First order Logic:

> In propositional Logic, we can only represent the facts, which are either True or False.

eg: It is raining.

> But It cannot represent the following statements.

eg: Some girls are intelligent.
All Mangoes are sweet.

> First-order-logic is capable of expressing facts about some or all objects.

> FOL specifies objects, relations and functions.

> It is also known as Predicate Logic (or) First order predicate Language.

Syntax:

Predicate (term 1, term 2 ... , term n).

x is a girl. → girl (x).

↓ subject

↓ Predicate

Quantifiers

↓ Universal quantifier

↓ ∀ - For all

↓

Eg: All employees.

∀x emp(x).

↓ Existential Quantifier

↓

∃ - For some.

↓

Eg: some students

∃x student (x).

Elements of FOL:

Constant - 1, 2, A, John, Chennai, Cat.

Variables - x, y, z, a, b, etc.

Predicates - student (boy, girl).

Function - Colour-of (Basket)

Connectives - $\wedge, \vee, \neg, \rightarrow, \leftrightarrow$

Equality - $==$

Quantifiers - $\forall, \exists$

FOL - example

$\wedge$ - AND

$\vee$ - OR

$\neg$ or $\sim$ - NOT

$\rightarrow$ - If ... Then.

$\leftrightarrow$ - IF AND only IF.

$\forall$ = $\rightarrow$

$\exists$ = M.

1. Sam is Tall:

Predicate (Subject)

Tall (sam).

2. John likes cricket:

likes (John, cricket).

3. Every one likes cricket:

$\forall x$ likes (cricket, x).

4. All students likes cricket.

$\forall x$ (student(x) $\rightarrow$ like (x, cricket))

5. Some boys are Intelligent.

$\exists x$ (boys(x) $\wedge$ Intelligent (x))

6. Some ~~boys~~ are even and some are Integers odd.

$\exists x$ even (x) $\wedge$ $\exists x$ odd (x)

7. Not all students like both Maths and Science.

$\neg \forall (x)$ (student(x) $\rightarrow$ like (x, Maths) $\wedge$ like (x, science)).