Review on Set Operations

Ex: $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 2, 3, 4, 5\}$, $B = \{4, 5, 6, 7, 8\}$

1. $A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8\}$
2. $A \cap B = \{4, 5\}$
3. $\bar{A} = \{0, 6, 7, 8, 9, 10\}$
4. $A - B = \{1, 2, 3\}$
5. $B - A = \{6, 7, 8\}$

Set Identities

- Commutative laws

$A \cup B = B \cup A$ $\qquad$ $A \cap B = B \cap A$

- Associate laws

$A \cup (B \cup C) = (A \cup B) \cup C$

$A \cap (B \cap C) = (A \cap B) \cap C$

- Distributive laws

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

$A \cup (B \cap C = (A \cup B) \cap (A \cup C)$

Set Identities

- De Morgan's laws

$\overline{A \cup B} = \overline{A \cap B}$ $\qquad$ $\overline{A \cap B} = \bar{A} \cup \bar{B}$

- Absorption laws

$A \cup (A \cap B) = A$ $\qquad$ $A \cap (A \cup B) = A$

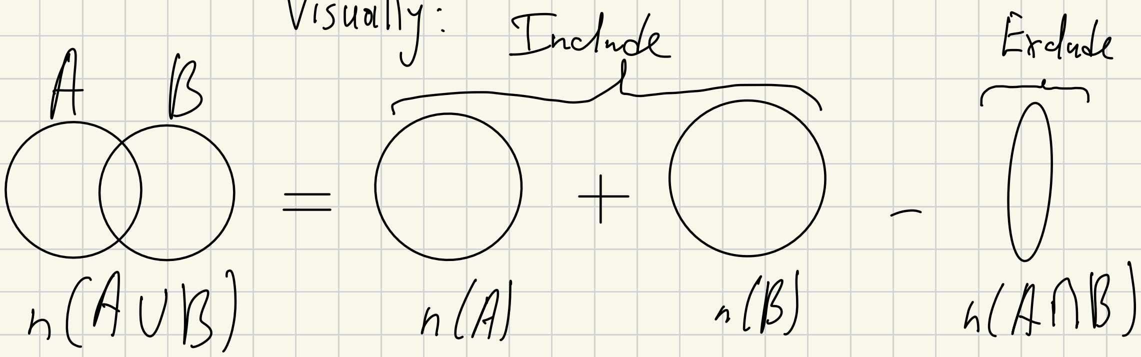
- Complement laws

$A \cup \bar{A} = U$ $\qquad$ $A \cap \bar{A} = \emptyset$

So, the cardinality of a union of two finite set A and B.

$$|A \cup B| = |A| + |B| - |A \cap B|$$

Visually:



Proving Set Identities

Two different ways of proving identies:

1. Prove that each set (side of identity) is a subset of the other using set builder notation and propositional logic.
2. Membership Tables: Verify that elements in the same combination of sets always either belong or do not belong to the same side of the identity. Use 1 to indicate that is not.