Laws of Set Theory

Example 1

Let $E = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 5, 7\}$

(i) Show that $(A \cup B)' = A' \cap B'$

(ii) Show that $A \cup B = B \cup A$

(iii) Show that $A \cap B = B \cap A$

(iv) Show that $(A \cap B)' = A' \cup B'$

Example 2

Let $X = \{a, b, c, d\}$, $Y = \{b, d, f\}$, $Z = \{a, c, e\}$

(i) Verify that $(X \cup Y) \cup Z = X \cup (Y \cup Z)$

(ii) Verify that $(X \cap Y) \cap Z = X \cap (Y \cap Z)$

Example 3

Let $A = \{p, q, r, s\}$, $B = \{u, q, s, v\}$

(i) Find $A - B$

(ii) Find $B - A$

(iii) Find $A \cap B$

Example 4

Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{3, 4, 5, 6\}$

(i) Find $A \cup B$

(ii) Find $A \cap B$

(iii) Find $A - B$

(iv) Find $B - A$

(v) Find $(A \cup B)'$

(vi) Show that $(A - B) \cup (A \cap B) = A$

Example 5

Let $P = \{a, b, c, d, e\}$, $Q = \{b, d, f, g\}$, $R = \{a, c, e, f\}$

(i) Find $P \cup Q \cup R$

(ii) Find $P \cap Q \cap R$

(iii) Find $(P \cup Q) \cap R$

(iv) Verify that $P \cap (Q \cup R) = (P \cap Q) \cup (P \cap R)$

(v) Verify that $P \cup (Q \cap R) = (P \cup Q) \cap (P \cup R)$