DE MORGAN'S THEOREMS

http://www.tutorialspoint.com/computer_logical_organization/demorgan_theroems.htm

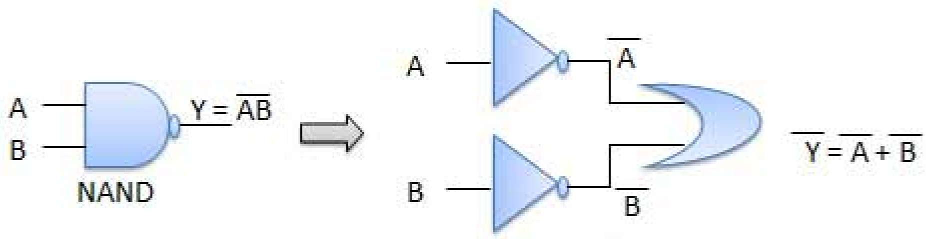
De Morgan has suggested two theorems which are extremely useful in Boolean Algebra. The two theorems are discussed below.

Theorem 1

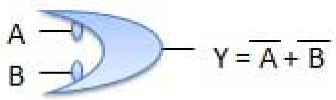
$$\overline{A.B} = \overline{A} + \overline{B}$$

NAND = Bubbled OR

- The left hand side *LHS* of this theorem represents a NAND gate with inputs A and B, whereas the right hand side *RHS* of the theorem represents an OR gate with inverted inputs.
- This OR gate is called as **Bubbled OR**.



NAND $\equiv$ Bubbled OR



Bubbled OR

Table showing verification of the De Morgan's first theorem −

A	B	$\overline{AB}$	$\overline{A}$	$\overline{B}$	$\overline{A} + \overline{B}$
0	0	1	1	1	1
0	1	1	1	0	1
1	0	1	0	1	1
1	1	0	0	0	0

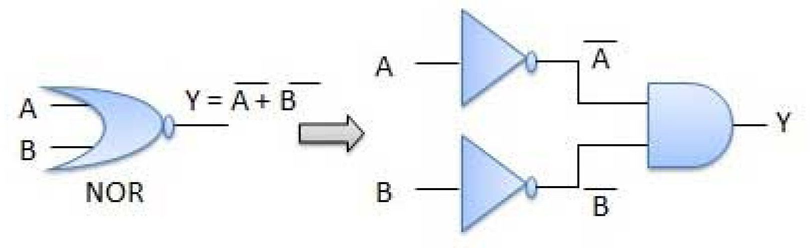
Theorem 2

$$\overline{A + B} = \overline{A}.\overline{B}$$

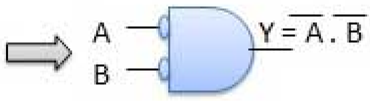
NOR = Bubbled AND

- The LHS of this theorem represents a NOR gate with inputs A and B, whereas the RHS represents an AND gate with inverted inputs.

- This AND gate is called as **Bubbled AND**.



NOR ≡ Bubbled AND



Bubbled AND

Table showing verification of the De Morgan's second theorem −

A	B	$\overline{A+B}$	$\overline{A}$	$\overline{B}$	$\overline{A} . \overline{B}$
0	0	1	1	1	1
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	0