/2, 3/4, 4/7, 5/3, 6/8, 7/6, 8/1] ;

X = [1/3, 2/5, 3/2, 4/8, 5/6, 6/4, 7/7, 8/1] ;

X = [1/3, 2/6, 3/4, 4/2, 5/8, 6/5, 7/7, 8/1] ;

X = [1/5, 2/7, 3/1, 4/3, 5/8, 6/6, 7/4, 8/2] ;

X = [1/4, 2/6, 3/8, 4/3, 5/1, 6/7, 7/5, 8/2] ;

X = [1/3, 2/6, 3/8, 4/1, 5/4, 6/7, 7/5, 8/2] ;

X = [1/5, 2/3, 3/8, 4/4, 5/7, 6/1, 7/6, 8/2] ;

X = [1/5, 2/7, 3/4, 4/1, 5/3, 6/8, 7/6, 8/2] ;

X = [1/4, 2/1, 3/5, 4/8, 5/6, 6/3, 7/7, 8/2] ;

X = [1/3, 2/6, 3/4, 4/1, 5/8, 6/5, 7/7, 8/2] ;

X = [1/4, 2/7, 3/5, 4/3, 5/1, 6/6, 7/8, 8/2] ;

X = [1/6, 2/4, 3/2, 4/8, 5/5, 6/7, 7/1, 8/3] ;

X = [1/6, 2/4, 3/7, 4/1, 5/8, 6/2, 7/5, 8/3] ;

X = [1/1, 2/7, 3/4, 4/6, 5/8, 6/2, 7/5, 8/3] ;

X = [1/6, 2/8, 3/2, 4/4, 5/1, 6/7, 7/5, 8/3] ;

X = [1/6, 2/2, 3/7, 4/1, 5/4, 6/8, 7/5, 8/3] ;

X = [1/4, 2/7, 3/1, 4/8, 5/5, 6/2, 7/6, 8/3] ;

X = [1/5, 2/8, 3/4, 4/1, 5/7, 6/2, 7/6, 8/3] ;

X = [1/4, 2/8, 3/1, 4/5, 5/7, 6/2, 7/6, 8/3] ;

X = [1/2, 2/7, 3/5, 4/8, 5/1, 6/4, 7/6, 8/3] ;

X = [1/1, 2/7, 3/5, 4/8, 5/2, 6/4, 7/6, 8/3] ;

X = [1/2, 2/5, 3/7, 4/4, 5/1, 6/8, 7/6, 8/3] ;

X = [1/4, 2/2, 3/7, 4/5, 5/1, 6/8, 7/6, 8/3] ;

X = [1/5, 2/7, 3/1, 4/4, 5/2, 6/8, 7/6, 8/3] ;

X = [1/6, 2/4, 3/1, 4/5, 5/8, 6/2, 7/7, 8/3] ;

X = [1/5, 2/1, 3/4, 4/6, 5/8, 6/2, 7/7, 8/3] ;

X = [1/5, 2/2, 3/6, 4/1, 5/7, 6/4, 7/8, 8/3] ;

X = [1/6, 2/3, 3/7, 4/2, 5/8, 6/5, 7/1, 8/4] ;

X = [1/2, 2/7, 3/3, 4/6, 5/8, 6/5, 7/1, 8/4] ;

X = [1/7, 2/3, 3/1, 4/6, 5/8, 6/5, 7/2, 8/4] ;

X = [1/5, 2/1, 3/8, 4/6, 5/3, 6/7, 7/2, 8/4] ;

X = [1/1, 2/5, 3/8, 4/6, 5/3, 6/7, 7/2, 8/4] ;

X = [1/3, 2/6, 3/8, 4/1, 5/5, 6/7, 7/2, 8/4] ;

X = [1/6, 2/3, 3/1, 4/7, 5/5, 6/8, 7/2, 8/4] ;

X = [1/7, 2/5, 3/3, 4/1, 5/6, 6/8, 7/2, 8/4] ;

X = [1/7, 2/3, 3/8, 4/2, 5/5, 6/1, 7/6, 8/4] ;

X = [1/5, 2/3, 3/1, 4/7, 5/2, 6/8, 7/6, 8/4] ;

X = [1/2, 2/5, 3/7, 4/1, 5/3, 6/8, 7/6, 8/4] ;

X = [1/3, 2/6, 3/2, 4/5, 5/8, 6/1, 7/7, 8/4] ;

X = [1/6, 2/1, 3/5, 4/2, 5/8, 6/3, 7/7, 8/4] ;

X = [1/8, 2/3, 3/1, 4/6, 5/2, 6/5, 7/7, 8/4] ;

X = [1/2, 2/8, 3/6, 4/1, 5/3, 6/5, 7/7, 8/4] ;

X = [1/5, 2/7, 3/2, 4/6, 5/3, 6/1, 7/8, 8/4] ;

X = [1/3, 2/6, 3/2, 4/7, 5/5, 6/1, 7/8, 8/4] ;

X = [1/6, 2/2, 3/7, 4/1, 5/3, 6/5, 7/8, 8/4] ;

X = [1/3, 2/7, 3/2, 4/8, 5/6, 6/4, 7/1, 8/5] ;

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X = [1/4, 2/2, 3/7, 4/3, 5/6, 6/8, 7/1, 8/5] ;

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X = [1/2, 2/6, 3/8, 4/3, 5/1, 6/4, 7/7, 8/5] ;

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X = [1/4, 2/8, 3/5, 4/3, 5/1, 6/7, 7/2, 8/6] ;

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false.