2.1 Statement of proposition is a declarative sentence that is true or false, but not both.

Examples of Statements of Proposition

- *2+3=5*: statement that is true
- *Do you speak English*? This is a question, not a statement
- *3-x=5*: is a declarative sentence, but not a statement since it depends on the value of x
- *Take two aspirins*: is a command, not a statement

2.2 Syntax and Formation Rules of PL (Propositional logic)

Connective	Description
$\wedge$ (and)	Such as $P \wedge Q$ is called a **conjunction;** its parts are **conjuncts.** Some logical books use the sign '&' for conjunction.
$\vee$ (or)	Such as A $\vee$ (P $\wedge$ *Q)*, is a **disjunction** of the **disjuncts** *A* and *(P$\wedge$Q).* The *exclusive* sense of 'or' is symbolized as '$\oplus$' or as '$\underline{\vee}$'.
$\Rightarrow$(implies)	Such as (P$\wedge$ *Q)* $\Rightarrow$ *R* is called an **implication** (conditional, **rules or if-then**). Its **premise or antecedent is *P* $\wedge$*Q*, and** its **conclusion or consequent is** *R.* This symbol is sometimes written as $\rightarrow$. The **converse** of $p \Rightarrow q$ is the implication that $q \Rightarrow p$ The **contrapositive** of $p \Rightarrow q$ is the implication that $\sim q \Rightarrow \sim p$
$\Leftrightarrow$(equivalent)	The sentence *(P$\vee$Q)* $\Leftrightarrow$ *(Q$\vee$P)* is an **equivalence (biconditional).** This symbol is sometimes written as $\leftrightarrow$ or as $\equiv$
$\neg$ (not)	Such as $\neg P$ is called **negation** of P; $\neg$ is the only unary connective The sign '~' is sometimes used in place of '$\neg$'.

Here is the BNF, a formal method for describing syntax, of PL.

$$
\begin{aligned}
\textit{Sentence} &\rightarrow \textit{AtomicSentence} \mid \textit{ComplexSentence} \\
\textit{AtomicSentence} &\rightarrow \textbf{True} \mid \textbf{False} \mid \textit{Symbol} \\
\textit{Symbol} &\rightarrow \textbf{P} \mid \textbf{Q} \mid \textbf{R} \mid \ldots \\
\textit{ComplexSentence} &\rightarrow \neg\, \textit{Sentence} \\
&\mid\ (\textit{Sentence} \wedge \textit{Sentence}) \\
&\mid\ (\textit{Sentence} \vee \textit{Sentence}) \\
&\mid\ (\textit{Sentence} \Rightarrow \textit{Sentence}) \\
&\mid\ (\textit{Sentence} \Leftrightarrow \textit{Sentence})
\end{aligned}
$$

The order of precedence in propositional logic is (from highest to lowest): $\neg$, $\wedge$, $\vee$, $\Rightarrow$, and $\Leftrightarrow$.
Hence, the sentence $\neg P \vee Q \wedge R \Rightarrow S$ is equivalent to the sentence $((\neg P) \vee (Q \wedge R)) \Rightarrow S$.

2.3 Truth Functions and Truth Tables

α	β	α&β	α∨β	α⊕β	α→β	α↔β
T	T	T	T	F	T	T
T	F	F	T	T	F	F
F	T	F	T	T	T	F
F	F	F	F	F	T	T

α	¬α
T	F
F	T

<u>A wff (well-formed formula) has n distinct letters, the number of truth-value assignments is 2^n.</u>

P	Q	R	|	((P	&	Q)	→	¬	R)
T	T	T	[redacted]	T	T	T	F	F	T
T	T	F	[redacted]	T	T	T	T	T	F
T	F	T	[redacted]	T	F	F	T	F	T
T	F	F	[redacted]	T	F	F	T	T	F
F	T	T	[redacted]	F	F	T	T	F	T
F	T	F	[redacted]	F	F	T	T	T	F
F	F	T	[redacted]	F	F	F	T	F	T
F	F	F	[redacted]	F	F	F	T	T	F