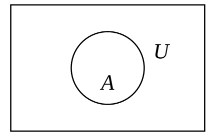
1.3 Venn-Euler diagrams

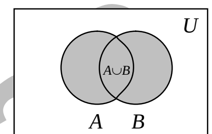
The combination of rectangles and circles are called *Venn-Euler diagrams* or simply **Venn-diagrams**.

If A and B are not equal but they have some common elements, then to represent A and B we draw two intersecting circles. Two disjoints sets are represented by two non-intersecting circles.



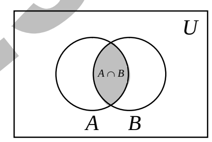
Operations on sets

(1) **Union of sets :** Let A and B be two sets. The union of A and B is the set of all elements which are in set A or in B. We denote the union of A and B by $A \cup B$, which is usually read as "A union B".



Symbolically, $A \cup B = \{x : x \in A \text{ or } x \in B\}$.

(2) **Intersection of sets :** Let A and B be two sets. The intersection of A and B is the set of all those elements that belong to both A and B.



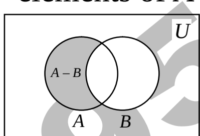
The intersection of A and B is denoted by $A \cap B$ (read as "A intersection B").

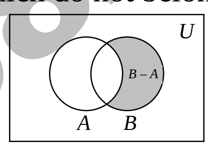
Thus, $A \cap B = \{x : x \in A \text{ and } x \in B\}$.

(3) **Disjoint sets:** Two sets A and B are said to be disjoint, if $A \cap B$ = ¤. If $A \cap B \neq$ ¤, then A and B are said to be non-intersecting or non-overlapping sets.

Example **:** Sets {1, 2}; {3, 4} are disjoint sets.

(4) **Difference of sets:** Let A and B be two sets. The difference of A and B written as $A - B$, is the set of all those elements of A which do not belong to B.





Thus, $A - B = \{x : x \in A \text{ and } x \notin B\}$

Similarly, the difference $B - A$ is the set of all those elements of B that do not belong to A *i.e.*, $B - A = \{x \in B : x \notin A\}$.

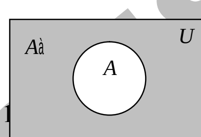
Example**:** Consider the sets $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$, then $A - B = \{1, 2\}; B - A = \{4, 5\}$.

(5) **Symmetric difference of two sets:** Let A and B be two sets. The symmetric difference of sets A and B is the set $(A - B) \cup (B - A)$ and is denoted by $A \Delta B$. Thus, $A \Delta B = (A - B) \cup (B - A) = \{x : x \notin A \cap B\}$.

(6) **Complement of a set:** Let U be the universal set and let A be a set such that $A \subset U$. Then, the complement of A with respect to U is denoted by A' or A^c or $C(A)$ or $U - A$ and is defined the set of all those elements of U which are not in A.

Thus, $A' = \{x \in U : x \notin A\}$.

Clearly, $x \in A' \Leftrightarrow x \notin A$



Example **:** Consider $U = \{1, 2, ..., 1$

and $A = \{1, 3, 5, 7, 9\}$.

Then $A' = \{2, 4, 6, 8, 10\}$