Affiliated to CBSE, New Delhi (Affiliation No. 1030642)

GNPS

GOMTI NANDAN PUBLIC SCHOOL

Gandhi Ward, Bina (M.P.) 470113. | 9165 609 333. | info@mygnps.com | www.mygnps.com

CLASS X · MATHEMATICS STANDARD (041) · CBSE BOARD EXAMINATION 2027

CHAPTER 1

Real Numbers

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

81 practice questions | 4 case studies | Board question index | Step-marked answer booklet

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE _____ / 20

1

READ THIS FIRST

Chapter Notes

The whole chapter in short-note form: every definition, formula, method and model answer. Revise from here – you should not need the textbook again.

1 The real number family

Natural numbers 1, 2, 3, … · **Whole numbers** 0, 1, 2, … · **Integers** …, –2, –1, 0, 1, 2, …

Rational number: can be written as $\frac{p}{q}$, where p, q are integers and $q \neq 0$. Examples: 5, $-\frac{3}{7}$, 0.25.

Irrational number: cannot be written as $\frac{p}{q}$. Its decimal form never ends and never repeats. Examples: $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, π.

Real numbers = all rational numbers + all irrational numbers.

2 Prime, composite and coprime numbers

- **Prime:** exactly two factors, 1 and itself (2, 3, 5, 7, 11, …). **Composite:** more than two factors (4, 6, 8, 9, …).
- **1 is neither prime nor composite.** 2 is the only even prime. Smallest composite = 4; smallest odd composite = 9.
- **Coprime numbers:** HCF = 1, e.g. 8 and 15. Two different primes are always coprime; so are two consecutive numbers.
- If a and b are coprime, then a^2 and b^2 (or any powers) are also coprime.

3 Fundamental Theorem of Arithmetic

Statement: Every composite number can be expressed as a product of primes, and this factorisation is **unique**, apart from the order in which the prime factors occur.

- So every composite number has exactly one set of prime factors – its "prime signature".
- Write the answer in **index form**, primes in ascending order: $3150 = 2 \times 3^2 \times 5^2 \times 7$.
- **Factor tree:** split into any two factors and keep splitting until every branch ends in a prime.
- **Division method:** divide repeatedly by 2, 3, 5, 7, … : 3150 → 1575 → 525 → 175 → 35 → 7.

4 HCF and LCM by prime factorisation

HCF = product of the **smallest** power of each **common** prime factor.
LCM = product of the **greatest** power of **every** prime factor present.

EXAMPLE – TWO NUMBERS

$60 = 2^2 \times 3 \times 5$, $84 = 2^2 \times 3 \times 7$
HCF $= 2^2 \times 3 = 12$ · LCM $= 2^2 \times 3 \times 5 \times 7 = 420$

EXAMPLE – THREE NUMBERS

$12 = 2^2 \times 3$, $18 = 2 \times 3^2$, $30 = 2 \times 3 \times 5$
HCF $= 2 \times 3 = 6$ · LCM $= 2^2 \times 3^2 \times 5 = 180$

WITH LETTERS

$12x^3y^2 = 2^2 \cdot 3 \cdot x^3y^2$, $18x^2y^4 = 2 \cdot 3^2 \cdot x^2y^4$
HCF $= 2 \cdot 3 \cdot x^2y^2 = 6x^2y^2$ · LCM $= 2^2 \cdot 3^2 \cdot x^3y^4 = 36x^3y^4$

5 Relation between HCF and LCM

For any two positive integers a and b:
$\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$

- Use it to find one when the other is given: LCM $= (a \times b) \div$ HCF.
- **Not true for three numbers:** for 12, 18, 30, HCF × LCM = 6 × 180 = 1080, but the product = 6480.
- HCF always divides LCM. So HCF = 15 with LCM = 175 is impossible (175 ÷ 15 is not a whole number).
- Coprime numbers: HCF = 1 and LCM = their product.
- HCF ≤ the smaller number; LCM ≥ the larger number.

6 Does a number end with 0?

- A number ends with 0 $\Leftrightarrow$ it is divisible by $10 = 2 \times 5$ $\Leftrightarrow$ its prime factorisation has **both 2 and 5**.
- $4^n = 2^{2n}$ has no 5 $\rightarrow$ never ends in 0. $15^n = 3^n \times 5^n$ has no 2 $\rightarrow$ never ends in 0. $20^n = 2^{2n} \times 5^n \rightarrow$ always ends in 0.
- By uniqueness (FTA), no new prime can appear in a^n – only the primes of a.
- Last digits: 5^n always ends in 5, 6^n always ends in 6, so $5^n + 6^n$ ends in 1.

7 Showing a number is composite

- Take out the common factor and show the number = (a number > 1) × (a number > 1).

EXAMPLE

$4 \times 9 \times 13 + 9 = 9 \times (4 \times 13 + 1) = 9 \times 53 \rightarrow$ it has factors other than 1 and itself, so it is composite.

$4 \times 3 \times 2 \times 1 + 4 = 4 \times (6 + 1) = 4 \times 7 = 28 \rightarrow$ composite.

8 The key theorem behind every irrationality proof

> Let p be a prime. If p divides a^2 (where a is a positive integer), then p divides a.

Why: by FTA, the primes in a^2 are exactly the primes in a, each appearing twice. So if p is a factor of a^2, it is already a factor of a.

9 Model answer: $\sqrt{2}$ is irrational (3 marks)

1. Assume, to the contrary, that $\sqrt{2}$ is rational. Then $\sqrt{2} = \frac{a}{b}$, where a, b are integers, $b \neq 0$, and a, b are coprime.
2. Squaring, $2b^2 = a^2$. So 2 divides a^2, hence 2 divides a.
3. Let $a = 2c$. Then $2b^2 = 4c^2$, i.e. $b^2 = 2c^2$. So 2 divides b^2, hence 2 divides b.
4. Now 2 is a common factor of a and b. This contradicts that a and b are coprime.
5. So our assumption is wrong. Hence $\sqrt{2}$ is irrational.

Same five steps for $\sqrt{3}$ and $\sqrt{5}$: replace 2 by 3 or 5 everywhere (e.g. $a = 3c$ gives $b^2 = 3c^2$).

10 Model answer: $a + b\sqrt{p}$ is irrational

SHOW THAT $4 - 5\sqrt{2}$ IS IRRATIONAL (GIVEN $\sqrt{2}$ IS IRRATIONAL)

1. Assume $4 - 5\sqrt{2}$ is rational: $4 - 5\sqrt{2} = \frac{a}{b}$, where a, b are coprime integers and $b \neq 0$.
2. Then $5\sqrt{2} = 4 - \frac{a}{b} = \frac{4b - a}{b}$, so $\sqrt{2} = \frac{4b - a}{5b}$.
3. As a, b are integers, $\frac{4b - a}{5b}$ is rational, so $\sqrt{2}$ would be rational.
4. This contradicts the fact that $\sqrt{2}$ is irrational. Hence $4 - 5\sqrt{2}$ is irrational.

For $\frac{1}{\sqrt{3}}$: assume $\frac{1}{\sqrt{3}} = \frac{a}{b} \rightarrow \sqrt{3} = \frac{b}{a}$, rational $\rightarrow$ contradiction.

11 Rational and irrational: what you get

rational ± irrational	always irrational: $3 + \sqrt{2}$
non-zero rational × or ÷ irrational	always irrational: $5\sqrt{3}$, $\frac{\sqrt{3}}{4}$
irrational ± irrational	may be rational: $\sqrt{2} + (-\sqrt{2}) = 0$; may be irrational: $\sqrt{2} + \sqrt{3}$
irrational × irrational	may be rational: $\sqrt{2} \times \sqrt{8} = 4$; may be irrational: $\sqrt{2} \times \sqrt{3} = \sqrt{6}$
$\sqrt{\text{perfect square}}$	rational: $\sqrt{\frac{9}{16}} = \frac{3}{4}$, $\sqrt{49} = 7$

12 HCF / LCM word problems – which formula?

Greatest number dividing a, b exactly	$\text{HCF}(a, b)$
... leaving remainders r_1, r_2	$\text{HCF}(a - r_1,\ b - r_2)$
Smallest number divisible by x, y, z	$\text{LCM}(x, y, z)$
... leaving remainder r in each case	$\text{LCM} + r$
... leaving remainders with $x - r_1 = y - r_2 = k$	$\text{LCM} - k$
Bells / lights / runners together again	LCM of the intervals
Largest square tile for a floor	side = HCF(length, breadth) in the same unit
Greatest n-digit number divisible by x, y	largest multiple of LCM with n digits

13 Model answer: HCF word problem (3 marks)

At a quiz, 60 Hindi, 84 English and 108 Maths participants are to be seated so that each room has the same number of participants, all of one subject. Find the minimum number of rooms.

1. Fewest rooms means the **most** participants in a room, and that number must divide 60, 84 and 108: so we need the HCF. ½
2. $60 = 2^2 \times 3 \times 5$, $84 = 2^2 \times 3 \times 7$, $108 = 2^2 \times 3^3$ 1
3. $\text{HCF} = 2^2 \times 3 = 12$ participants per room ½
4. $\text{Rooms} = \dfrac{60 + 84 + 108}{12} = \dfrac{252}{12} = 21$ 1

"Greatest", "largest", "maximum" in a sharing question → HCF. "Together again", "least", "smallest" → LCM.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Fundamental Theorem of Arithmetic: prime factorisation, HCF and LCM.
- Proofs that $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ are irrational, and numbers built from them like $a + b\sqrt{p}$ and $\frac{1}{\sqrt{p}}$.

Not asked: Euclid's division lemma and algorithm, decimal expansions of rational numbers (both deleted).

BOARD WEIGHTAGE

6 / 80

Unit I Number Systems is this chapter alone. Every paper checked had an irrationality proof (2 or 3 marks) and one or two 1-mark questions on HCF/LCM, primes or last digits; three of the four papers also had an HCF/LCM word problem.

MOST ASKED IN BOARD PAPERS, 2024–2026 + SAMPLE PAPER 2026–27 (4 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★★	Prove a number irrational: $\sqrt{p}$, $a \pm b\sqrt{p}$ or $\frac{1}{\sqrt{p}}$	2–3	4 of 4
★★★	Find the HCF or LCM, including algebraic terms such as $18a^2b^4$	1	3 of 4
★★☆	HCF/LCM word problems: rooms, longest ruler, bells, greatest number with remainders	1–3	2 of 4
★★☆	Prime or composite: show that an expression like $5 \times 11 \times 17 + 3 \times 11$ is composite	1–2	2 of 4
★☆☆	Last digit of a^n, numbers ending in 0	1	1 of 4
★☆☆	Rational number between two surds; number facts such as powers of -1	1	1 of 4

MISTAKES THAT COST MARKS

- Leaving out "a and b are coprime" in a proof. The contradiction at the end depends on it.
- Using HCF × LCM = product for three numbers. It works only for two.
- Taking the LCM when the HCF is needed. Sharing into the largest equal groups → HCF; meeting together again → LCM.
- Mixing metres and centimetres in a word problem. Change everything to the smaller unit first.
- Calling 1 a prime, or 2 a composite number. 1 is neither; 2 is the only even prime.
- Writing "irrational + irrational is irrational". $\sqrt{2} + (-\sqrt{2}) = 0$ is rational.

HOW TO USE THIS BOOKLET

1. **Day 1:** Notes, then Part A (NCERT) and Part B (Exemplar). Do every MUST DO question first.
2. **Day 2:** Part C (board pattern) and Part D (case studies).
3. **Day 3:** Part E (challenge) and the real board questions in Part F.
4. **Sun 6 Dec: Sunday chapter test – 20 marks in 40 minutes, without the booklet.**
5. Check every answer in the Answer Booklet. Write each mistake on the My Mistakes page.

RULES AT A GLANCE

Two numbers a, b	$\text{HCF} \times \text{LCM} = a \times b$
HCF / LCM	smallest power of common primes / greatest power of all primes
Ends in 0	prime factors must include 2 and 5
Key theorem	prime p divides $a^2 \Rightarrow p$ divides a
Rational ± irrational	always irrational
Remainders r_1, r_2	$\text{HCF}(a - r_1, b - r_2)$; same remainder r: LCM $+ r$

PART A · NCERT PRACTICE

A NCERT Practice

The same skills as the NCERT examples and exercises, with new numbers. Finish every question before moving on.

Prime factorisation (Fundamental Theorem of Arithmetic)

A1. Express each number as a product of its prime factors: MUST DO [5]

(i) 180 (ii) 252 (iii) 4725 (iv) 6435 (v) 4199

A2. The exponent of 2 in the prime factorisation of 144 is: [1]

(a) 2 (b) 3 (c) 4 (d) 5

A3. Check whether 8^n can end with the digit 0 for any natural number n. MUST DO [2]

A4. Explain why $5 \times 11 \times 17 + 17$ and $6 \times 5 \times 4 \times 3 \times 2 \times 1 + 6$ are composite numbers. MUST DO [2]

HCF and LCM by prime factorisation

A5. Find the HCF and LCM of 12 and 42 by the prime factorisation method. [2]

A6. Find the LCM and HCF of each pair and verify that LCM × HCF = product of the two numbers: MUST DO [3]

(i) 38 and 57 (ii) 390 and 76 (iii) 288 and 120

A7. Find the LCM and HCF of the following integers by the prime factorisation method: [3]

(i) 18, 24 and 30 (ii) 13, 19 and 31 (iii) 4, 27 and 35

A8. Given that HCF(252, 594) = 18, find LCM(252, 594). MUST DO [2]

A9. Two cyclists start together from the same point of a circular track and ride in the same direction. One completes a round in 16 minutes and the other in 20 minutes. After how many minutes will they meet again at the starting point? MUST DO [2]

Irrational numbers

A10. Prove that $\sqrt{5}$ is irrational. MUST DO [3]

A11. Given that $\sqrt{3}$ is irrational, prove that $2 + 5\sqrt{3}$ is irrational. MUST DO [3]

A12. Prove that the following are irrational: [3]

(i) $\dfrac{1}{\sqrt{3}}$ (ii) $4\sqrt{2}$ (iii) $7 - \sqrt{5}$

A13. If 3 divides a^2, where a is a positive integer, then which of these must be true? [1]

(a) 9 divides a (b) 3 divides a

(c) a is odd (d) 6 divides a

B · Exemplar Practice

PART B · EXEMPLAR PRACTICE

Exemplar-style questions on the same ideas, one step harder. Give a reason for every 2-mark answer.

Multiple choice

1 mark each

B1. If $a = x^2y^3$ and $b = x^3y$, where x and y are prime numbers, then HCF(a, b) is: [1]

(a) xy (b) x^2y (c) xy^2 (d) x^3y^3

B2. If p and q are two different odd prime numbers, then $p + q$ is always: [1]

(a) an odd number (b) an even number

(c) a prime number (d) a multiple of 4

B3. The LCM of the smallest odd composite number and the smallest two-digit prime number is: [1]

(a) 18 (b) 20 (c) 99 (d) 33

B4. If HCF(45, 105) = 15, then LCM(45, 105) is: [1]

(a) 315 (b) 105 (c) 945 (d) 675

B5. The sum of the exponents of the prime factors in the prime factorisation of 360 is: [1]

(a) 4 (b) 5 (c) 7 (d) 6

B6. The least number that is divisible by each of the numbers from 1 to 8 is: [1]

(a) 420 (b) 840 (c) 1680 (d) 40320

B7. If $\text{HCF}(84, 126) = 126 - 84m$, then the value of m is: [1]

(a) 1 (b) 2 (c) 3 (d) $\frac{1}{2}$

B8. If $a = 2^2 \times 3^3$, $b = 2 \times 3 \times 5$, $c = 2^n \times 7$ and $\text{LCM}(a, b, c) = 2^4 \times 3^3 \times 5 \times 7$, then n is: [1]

(a) 1 (b) 2 (c) 3 (d) 4

B9. Which of the following is a rational number? [1]

(a) $\sqrt{2} + \sqrt{8}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\sqrt{2} \times \sqrt{8}$ (d) 2π

Short answer with reasons

2 marks each

B10. Can two numbers have 15 as their HCF and 175 as their LCM? Give a reason. MUST DO [2]

B11. Show that 14^n cannot end with the digit 0 or 5 for any natural number n. [2]

B12. The HCF of two numbers is 9 and their LCM is 360. If one of the numbers is 45, find the other. MUST DO [2]

B13. Is the product of two irrational numbers always irrational? Justify your answer with an example. [2]

B14. Find the HCF and LCM of $2^4 \times 3^2 \times 5$ and $2^2 \times 3^5 \times 7$. Leave your answers in index form. [2]

B15. Find the smallest number which, when divided by 12 and by 18, leaves a remainder 5 in each case. [2]

Short answer

3 marks each

B16. Prove that $\sqrt{2} + \sqrt{5}$ is irrational. MUST DO [3]

B17. Given that $\sqrt{6}$ is irrational, show that $\left(\sqrt{2} + \sqrt{3}\right)^2$ is irrational. [3]

B18. Three friends start walking together from the same point. Their steps measure 63 cm, 70 cm and 77 cm. What is the minimum distance each should walk so that all of them cover it in a whole number of steps? MUST DO [3]

C

PART C · BOARD PATTERN

Board Pattern Practice

Question types from real 2024–2026 board papers and the 2026–27 Sample Paper, grouped by type. ★★★ = asked in 3 or 4 of the 4 papers checked · ★★ = 2 papers · ★ = 1 paper.

ASSERTION–REASON: HOW TO ANSWER

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

Irrationality proofs

★★★ 4 of 4 papers · 2–3 marks

C1. Prove that $\sqrt{3}$ is irrational. MUST DO [3]

C2. Given that $\sqrt{5}$ is irrational, prove that $4 - 3\sqrt{5}$ is irrational. MUST DO [2]

C3. Given that $\sqrt{5}$ is irrational, prove that $\dfrac{3}{\sqrt{5}}$ is irrational. [2]

C4. Given that $\sqrt{3}$ is irrational, prove that $\dfrac{5 + 2\sqrt{3}}{7}$ is irrational. [3]

C5. Given that $\sqrt{2}$ is irrational, prove that $3\sqrt{2} - 1$ is irrational. [2]

C6. ASSERTION–REASON [1]
Assertion (A): $\sqrt{3} + \sqrt{12}$ is an irrational number.
Reason (R): The sum of two irrational numbers is always irrational.

Finding HCF and LCM

★★★ 3 of 4 papers · 1 mark

C7. The HCF of 756 and 504 is: MUST DO [1]
(a) 126 (b) 252 (c) 504 (d) 84

C8. The LCM of $2^3 \times 3^2$ and $2^2 \times 3^3$ is: [1]
(a) 108 (b) 72 (c) 36 (d) 216

C9. The LCM of $15a^2b^3$ and $10a^4b$ is: [1]
(a) $5a^2b$ (b) $30a^4b^3$ (c) $150a^6b^4$ (d) $30a^2b$

C10. If $\text{HCF}(a, b) = 12$ and $a \times b = 1800$, then $\text{LCM}(a, b)$ is: [1]
(a) 12 (b) 900 (c) 150 (d) 1800

C11. Let $\text{HCF}(56, 84) = m$ and $\text{LCM}(56, 84) = n$. The value of $n - 6m$ is: [1]
(a) 0 (b) 28 (c) 84 (d) 140

C12. If two positive integers p and q are coprime, then $\text{LCM}(p, q)$ is: [1]
(a) 1 (b) $p + q$ (c) pq (d) $\dfrac{p}{q}$

C13. Given that HCF(1080, 1200) = 120 and $\text{LCM}(1080, 1200) = 108 \times k$, the value of k is: [1]
(a) 10 (b) 1000 (c) 100 (d) 120

C14. ASSERTION–REASON [1]
Assertion (A): There are two natural numbers whose HCF is 16 and LCM is 380.
Reason (R): The HCF of two natural numbers always divides their LCM.

C15. The HCF of two numbers is 23 and their LCM is 1449. If one of the numbers is 161, find the other. MUST DO [2]

C16. Find the HCF of 120 and 144 by prime factorisation. Hence find their LCM. [2]

C17. Two numbers are in the ratio 3 : 5 and their LCM is 240. Find their HCF. [2]

C18. Find the HCF and LCM of 72, 108 and 180 by prime factorisation. Is HCF × LCM equal to the product of the three numbers? Justify. MUST DO [3]

HCF and LCM word problems

★★☆ 2 of 4 papers · 1–3 marks

C19. Three school bells ring at intervals of 12, 18 and 30 minutes. If they ring together at 8:00 a.m., at what time will they next ring together? MUST DO [2]

C20. The traffic lights at three crossings change every 48 seconds, 72 seconds and 108 seconds. If they change together at 7:00:00 a.m., at what time will they next change together? [2]

C21. A school workshop has 45 Science, 75 Maths and 105 English teachers. Each room must seat the same number of teachers, all of one subject. Find the minimum number of rooms needed. [3]
MUST DO

C22. A sweet shop has 576 laddoos and 432 barfis. They are to be stacked so that each stack has the same number of sweets, all of one kind, and the stacks cover the least area of the tray. How many sweets go in each stack? How many stacks are there? [3]

C23. The floor of a hall is 15 m 17 cm long and 9 m 2 cm broad. It is to be paved with equal square tiles. Find the side of the largest square tile that can be used and the number of tiles needed. [3]

C24. Find the greatest length of a measuring rod that can measure 3 m 85 cm and 5 m 95 cm an exact number of times. [2]

C25. Find the greatest number which divides 245 and 1029, leaving a remainder 5 in each case. [2]
MUST DO

C26. The largest number which divides 318 and 739, leaving remainders 3 and 4 respectively, is: [1]

(a) 35 (b) 105 (c) 21 (d) 315

C27. Find the smallest number which, when increased by 13, is exactly divisible by both 280 and 504. [2]

Prime and composite numbers · factor trees

★★☆ 2 of 4 papers · 1–2 marks

C28. Which of the following statements is true? MUST DO [1]

(a) 2 is the smallest composite number (b) 1 is the smallest prime number
(c) 2 is the only even prime number (d) every odd number is prime

C29. The number $5 \times 7 \times 11 + 7$ is: [1]

(a) a prime number (b) a composite number
(c) neither prime nor composite (d) a perfect square

C30. Show that $2 \times 3 \times 5 \times 7 \times 11 + 7 \times 11$ is a composite number. MUST DO [2]

C31. ASSERTION–REASON [1]
Assertion (A): $7 \times 11 \times 13 + 13$ is a composite number.
Reason (R): A number that has a factor other than 1 and itself is composite.

C32. If a and b are coprime, then a^2 and b^2 are: [1]

(a) coprime (b) not coprime (c) always even (d) always odd

C33. In a factor tree, N splits as $2 \times a$, a splits as $3 \times b$, and b splits as 7×13. Find b, a and N, and write N as a product of primes. [2]

Last digit · numbers ending in 0

★☆☆ 1 of 4 papers · 1 mark

C34. For any natural number n, the last digit of $5^n + 6^n$ is: [1]

(a) 1 (b) 5 (c) 6 (d) 0

C35. Which of the following ends with the digit 0 for some natural number n? MUST DO [1]

(a) 4^n (b) 6^n (c) 15^n (d) 20^n

C36. For any natural number n, $6^n - 5^n$ always ends with the digit: [1]

(a) 3 (b) 1 (c) 5 (d) 7

C37. If $n = 2^3 \times 3^2 \times 5^2 \times 7$, the number of zeros at the end of n is: [1]

(a) 2 (b) 3 (c) 4 (d) 5

C38. Check whether 35^n can end with the digit 0 for any natural number n. Justify your answer. [2]

Rational or irrational? Number facts

★☆☆ 1 of 4 papers · 1 mark

C39. A rational number between $\sqrt{2}$ and $\sqrt{3}$ is: [1]

(a) 1.2 (b) 1.5 (c) 1.8 (d) $\sqrt{2.5}$

C40. If $p^2 = \dfrac{45}{80}$, then p is: [1]

(a) a natural number (b) an integer

(c) a rational number (d) an irrational number

C41. Which of the following is irrational? [1]

(a) $(2+\sqrt{3})(2-\sqrt{3})$ (b) $(\sqrt{5})^2$

(c) $\sqrt{2} \times \sqrt{18}$ (d) $(1+\sqrt{3})^2$

C42. ASSERTION–REASON [1]

Assertion (A): $5 + \sqrt{3}$ is an irrational number.

Reason (R): The sum of a rational number and an irrational number is irrational.

C43. If $(-1)^n + (-1)^{2n} = 0$, then: [1]

(a) n is any natural number (b) n is odd

(c) n is even (d) n is a multiple of 4

D

PART D · SECTION E STYLE

Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in Section E of the board paper. Read the situation carefully before answering.

D1. Case Study · Sports Meet [4]

At the school sports meet, Aarav, Bhavya and Charu start jogging round a circular track from the same point at 7:00 a.m., in the same direction. They take 6 minutes, 9 minutes and 15 minutes respectively for one round.

(i) After how many minutes will Aarav and Bhavya first meet again at the starting point? [1]

(ii) Find the HCF of 6, 9 and 15. [1]

(iii) At what time will all three be at the starting point together again? [2]

OR

(iii) How many rounds will Charu have completed when all three first meet again at the starting point? [2]

D2. Case Study · Donation Drive [4]

Class X collected 336 notebooks, 240 pencils and 96 geometry boxes for a village school. They want to pack identical kits, using every item, with as many kits as possible.

(i) What is the greatest number of identical kits they can make? [1]

(ii) How many notebooks will there be in each kit? [1]

(iii) Write 336 and 240 as products of primes and find their LCM. [2]

OR

(iii) If they had collected 252 pencils instead of 240, what would be the greatest number of identical kits? [2]

D3. Case Study · Number Card Game [4]

In a maths quiz, a team gets the six cards shown and must sort them into rational and irrational numbers.

A	B	C	D	E	F
$\sqrt{36}$	$\sqrt{2} \times \sqrt{50}$	$2 + \sqrt{3}$	$4\sqrt{7}$	$\sqrt{\frac{9}{16}}$	$\sqrt{12}$

(i) Which of the cards A to F show rational numbers? [1]

(ii) Is the sum of the numbers on cards C and F rational or irrational? Give a reason. [1]

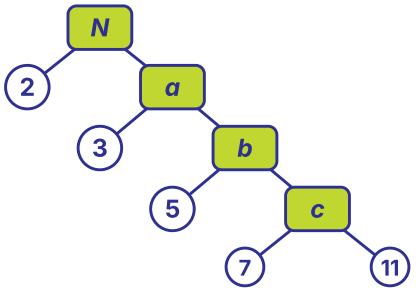
(iii) Given that $\sqrt{3}$ is irrational, prove that the number on card C is irrational. [2]

OR

(iii) Given that $\sqrt{7}$ is irrational, prove that the number on card D is irrational. [2]

D4. Case Study · Factor Tree [4]

Riya drew the factor tree below for a number N, but some values are missing. Each circle holds a prime number.



(i) Find the values of c and b. [1]

(ii) Find N and write it as a product of primes. [1]

(iii) Find the HCF and LCM of N and 840 by prime factorisation. [2]

OR

(iii) Find the smallest number divisible by each of 2, 3, 4, 5, 7 and 11. Is it equal to N? Give a reason. [2]

PART E · FOR 95+

E Challenge Questions

Harder than the usual board question. Try these after Parts A–D: they stretch the same methods to the toughest 3- and 5-mark questions.

E1. If p is a prime number, prove that $\sqrt{p}$ is irrational. [3]

E2. If p and q are two different primes, prove that $\sqrt{p}+\sqrt{q}$ is irrational. [3]

E3. Find the smallest number which, when divided by 28 and 32, leaves remainders 8 and 12 respectively. [3]

E4. Find the least number which leaves a remainder 5 when divided by 6, 15 and 18, and is exactly divisible by 7. [3]

E5. The HCF of two numbers is 6 and their product is 1080. Find their LCM, and all possible pairs of such numbers. [3]

E6. Find the greatest 4-digit number which is exactly divisible by 15, 24 and 36. [2]

E7. Find the smallest 5-digit number which is exactly divisible by 16, 24 and 40. [2]

F

PART F · REAL BOARD QUESTIONS

Board PYQ Index

Real questions from recent Maths Standard board papers and the 2026–27 Sample Paper, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★★	**Prove a number irrational**	2–3	**2026:** 30/1/1 Q26 · **2025:** 30/1/1 Q29 · **2024:** 30/1/1 Q25(A) · **SQP 2026–27:** Q26	A10–A13, B16–B17, C1–C6, D3, E1–E2
★★★	**Find HCF / LCM**	1	**2026:** 30/1/1 Q1 · **2025:** 30/1/1 Q6 · **2024:** 30/1/1 Q5	A5–A9, B1, B3–B4, B6–B8, B10, B12, B14, C7–C18, E5
★★☆	**HCF / LCM word problems**	1–3	**2024:** 30/1/1 Q27 · **SQP 2026–27:** Q1, Q21(A), Q21(B)	A9, B15, B18, C19–C27, D1–D2, E3–E4, E6–E7
★★☆	**Prime / composite**	1–2	**2026:** 30/1/1 Q2 · **2024:** 30/1/1 Q25(B)	A4, B2, C28–C33
★☆☆	**Last digit / ends in 0**	1	**2026:** 30/1/1 Q3	A3, B11, C34–C38
★☆☆	**Rational or irrational? Number facts**	1	**2025:** 30/1/1 Q9, Q14	B9, B13, C39–C43

PAPERS CHECKED

- **2026:** 30/1/1 (Delhi, Set 1)
- **2025:** 30/1/1 (Delhi, Set 1)
- **2024:** 30/1/1 (Delhi, Set 1)
- **CBSE Sample Paper 2026–27** (Mathematics Standard)

Sets of one code family (30/1/1, 30/1/2, 30/1/3) share most questions, so each counts as one paper. Download the official papers from cbse.gov.in → Previous Year Question Papers, and solve the exact questions listed above.

PART G · YOUR RECORD

G My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the next test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓