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## Tautologies and Fallacies

The compound statements (or propositions) which are true for any truth value of their components are called "tautologies". For example " $p \vee \sim p$ " is a tautology,  $p$  being any logical statement. This is illustrated by the truth table given below which shows only T's in the last column.

Truth table ( $p \vee \sim p$ )		
$p$	$\sim p$	$p \vee \sim p$
T	F	T
F	T	T

The negation of a tautology is called a fallacy or a contradiction i.e. a proposition which is false for any truth value of their components is called a fallacy. For example, " $p \wedge \sim p$ " is a fallacy,  $p$  being any logical statement. This is illustrated by the truth table given above which shows only F's in the last column.

Truth table ( $p \wedge \sim p$ )		
$p$	$\sim p$	$p \wedge \sim p$
T	F	F
F	T	F

**Notes:** A tautology is usually denoted by "t" and a fallacy by "f".

- $p \vee q$  is true iff at least one of  $p$  and  $q$  is true.
- $p \underline{\vee} q$  is true iff exactly one of  $p$  and  $q$  is true and the other is false.
- $p \wedge q$  is true iff both  $p$  and  $q$  are true.
- A tautology is always true.
- A fallacy is always false.

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