CBSE Test Paper 02

CH-01 Sets

Section A

1. Let A and B be two sets such that $n(A) = 35, n(B) = 42 \quad and \quad n(A \cap B) = 17$, find $n(A - B)$
   a. 25
   b. 19
   c. 18
   d. 17
2. If A = { 2,3,4,8,10 } , B = { 3,4,5,10,12 } and C = { 4,5,6,12,14 } , then $(A \cup B) \cap (A \cup C)$ is equal to
   a. { 4,5,8,10,12 }
   b. { 2,4,5,10,12 }
   c. { 3,8,10,12 }
   d. { 2,3,4,5,8,10,12 }
3. If A , B and C are non – empty sets , then (A – B) $\cup$(B – A) equals :
   a. $(A \cap B) - B$
   b. (A $\cap$ B) $\cup$(A $\cup$B)
   c. (A $\cup$ B) - B
   d. (A $\cup$B) – (A $\cap$ B)
4. If A and B are two sets then $A \cap (A \cap B')$= . . . .
   a. ϕ

b. A

c. ϕ

d. B

5. Sets A and B have 3 and 6 elements respectively. What can be the maximum number of elements in A $\cup$ B.

   a. 3

   b. 9

   c. 18

   d. 6

6. Fill in the blanks:

   If A = {e, f, g} and B = ϕ, then A $\cap$ B is ________.

7. Fill in the blanks:

   The total number of subsets and a proper subset of a finite set containing 'n' element is ________ and ________, respectively.

8. If A = {3, 5, 7, 9, 11} , B = {7, 9, 11, 13}, C = {11, 13, 15} and D = {15, 17} find: $A \cap C$

9. Describe {x $\in$ R: x > x) set in Roster form.

10. Is set C = { x : x - 5 = 0} and E = {x : x is an integral positive root of the equation x^2 - 2x - 15 = 0} are equal?

11. Show that $A \cap B = A \cap C$ need not imply B = C?

12. Write the set of all natural numbers x such that 4x + 9 < 50 in roster form.

13. In the following, state whether A = B or not: A = {a, b, c, d} B = {d, c, b, a}

14. If X = {a, b, c, d} and Y = {f, b, d, g}, then find

i. X - Y
ii. Y - X
iii. $X \cap Y$
iv. $X \cup Y$

15. In a group of 100 people, 65 like to play Cricket, 40 like to play Tennis and 55 like to play Volleyball. All of them like to play at least one of the three games. If 25 like to play both Cricket and Tennis, 24 like to play both Tennis and Volleyball and 22 like to play both Cricket and Volleyball, then

i. how many like to play all the three games?
ii. how many like to play Cricket only?
iii. how many like to play Tennis only?

Represent the above information in a Venn diagram.

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Solution

Section A

1. (c) 18

   Explanation:

   Given that $n(A \cap B) = 17$

   We have $A - B = A - (A \cap B)$

   Therefore $n(A - B) = n(A) - n(A \cap B) = 35 - 17 = 18$

2. (d) { 2,3,4,5,8,10,12 }

   Explanation:

   Given A= 2,3,4,8,10, B= 3,4,5,10,12 and C= 4,5,6,12,14

   Here$A \cup B = \{2, 3, 4, 5, 8, 10, 12\}$ and $A \cup C = \{2, 3, 4, 5, 6, 8, 10, 12, 14\}$

   Now, $(A \cup B) \cap (A \cup C) = \{2, 3, 4, 5, 8, 10, 12\}$

3. (d) (A ∪B) – (A ∩ B)

   Explanation:

   $$We \quad have \quad (A \cup B) = (A - B) \cup (B - A) \cup (A \cap B)$$
   $$Hence\,(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$$

4. (b) A

   Explanation:

   $$(A \cap B') = A$$
   $$\Rightarrow A \cap (A \cap B') = A \cap A = A$$

5. (b) 9

   Explanation:

   n(A ∪ B)= n(A) +n(B)-n(A ∩B)

   if n(A∩B) =0 then n(A ∪ B) is max.

so max. number of element in $A \cup B = 9$

6. ϕ

7. 2^n, $2^n - 1$

8. Here A = {3, 5, 7, 9, 11} , B = {7, 9, 11, 13}, C = {11, 13, 15} and D = {15, 17}

   $A \cap C = \{3,5,7,9,11\} \cap \{11,13,15\}$= {11}

9. We know that given any x$\in$R, x is always less than or equal to itself, i.e.,x$\leq$x. Hence, the above set is empty i.e, ϕ.

10. C = {5}

    x^2-2x-15=0

    x^2-5x+3x-15=0

    x(x-5)+3(x-5)=0

    (x-5)(x+3)=0

    x=5

    x=-3 [x= -3 reject]

    x= 5

    E= {5}

    Hence C = E.

11. Let A = {1, 2, 3, 4} , B = {2, 3, 4, 5, 6}, C = {2, 3, 4, 9, 10}
    $\therefore A \cap B$= {1, 2, 3, 4} $\cap$ {2, 3, 4, 5, 6}
    = {2,3, 4}
    $A \cap C$ = {1, 2, 3, 4}, B = {2, 3, 4, 5, 6}, C = {2, 3, 4, 9, 10}
    = {2, 3, 4}
    $A \cap C$ = {1, 2, 3, 4} $\cap$ {2, 3, 4, 9, 10}
    = {2, 3, 4}
    Now we have $A \cap B = A \cap C$
    But $B \neq C$

12. According to the question,
    4x + 9 < 50

$\Rightarrow$ 4x + 9 - 9 < 50 - 9 [subtracting 9 from both sides]

$\Rightarrow$4x < 41 $\Rightarrow x < \frac{41}{4}$

Since, x is a natural number, so x can take values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

$\therefore$ Required set = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

13. A = {a, b, c, d} and B = {d, c, b, a} are equal sets because order of elements does not change a set. $\therefore$ A = B = {a, b, c, d}

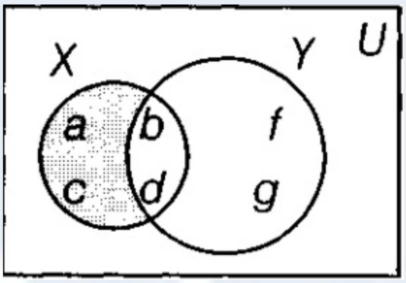
14. Given, X = {a, b, c, d} and Y = {f, b, d, g}

    i. X - Y

       X - Y will contain elements of X which are not present in Y.

       So, X - Y = {a, b, c, d } - { f , b, d, g} = {a, c}

       This is also shown with the help of Venn diagram. The shaded portion is X - Y

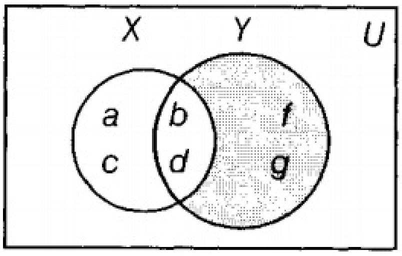


    ii. Y - X

       Y - X will contain elements of Y which are not present in X.

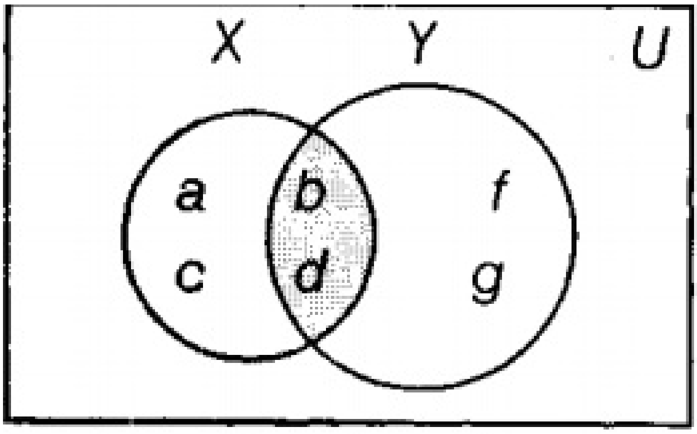
       So, Y - X = {f, b, d, g} - {a, b, c, d} = {f, g}

       This is also shown with the help of Venn diagram. The shaded portion is Y - X



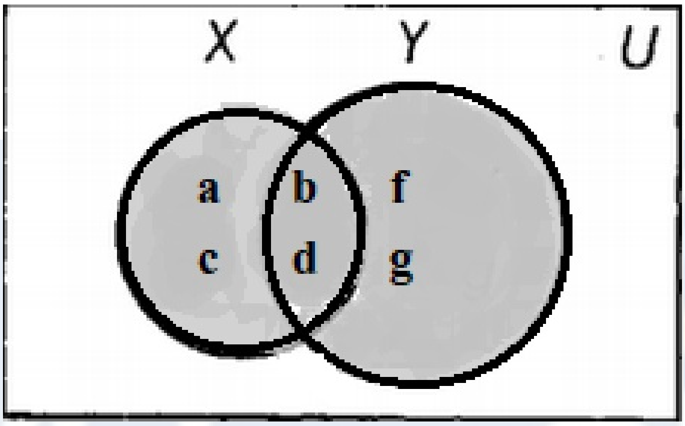
    iii. X ∩ Y = {a, b, c, d) ∩ { f, b, d, g} = {b, d}

       This is also shown with the help of Venn diagram. The shaded portion is X ∩ Y

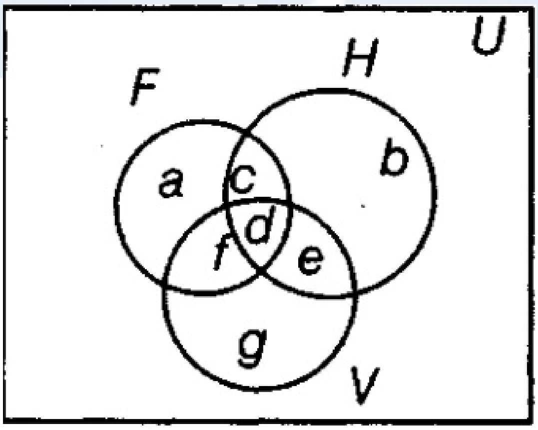


iv. X ∪ Y = (a, b, c, d} ∪ {f, b, d, g } = {a ,b ,c ,d ,f ,g}

This is also shown with the help of Venn diagram. The shaded portion is X ∪ Y



15. Let n(C) represent the number of people playing Cricket, n(T) represents the number of people playing Tennis and n(V) represents the number of people playing Volleyball.



Let in Venn diagram a, b, c, d, e, f and g denote the number of elements in respective regions.

Now, from the Venn diagram, we have

n($C \cup T \cup V$) = a + b + c + d + e + f + g = 100 ...(i)

$n(C) = a + c + d + f = 65$..........(ii)

$n(T) = c + b + d + e = 40$..........(iii)

$n(V) = e + d + f + g = 55$......... (iv)
$n(C \cap T) = c + d = 25$...............(v)
$n(T \cap V) = d + e = 24$ ....(vi)
$n(C \cap V) = f + d = 22$ ....(vii)
and n(C ∩ T ∩V) = d
Using the identity,
$n(C \cup T \cup V)= [n(C) + n(T) + n(V)] - [n(C \cap T) + n(T \cap V)$
$+ n(C \cap V)] + n(C \cap T \cap V)$
$\Rightarrow n(C \cap T \cap V) = n(C \cup T \cup V)$-[n(C) + n(T) + n(V)] +
$[n(C \cap T) + n(T \cap V) + n(C \cap V)]$
$= 100 - (65 + 40 + 55) + (25 + 24 + 22)$
$= 100 - 160 + 71 = 11$
Thus, n($C \cap T \cap V$) = d = 11
From Eq. (v), we get
$c = 25 - 11 = 14$
From Eq. (vi), we get,
$e = 24 - 11 = 13$
From Eq. (vii), we get,
$f = 22 - 11 = 11$
From Eq. (iv), we get,
$g = 55 - (13 + 11 + 11) = 20$
From Eq. (iii), we get,
$b = 40 - (14 + 11 + 13) = 2$
From Eq. (ii), we get,
$a = 65 - (14 + 11 + 11) = 29$
Hence,

i. the number of people who like to play all three games, $d = 11$
ii. the number of people who like to play Cricket only, $a = 29$
iii. the number of people who like to play Tennis only, $b = 2$