1. Show that we can have A U B = A U C, without B = C.
2. Sketch Venn diagrams that show the universal set, U, the sets *A* and *B*, and a single element *x* in each of the following cases:
   (a) $x \in A$; $A \subset B$
   (b) $x \in A$; *A* and *B* are disjoint
   (c) $x \in A$; $x \notin B$; $B \subset A$
   (d) $x \in A$; $x \in B$; *A* is not a subset of *B*; *B* is not a subset of *A*
3. If A={Φ}, B= {a, {Φ}, Φ}, C = {a, d, e, g} and D= {d, e, f, g}, Find $A \oplus B$ and $C \oplus D$
4. Prove Distributive laws using laws of logic.
5. Using the laws of logic PT $(P \vee Q) \supset R = (P \supset R) \wedge (Q \supset R)$
6. Using the laws of logic simplify $P \vee (P \vee Q)$
7. Construct truth tables to determine whether each of the following is a tautology, contingency or contradiction

   $P \supset (P \supset P)$

   $(P \supset \sim P)$ and $(\sim P \supset P)$

   $P \rightarrow (q \rightarrow p)$
8. Determine whether the following statement is true or false. Justify your answer. Sample

   P(A) – {A}= P(A)

9. Let A = {1,2,3,4,5,6,7,8}. Consider the following subset of A

   A1= {1,2,3}, A2= {1,4,5,6,7}, A3= {5,6,7}, A4={4,8},A5={5,6}
   Determine whether the following is a partition of A or not. Justify your answer.

   (i) (ii) set of subsets

10. Let a and b be arbitrary real numbers. Using the principle of mathematical induction, prove that
    $(ab)^n = a^n b^n$ for all $n \in N$.
11. Using the principle of mathematical induction, prove that
    $1^2 + 2^2 + 3^2 + ... + n^2 = (1/6)\{n(n + 1)(2n + 1\}$ for all $n \in N$.

12. **Prove that** $n! >= 2^n$ for $n>= 4$

13. In a survey of 100 student at a university, it was found that 100 study java, 50 study Python, 80 study C, 45 study java and Python,40 study Python and C, 35 study java and C. Find number of student who study:

(i) All the languages.
(ii) Exactly one language
(iii) Exactly two languages

14. Choose and Justify your answer…(options will be given)

(i) $P \rightarrow (Q \rightarrow R)$ is equivalent to ………….

(ii) Let a, b, c, d be propositions. Assume that the equivalence $a \leftrightarrow (b \vee \sim b)$ and $b \leftrightarrow c$ hold. Then truth value of the formula $(a \wedge b) \rightarrow ((a \wedge c) \vee$ is always …………….

15. Define Reflexive closure, Symmetric closure along with the suitable examples. Let R be a relation on set S = {a,b,c,d} , given as

R={(a,d),(b,a),(b,d),(c,b),(c,d),(d,c)}.

Find transitive closure using Warshall's algorithm.

16. Find the number of integers between 1 and 1000 which are

i) Divisible by 2 or 5 or 7

ii) Divisible by 5 but not by 2 or 7