# PRACTICAL FILE for Core Paper XIII: Artificial Intelligence

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First 4 Queries

(1) Who is a parent of Jim? Assume that this is some Y.

```
parent(Y,jim).
Y = pat.
```

(2) Who is a parent of Y? Assume that this is some X.

```
parent(Y,jim),parent(X,Y).
Y = pat,
X = bob.
```

(3) Who is a parent X of Ann?

```
parent(X,ann).
X = bob.
```

(4) Is (this same) X a parent of Pat?

```
parent(X,ann),parent(X,pat).
X = bob.
```

Exercises:

1.1

```
parent(jim,X).
false.

parent(X,jim).
X = pat.

parent(pam,X), parent(X,pat).
X = bob.

parent(pam,X), parent(X,Y), parent(Y,jim).
X = bob,
Y = pat.
```

1.2

```
parent(X,pat).
X = bob.

parent(liz,x).
false.

parent(G,P),parent(P,pat).
G = pam,
P = bob ;
G = tom,
P = bob ;
false.
```

### 1.3

(a)

```
happy(P):-parent(P,C).
```

(b)

```
sister(G,B):-parent(P,G),parent(P,B),female(G).
hastwochildren(P):-parent(P,C),sister(C,S).
```

### 1.4

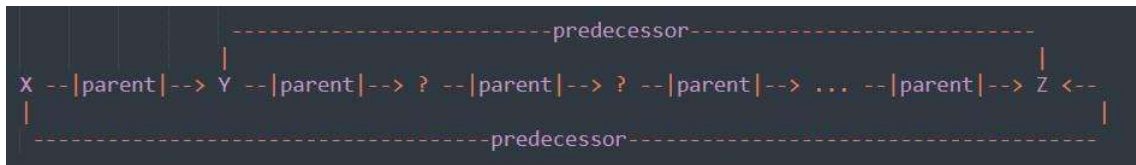```
grandchild(C,G):-parent(G,P),parent(P,C).
```

### 1.5

```
sister(G,B):-parent(P,G),parent(P,B),female(G).
aunt(A,C):-parent(P,C),sister(A,P).
```
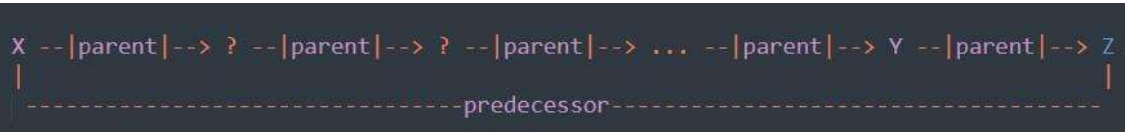
### 1.6

This is the old relation:

```
                  ------------------------predecessor-------------------------
                  |                                                          |
X --|parent|--> Y --|parent|--> ? --|parent|--> ? --|parent|--> ... --|parent|--> Z <--
|                                                                              |
------------------------------------predecessor---------------------------------
```

This is the new relation: Yes, it does seem correct.

```
X --|parent|--> ? --|parent|--> ? --|parent|--> ... --|parent|--> Y --|parent|--> Z
|                                                                              |
-------------------------------------predecessor--------------------------------
```

1.7

(a)

```
~Fact parent(pam,bob)
```

(b)

```
------> mother(pam,bob) <------
\                       \
 \                       \
  -- parent(pam,bob) ~yes   -- female(pam) ~yes
```

(c)

```
--> grandparent(pam,ann) <---
\                         \
 \                         \
  -- parent(pam,P) <--       -- parent(P,ann) <--
               \                          \
                P=bob                      P=bob
                 \                          \
  ~Fact parent(pam,bob) --    ~Fact parent(bob,ann) --
```

(d)

```
--> grandparent(bob,jim) <---
\                        \
 \                        \
  -- parent(bob,P) <--       -- parent(P,jim) <--
                \                            \
          P=pat,ann ~yes              P=pat ~yes
                  \                            \
   ~Fact parent(bob,pat) --     ~Fact parent(pat,jim) --
   ~Fact parent(bob,ann) --
```

1.8

```
maternalgrandmother(G,C):-female(G),parent(G,P),female(P),parent(P,C).
maternalgrandfather(G,C):-male(G),parent(G,P),female(P),parent(P,C).
paternalgrandmother(G,C):-female(G),parent(G,P),male(P),parent(P,C).
paternalgrandfather(G,C):-male(G),parent(G,P),male(P),parent(P,C).
```
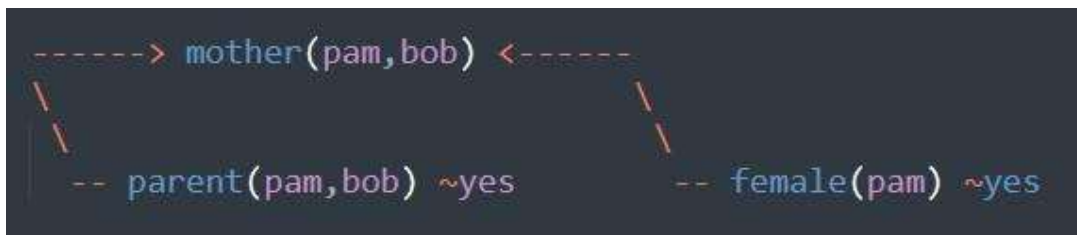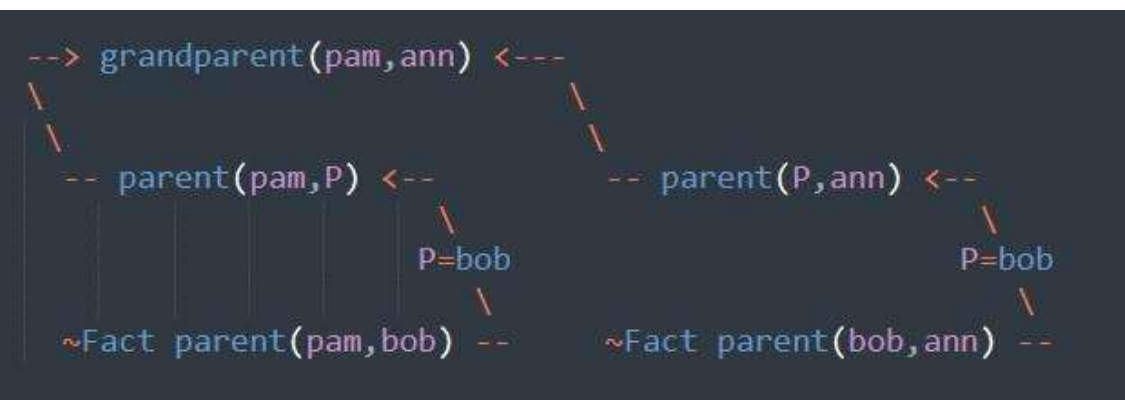
1.9

```
mother(M,C):-parent(M,C),female(M).
father(F,C):-parent(F,C),male(F).
siblings(A,B):-mother(M,A),mother(M,B),father(F,A),father(F,B).
cousins(A,B):-mother(X,A),parent(Y,A),siblings(X,Y).
```