

Logic: Truth Tables

Truth tables are a useful means of elaborating logical expressions or proving the equivalence of logical statements.

The effect of the logical operator “*not*” is to change the value of the operand from *true* to *false* or from *false* to *true*.

The truth table for *not* is as follows:

A	<i>not</i> A
T	F
F	T

The binary logical operators act on two operands and could either be *true* or *false*. The truth table for *and* is as follows

A	B	<i>A and B</i>
T	T	T
T	F	F
F	T	F
F	F	F

The truth table for *or* is as follows

A	B	<i>A or B</i>
T	T	T
T	F	T
F	T	T
F	F	F

Truth tables can also be used to demonstrate the truth of equivalent logical statements.

For example in order to demonstrate $\neg(A \wedge B) \Leftrightarrow \neg A \vee \neg B$ we can develop a truth table as follows.

A	B	$A \wedge B$	$\neg(A \wedge B)$	$\neg A$	$\neg B$	$\Leftrightarrow \neg A \vee \neg B$
T	T	T	F	F	F	F
T	F	F	T	F	T	T
F	T	F	T	T	F	T
F	F	F	T	T	T	T

Note that columns four and seven are the same, showing the equivalence of the logical expressions.