

# Boolean algebra and logic gates

A and B can be equal 0 or 1.

$\bar{A}$  = not A, contradiction of A, A reversed

**Statement 1.** - Commutative Law

$$A+B = B+A$$

$$A*B = B*A$$

**Statement 2.** - Associative Law

$$(A+B)+C = A+(B+C)$$

**Statement 3.**

$$A*(B+C) = A*B+A*C$$

$$A+(B*C) = (A+B)*(A+C)$$

**Statement 4.** - Idempotent Law

$$A+A = A$$

$$A*A = A$$

**Statement 5.**

$$A*B+A*\bar{B} = A$$

$$(A+B)*(A+B) = A$$

**Statement 6.** - Absorption Law

$$A+A*B = A$$

$$A*(A+B) = A$$

**Statement 7.** - Identity Law

$$0+A = A$$

$$0*A = 0$$

**Statement 8.**

$$1+A = 1$$

$$1*A = A$$

**Statement 9.**

$$\bar{A}+A = 1$$

$$\bar{A}*A = 0$$

**Statement 10.**

$$A+\bar{A}*B = A+B$$







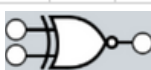
$$A*(\bar{A}+B) = A*B$$

**Statement 11.** - De Morgan's Law

$$\overline{A+B} = \bar{A}*\bar{B}$$

$$\overline{A*B} = \bar{A}+\bar{B}$$

Y is the result of letting A and B through a given logic gate.

OR			AND			XOR			NOT	
Y = A+B			Y = A*B			Y = A*\bar{B}+\bar{A}*B			Y = \bar{A}	
A	B	Y	A	B	Y	A	B	Y	A	B
0	0	0	0	0	0	0	0	0	0	1
0	1	1	0	1	0	0	1	1	1	0
1	0	1	1	0	0	1	0	1		
1	1	1	1	1	1	1	1	0		
										
NOR			NAND			XNOR				
Y = \overline{A+B}			Y = \overline{A*B}			Y = A*B+\bar{A}*\bar{B}				
A	B	Y	A	B	Y	A	B	Y		
0	0	1	0	0	1	0	0	1		
0	1	0	0	1	1	0	1	0		
1	0	0	1	0	1	1	0	0		
1	1	0	1	1	0	1	1	1		
										

A	B	$\bar{A}*\bar{B}$	$\bar{A}*B$
0	0	1	1
0	1	1	0
1	0	1	0
1	1	0	0