1. Which of the following collections are sets? Justify your answer:

    (i) A collection of all natural numbers less than 50.

    (ii) The collection of all girls in your class.   (iii) The collection of difficult topics in mathematics.

2. Describe the following sets in Roster form:

    (i) {x : x is a letter before e in the English alphabet);

    (ii) {x $\in$ N : x is a prime number, 10 < x < 20}   (iii) {x $\in$ R: x>x}.

3. List all the elements of the following sets:

    (i)   A = {x: $x^2 \le 10$, x$\in$Z}   (ii)   B = {x:x is an integer, $-\frac{1}{2} < x < \frac{9}{2}$}

    (iii) C = {x: x is a month of a year not having 31 days}

    (iv) $D = \{x : x \in Z \text{ and } |x| \le 2\}$ (v) $E = \{x : x = \frac{n}{n^2+1} \text{ and } 1 \le n \le 3, where\ n \in N\}$

4. Let A = {1, 2, 3, 4}, B = {1, 2, 3} and C = {2, 4}. Find all sets X satisfying each pair of conditions:

    (i) X$\subset$B and X$\not\subset$C (ii) X$\subset$B, X$\ne$B and X$\not\subset$C   (iii) X$\subset$A, X$\subset$B and X$\subset$C.

5. In each of the following, determine whether the statement is true or false. If it is true, prove it.

    If it is false, give an example.

    (i)   If x$\in$A and A$\in$B, then x$\in$B   (ii)   If A$\subset$B and B$\subset$C, then A$\subset$C

    (iii) If x$\in$A and A$\not\subset$B, then x$\in$B

6. Let A = {a, b, {c, d}, e}. Which of the following statements are false and why?

    (i) {c. d} $\subset$ A   (ii) {c, d} $\in$ A   (iii) {{c, d}} $\subset$A
    (iv) {a} $\subset${{a}, b}   (v) a $\in$A   (vi) {a, b, e} $\subset$A
    (vii) {a, b, c} $\subset$ A   (viii) ϕ $\in$A   (ix) {ϕ}$\subset$A

7. Let U = {1,2,3,4,5,6,7,8,9}, A = {2,4,6,8} and B = {2,3,5,7},

    Verify that (i) (A$\cup$B)^c = A$^c \cap$B^c (ii) (A$\cap$B)^c = A$^c \cup$B^c.

8. If A = {1,3,5,7,11,13,15,17}, B = {2,4,6, ...,18} and N is the universal set, then find   A$^c \cup$((A$\cup$B)$\cap$B^c).

9. For three sets A, B and C, show that

    (i) A$\cap$B=A$\cap$C need not imply B = C.   (ii) A$\subset$B $\Rightarrow$ C$-$B $\subset$ C$-$A

10. If A and B be two sets containing 3 and 6 elements respectively, what can be the minimum number of

    elements in A$\cup$B? Find also, the maximum number of elements in A$\cup$B.

11. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans

    like both cheese and apples, find the value of x.

12. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B

    and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2%

    families buy all the three news papers, find the number of families which buy

    (i) A only   (ii) B only   (iii) none of A, B and C.

13. A survey of 500 television viewers produced the following information; 285 watch football, 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. How many watch all the three games? How many watch exactly one of the three games ?

14. In a survey of 100 students, the number of students studying the various languages were found to be English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24. Find:
    (i) How many students were studying Hindi ?
    (ii) How many students were studying English and Hindi ?

15. In a survey of 25 students, it was found that 15 had taken mathematics, 12 had taken physics and 11 had taken chemistry, 5 had taken mathematics and chemistry, 9 had taken mathematics and physics, 4 had taken physics and chemistry and 3 had taken all the three subjects. Find the number of students that had
    (i)   only chemistry
    (ii) only mathematics.
    (iii) only physics.
    (iv) physics and chemistry but not mathematics.
    (v) mathematics and physics but not chemistry.
    (vi) only one of the subjects.
    (vii) at least one of the three subjects.
    (viii) none of the subjects.