Theorems in Boolean Algebra

Operations with 0 and 1:

1. $X + 0 = X$ 1D. $X \cdot 1 = X$

2. $X + 1 = 1$ 2D. $X \cdot 0 = 0$

Idempotent laws:

3. $X + X = X$ 3D. $X \cdot X = X$

Involution law:

4. $(X')' = X$

Laws of complementarity:

5. $X + X' = 1$ 5D. $X \cdot X' = 0$

Commutative laws:

6. $X + Y = Y + X$ 6D. $XY = YX$

Associative laws:

7. $(X + Y) + Z = X + (Y + Z) = X + Y + Z$ 7D. $(XY)Z = X(YZ) = XYZ$

Distributive laws:

8. $X(Y + Z) = XY + XZ$ 8D. $X + YZ = (X + Y)(X + Z)$

Simplification theorems:

9. $XY + XY' = X$ 9D. $(X + Y)(X + Y') = X$

10. $X + XY = X$ 10D. $X(X + Y) = X$

11. $(X + Y')Y = XY$ 11D. $XY' + Y = X + Y$

Theorem for multiplying out and factoring:

12. $(X + Y)(X' + Z) = XZ + X'Y$ 12D. $XY + X'Z = (X + Z)(X' + Y)$

Consensus theorem:

13. $XY + YZ + X'Z = XY + X'Z$

13D. $(X + Y)(Y + Z)(X' + Z) = (X + Y)(X' + Z)$

DeMorgan's laws:

14. $(X + Y + Z + \ldots)' = X'Y'Z' \ldots$ 14D. $(XYZ \ldots)' = X' + Y' + Z' + \ldots$

Duality:

15. $(X + Y + Z + \ldots)^D = XYZ \ldots$ 15D. $(XYZ \ldots)^D = X + Y + Z + \ldots$