Truth Tables

P	Q	$P \vee Q$
T	T	T
T	F	T
F	T	T
F	F	F

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

P	$\sim P$
T	F
F	T

P	Q	$P \implies Q$
T	T	T
T	F	F
F	T	T
F	F	T

P	Q	$P \iff Q$
T	T	T
T	F	F
F	T	F
F	F	T

The tables above are the standard tables for *or*, *and*, *not*, *implies* and *iff* (if and only if).

P	$\sim P$	$P \wedge (\sim P)$
T	F	F
F	T	F

P	$\sim P$	$P \vee (\sim P)$
T	F	T
F	T	T

P	$\sim P$	$P \implies (\sim P)$
T	F	F
F	T	T

A truth table which is always false is called a *contradiction* (leftmost example). A truth table which is always true is called a *tautology* (middle example). Most truth tables are neither (rightmost example).

P	Q	$\sim P$	$(\sim P) \vee Q$	$P \implies Q$
T	T	F	T	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

The above table demonstrates that $(\sim P) \vee Q$ is logically equivalent to $P \implies Q$.

P	Q	$\sim P$	$\sim Q$	$P \implies Q$	$(\sim Q) \implies (\sim P)$
T	T	F	F	T	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

The above table demonstrates that $P \implies Q$ is logically equivalent to $(\sim Q) \implies (\sim P)$. The latter expression is called the *contrapositive* of the former. This term refers to this specific situation: any if-then statement has a contrapositive form.