Indian Institute of Information Technology Vadodara
MA 102: Introduction to Discrete Mathematics
Tutorial 1

1. A survey has been taken on methods of commuter travel. Each respondent was asked to check BUS, TRAIN, or AUTOMOBILE as a major method of traveling to work. More than one answer was permitted. The results reported were as follows: BUS, 30 people; TRAIN, 35 people; AUTOMOBILE, 100 people; BUS and TRAIN, 15 people; BUS and AUTOMOBILE, 15 people; TRAIN and AUTOMOBILE, 20 people; and all three methods, 5 people. How many people completed a survey form?

2. In a class of 120 students numbered 1 to 120, all even numbered students opt for Physics, those whose numbers are divisible by 5 opt for Chemistry and those whose numbers are divisible by 7 opt for Math. How many opt for none of the three subjects?

3. Find $\cup_{i=1}^{n} A_i$ and $\cap_{i=1}^{n} A_i$ for the following:
   (a) $A_i = \{0, i\}$
   (b) $A_i = \{\cdots, -2, -1, 0, 1, 2, \cdots, i\}$
   (c) $A_i = \{i, i+1, i+2, \cdots\}$

4. Is it true that $(A - B) - C = A - (B - C)$ for sets A, B, C ?

5. For sets A, B, we define $A \oplus B = (A - B) \cup (B - A)$. Is the associative law true for $\oplus$? Give justification.

6. For finite sets A, B, C, find formulae for $|A - B|, |B - A|, |A \oplus B|, |(A - B) - C|, |A \cap B \cap C|$.

7. Under what condition following is true?
   $(A - B) \cup (A - C) = A$, for the sets A, B, C.

8. Find total number of natural numbers which either divides 1800 or 2460.

9. Given two sets A, B, what can you say about $P(A \cup B), P(A \cap B)$ in terms of $P(A), P(B)$?

10. (Computer Representation of Sets) Assume that the universal set U is finite First, fix an ordering of the elements of U, for instance $a_1, a_2, ..., a_n$. Represent a subset A of U with the bit string of length n, where the i^{th} bit in this string is 1 if a_i belongs to A and is 0 if a_i does not belong to A.
    For $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, every subset A of U will correspond to a binary string of length 10. For example, $A = \{1, 2, 3\}$ will correspond to 1110000000.
    Define operations on binary strings corresponding to union, intersection, complement of subsets of U. Write down C program for these operations.