



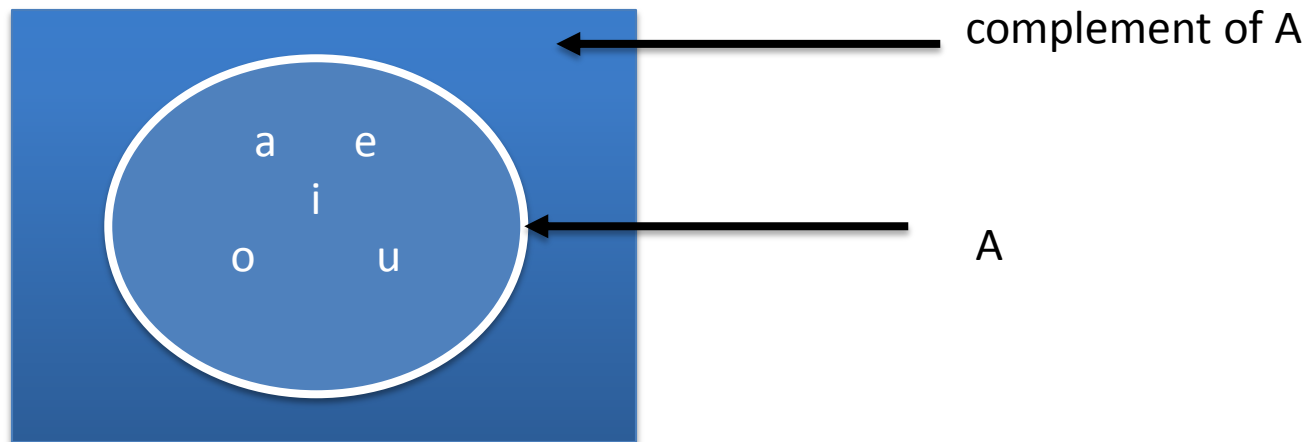
IT 1002 – Mathematics for Computing



Sets & Basic Set Operations -2

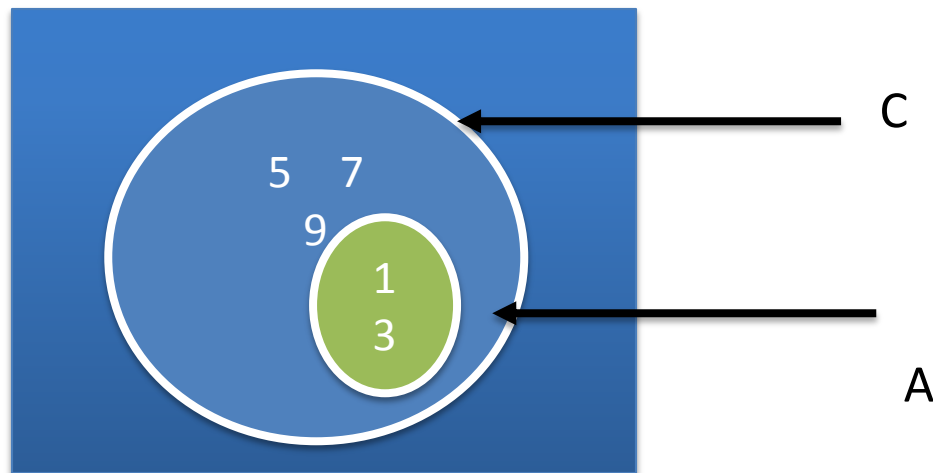
Venn Diagrams

- A pictorial way of representing sets
- Various sets are represented by circles inside a big rectangle
- Eg: $A = \{ a, e, i, o, u \}$



Sub Set

- If every element of set A is also contained in set B then set A is a subset of set B
- “A” is contained in “B” or “B” contains “A”
- It is denoted by $A \subseteq B$ or $B \supseteq A$



$$A = \{1, 3\}$$

$$C = \{1, 3, 5, 7, 9\}$$

$$A \subseteq C$$



Proper subset

- A proper subset of a set A is a subset of A that is not equal to A .
- In other words, if B is a proper subset of A , then all elements of B are in A but A contains at least one element that is not in B .
- It is denoted by $B \subset A$



- Eg: $A = \{1, 3, 5\}$

$$B = \{1, 5\}$$

$$C = \{1, 3, 5\}$$

$$D = \{1, 4\} \text{ then}$$

$$B \subset A$$

$$C \not\subset A \text{ but } C \subseteq A$$

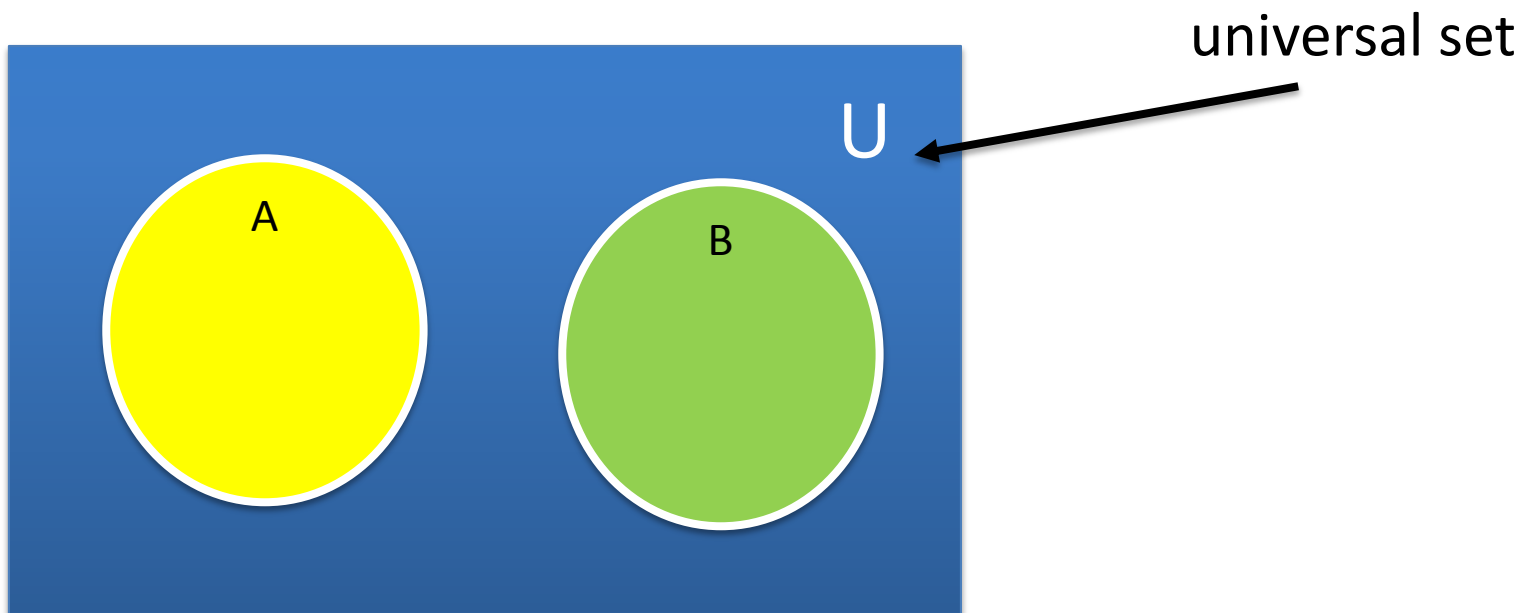
$$D \not\subset A \text{ and } D \not\subseteq A$$



Universal Set

- The members of all the investigated sets in a particular problem usually belongs to some fixed large set. That set is called the universal set
- Eg: $U = \{\text{all students at ATI}\}$
some subsets:
 $A = \{\text{all HNDIT students}\}$
 $B = \{\text{first year students}\}$

- The universal set is represented by the interior of a **rectangle** & other sets are represented by **disks** within the rectangle





Empty set (Null set)

- The set that has no elements is called the empty set
- It is denoted by ϕ or $\{ \}$
- The empty set is a subset of every set including itself
- Eg: $A = \{ x: x^2=4 \text{ \& } x \text{ is an odd integer} \}$



Power set (P)

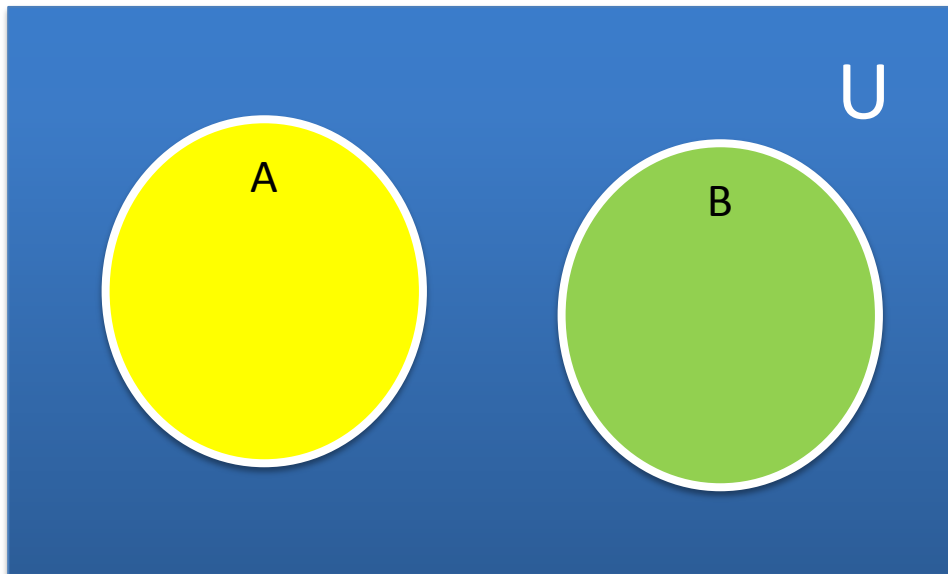
- The **power set** is the set of all subsets that can be created from a given set
- If $|A|=n$ then $|P(A)|=2^n$
- Eg: $A = \{1,2,3\}$ where $|A|=3$

$$|P(A)|=2^3 = 8$$

$$P(A) = \{\phi, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$$

Disjoint sets

- If A and B have no common elements they are said to be disjoint i.e. $A \cap B = \phi$



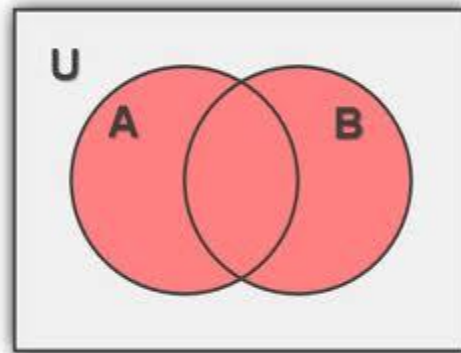


Set Operations

- There are several fundamental operations for constructing new sets from given sets.
 - Union
 - Intersection
 - Difference
 - Symmetric difference
 - compliment

Union

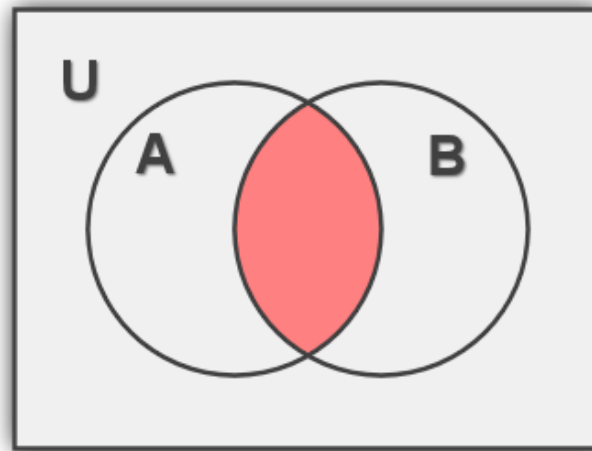
- Union of two sets A & B is the set of all elements which belongs to either A or B or both
- This is denoted by $A \cup B$



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

Intersection

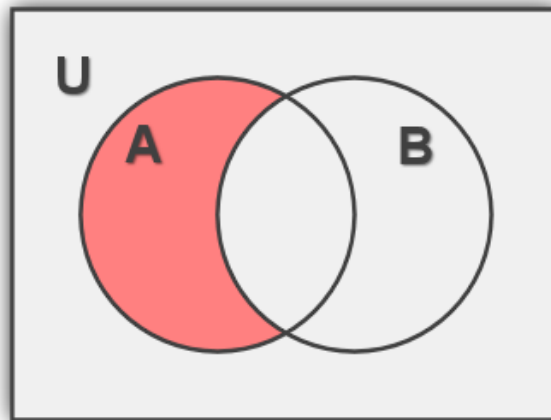
- Intersection of two sets A & B is the set of all elements which belongs to both A & B
- This is denoted by $A \cap B$



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

Difference

- Difference of two sets A & B is the set of all elements which belongs to A but which does not belongs to B
- This is denoted by $A \setminus B$ or $A - B$



- $A \setminus B = \{ x : x \in A, x \notin B \}$