CLASS 11 MATHS EXTRA QUESTIONS

# Class 11 Maths Chapter 1 Sets – Important HOTS & Extra Questions with Solutions

The NCERT exercises test whether you know the definitions and can apply them to specific numbers. Board and competitive exams often go one level deeper -- asking you to prove a result for any sets A, B, C rather than just one example, or to work backwards from a given answer to figure out the sets. The questions bel...

## Contents

The NCERT exercises test whether you know the definitions and can apply them to specific numbers. Board and competitive exams often go one level deeper — asking you to prove a result for *any* sets A, B, C rather than just one example, or to work backwards from a given answer to figure out the sets. The questions below are designed to build exactly that skill. All numbers and scenarios here are freshly written and do not appear in the NCERT textbook.

## Q1. General proof: Prove that for any two sets A and B, A – (A – B) = A ∩ B.

**Solution:** Let x ∈ A-(A-B). Then x∈A and x∉(A-B). Since x∈A, this means x is not excluded by being outside B, so x∈B. Hence x∈A∩B, giving A-(A-B)⊂A∩B. Conversely, let x∈A∩B: x∈A, x∈B. Since x∈B, x cannot be in A-B, so x∈A-(A-B). This gives A∩B⊂A-(A-B). Combining: **A-(A-B)=A∩B**.

## Q2. Assertion-Reason

**Assertion (A):** If n(A)=5 and n(B)=7 and A,B are disjoint, then n(A∪B)=12.
**Reason (R):** For any two sets, n(A∪B)=n(A)+n(B)-n(A∩B).

**Solution:** R is always true. Since A,B disjoint, n(A∩B)=0, so n(A∪B)=5+7-0=12, matching A. R correctly explains A. **Answer: (a) Both true, R explains A.**

## Q3. Reverse-engineering

n(A)=18, n(A∪B)=30, n(A∩B)=6. A student claims n(B)=20. Verify or correct, and find B if A={multiples of 3 from 3 to 54}.

**Solution:** 30=18+n(B)-6 ⇒ n(B)=18. The claim of 20 is **incorrect**; correct value is 18. Since A={3,6,…,54} has 18 elements, one valid B (with 6 overlapping elements) is B={3,6,9,12,15,18,1,2,4,5,7,8,10,11,13,14,16,17} — any set satisfying n(B)=18 and |A∩B|=6 works, showing reverse problems can have multiple valid answers.

## Q4. Multi-set survey (3 sets)

100 students: 42 play cricket, 50 football, 40 hockey. 20 both cricket & football, 15 both football & hockey, 18 both cricket & hockey, 8 play all three. How many play none?

**Solution:** n(C∪F∪H)=42+50+40-20-15-18+8=87. None = 100-87=**13 students**.

## Q5. Multi-set survey – exactly one

Using Q4's data, how many play exactly one game?

**Solution:** Cricket only=42-(20+18-8)=12. Football only=50-(20+15-8)=23. Hockey only=40-(15+18-8)=15. Total=12+23+15=**50 students**.

## Q6. De Morgan's Law – general proof

Prove $(A \cup B)' = A' \cap B'$ for any sets A,B in universal set U.

**Solution:** $x \in (A \cup B)' \Rightarrow x \notin A$ and $x \notin B \Rightarrow x \in A' \cap B'$, so $(A \cup B)' \subset A' \cap B'$. Conversely $x \in A' \cap B' \Rightarrow x \notin A, x \notin B \Rightarrow x \notin (A \cup B) \Rightarrow x \in (A \cup B)'$. So $A' \cap B' \subset (A \cup B)'$. Combining: **$(A \cup B)' = A' \cap B'$**.

## Q7. Assertion-Reason (power sets)

**Assertion (A):** A set with 6 elements has P(A) with 64 elements.
**Reason (R):** $|P(A)|$ always equals $2^n$.

**Solution:** $2^6 = 64$, matching A. **Answer: (a) Both true, R explains A.**

## Q8. Reverse-engineering (complements)

U={1..15}. A′={1,2,3,4,5,6,8,10,12,14}. Find A, verify $A \cup A' = U$ and $A \cap A' = \varphi$.

**Solution:** A=U-A′={7,9,11,13,15}. $A \cup A' = \{1..15\} = U$ ✓. $A \cap A' = \varphi$ ✓.

## Q9. Abstract proof

If $A \subset B$, prove $P(A) \subset P(B)$.

**Solution:** Let $S \in P(A)$, so $S \subset A$. Since $A \subset B$, by transitivity $S \subset B$, so $S \in P(B)$. Hence **$P(A) \subset P(B)$**.

## Q10. Multi-set word problem (three newspapers)

150 people: 65 read X, 72 read Y, 58 read Z, 25 both X&Y, 20 both Y&Z, 15 both X&Z, everyone reads at least one. Find how many read all three.

**Solution:** $150 = 65+72+58-25-20-15+a = 135+a \Rightarrow a =$ **15 people**.

## Q11. Assertion-Reason (set difference)

**Assertion (A):** A-B and B-A are always disjoint.
**Reason (R):** An element of A-B cannot lie in B, and an element of B-A cannot lie in A, so they cannot overlap.

**Solution:** R correctly explains why the two sets never overlap. **Answer: (a) Both true, R explains A.**

## Q12. Reverse-engineering (three-set Venn, consistency check)

80 students, “exactly two subjects” total = 26, all-three = 6, n(M)=45, n(P)=40, n(C)=35, everyone studies at least one. Check consistency.

**Solution:** Pairwise sum = 26+3(6)=44. $n(M \cup P \cup C) = 45+40+35-44+6 = 82$. But total given is 80 — a **contradiction**, showing the data is over-determined/inconsistent as stated. A useful check to apply after any real survey calculation.

## Related NCERT Content for Class 11 Maths Chapter 1

NCERT Solutions for Sets

Revision Notes for Sets

Class 11 Maths Formulas Handbook

Class 11 Maths NCERT Book (Download PDF)