Logic and Set Identities:

The identities below are shown in the language of Boolean Algebra on the left (P, Q, R are Boolean variables) and Set Algebra on the right (A, B, C are subsets of some universal set U). This document uses the C superscript (A^C) instead of the bar notation ($\bar{A}$) to indicate the complement operation, they mean the same thing.

Associative Laws

(P ∨ Q) ∨ R = P ∨ (Q ∨ R)	$(A \cup B) \cup C = A \cup (B \cup C)$
(P ∧ Q) ∧ R = P ∧ (Q ∧ R)	$(A \cap B) \cap C = A \cap (B \cap C)$

Double Negation

¬ ¬ P = P	$(A^C)^C = A$

DeMorgan's Laws

¬(P ∨ Q) = ¬ P ∧ ¬ Q	$(A \cup B)^C = A^C \cap B^C$
¬(P ∧ Q) = ¬ P ∨ ¬ Q	$(A \cap B)^C = A^C \cup B^C$

Distributive Laws

P ∧ (Q ∨ R) = (P ∧ Q) ∨ (P ∧ R)	$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
P ∨ (Q ∧ R) = (P ∨ Q) ∧ (P ∨ R)	$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

Absorption Laws

P ∧ (P ∨ Q) = P	$A \cap (A \cup B) = A$
P ∨ (P ∧ Q) = P	$A \cup (A \cap B) = A$

Complement Laws

P ∨ ¬ P = T	$A \cup A^C = U$
P ∧ ¬ P = F	$A \cap A^C = \emptyset$

Idempotent Laws

P ∨ P = P	$A \cup A = A$
P ∧ P = P	$A \cap A = A$

Identity

False ∨ P = P	$\emptyset \cup A = A$
True ∧ P = P	$U \cap A = A$

Domination:

True ∨ P = True	$U \cup A = U$
False ∧ P = False	$\emptyset \cap A = \emptyset$