Set Complementation

If U is a universal set and A is a subset of U, then

a. $U^c = \varnothing$ **b.** $\varnothing^c = U$ **c.** $(A^c)^c = A$
d. $A \cup A^c = U$ **e.** $A \cap A^c = \varnothing$

The operations on sets satisfy the following properties.

Properties of Set Operations

Let U be a universal set. If A, B, and C are arbitrary subsets of U, then

$A \cup B = B \cup A$	Commutative law for union
$A \cap B = B \cap A$	Commutative law for intersection
$A \cup (B \cup C) = (A \cup B) \cup C$	Associative law for union
$A \cap (B \cap C) = (A \cap B) \cap C$	Associative law for intersection
$A \cup (B \cap C)$ $= (A \cup B) \cap (A \cup C)$	Distributive law for union
$A \cap (B \cup C)$ $= (A \cap B) \cup (A \cap C)$	Distributive law for intersection

Two additional properties, referred to as De Morgan's laws, hold for the operations on sets.

De Morgan's Laws

Let A and B be sets. Then

$$(A \cup B)^c = A^c \cap B^c \tag{1}$$

$$(A \cap B)^c = A^c \cup B^c \tag{2}$$