What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?-

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a ground instance of a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* are identical
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

OOPS! Time to modify things a bit.

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(betty,roxy) :-
 mother(betty,Z),parent(Z,roxy).
parent(X,Y) :- mother(X,Y).
parent(X,Y) :- father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = grandmother(betty,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(betty,roxy) :-
 mother(betty,Z),parent(Z,roxy).
parent(X,Y) :- mother(X,Y).
parent(X,Y) :- father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,Z),
parent(Z,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*, *else* output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = mother(betty,bamm-bamm),
parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1,…,Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1,…,Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate
    substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate
    substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(bamm-bamm,roxy) :-
 father(bamm-bamm,roxy).
```

?- grandmother(betty,roxy).

resolvent = parent(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate
    substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(bamm-bamm,roxy) :-
 father(bamm-bamm,roxy).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate
    substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1,…,Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1,…,Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1,…,Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1,…,Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent = father(bamm-bamm,roxy)

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit
    the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate
    substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*,
  else output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*, *else* output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).

resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
choose a goal *A* from the resolvent
choose a clause
A' :- *B1*,…,*Bn* from program *P*
such that *A* and *A'* unify
(if no such goal and clause exist, exit the while loop)
replace *A* by *B1*,…,*Bn* in the resolvent
(after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*, *else* output *no*

What if P has rules?

The program (*P*):

```
father(fred,pebbles).
father(bamm-bamm,roxy).
father(barney,bamm-bamm).
father(bamm-bamm,chip).
mother(pebbles,roxy).
mother(pebbles,chip).
mother(wilma,pebbles).
mother(betty,bamm-bamm).
grandmother(X,Y) :-
 mother(X,Z),parent(Z,Y).
parent(X,Y) :-
mother(X,Y).
parent(X,Y) :-
father(X,Y).
```

?- grandmother(betty,roxy).
yes
resolvent =

Initialize resolvent to goal G (the query)
while resolvent not empty *do*
  choose a goal *A* from the resolvent
  choose a clause
    A' :- *B1*,…,*Bn* from program *P*
    such that *A* and *A'* unify
    (if no such goal and clause exist, exit the while loop)
  replace *A* by *B1*,…,*Bn* in the resolvent
    (after performing the appropriate substitutions)
If the resolvent is empty, *then* output *yes*, *else* output *no*

Questions?