

LAWS AND THEOREMS OF BOOLEAN ALGEBRA

Identity	Dual
Operations with 0 and 1: 1. $X + 0 = X$ (identity) 3. $X + 1 = 1$ (null element)	2. $X.1 = X$ 4. $X.0 = 0$
Idempotency theorem: 5. $X + X = X$	6. $X.X = X$
Complementarity: 7. $X + X' = 1$	8. $X.X' = 0$
Involution theorem: 9. $(X')' = X$	
Identities for multiple variables	
Cummutative law: 10. $X + Y = Y + X$	11. $X.Y = Y.X$
Associative law: 12. $(X + Y) + Z = X + (Y + Z)$ $= X + Y + Z$	13. $(XY)Z = X(YZ)$ $= XYZ$
Distributive law: 14. $X(Y + Z) = XY + XZ$	15. $X + (YZ) = (X + Y)(X + Z)$
DeMorgan's theorem: 16. $(X + Y + Z + \dots)' = X'Y'Z' \dots$ or $\{f(X_1, X_2, \dots, X_n, 0, 1, +, \cdot)\}$ $= \{f(X_1', X_2', \dots, X_n', 1, 0, \cdot, +)\}$	17. $(XYZ \dots)' = X' + Y' + Z' + \dots$
Simplification theorems: 18. $XY + XY' = X$ (uniting) 20. $X + XY = X$ (absorption) 22. $(X + Y')Y = XY$ (adsorption)	19. $(X + Y)(X + Y') = X$ 21. $X(X + Y) = X$ 23. $XY' + Y = X + Y$
Consensus theorem: 24. $XY + X'Z + YZ = XY + X'Z$	25. $(X + Y)(X' + Z)(Y + Z)$ $= (X + Y)(X' + Z)$
Duality: 26. $(X + Y + Z + \dots)^D = XYZ \dots$ or $\{f(X_1, X_2, \dots, X_n, 0, 1, +, \cdot)\}^D$ $= f(X_1, X_2, \dots, X_n, 1, 0, \cdot, +)$	27. $(XYZ \dots)^D = X + Y + Z + \dots$