

- **B1:**  $0 \cdot 0 = 0$       **B2:**  $1 \cdot 1 = 1$       **B3:**  $1 \cdot 0 = 0 \cdot 1 = 0$
- **B4:**  $1 + 1 = 1$       **B5:**  $0 + 0 = 0$       **B6:**  $1 + 0 = 0 + 1 = 1$
- **Boolean Algebra Laws and Theorems**

Operations with 0 and 1	
1. $X + 0 = X$	1D. $X \cdot 1 = X$
2. $X + 1 = 1$	2D. $X \cdot 0 = 0$
Idempotent theorem	
3. $X + X = X$	3D. $X \cdot X = X$
Involution theorem	
4. $\overline{(\overline{X})} = X$	
Complementarity theorem	
5. $X + \overline{X} = 1$	5D. $X \cdot \overline{X} = 0$
Commutative law	
6. $X + Y = Y + X$	6D. $X \cdot Y = Y \cdot X$
Associative law	
7. $(X + Y) + Z = X + (Y + Z) = X + Y + Z$	7D. $(X \cdot Y) \cdot Z = X \cdot (Y \cdot Z) = X \cdot Y \cdot Z$
Distributive law	
8. $X \cdot (Y + Z) = X \cdot Y + X \cdot Z$	8D. $X + (Y \cdot Z) = (X + Y) \cdot (X + Z)$
Simplification theorems	
9. $X \cdot Y + X \cdot \overline{Y} = X$	9D. $(X + Y) \cdot (X + \overline{Y}) = X$
10. $X + X \cdot Y = X$	10D. $X \cdot (X + Y) = X$
11. $(X + \overline{Y}) \cdot Y = X \cdot Y$	11D. $(X \cdot \overline{Y}) + Y = X + Y$
DeMorgan's theorem	
12. $\overline{(X + Y + Z + \dots)} = \overline{X} \cdot \overline{Y} \cdot \overline{Z} \cdot \dots$	12D. $\overline{(\overline{X} \cdot \overline{Y} \cdot \overline{Z} \cdot \dots)} = \overline{\overline{X}} + \overline{\overline{Y}} + \overline{\overline{Z}} + \dots$
Multiplying and factoring theorems	
13. $(X + Y) \cdot (\overline{X} + Z) = X \cdot Z + \overline{X} \cdot Y$	13D. $X \cdot Y + \overline{X} \cdot Z = (X + Z) \cdot (\overline{X} + Y)$
Consensus theorem	
14. $X \cdot Y + Y \cdot Z + \overline{X} \cdot Z = X \cdot Y + \overline{X} \cdot Z$	14D. $(X + Y) \cdot (Y + Z) \cdot (\overline{X} + Z)$ $= (X + Y) \cdot (\overline{X} + Z)$