Here's a clear and simple explanation of the Syntax and Semantics of Prolog, especially useful for understanding Knowledge Representation:

📘 Syntax and Semantics of Prolog

🔷 1. Syntax of Prolog

Prolog has a specific structure or grammar used to define facts, rules, and queries.

✅ Basic Elements:

- Atoms: Names for objects or relations. Start with a lowercase letter.
  Example: john, likes, apple.
- Variables: Start with an uppercase letter or underscore (_).
  Example: X, Person, _Thing.
- Predicate: Represents a relation. Written as predicate(arg1, arg2, ...).

✅ Types of Statements in Prolog:

Type	Syntax	Example
Fact	predicate(arg1, arg2, ...).	parent(john, mary).
Rule	head :- body.	father(X, Y) :- parent(X, Y), male(X).
Query	?- question.	?- parent(john, X).

🔷 2. Semantics of Prolog

Semantics refers to the meaning of the statements written in Prolog.

✅ Meaning of Facts:

- A fact is an assertion that something is true.

male(john).

Means: John is male.

✅ Meaning of Rules:

- A rule is a conditional statement that says something is true if certain conditions are met.

father(X, Y) :- parent(X, Y), male(X).

Means: X is the father of Y if X is a parent of Y and X is male.

✅ Meaning of Queries:

- A query asks the Prolog system to find out if something is true, or to find the values of variables that make it true.

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?- father(john, mary).
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Means: Is John the father of Mary?

🔁 How Prolog Works (Execution Semantics):

1. Prolog tries to match a query with facts or the head of a rule.
2. If a rule matches, it tries to satisfy the conditions (body).
3. It uses backtracking to explore multiple possibilities.

🔚 Summary

Concept	Description	Example
Syntax	How Prolog statements are written	father(X, Y) :- parent(X, Y).
Semantics	What those statements mean (their logic)	"X is a father of Y if X is a parent and male"

If you'd like a short quiz or example program to test this knowledge, I’d be happy to create one for you!