1. A Prolog program is a collection of procedures.

2. Data in Prolog are (rather simple) procedures.

3. Prolog supports recursion.

4. Prolog has no assignment statement.

5. Prolog has no distinction between actual & formal parameters, input & output parameters.

6. Prolog is (essentially) typeless.

7. Prolog has no run-time errors.

8. In Prolog, we tell the computer *WHAT* result we want computed, not *HOW* to compute it.
Prolog Syntax

- **variables** — 1\textsuperscript{st} char. is upper case
- **constants** — 1\textsuperscript{st} char. is lower case
- **delimiters** — parentheses and commas
- **procedures** or **rules**:

Rules are of the form (in BNF-like notation)

\[
\text{<head>} :: \text{<body>}. \\
\]

where <head> is a goal, and <body> is a (possibly empty) list of goals separated by commas, followed by a period.

The rule: \[ B :: A_1, A_2, ..., A_n. \]

can be interpreted *logically* as

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“B is true if each of the A_i’s is true.”
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It can also be interpreted *operationally* as

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“To solve B, 

it suffices to solve each of the A_i’s.”
```

A Prolog program is a collection of rules.
A simple example: Chemical Reactions

We use constants to represent chemicals:

mg  magnesium
o2  oxygen
mgo magnesium oxide
h2  hydrogen
h2o dihydrogen oxide (water)
c  carbon
co2 carbon dioxide
h2co3 carbonic acid

Rules represent chemical reactions:

mg  :-  mgo, h2.  (you have mg if you have mgo and h2)
h2o :- mgo, h2.  (you have h2o if you have mgo and h2)
co2 :- c, o2.   (you have co2 if you have c and o2)
h2co3 :- h2o, co2.  (you have h2co3 if you have h2o and co2)
mg    magnesium
o2    oxygen
mgo   magnesium oxide
h2    hydrogen
h2o   dihydrogen oxide (water)
c     carbon
c02   carbon dioxide
h2co3  carbonic acid

Assertions represent given information:

mgo :- . (there is magnesium oxide) mgo.
h2  :- . (there is hydrogen) h2.
o2  :- . (there is oxygen) o2.
c   :- . (there is carbon) c.

Submitting a goal list at Prolog’s prompt:

?- h2co3.

will produce the response ‘‘Yes’’.
mg :- mgo, h2. (you have mg if you have mgo and h2)
h2o :- mgo, h2. (you have h2o if you have mgo and h2)
co2 :- c, o2. (you have co2 if you have c and o2)
h2co3 :- h2o, co2. (you have h2co3 if you have h2o and co2)
mgo. (there is magnesium oxide)
h2. (there is hydrogen)
o2. (there is oxygen)
c. (there is carbon)

How did Prolog arrive at “Yes”? 

?- h2co3. The initial goal list
?- h2o, co2. was replaced by this (4th rule);
?- mgo, h2, co2. h2o was replaced by mgo & h2 (2nd rule)
?- h2, co2. mgo was removed (5th rule)
?- co2. h2 was removed (6th rule)
?- c, o2. co2 was replaced by c & o2 (3rd rule)
?- o2. c was removed (8th rule)
?- <empty> o2 was removed (7th rule)