

Boolean Exercise: Set 2

Name	AND	OR
Identity Law	$1 \wedge x = x$	$0 \vee x = x$
Null Law	$0 \wedge x = 0$	$1 \vee x = 1$
Idempotent Law	$x \wedge x = x$	$x \vee x = x$
Inverse Law	$x \wedge \sim x = 0$	$x \vee \sim x = 1$
Commutative Law	$x \wedge y = y \wedge x$	$x \vee y = y \vee x$
Associative Law	$(x \wedge y) \wedge z = x \wedge (y \wedge z)$	$(x \vee y) \vee z = x \vee (y \vee z)$
Distributive Law	$x \vee (y \wedge z) = (x \vee y) \wedge (x \vee z)$	$x \wedge (y \vee z) = (x \wedge y) \vee (x \wedge z)$
Absorption Law	$x \wedge (x \vee y) = x$	$x \vee (x \wedge y) = x$
De Morgan's Law	$\sim(x \wedge y) = \sim x \vee \sim y$	$\sim(x \vee y) = \sim x \wedge \sim y$
Double Complement Law		$\sim(\sim x) = x$

1. $(A \wedge B \wedge \sim C) \vee (A \wedge B \wedge C) \vee (A \wedge \sim B)$
2. $(\sim A \wedge B) \vee (A \wedge B \wedge \sim C) \vee (A \wedge B) \vee C$
3. $(\sim A \wedge B) \vee (\sim A \wedge B \wedge C) \vee (\sim A \wedge \sim B \wedge \sim C) \vee (A \wedge \sim B \wedge \sim C)$
4. $(B \wedge C \wedge (\sim C \vee D)) \vee (C \wedge D) \vee C \vee \sim A$
5. $(A \wedge B) \vee B$
6. $C \wedge (A \vee \sim C)$
7. $(A \wedge B \wedge \sim C) \vee (A \wedge \sim C) \vee (\sim A \wedge \sim C \wedge D) \vee (\sim A \wedge C \wedge \sim D)$
8. $(A \wedge C \wedge (\sim B \vee C)) \vee (B \wedge C) \vee B$
9. $(B \wedge (A \vee \sim C)) \vee A \vee (A \wedge (\sim A \vee B))$
10. $(A \wedge B \wedge \sim C) \vee (B \wedge C) \vee (\sim A \wedge B \wedge \sim C) \vee (A \wedge B \wedge \sim B)$
11. $(A \wedge B \wedge C) \vee (\sim A \wedge C) \vee (C \wedge (D \vee \sim C)) \vee A$
12. $\sim(\sim(A \vee \sim B) \wedge \sim(\sim C \vee D))$
13. $\sim(\sim(\sim(A \wedge \sim(C)) \wedge \sim B) \wedge D) \vee \sim(\sim C \wedge D)$
14. $\sim(A \vee B) \vee \sim A \wedge (C \vee B)$
15. $(A \wedge B \wedge C) \vee (B \wedge C \wedge D) \vee (B \wedge C \wedge \sim D) \vee (B \wedge \sim C \wedge D) \vee (A \wedge B \wedge \sim C) \vee (\sim A \wedge B \wedge \sim C)$
16. $(A \wedge B \wedge C \wedge D) \vee (A \wedge B \wedge D) \vee (A \wedge \sim B \wedge D) \vee (A \wedge \sim B \wedge D) \vee (A \wedge \sim B \wedge C \wedge D) \vee (A \wedge C \wedge D) \vee (\sim A \wedge C \wedge D)$
17. Show that $A \wedge \sim B \vee \sim(A \wedge B) \vee \sim(A \wedge \sim B) = \sim A$