Logic

Truth Tables

A truth table is a table showing the possible combinations of inputs to a boolean expression such as:

a & b	**a and b**
a | b	**a or b**
a | -b	**a or not b**
-(a & b)	**not (a and b)**

AND

a	b	a & b
T	T	T
T	F	F
F	T	F
F	F	F

Truth table for possible values of a & b

OR

a	b	a | b
T	T	T
T	F	T
F	T	T
F	F	F

Truth table for possible values of a | b

NOT

a	-a
T	F
F	T

Truth table for possible values of -a

Example

-(a & b)

a	b	a & b	-(a & b)
T	T	T	F
T	F	F	T
F	T	F	T
F	F	F	T

Example

-a | -b

a	b	-a	-b	-a | -b
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

Example

(a | -b) & c

a	b	c	-b	a | -b	(a | -b) & c
T	T	T	F	T	T
T	F	T	T	F	F
F	T	T	F	F	F
F	F	T	T	T	T
T	T	F	F	T	F
T	F	F	T	T	F
F	T	F	F	F	F
F	F	F	T	T	F

Example

(a | -b) | c

a	b	c	-b	a | -b	(a | -b) | c
T	T	T	F	T	T
T	F	T	T	F	T
F	T	T	F	F	T
F	F	T	T	T	T
T	T	F	F	T	T
T	F	F	T	T	T
F	T	F	F	F	F
F	F	F	T	T	T

XOR

a	b	a ⊕ b
T	T	F
T	F	T
F	T	T
F	F	F

Truth table for possible values of a ⊕ b

Implies

a	b	a → b
T	T	T
T	F	F
F	T	T
F	F	T

Truth table for possible values of a → b