

**Question 1:**

Think of a family of three or four generations (it could be yours, some famous people, or a hypothetical family). Name all the members, and provide facts on the gender (such as: `male(john).`), and parent relation (such as: `parent(john, sue).`). Declare these facts in a Prolog program.

Now, define and add the following relations in Prolog: father, mother, brother, sibling, grandson, cousin, mother in law, and descendant. Any reasonable and common definition of those relations is accepted.

For each relation you have defined, ask Prolog a few queries which return “true” or “false”, and several queries with variables (and get all answers). Write down what Prolog returns (also include 1-2 screenshots).

%%%

**Code:**

```
male(jonathan).
male(straizo).
male(dio).
male(zeppeli).
male(jeorge).
male(gio).
male(joseph).
male(caesar).

female(erina).
female(elizabeth).
female(mariah).
female(roberta).
female(lisa).
female(susan).
female(suzy).
female(holly).

parent(jonathan, jeorge).
parent(erina, jeorge).
parent(straizo, lisa).
parent(elizabeth, lisa).
parent(dio, gio).
parent(mariah, gio).
parent(zeppeli, susan).
parent(roberta, susan).
parent(jeorge, joseph).
parent(lisa, joseph).
parent(gio, suzy).
parent(susan, suzy).
parent(jeorge, caesar).
parent(lisa, caesar).
parent(joseph, holly).
parent(suzy, holly).

married(jonathan, erina).
```

```

married(erina, jonathan).
married(straizo, elizabeth).
married(elizabeth, straizo).
married(dio, mariah).
married(mariah, dio).
married(zeppeli, roberta).
married(roberta, zeppeli).
married(jeorge, lisa).
married(lisa, jeorge).
married(gio, susan).
married(susan, gio).
married(joseph, suzy).
married(suzy, joseph).

```

```

father(F, C) :- male(F), parent(F, C).
mother(M, C) :- female(M), parent(M, C).
sibling(A,B):- mother(M,A),mother(M,B),father(F,A),father(F,B),A\=B.
brother(A, B):- male(A), sibling(A, B).
grandson(A, B):- male(A), parent(P,A), parent(B,P).
cousin(A, B):- parent(P,A), parent(Q,B), sibling(P,Q).
mother_in_law(M, A):- married(A, B), mother(M, B).

descendant(D, A):- parent(A, D).
descendant(D, A):- parent(P, D), descendant(P, A).

```

%%%

**Examples:**

```

obelix.gaul.csd.uwo.ca[32]% pl
Welcome to SWI-Prolog (Multi-threaded, Version 5.4.7)
Copyright (c) 1990-2003 University of Amsterdam.
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software,
and you are welcome to redistribute it under certain conditions.
Please visit http://www.swi-prolog.org for details.

For help, use ?- help(Topic). or ?- apropos(Word).

?- ['q1.pl'].
% q1.pl compiled 0.00 sec, 6,308 bytes

Yes
?- father(X,caesar).

X = jeorge ;

No
?- father(dio, X).

X = gio ;

No
?- father(erina, jeorge).

```

```

?- sibling(caesar, joseph).

Yes
?- brother(joseph, caesar).

Yes
?- brother(caesar,X).

X = joseph ;

No
?- grandson(jonathan,X).

No
?- grandson(X,jonathan).

X = joseph ;

X = caesar ;

No
?- mother_in_law(X,joseph).

X = susan ;

No
?- mother_in_law(lisa,suzy).

Yes
?- descendant(joseph, jonathan).
Correct to: descendant(joseph, jonathan)? yes

Yes
?- descendant(suzy, jonathan).

No
?- descendant(X, jonathan).

X = george ;

X = joseph ;

X = caesar ;

X = holly ;

No
?- 

```

```

?- mother(erina, george).

Yes
?- mother(lisa,X).

X = joseph ;

X = caesar ;

No
?- mother(X, gio).

X = mariah ;

No
?- mother(dio, gio).

No
?- 

```



%%%


**Examples:**

```
For help, use ?- help(Topic) . or ?- apropos(Word) .

?- ['q2.pl'].
% q2.pl compiled 0.00 sec, 3,484 bytes

Yes
?- has_airport(X, Y1), has_airport(X, Y2), hero(Y1), battle(Y2) .

X = chicago
Y1 = ohare
Y2 = midway ;

No
?- 
```





```
block_split(A) :- o(B), o(C), \+ (B = C), line(A,B,D), line(A,C,E),  
empty(D), empty(E).
```

```
build(A) :- x(B), line(A,B,C), empty(C).
```

```
good(5).                % choose a cell in a good location  
good(1).  
good(3).  
good(7).  
good(9).  
good(2).  
good(4).  
good(6).  
good(8).
```







**Examples:**

```
% q5.pl compiled 0.00 sec, 4,304 bytes

Yes
?- solution(V1,V2,V3,H1,H2) .

V1 = five
V2 = run
V3 = mess
H1 = forum
H2 = vanish
```

[illegible]