

Sets — CBSE Pattern Test 1

Class 11 Maths · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

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Class 11 Maths · Sets · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.
(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.
(3) For MCQ questions choose the single correct option; for VSA answers write a single line.
(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. A collection of well-defined objects is called a
 - (A) set
 - (B) list
 - (C) relation
 - (D) function
2. The set $\{ \}$ or $\emptyset$ is called the
 - (A) empty set
 - (B) universal set
 - (C) power set
 - (D) union
3. The number of subsets of a set with n elements is
 - (A) 2^n
 - (B) n
 - (C) n^2
 - (D) $2n$
4. The set containing all the elements under consideration is called the
 - (A) universal set
 - (B) empty set
 - (C) power set
 - (D) subset
5. $A \cup B$ contains elements that belong to
 - (A) A or B (or both)
 - (B) only A
 - (C) only B
 - (D) both A and B
6. $A \cap B$ contains elements that belong to
 - (A) both A and B
 - (B) A only
 - (C) B only
 - (D) neither A nor B
7. De Morgan's law states that $(A \cup B)'$ is equal to
 - (A) $A' \cap B'$

(B) $A' \cap B'$

(C) $A \cap B$

(D) $A \cap B$

8. For any two finite sets A and B, $n(A \cap B)$ is equal to

(A) $n(A) + n(B) - n(A \cap B)$

(B) $n(A) + n(B)$

(C) $n(A) - n(B)$

(D) $n(A) \times n(B)$

9. Define a set.

10. State De Morgan's laws.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. Write the set $\{2, 4, 6, 8\}$ in set-builder form.

12. Define an empty set with one example.

13. If $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, find $A \cap B$ and $A \cup B$.

14. If $n(A) = 5$ and $n(B) = 7$ and A, B are disjoint, find $n(A \cup B)$.

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Write the power set of $A = \{1, 2, 3\}$ and state the number of elements in it.

16. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$ and $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, find $A \cap B$, $A \cup B$ and $(A \cap B)'$.

17. Verify De Morgan's law $(A \cap B)' = A' \cup B'$ for $A = \{1, 2\}$, $B = \{2, 3\}$, $U = \{1, 2, 3, 4\}$.

18. In a class of 40 students, 25 play cricket and 20 play football and 10 play both. Use the formula for $n(A \cup B)$ to find how many play at least one game.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. State and prove De Morgan's laws using Venn diagrams.

20. State the formula $n(A \cup B) = n(A) + n(B) - n(A \cap B)$. In a survey of 100 people, 60 read newspaper A, 45 read newspaper B and 25 read both. Find how many read neither newspaper.

Answer Key (Marking Scheme)

Q1 — (A) set. Q2 — (A) empty set. Q3 — (A) 2^n . Q4 — (A) universal set.

Q5 — (A) A or B (or both). Q6 — (A) both A and B. Q7 — (A) $A' \cap B'$. Q8 — (A) $n(A) + n(B) - n(A \cap B)$.

Q9 — A well-defined collection of objects.

Q10 — $(A \cap B)' = A' \cup B'$ and $(A \cup B)' = A' \cap B'$.

Q11 — $\{x : x = 2n, n \in \mathbb{N}, n \leq 4\}$.

Q12 — A set with no elements, e.g. $\{x : x \in \mathbb{N}, x < 1\} = \emptyset$.

Q13 — $A \cap B = \{1, 2, 3, 4\}$; $A \cup B = \{2, 3\}$.

Q14 — 12.

Q15 — $\{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$; 8 elements.

Q16 — $A \cap B = \{1,2,3,4,5,6\}$; $A \cup B = \{3,4\}$; $(A \cap B)' = \{7,8\}$.

Q17 — $(A \cap B)' = \{4\} = A' \cap B'$.

Q18 — $n(A \cap B) = 25 + 20 - 10 = 35$.

Q19 — Proof using Venn diagrams as in notes.

Q20 — $100 - (60 + 45 - 25) = 20$ read neither.