* **Predicate Logic**

predicate (arguments).

Relationship between objects.

Property of an object or objects

**Examples**

1- liquid (water).
   is (water, liquid).

2- Today is Saturday
day (Saturday).

3- It is raining today.
   weather (today, rain).

4- P1= “it rained on Saturday”.
P2 = “it rained on Sunday”.
P3= “it rained on Monday”.
P4 = “it rained on Tuesday”.
P5= “it rained on Wednesday”.

P6 = “it rained on Thursday”.
P7 = “it rained on Friday”.

weather (X, rain). Where X ∈ {Saturday, Sunday, ….., Friday).

- Predicate logic allows us to deal with the components of a proposition.
- Predicate logic allows the use of variables, which make the sentence more general.
- The values the variable may assume have to be stated.

* **Quantifiers**
  ∴ For all
  ∃ There exists

**Examples**

∀X weather (X, rain) → true for all values of X.
∃X weather (X,rain) → true for some values of X

* **First Order Logic**
The quantifiers are on variables only.

* **Higher Order Logic**
The quantifiers may be on predicates.
  Example: ∀X ∀like  like(X,sports).

* **Definitions**

  1- **Constant:**
  A constant refers to a specific object or to a property of an object. A constant starts with a lower case letter.

  2- **Variable:**
  A variable is used to refer to general cases of objects or properties. Variables start with upper case letter.

  3- **Function:**
  A function name starts with a lower case letter. It has an associated number of arguments. Each argument can be either: constant, variable, or a function.
Example: product (a, b)

{ return a*b; }

4- Term:
A term refers either to constant, variable, or a function.

- The English alphabet and the digits 0, 1, 2, ……, 9 and the underscore “_” are used to construct a term.

5- Predicate:
A predicate names a relationship between zero or more objects. It starts with a lower case letter and the name is constructed using the characters used for terms.

6- Atomic Sentence:
Is a predicate with arity n followed by n terms enclosed in parentheses and separated by commas, predicate logic sentences are delimited by the period character “.”.

Examples:
- like (X,Y).
- ∀X ∃Y like(X,Y).
- ∃X ∀Y like(X,Y).

Atomic sentence may be combined using the connectives (\&,\vee,\neg,\Rightarrow,= ).

7- Literal:
A literal is an atomic sentence or the negation of an atomic sentence.

8- Clause:
A clause is one or more literals connected by the connectives (\&,\vee,\neg,\Rightarrow,= ).

A clause with one literal is called a unit clause.