

RIPHAH INTERNATIONAL

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Artificial Intelligence Lab

Lab 10

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Question 1

1. Which of the following sequences of characters are atoms, which are variables, which are complex terms, and which are not terms at all? Give the functor and arity of each complex term.
- a. loves(Vincent,mia)
 - b. 'loves(Vincent,mia)'
 - c. Butch(boxer)
 - d. boxer(Butch)
 - e. and(big(burger), kahuna(burger))
 - f. and(big(X), kahuna(X))
 - g. _and(big(X), kahuna(X))
 - h. (Butch kills Vincent)
 - i. kills(Butch Vincent)
 - kills(Butch,Vincent)

Answer:

loves(Vincent,mia)

■ Type: Complex term

■ Functor: loves

■ Arity: 2

'loves(Vincent,mia)'

■ Type: Atom

■ Functor/Arity: N/A

Butch(boxer)

■ Type: Not a valid term (variables and functors must start with lowercase letters, but Butch starts with an uppercase letter, which is invalid for a functor)

boxer(Butch)

■ Type: Complex term

- Functor: boxer

- Arity: 1

and(big(burger), kahuna(burger))

- Type: Complex term

- Functor: and

- Arity: 2

and(big(X), kahuna(X))

- Type: Complex term

- Functor: and

- Arity: 2

and(big(X), kahuna(X))

- Type: Atom (begins with an underscore, so it's treated as an atom, not a functor)

- Functor/Arity: N/A (not a complex term)

(Butch kills Vincent)

- Type: Not a valid term (parentheses are used incorrectly; it's neither a complex term nor an atom)

kills(Butch Vincent)

- Type: Not a valid term (arguments must be separated by commas)

kills(Butch, Vincent)

- Type: Complex term

- Functor: kills

- Arity: 2

Question 2

How many facts, rules, clauses, and predicates are there in the following knowledge base?

What are the heads of the rules, and what are the goals they contain?

woman(vincent). woman(mia). man(jules). person(X):- man(X); woman(X). loves(X,Y):-

father(X,Y). father(Y,Z):- man(Y), son(Z,Y).

father(Y,Z):- man(Y), daughter(Z,Y).

Answer:

woman(vincent). woman(mia). man(jules).

Facts=3

person(X):- man(X); woman(X).

loves(X,Y):- father(X,Y). father(Y,Z):- man(Y), son(Z,Y).

father(Y,Z):- man(Y), daughter(Z,Y).

Rules=3

A clause is a single fact or a rule. Since we have 3 facts and 4 rules, we have: Total

Clauses: 7

Predicate:

■ woman/1 (used in two facts)

■ man/1 (used in one fact and one rule goal)

■ person/1 (used in one rule)

■ loves/2 (used in one rule)

■ father/2 (used in three rules)

■ son/2 (used in one rule goal)

■ daughter/2 (used in one rule goal)

Total Predicates: 7 (counted by unique functor and arity)

Question 3

1. Represent the following in Prolog:

a. Butch is a killer.

b. Mia and Marsellus are married.

- c. Zed is dead.
- d. Marsellus kills everyone who gives Mia a foot massage.
- e. Mia loves everyone who is a good dancer.
- f. Jules eats anything that is nutritious or tasty.

Answer:

killer(butch).

married(mia, marsellus).

married(marsellus, mia).

dead(zed).

kills(marsellus, X) :- gives(X, mia, foot_message).

loves(mia, X) :- good_dancer(X).

eats(jules, X) :- nutritious(X); tasty(X).

Question 4

1. Suppose we are working with the following knowledge base:

wizard(ron). hasWand(harry). quidditchPlayer(harry).

wizard(X):- hasBroom(X), hasWand(X).

hasBroom(X):- quidditchPlayer(X).

Answer:

wizard(ron).

hasWand(harry).

quidditchPlayer(harry).

hasBroom(harry). % Inferred

wizard(harry). % Inferred

How does Prolog respond to the following queries?

- a. wizard(ron).
- b. witch(ron).
- c. wizard(hermione).
- d. witch(hermione).
- e. wizard(harry).
- f. wizard(Y).
- g. witch(Y).

Query Response

wizard(ron). true

witch(ron). false

wizard(hermione). false

witch(hermione). false

wizard(harry). true

wizard(Y).	Y = ron; Y = harry
Witch(Y)	False