

Operations with 0 and 1:

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

Idempotent Laws:

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| 3. $X + X = X$ | 3D. $X \cdot X = X$ |
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Involution Law:

4. $(X')' = X$

Laws of Complementarity:

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| 5. $X + X' = 1$ | 5D. $X \cdot X' = 0$ |
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Commutative Laws"

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| 6. $X + Y = Y + X$ | 6D. $XY = YX$ |
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Associative Laws:

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

Distributive Laws:

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| 8. $X(Y + Z) = XY + XZ$ | 8D. $X + YZ = (X + Y)(X + Z)$ |
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Simplification Theorems:

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| 9. $XY + XY' = X$ | 9D. $(X + Y)(X + Y') = X$ |
| 10. $X + XY = X$ | 10D. $X(X + Y) = X$ |
| 11. $X(X' + Y) = XY$ | 11D. $X + X'Y = X + Y$ |

Try these first.

DeMorgan's Laws:

12. $(X + Y + Z + \dots)' = X'Y'Z'\dots$ 12D. $(XYZ\dots)' = X' + Y' + Z' + \dots$

Duality:

13. $(X + Y + Z)^D = XYZ\dots$ 13D. $(XYZ\dots)^D = X + Y + X + \dots$

Almost never used.

Multiplying Out & Factoring Theorem

14. $(X + Y)(X' + Z) = XZ + X'Y$ 14D. $XY + X'Z = (X + Z)(X' + Y)$

Consensus Theorem:

15. $XY + YZ + X'Z = XY + YZ$ 15D. $(X + Y)(Y + Z)(X' + Z) = (X + Y)(X' + YZ + Z)$

If Simplification Theorems don't work, try this.

XOR & XNAND

- XOR: $X @ Y = X'Y + XY'$ XNAND: $(X @ Y)' X = Y = X'Y' + XY$



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