Logic Operators

If p and q are propositions. A proposition is a declarative statement that states a fact that is either true or false.

EXAMPLES	NON-EXAMPLES
Toronto is the capital of Ontario. (*True Proposition*)	Read this tip sheet. (*Not a Proposition*)
1 + 2 = 5 (*False Proposition*)	$x + 3 = 10$

If x = # then it will be a true/false proposition.
If x = 7, then it will be a true proposition.
If x = 9 then it will be a false proposition.

Precedence

PRECEDENCE	OPERATOR
1	¬ (negation)
2	∧ (and)
3	v (or)
4	→ (conditional)
5	↔ (bi-conditional)

We usually use parenteses first, then use these rules of precedence to specify the order you apply the logical operators.

For Example: p v q ∧ r *means* p v (q ∧ r)
rather than (p v q) ∧ r

Truth tables

In the truth tables below, F (or zero) denotes a false proposition while T (or one) denotes a true proposition.

p	q	NEGATION $\bar{p}$, (¬ p) not p	CONJUNCTION (p ∧ q) p and q	DISJUNCTION (p v q) p or q	CONDITIONAL (p → q) If p, then q; p implies q; q whenever p;	BI-CONDITIONAL (p ↔ q) p if and only if q	EXCLUSIVE OR (p ⊕ q) p or q but not both
T	T	F	T	T	T	T	F
T	F	F	F	T	F	F	T
F	T	T	F	T	T	F	T
F	F	T	F	F	T	T	F

p	q	CONVERSE q → p	CONTRAPOSITIVE $\bar{q} \rightarrow \bar{p}$	INVERSE $\bar{p} \rightarrow \bar{q}$
		If q, then p	If not q, then not p	If not p, then not q
T	T	T	T	T
T	F	T	F	T
F	T	F	T	F
F	F	T	T	T