Class 11

Important Formulas

Sets

1. A set is a well defined collection of objects.
2. A set is described either in set builder form or tabular form.
3. A set consisting of no element is called the null set and is denoted by ϕ
4. A set consisting of a single element is called a singleton set.
5. A set consisting of a definite number of elements is called a finite set, otherwise the set is called an infinite set.
6. The number of elements in a finite set A is called its cardinal number or order and is denoted by $n(A)$.
7. Two sets A and B are equal if they have exactly the same elements.
8. A set A is said to be a subset of a set B, if every element of A is also an element of B.
9. If a, b are real numbers such that $a < b$, then the set
   (i) $\{x : x \in R \text{ and } a \le x \le b\}$ is called the closed interval $[a, b]$
   (ii) $\{x : x \in R \text{ and } a < x < b\}$ is called the open interval (a, b)
   (iii) $\{x : x \in R \text{ and } a \le x < b\}$ is called the semi-open or semi-closed interval $[a, b)$.
   (iv) $\{x : x \in R \text{ and } a < x \le b\}$ is called the semi-open or semi-closed interval $(a, b]$.
10. The total number of subsets of a finite set consisting of n elements is 2^n.
11. The collection of all subsets of a set A is called the power set of A and is denoted by $P(A)$.
12. The union of two sets A and B is the set of all those elements which are either in A or in B or in both and is denoted by $A \cup B$. Thus, $A \cup B = \{x : x \in A \text{ or } x \in B\}$
13. The intersection of two sets A and B is the set of all those elements which are common to both A and B and is denoted by $A \cap B$. Thus, $A \cap B = \{x : x \in A \text{ and } x \in B\}$.
14. The difference $A - B$ of two sets A and B is the set of all those elements of A which do not belong to B i.e. $A - B = \{x : x \in A \text{ and } x \notin B\}$. Similarly, $B - A = \{x : x \in B \text{ and } x \notin A\}$.
15. The symmetric difference of two sets A and B is the set $(A - B) \cup (B - A)$ and is denoted by $A \Delta B$.
16. The complement of a subset A of universal set U is the set of all those elements of U which are not the elements of A. The complement of A is denoted by A' or A^c.
17. For any three sets A, B and C, we have
   (i) $A \cup A = A$ and $A \cap A = A$ (Idempotent laws)
   (ii) $A \cup \phi = A$ and $A \cap U = A$ (Identity laws)
   (iii) $A \cup B = B \cup A$ and $A \cap B = B \cap A$ (Commutative laws)
   (iv) $(A \cup B) \cup C = A \cup (B \cup C)$ and $(A \cap B) \cap C = A \cap (B \cap C)$ (Associative laws)
   (v) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ and $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (Distributive laws)
   (vi) $(A \dot{\cup} B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$ (De' Morgan's laws)

18. If A, B and C are finite sets and U be the finite universal set, then

(i) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

(ii) $n(A \cup B) = n(A) + n(B) \Leftrightarrow A, B$ are disjoint non-void sets

(iii) $n(A - B) = n(A) - n(A \cap B)$ i.e., $n(A - B) + n(A \cap B) = n(A)$

(iv) $n(A \Delta B) = n(A - B) + n(B - A) = n(A) + n(B) - 2n(A \cap B)$

(v) $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

(vi) Number of elements in exactly two of sets A, B and C

$= n(A \cap B) + n(B \cap C) + n(C \cap A) - 3\,n(A \cap B \cap C)$

(vii) Number of elements in exactly one of sets A, B and C

$= n(A) + n(B) + n(C) - 2\,n(A \cap B) - 2\,n(B \cap C) - 2\,n(A \cap C) + 3\,n(A \cap B \cap C)$.