Definition: A **proposition** is a declarative sentence that is either true or false (but not both). That is, a statement ends up having one of two possible truth values:

- If a statement is true, we assign it the truth value T. If a statement is false, we assign it the truth value F. In practice, we will often think of statements as *potentially* having one of the two possible truth values without actually giving it a specific assignment.
- In fact, we may not even give an actual statement. Instead, we use lower case letters such as p, q, r, s to denote **propositional variables** (unspecified statements).
- We then consider all possible ways of assigning truth values to variables representing statements, often after combining several statements using *logical connectives* to form **compound propositions**.

Basic Truth Tables:

The truth table for "not" (\neg): Given a simple statement p. If p is true, then $\neg p$ is false. Similarly, if p is false, then $\neg p$ is true. Note that the statement p has only two possible truth values, so there are two rows in the truth table. The following table summarizes this information.

p	$\neg p$
T	F
F	Т

The truth table for "or" (\lor): Given two simple statements p, q, the compound statement $p \lor q$ has four possible truth value assignments: both could be true, both could be false, the first could be true while the second is false, and the first could be false while the second is true. Since \lor always represents an *inclusive or*, the statement $p \lor q$ is true except when p and q are both false. The following table summarizes this information.

p	q	$p \vee q$
T	T	T
T	F	T
F	Т	T
F	F	F

The truth table for "and" (\wedge): Given two simple statements p, q, as above the compound statement $p \wedge q$ has four truth value assignments. The statement $p \wedge q$ is only true when p and q are both true. The following table summarizes this information.

p	q	$p \wedge q$
T	Т	T
T	F	F
F	T	F
F	F	F

The truth table for a conditional (\rightarrow) : Given two simple statements p, q, as above the compound statement $p \rightarrow q$ has four possible truth value assignments. The statement $p \rightarrow q$ is true except in the case when p is true and q is false. To see this, it is helpful to think about the conditional statement, "If you eat your vegetables then you will get dessert." When is this a false statement? The following table summarizes this information.

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

The truth table for a biconditional (\longleftrightarrow) : Given two simple statements p, q, as above the compound statement $p \leftrightarrow q$ has four possible truth value assignments. The statement $p \leftrightarrow q$ is true when p and q are both true and when p and q are both false. When p and q have opposite truth values, the statement $p \leftrightarrow q$ is false. The following table summarizes this information.

p	q	$p \longleftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T