

# Boolean algebra reference sheet

Matthew Ireland, October MMXIV

Let  $A, B, C$  and  $D$  be Boolean variables. Let  $+$  denote logical OR,  $.$  denote logical AND, and  $\oplus$  denote logical EXCLUSIVE OR.

## Truth tables

$A$	$\bar{A}$	$A$	$B$	$A.B$	$A$	$B$	$A+B$	$A$	$B$	$A\oplus B$
0	1	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	1	1	0	1	1
1	0	1	0	0	1	0	1	1	0	1
1	1	1	1	1	1	1	1	1	1	0

## Logical identities

Commutativity	$A+B \equiv B+A$	$A.B \equiv B.A$		
Associativity	$A+(B+C) \equiv (A+B)+C$	$A.(B.C) \equiv (A.B).C$		
Properties of $.$	$0.A \equiv 0$	$1.A \equiv A$	$A.A \equiv A$	$A.\bar{A} \equiv 0$
Properties of $+$	$0+A \equiv A$	$1+A \equiv 1$	$A+A \equiv A$	$A+\bar{A} \equiv 1$
Double inversion law	$\overline{\bar{A}} \equiv A$			
Distributive law	$A.(B+C) \equiv A.B+A.C$			
Product laws	$(A+B).(A+B) \equiv A.A+A.B+B.A+B.B$			
	$A+(B.C) \equiv (A+B).(A+C)$			
Disjunction law	$A+A.B \equiv A$			
Redundancy law	$A.B+A.B.C+A.B.D \equiv A.B$			
De Morgan's laws	$\overline{A+B} \equiv \bar{A}.\bar{B}$		$\overline{A.B} \equiv \bar{A}+\bar{B}$	