1.4 Some important results on number of elements in sets

If A, B and C are finite sets and U be the finite universal set, then (1) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

(2) $n(A \cup B) = n(A) + n(B) \Leftrightarrow A, B$ are disjoint non-void sets.

(3) $n(A - B) = n(A) - n(A \cap B)$ *i.e.*, $n(A - B) + n(A \cap B) = n(A)$

(4) $n(A \Delta B)$ = Number of elements which belong to exactly one of A or B $= n((A - B) \cup (B - A)) = n(A - B) + n(B - A)$

[$\because$ $(A - B)$ and $(B - A)$ are disjoint]

$= n(A) - n(A \cap B) + n(B) - n(A \cap B) = n(A) + n(B) - 2n(A \cap B)$

(5) $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$

(6) n (Number of elements in exactly two of the sets A, B, C) $= n(A \cap B) + n(B \cap C) + n(C \cap A) - 3n(A \cap B \cap C)$

(7) n(Number of elements in exactly one of the sets A, B, C) $= n(A) + n(B) + n(C)$

$- 2n(A \cap B) - 2n(B \cap C) - 2n(A \cap C) + 3n(A \cap B \cap C)$

(8) $n(A' \cup B') = n(A \cap B)' = n(U) - n(A \cap B)$

(9) $n(A' \cap B') = n(A \cup B)' = n(U) - n(A \cup B)$