

**CBSE Test Paper 01**

**CH-01 Sets**

---

**Section A**

1. Let  $U$  be the universal containing 700 elements. If  $A$  and  $B$  are subsets of  $U$  such that  $n(A) = 200$ ,  $n(B) = 300$  and  $n(A \cap B) = 100$  then  $n(A' \cap B') = \dots$
- a. 400
  - b. 300
  - c. 500
  - d. 800
2. If  $A = \{1, 2, 3, 4\}$ ,  $B = \{4, 5, 6, 7\}$ ,  $A \cap B =$
- a.  $\{4\}$
  - b.  $\{1, 2, 3, 4\}$
  - c.  $\{6, 7\}$ .
  - d.  $\{1, 2\}$
3. If  $n(A) = 3$  and  $n(B) = 6$  and  $A \subseteq B$ , then  $n(A \cup B) = ?$
- a. 9
  - b. 3
  - c. 6
  - d. none of these
4. The number of proper subsets of the set  $\{1, 2, 3\}$  is :

---

a. 6

b. 7

c. 8

d. 5

5. If A class has 175 students . The following data shows the number of students offering one or more subjects. Mathematics 100 ; Physics 70 ; Chemistry 40 ; Mathematics and Physics 30 ; Mathematics and Chemistry 28 ; Physics and Chemistry 23 ; Mathematics , Physics and Chemistry 18 . How many students have offered Mathematics alone?

a. 35

b. 22.

c. 48

d. 60

6. Fill in the blanks:

If  $A = \{1, 3, 5, 7, 9\}$  and  $B = \{2, 3, 5, 7, 11\}$ , then  $A \Delta B$  is \_\_\_\_\_.

7. Fill in the blanks:

A set, consisting of a single element, is called a \_\_\_\_\_.

8. List all the elements of set  $\{x : x \text{ is a month of a year not having 31 days}\}$ .

9. State whether the statement is true or false:  $\{a, e, i, o, u\}$  and  $\{a, b, c, d\}$  are disjoint sets.

10. If  $U = \{a, b, c, d, e, f, g, h\}$ , find the complement of the set:  $D = \{f, g, h, a\}$

11. Let  $A = \{1, 2, 4, 5\}$   $B = \{2, 3, 5, 6\}$   $C = \{4, 5, 6, 7\}$ . Verify:

$$A - (B \cup C) = (A - B) \cap (A - C)$$

12. If A is any set, prove that:  $A \subseteq \phi \Leftrightarrow A = \phi$

---

13. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers.

Find: the number of people who read at least one of the newspaper.

14. For any two sets A and B prove that:  $P(A \cap B) = P(A) \cap P(B)$ .

15. If  $U = \{a, b, c, d, e, f\}$ ,  $A = \{a, b, c\}$ ,  $B = \{c, d, e, f\}$ ,  $C = \{c, d, e\}$  and  $D = \{d, e, f\}$ , then tabulate the following sets:

- i.  $A \cap D$
- ii.  $A \cap C$
- iii.  $U \cap D$
- iv.  $A \cup \phi$
- v.  $(U \cap \phi)'$
- vi.  $(U \cup A)'$



Vidya Champ

---

**CBSE Test Paper 01**

**CH-01 Sets**

---

**Solution**

**Section A**

1. (b) 300

**Explanation:**

Given  $n(A) = 200$ ,  $n(B) = 300$ ,  $n(A \cap B) = 100$

$$n(A \cup B) = n(A) + n(B) - n(A \cap B) = 200 + 300 - 100 = 400$$

$$n(A' \cap B') = n(A \cup B)' + n(U) - n(A \cup B) = 700 - 400 = 300$$

[By De Morgan's law]

2. (a) { 4 }

**Explanation:** Given  $A = \{1, 2, 3, 4\}$  and  $B = \{4, 5, 6, 7\}$

$$(A \cap B) = \{4\}$$

3. (c) 6

Explanation:  $A \subseteq B$

$$\Rightarrow n(A \cup B) = n(B) = 6$$

4. (b) 7

**Explanation:** The no of proper subsets  $= 2^n - 1 = 2^3 - 1 = 7$

Here  $n =$  no of elements of given set  $= 3$

5. (d) 60

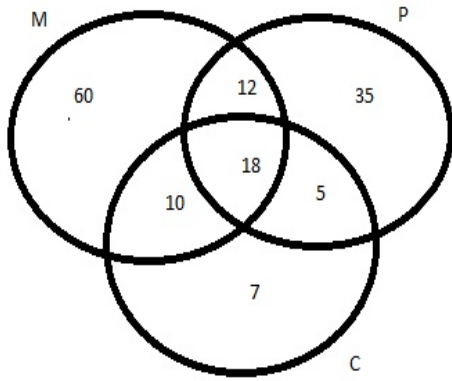
**Explanation:**

M - mathematics

P - physics

C - chemistry

Venn Diagram



By Venn Diagram we can see that the students who offered mathematics alone are 60.

6. {1, 2, 9, 11}

7. singleton set

8. A month has either 28, 29, 30 or 31 days.

Out of the 12 months in a year, the months that have 31 days are:

January, March, May, July, August, October, December

$\therefore$  Given set has elements {February, April, June, September, November}

9. Let  $A = \{a, e, i, o, u\}$  and  $B = \{a, b, c, d\}$

Now  $A \cap B = \{a, e, i, o, u\} \cap \{a, b, c, d\} = \{a\}$

Hence A and B are not disjoint. So the statement is false.

10.  $D' = U - D = \{a, b, c, d, e, f, g, h\} - \{f, g, h, a\} = \{b, c, d, e\}$

11.  $A = \{1, 2, 4, 5\}$ ,  $B = \{2, 3, 5, 6\}$ ,  $C = \{4, 5, 6, 7\}$

$B \cup C = \{2, 3, 4, 5, 6, 7\}$

$A - (B \cup C) = \{1\}$  .....(i)

$(A - B) = \{1, 4\}$

$(A - C) = \{1, 2\}$

$(A - B) \cap (A - C) = \{1\}$  .....(ii)

From eq<sup>n</sup> (i) and eq<sup>n</sup> (ii), we get

$A - (B \cup C) = (A - B) \cap (A - C)$

12. The symbol ' $\Leftrightarrow$ ' stands for if and only if (in short if).

In order to show that two sets A and B are equal, we show that  $A \subseteq B$  and  $B \subseteq A$ .

We have  $A \subseteq \phi$ ,  $\because \phi$  is a subset of every set,

$$\therefore \phi \subseteq A$$

Hence  $A = \phi$

To show the backward implication, suppose that  $A = \phi$ .

$\therefore$  every set is a subset of itself

$$\therefore \phi = A \subseteq \phi$$

Hence, proved.

13. Here

$$n(U) = a + b + c + d + e + f + g + h = 60 \dots\dots (i)$$

$$n(H) = a + b + c + d = 25 \dots\dots (ii)$$

$$n(T) = b + c + f + g = 26 \dots\dots (iii)$$

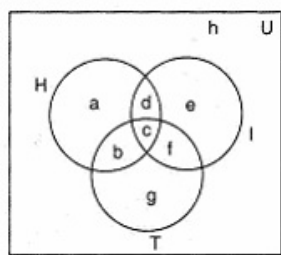
$$n(I) = c + d + e + f = 26 \dots\dots (iv)$$

$$n(H \cap I) = c + d = 9 \dots\dots (v)$$

$$n(H \cap T) = b + c = 11 \dots\dots (vi)$$

$$n(T \cap I) = c + f = 8 \dots\dots (vii)$$

$$n(H \cap T \cap I) = c = 3 \dots\dots (viii)$$



Putting value of  $c$  in (vii),

$$3 + f = 8 \Rightarrow f = 5$$

Putting value of  $c$  in (vi),

$$3 + b = 11 \Rightarrow b = 8$$

Putting values of  $c$  in (v),

$$3 + d = 9 \Rightarrow d = 6$$

Putting value of  $c, d, f$  in (iv),

$$3 + 6 + e + 5 = 26 \Rightarrow e = 26 - 14 = 12$$

Putting value of  $b, c, f$  in (iii),

$$8 + 3 + 5 + g = 26 \Rightarrow g = 26 - 16 = 10$$

Putting value of  $b, c, d$  in (ii)

$$a + 8 + 3 + 6 = 25 \Rightarrow a = 25 - 17 = 8$$

Number of people who read at least one of the three newspapers

$$= a + b + c + d + e + f + g$$

$$= 8 + 8 + 3 + 6 + 12 + 5 + 10 = 52$$

14. Let  $x \in P(A \cap B)$

$$\Rightarrow x \subset (A \cap B)$$

$$\Rightarrow x \subset A \text{ and } x \subset B$$

$$\Rightarrow x \in P(A) \text{ and } x \in P(B)$$

$$\Rightarrow x \in P(A) \cap P(B)$$

$$\Rightarrow x \subset P(A) \cap P(B)$$

$$\therefore P(A \cap B) \subset P(A) \cap P(B) \dots (i)$$

Let  $x \in P(A) \cap P(B)$

$$\Rightarrow x \in P(A) \text{ and } x \in P(B)$$

$$\Rightarrow x \subset A \text{ and } \Rightarrow x \subset B$$

$$\Rightarrow x \subset A \cap B$$

$$\Rightarrow x \subset P(A \cap B)$$

$$\therefore P(A) \cap P(B) \subset P(A \cap B) \dots (ii)$$

From (i) and (ii), we have

$$P(A \cup B) = P(A) \cap P(B)$$

15. According to the question, we are given that,

$$U = \{a, b, c, d, e, f\}, A = \{a, b, c\}, B = \{c, d, e, f\}, C = \{c, d, e\} \text{ and } D = \{d, e, f\}$$

i.  $A \cap D = \{a, b, c\} \cap \{d, e, f\} = \phi$

ii.  $A \cap C = \{a, b, c\} \cap \{c, d, e\} = \{c\}$

iii.  $U \cap D = \{a, b, c, d, e, f\} \cap \{d, e, f\} = \{d, e, f\}$

iv.  $A \cup \phi = \{a, b, c\} \cup \{\} = \{a, b, c\}$

v.  $U \cap \phi = \{a, b, c, d, e, f\} \cap \{\} = \phi$

$$(U \cap \phi)'$$

$$= \phi'$$

$$= U$$

vi.  $U \cup A = \{a, b, c, d, e, f\} \cup \{a, b, c\}$

$$= \{a, b, c, d, e, f\}$$

$$= U$$

$$\therefore (U \cup A)' = \phi$$