

The Subject of Extending Logical Minds

Combine some logic with some bomb defusing; now how about understanding this to make your life easier?

- The original Logic manual can be found [here](https://ktane.timwi.de/HTML/Logic.html). (<https://ktane.timwi.de/HTML/Logic.html>)
- This contains ONLY specific logical identities and certain logic gate equivalents for this module and other "Logic" modules.
- The experts are allowed to use [this](https://www.allaboutcircuits.com/technical-articles/boolean-identities/) (<https://www.allaboutcircuits.com/technical-articles/boolean-identities/>) for a better reference.

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A	V	U	<input type="checkbox"/>	P	F		
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"A" and "B" are boolean variables in the reference sheet provided.

An "!" character represents a negate operator, E.G. !A represents NOT A.

Some Logic Identities

Involution	$!!A = A$
Dominance (OR)	$\text{TRUE} \vee A = \text{TRUE}$
Dominance (AND)	$\text{FALSE} \wedge A = \text{FALSE}$
Complementarity (OR)	$!A \vee A = \text{TRUE}$
Complementarity (AND)	$!A \wedge A = \text{FALSE}$
DeMorgan's (OR)	$A \vee B = !A \downarrow !B$
DeMorgan's (AND)	$A \wedge B = !A \uparrow !B$
Absorption	$A \wedge (A \vee B) = A$
Idempotence	$A \wedge A = A \vee A = A$
Other Identities	
$A \leftrightarrow A = \text{TRUE}$	$A \veebar A = \text{FALSE}$

Logical Gate Equivalents

$A \leftrightarrow B = !A \vee B = A \vee !B = !(A \vee B)$	$A \vee B = !A \leftrightarrow B = A \leftrightarrow !B = !(A \leftrightarrow B)$
$A \rightarrow B = !A \vee B$	$A \leftarrow B = A \vee !B$
$A \vee B = A \leftarrow !B = !A \rightarrow B$	$A \downarrow B = !(A \vee B)$
$A \mid B = !(A \wedge B)$	

Table ALT: Logical connective symbol list

Logical Connective	Symbol	Logic Gate Equivalent	Interpterion
Conjunction	\wedge	AND	Both TRUE returns TRUE. Otherwise at least 1 FALSE returns FALSE.
Disjunction	\vee	OR	At least 1 TRUE returns TRUE. Otherwise both FALSE returns FALSE.
Exclusive Disjunction	\vee	XOR	Matching inputs returns FALSE. NOT matching inputs returns TRUE.
Alternative Denial	\mid	NAND	At least 1 FALSE returns TRUE. Otherwise, both TRUE returns FALSE.
Joint Denial	\downarrow	NOR	Both FALSE returns TRUE. Otherwise, at least 1 TRUE returns FALSE.
Biconditional	\leftrightarrow	XNOR	Matching inputs returns TRUE. NOT matching inputs returns FALSE.
Implication (Left)	\rightarrow	-	Left TRUE and right FALSE returns FALSE. Otherwise TRUE.
Implication (Right)	\leftarrow	-	Left FALSE and right TRUE returns FALSE. Otherwise TRUE.