

Operations on Sets

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Union of Sets

Let A and B be two non-empty sets. The union of A and B is the set which consists of all the elements of A and all the elements of B and the common elements of A and B are taken only once.

We denote union of two sets by the symbol 'U' and write as $A \cup B$ and usually read as 'A union B'.

Example: Let $A = \{2, 4, 6, 8, 10\}$ and $B = \{1, 3, 5, 7, 9\}$ be two sets
So, $A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

Thus, we can define the union of two sets as:

The union of two sets A and B is the set C which consists of all those elements which are either in A or in B (including those which are in both)

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

Properties of the Operation of Union

- 1) $A \cup B = B \cup A$ ([Commutative law](#))
- 2) $(A \cup B) \cup C = A \cup (B \cup C)$ ([Associative law](#))
- 3) $A \cup \phi = A$ (Law of [Identity element](#), ϕ is the identity of U)
- 4) $A \cup A = A$ ([Idempotent law](#))
- 5) $U \cup A = U$ (Law of U)

Intersection of Sets

Let A and b be two non-empty sets. The intersection of sets A and B is the set of all elements which are common to both A and B.

We denote intersection of two sets by the symbol '?' and write as $A \cap B$ and usually read as 'A intersection B'.

Example: Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $B = \{2, 3, 5, 7\}$ be two sets

$$\text{So, } A \cap B = \{2, 3, 5, 7\}$$

From the above discussion, the intersection of two sets A and B is the set of all those elements which belong to both A and B.

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

Properties of the Operation of Intersection

- 1) $A \cap B = B \cap A$ (Commutative law)
- 2) $(A \cap B) \cap C = A \cap (B \cap C)$ (Associative law)
- 3) $\emptyset \cap A = \emptyset$, $U \cap A = A$ (Law of \emptyset and U)
- 4) $A \cap A = A$
- 5) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ ([Distributive law](#))

Difference of Sets

If A and B are two non-empty sets then the difference of the sets A and B in the same order is the set of elements which belong to A but not to B .

We write it as, $A - B$ and read as A minus B .

Example: Let $A = \{2, 3, 5, 6, 9\}$ and $B = \{1, 2, 4, 6, 9\}$, find $A - B$ and $B - A$.

$A - B = \{3, 5\}$, since the elements 3, 5 belong to A but not to B .

$B - A = \{1, 4\}$, since the elements 1, 4 belong to B but not to A .

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Reference Links:

- [http://en.wikipedia.org/wiki/Set_\(mathematics\)#Basic_operations](http://en.wikipedia.org/wiki/Set_(mathematics)#Basic_operations)
- [http://en.wikipedia.org/wiki/Union_\(set_theory\)](http://en.wikipedia.org/wiki/Union_(set_theory))
- [http://en.wikipedia.org/wiki/Intersection_\(set_theory\)](http://en.wikipedia.org/wiki/Intersection_(set_theory))
- http://en.wikipedia.org/wiki/Difference_set
- <http://en.wikipedia.org/wiki/Commutativity>
- <http://en.wikipedia.org/wiki/Associativity>
- http://en.wikipedia.org/wiki/Identity_element
- <http://www.encyclopedia.com/doc/1O11-idempotentlaw.html>
- <http://en.wikipedia.org/wiki/Distributivity>

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