Logische Programmierung, Serie 01

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1

c)

```
% 1.A
parent(walter,mirco).       %f-p1
parent(walter,jana).        %f-p2
parent(mirco,nele).         %f-p3
parent(silke,nele).         %f-p4
parent(mirco,willi).        %f-p5
parent(silke,filip).        %f-p6
parent(dorothea,dagmar).    %f-p7
parent(dagmar,silke).       %f-p8
parent(dagmar,jan).         %f-p9


female(dorothea).           %f-f1
female(dagmar).             %f-f2
female(jana).               %f-f3
female(silke).              %f-f4
female(nele).               %f-f5

male(walter).               %f-m1
male(mirco).                %f-m2
male(jan).                  %f-m3
male(filip).                %f-m4
male(willi).                %f-m5


% 1.B
% Helpdef. for brother, sister, aunt, uncle
sibling(X,Y) :- parent(A,X),parent(A,Y),X \== Y.    %r0

child(X,Y) :- parent(Y,X).                          %r1
daughter(X,Y) :- female(X),child(X,Y).              %r2
son(X,Y) :- male(X),child(X,Y).                     %r3
brother(X,Y) :- male(X),sibling(X,Y).               %r4
sister(X,Y) :- female(X),sibling(X,Y).              %r5
aunt(X,Y) :- parent(Z,Y),sister(X,Z).               %r6
uncle(X,Y) :- parent(Z,Y),brother(X,Z).             %r7
grandparent(X,Y) :- parent(X,Z),parent(Z,Y).        %r8
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swi-prolog.org
For built-in help, use ?- help(Topic).
pos(Word).

[?- [aufgabe1].
true.

[?- child(dagmar,dorothea). %true
true.

[?- daughter(dagmar,dorothea). %true
true.

[?- son(jan,dagmar). %true
true.

[?- brother(filip,nele). %true
true.

[?- sister(filip,nele). %false
false.

[?- aunt(jana,willi). %true
true.

[?- uncle(jan,filip). %true
true.

[?- grandparent(dorothea,jan). %true
true.

[?- halt.
Nilss-Mac:Prolog nils$
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d)

brother(X,Y).
⇓ r4 {X=X, Y=Y}
male(X),sibling(X,Y).
⇓ f-m1 {X=walter, Y=Y}
male(walter),sibling(walter,Y).
⇓ r0 {X=walter, Y=Y, A=A}
male(walter),parent(A,walter),parent(A,Y),walter≠Y.
⇓ kein passender Fakt: parent(A,walter)
false. ⇒ sibling(walter,Y) is false ⇒ brother(walter,Y) is false.

male(X),sibling(X,Y).
⇓ f-m2 {X=mirco, Y=Y}
male(mirco),sibling(mirco,Y).
⇓ r0 {X=mirco, Y=Y, A=A}
male(mirco),parent(A,mirco),parent(A,Y),mirco≠Y.
⇓ f-p1 {X=mirco, Y=Y, A=walter}
male(mirco),parent(walter,mirco),parent(walter,Y),mirco≠Y.
* ⇓ f-p1 {X=mirco, Y=mirco, A=walter}
* male(mirco),parent(walter,mirco),parent(walter,mirco),mirco≠mirco.
* ⇓ mirco=mirco, daher
* false.
**⇓ f-p2 {X=mirco, Y=jana, A=walter}
**male(mirco),parent(walter,mirco),parent(walter,jana),mirco≠jana.
**⇓ mirco≠jana,daher
true. ⇒ sibling(mirco,jana) is true ⇒ brother(mirco,jana) is true. ⇒
X=mirco, Y=jana;

male(X),sibling(X,Y).
⇓ f-m3 {X=jan, Y=Y}
male(jan),sibling(jan,Y).
⇓ r0 {X=jan, Y=Y, A=A}
male(jan),parent(A,jan),parent(A,Y),jan≠Y.
⇓ f-p9 {X=jan, Y=Y, A=dagmar}
male(jan),parent(dagmar,jan),parent(dagmar,Y),jan≠Y.
* ⇓ f-p8 {X=jan, Y=silke, A=dagmar}
* male(jan),parent(dagmar,jan),parent(dagmar,silke),jan≠silke.
* ⇓ jan≠silke,daher
true. ⇒ sibling(jan,silke) is true ⇒ brother(jan,silke) is true. ⇒
X=jan, Y=silke;
**⇓ f-p9 {X=jan, Y=jan, A=dagmar}
**male(jan),parent(dagmar,jan),parent(dagmar,jan),jan≠jan.
**jan=jan, daher false.

male(X),sibling(X,Y).
⇓ f-m4 {X=filip, Y=Y}
male(filip),sibling(filip,Y).
⇓ r0 {X=filip, Y=Y, A=A}
male(filip),parent(A,filip),parent(A,Y),filip≠Y.
⇓ f-p6 {X=filip, Y=Y, A=silke}
male(filip),parent(silke,filip),parent(silke,Y),filip≠Y.
* ⇓ f-p4 {X=filip, Y=nele, A=silke}
* male(filip),parent(silke,filip),parent(silke,nele),filip≠nele.
* ⇓ filip≠nele,daher
true. ⇒ sibling(filip,nele) is true ⇒ brother(filip,nele) is true. ⇒
X=filip, Y=nele;
**⇓ f-p6 {X=filip, Y=filip, A=silke}
**male(filip),parent(silke,filip),parent(silke,filip),filip≠filip.
**filip=filip, daher false.

male(X),sibling(X,Y).
⇓ f-m5 {X=willi, Y=Y}
male(willi),sibling(willi,Y).
⇓ r0 {X=willi, Y=Y, A=A}
male(willi),parent(A,willi),parent(A,Y),filip≠Y.
⇓ f-p5 {X=willi, Y=Y, A=mirco}
male(willi),parent(mirco,willi),parent(mirco,Y),willi≠Y.
* ⇓ f-p3 {X=willi, Y=nele, A=mirco}
* male(willi),parent(mirco,willi),parent(mirco,nele),willi≠nele.
* ⇓ willi≠nele,daher
true. ⇒ sibling(willi,nele) is true ⇒ brother(willi,nele) is true. ⇒
X=willi, Y=nele;
**⇓ f-p5 {X=willi, Y=willi, A=mirco}
**male(willi),parent(mirco,willi),parent(mirco,willi),willi≠willi.
**willi=willi, daher false.

sister(X,Y).
⇓ r5 {X=X, Y=Y}
female(X),sibling(X,Y).
⇓ f-f1 {X=dorothea, Y=Y}
female(dorothea),sibling(dorothea,Y).
⇓ r0 {X=dorothea, Y=Y, A=A}
female(dorothea),parent(A,dorothea),parent(A,Y),dorothea≠Y.
⇓ kein passender Fakt: parent(A,dorothea)
false. ⇒ sibling(dorothea,Y) is false ⇒ sister(dorothea,Y) is false.

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female(X),sibling(X,Y).
⇓ f-m2 {X=dagmar, Y=Y}
female(dagmar),sibling(dagmar,Y).
⇓ r0 {X=dagmar, Y=Y, A=A}
female(dagmar),parent(A,dagmar),parent(A,Y),dagmar≠Y.
⇓ f-p7 {X=dagmar, Y=Y, A=dorothea}
female(dagmar),parent(dorothea,dagmar),parent(dorothea,Y),dagmar≠Y.
⇓ f-p7 {X=dagmar, Y=dagmar, A=dorothea}
female(dagmar),parent(dorothea,dagmar),parent(dorothea,dagmar),dagmar≠dagmar.
⇓ dagmar=dagmar, daher
false.  ⇒ sibling(dagmar,Y) is false ⇒ sister(dagmar,Y) is false.

female(X),sibling(X,Y).
⇓ f-m3 {X=jana, Y=Y}
female(jana),sibling(jana,Y).
⇓ r0 {X=jana, Y=Y, A=A}
female(jana),parent(A,jana),parent(A,Y),jana≠Y.
⇓ f-p2 {X=jana, Y=Y, A=walter}
female(jana),parent(walter,jana),parent(walter,Y),jana≠Y.
* ⇓ f-p1 {X=jana, Y=mirco, A=walter}
* female(jana),parent(walter,jana),parent(walter,mirco),jana≠mirco.
* ⇓ jana≠mirco,daher
true.  ⇒ sibling(jana,mirco) is true ⇒ sister(jana,mirco) is true.  ⇒
X=jana, Y=mirco;
**⇓ f-p2 {X=jana, Y=jana, A=walter}
**female(jana),parent(walter,jana),parent(walter,jana),jana≠jana.
**jana=jana, daher false.

female(X),sibling(X,Y).
⇓ f-m4 {X=silke, Y=Y}
female(silke),sibling(silke,Y).
⇓ r0 {X=silke, Y=Y, A=A}
female(silke),parent(A,silke),parent(A,Y),silke≠Y.
⇓ f-p8 {X=silke, Y=Y, A=dagmar}
female(silke),parent(dagmar,silke),parent(dagmar,Y),silke≠Y.
* ⇓ f-p8 {X=silke, Y=silke, A=dagmar}
* female(silke),parent(dagmar,silke),parent(dagmar,silke),silke≠silke.
* jana=jana, daher false.
**⇓ f-p9 {X=jana, Y=jan, A=walter}
**female(silke),parent(dagmar,silke),parent(dagmar,jan),silke≠jan.
**⇓ silke≠jan,daher
true.  ⇒ sibling(silke,jan) is true ⇒ sister(silke,jan) is true.  ⇒
X=silke, Y=jan;
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female(X),sibling(X,Y).
⇓ f-m5 {X=nele, Y=Y}
female(nele),sibling(nele,Y).
⇓ r0 {X=nele, Y=Y, A=A}
female(nele),parent(A,nele),parent(A,Y),nele≠Y.
' ⇓ f-p3 {X=nele, Y=Y, A=mirco}
' female(nele),parent(mirco,nele),parent(mirco,Y),nele≠Y.
' * ⇓ f-p3 {X=nele, Y=nele, A=mirco}
' * female(nele),parent(mirco,nele),parent(mirco,nele),nele≠nele.
' * nele=nele, daher false.
' **⇓ f-p6 {X=nele, Y=willi, A=mirco}
' **female(nele),parent(mirco,nele),parent(mirco,willi),nele≠willi.
' **⇓ nele≠willi,daher
true.  ⇒ sibling(nele,willi) is true ⇒ sister(nele,willi) is true.  ⇒
X=nele, Y=willi;
''⇓ f-p4 {X=nele, Y=Y, A=silke}
''female(nele),parent(silke,nele),parent(silke,Y),nele≠Y.
''* ⇓ f-p4 {X=nele, Y=nele, A=silke}
''* female(nele),parent(silke,nele),parent(silke,nele),nele≠nele.
''* nele=nele, daher false.
''**⇓ f-p6 {X=nele, Y=filip, A=silke}
''**female(nele),parent(silke,nele),parent(silke,filip),nele≠filip.
''**⇓ nele≠filip,daher
true.  ⇒ sibling(nele,filip) is true ⇒ sister(nele,filip) is true.  ⇒
X=nele, Y=filip;
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