1.2.3 Equal

Two sets S and S_1 are said to be equal if S is a subset of S_1 and S1 is a subset of S.

1.2.4 Algebraic Operations on Sets

- **Union:** If there are two sets A and B, then their union is denoted by $A \cup B$.
  Let $A =\{2, 3, 4\}$ and $B =\{3, 5, 6\}$. Then, $A \cup B =\{2, 3, 4, 5, 6\}$.
  In general, $A \cup B =\{x|x \in A \text{ or } x \in B\}$.

  Diagrammatically, the union operation on two sets can be represented as shown in Fig. 1.1. This diagrammatic representation of sets is called the Venn diagram.

1 picture

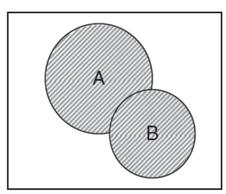

Fig. 1.1 $A \cup B$

- **Intersection:** If there are two sets A and B, then their intersection is denoted by $A \cap B$. Let $A = \{2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$. Then, $A \cap B = \{3, 4\}$. In general, $A \cap B = \{x|x \in A \text{ and } x \in B\}$. The Venn representation of the intersection operation on two sets can be represented as shown in Fig. 1.2.

2 picture

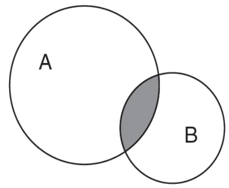

Fig. 1.2 $A \cap B$

- **Difference:** If there are two sets A and B, then their difference is denoted by $A-B$. $Let A = \{2,3,4,5\}$ and $B = \{3,4\}$. Then, $A-B = \{2,5\}$. In general, $A-B = \{x|x \in Aandx \in B\}$.

  The Venn representation of the difference operation on two sets can be represented as shown in Fig. 1.3.

3 picture

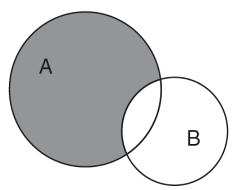

Fig. 1.3 $A-B$

- **Complementation:** The complement of a set A, which is a subset of a large set U is denoted by AC or A', defined by A' $= \{x \in U : xA\}$.

  The Venn representation of the complement operation is given in Fig. 1.4.

4 picture

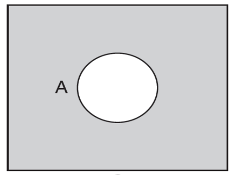

Fig. 1.4 A^c

- **Cartesian product:** If there are two sets A and B, then their Cartesian product is denoted by $A \times B$. Let $A = \{2, 3, 4, 5\}$ and $B = \{3, 4\}$. Then, $A \times B = \{(2, 3), (2, 4), (3, 3), (3, 4), (4, 3), (4, 4), (5, 3), (5, 4)\}$. In general, $A \times B = \{(a, b)|a \in Aandb \in B\}$.
- **Power set:** The power set of a set A is the set of all possible subsets of A. Let $A = \{a, b\}$. Then, the power set of A is $\{(\emptyset), (a), (b), (a, b)\}$. For a set of elements n, the number of elements of the power set of A is 2^n.

1.2.5 Properties Related to Basic Operation

Some properties related to basic operations on set are as follows:

- $A \cup \emptyset = A, A \cap \emptyset = A$ ($\emptyset$ is called null set)
- $A \cup U = U$, $A \cap U =$ A (where $A \subset U$)
- $A \cup A = A, A \cap A = A$ (idempotent law)