Class 10 Maths Chapter 1: Real Numbers - Notes, Important Questions and MCQs (2026-27)

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These Real Numbers Class 10 notes cover NCERT Class 10 Maths Chapter 1 completely: the Fundamental Theorem of Arithmetic, HCF and LCM by prime factorisation, the HCF × LCM relation, and proofs that √2, √3 and √5 are irrational. Every idea comes with solved examples, exam-style questions, 10 MCQs and a free PDF.

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Chapter Overview

Real numbers are all the rational and irrational numbers together. In this chapter you use one powerful idea – every composite number can be written as a product of primes in exactly one way – to find HCF and LCM, and to prove that numbers like √2 are irrational.

In the rationalised 2026-27 syllabus, the chapter has two parts: the Fundamental Theorem of Arithmetic (with its use in HCF/LCM problems) and revisiting irrational numbers (proof by contradiction). Euclid’s division lemma and decimal expansions are no longer part of the syllabus.

Important Topics and Concepts

Fundamental Theorem of Arithmetic

- Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order of the prime factors.
- Example: $3420 = 2^2 \times 3^2 \times 5 \times 19$.
- Use a factor tree or repeated division by primes to find the factorisation.
- Consequence: if a prime p divides a^2, then p divides a (where a is a positive integer).

HCF and LCM by Prime Factorisation

- HCF = product of the smallest power of each common prime factor.
- LCM = product of the greatest power of each prime factor involved.
- For any two positive integers a and b: HCF(a, b) × LCM(a, b) = a × b.
- This product rule does NOT hold for three numbers.
- Example: $6 = 2 \times 3$ and $20 = 2^2 \times 5 \rightarrow$ HCF = 2, LCM = $2^2 \times 3 \times 5 = 60$; check $2 \times 60 = 120 = 6 \times 20$.

Using the theorem to answer “can it end with 0?”

- A number ends with digit 0 only if it is divisible by 10, i.e. its prime factorisation contains both 2 and 5.
- $6^n = (2 \times 3)^n$ has no factor 5, so 6^n can never end with 0 for any natural number n.
- Similarly $4^n = 2^{2n}$ can never end with 0.

Irrational Numbers and Proof by Contradiction

- A number is irrational if it cannot be written as p/q, where p and q are integers and $q \neq 0$.
- To prove $\sqrt{2}$ is irrational: assume $\sqrt{2} = a/b$ with a, b coprime; then $2b^2 = a^2$, so 2 divides a; write $a = 2c$; then $b^2 = 2c^2$, so 2 divides b. So 2 divides both a and b – contradicting that they are coprime. Hence $\sqrt{2}$ is irrational.
- The same method proves $\sqrt{3}$ and $\sqrt{5}$ are irrational.
- Sum or difference of a rational and an irrational number is irrational (e.g. $5 - \sqrt{3}$).
- Product or quotient of a non-zero rational and an irrational number is irrational (e.g. $2\sqrt{3}$, $1/\sqrt{2}$).

Solved Examples

Typical board-exam questions with full working.

- Find HCF and LCM of 96 and 404. $96 = 2^5 \times 3$, $404 = 2^2 \times 101$. HCF = $2^2 = 4$. LCM = 96 × 404 / 4 = 9696.
- Find HCF and LCM of 6, 72 and 120. $6 = 2 \times 3$, $72 = 2^3 \times 3^2$, $120 = 2^3 \times 3 \times 5$. HCF = $2 \times 3 = 6$; LCM = $2^3 \times 3^2 \times 5 = 360$.
- Prove $5 - \sqrt{3}$ is irrational. Suppose $5 - \sqrt{3} = r$ (rational). Then $\sqrt{3} = 5 - r$, which is rational – a contradiction, since $\sqrt{3}$ is irrational. Hence $5 - \sqrt{3}$ is irrational.
- Two bells ring every 18 and 12 minutes. When do they ring together again? LCM(18, 12) = 36 minutes.

HCF vs LCM: When to Use Which

Word problems become easy once you know which one the question needs.

Use HCF when…	Use LCM when…
you divide things into the largest equal groups	you find when events happen together again
“greatest”, “maximum size”, “largest number”	“least”, “minimum time”, “smallest number”
e.g. largest tile that fits a floor exactly	e.g. two runners meeting at the start point

Key Formulas at a Glance

Result	Statement
Fundamental Theorem of Arithmetic	Composite number = unique product of primes
HCF	Product of smallest powers of common primes
LCM	Product of greatest powers of all primes
Two numbers	HCF × LCM = product of the numbers
Prime p | a^2	then p | a
Rational ± irrational	irrational

Important Formulas and Definitions

Formula / Term	Meaning / Use
Prime number	A natural number greater than 1 with exactly two factors, 1 and itself
Composite number	A natural number greater than 1 that is not prime
Coprime numbers	Numbers whose HCF is 1
HCF	Highest Common Factor – the greatest number dividing all given numbers
LCM	Lowest Common Multiple – the smallest number divisible by all given numbers
Rational number	Can be written as p/q, p and q integers, $q \neq 0$
Irrational number	Cannot be written as p/q; e.g. $\sqrt{2}$, π
Real numbers	All rational and irrational numbers together
Proof by contradiction	Assume the opposite, reach an impossible result, so the original statement is true

Short Answer Questions

Q1. Express 140 as a product of its prime factors.

$140 = 2 \times 70 = 2 \times 2 \times 35 = 2^2 \times 5 \times 7$.

Q2. Find the HCF and LCM of 26 and 91 and verify HCF × LCM = product.

$26 = 2 \times 13$, $91 = 7 \times 13$. HCF = 13, LCM = $2 \times 7 \times 13 = 182$. Check: $13 \times 182 = 2366 = 26 \times 91$.

Q3. Given HCF(306, 657) = 9, find LCM(306, 657).

Q4. Check whether 6^n can end with the digit 0 for any natural number n.

$6^n = 2^n \times 3^n$. To end with 0 it needs a factor 5, which it does not have. By the uniqueness of prime factorisation, 6^n can never end with 0.

Q5. Explain why $7 \times 11 \times 13 + 13$ is a composite number.

$7 \times 11 \times 13 + 13 = 13 \times (77 + 1) = 13 \times 78$. It has factors other than 1 and itself, so it is composite.

Q6. Show that $3\sqrt{2}$ is irrational.

Suppose $3\sqrt{2} = r$, a rational number. Then $\sqrt{2} = r/3$, which is rational. This contradicts that $\sqrt{2}$ is irrational. So $3\sqrt{2}$ is irrational.

Q7. Find the HCF and LCM of 12, 15 and 21.

$12 = 2^2 \times 3$, $15 = 3 \times 5$, $21 = 3 \times 7$. HCF = 3, LCM = $2^2 \times 3 \times 5 \times 7 = 420$.

Q8. Sonia takes 18 minutes and Ravi 12 minutes to complete one round of a field. If they start together, after how many minutes will they meet again at the start?

LCM(18, 12) = 36. They meet again after 36 minutes.

Long Answer Questions

Q1. Prove that $\sqrt{5}$ is irrational.

Assume $\sqrt{5}$ is rational, so $\sqrt{5} = a/b$ where a and b are coprime integers and $b \neq 0$.

Then $\sqrt{5}\, b = a$; squaring, $5b^2 = a^2$. So 5 divides a^2, hence 5 divides a.

Let $a = 5c$. Then $5b^2 = 25c^2$, so $b^2 = 5c^2$, which means 5 divides b^2 and so 5 divides b.

Thus 5 divides both a and b, contradicting that a and b are coprime.

Hence our assumption is wrong, and $\sqrt{5}$ is irrational.

Q2. Prove that $3 + 2\sqrt{5}$ is irrational.

Assume $3 + 2\sqrt{5}$ is rational. Then $3 + 2\sqrt{5} = a/b$, with a, b coprime integers, $b \neq 0$.

Rearranging: $\sqrt{5} = (a - 3b)/(2b)$.

Since a and b are integers, $(a - 3b)/(2b)$ is rational, so $\sqrt{5}$ would be rational.

This contradicts the fact that $\sqrt{5}$ is irrational.

Hence $3 + 2\sqrt{5}$ is irrational.

Q3. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round, while Ravi takes 12 minutes. They start at the same point at the same time in the same direction. After how many minutes will they meet again? Also find the HCF × LCM check.

They meet again when both have completed a whole number of rounds – this is the LCM of 18 and 12.

$18 = 2 \times 3^2$, $12 = 2^2 \times 3$.

LCM = $2^2 \times 3^2 = 36$; HCF = $2 \times 3 = 6$.

Check: HCF × LCM = $6 \times 36 = 216 = 18 \times 12$.

MCQs with Answers

1. The prime factorisation of 156 is(a) $2^2 \times 3 \times 13$ (b) $2 \times 3^2 \times 13$ (c) $2^3 \times 13$ (d) $2 \times 3 \times 13$Answer: (a) $2^2 \times 3 \times 13$ – $156 = 4 \times 39$

2. HCF of $2^3 \times 3^2$ and $2^2 \times 3^3$ is(a) 6 (b) 36 (c) 72 (d) 216Answer: (b) 36 – $2^2 \times 3^2 = 36$

3. If HCF(a, b) = 4 and $a \times b = 96$, then LCM(a, b) is(a) 24 (b) 92 (c) 100 (d) 384Answer: (a) 24 – 96 / 4

4. Which of these is irrational?(a) √16 (b) √(4/9) (c) √7 (d) 0.25Answer: (c) √7

5. 6^n can end with digit(a) 0 (b) 5 (c) 6 (d) 2 onlyAnswer: (c) 6 – $6 \times 6 = 36$, always ends in 6

6. LCM of the smallest prime and the smallest composite number is(a) 2 (b) 4 (c) 6 (d) 8Answer: (b) 4 – LCM(2, 4) = 4

7. If p is prime and p divides a^2, then(a) p divides a (b) a divides p (c) p = a (d) $p^2 = a$Answer: (a) p divides a

8. The product of a non-zero rational and an irrational number is(a) always rational (b) always irrational (c) zero (d) an integerAnswer: (b) always irrational

9. HCF of two coprime numbers is(a) 0 (b) 1 (c) their product (d) their sumAnswer: (b) 1

10. The number $3420 = 2^2 \times 3^2 \times 5 \times 19$. How many distinct prime factors does it have?(a) 3 (b) 4 (c) 5 (d) 6Answer: (b) 4 – 2, 3, 5, 19

Quick Revision Points

- Fundamental Theorem of Arithmetic: prime factorisation is unique.
- HCF = smallest powers of common primes; LCM = greatest powers of all primes.
- HCF × LCM = a × b (two numbers only).
- A number ends in 0 only if it has both 2 and 5 as prime factors.
- √2, √3, √5 are irrational – prove by contradiction using coprime a/b.
- Rational ± irrational = irrational; non-zero rational × irrational = irrational.

Chapter Summary

Real Numbers is built on the Fundamental Theorem of Arithmetic: every composite number is a product of primes in exactly one way. Prime factorisation gives a quick way to find HCF (smallest powers of common primes) and LCM (greatest powers of all primes), and for two numbers HCF × LCM equals their product.

The chapter also proves that √2, √3 and √5 are irrational by contradiction, and uses those results to show that expressions like $5 - \sqrt{3}$ or $3\sqrt{2}$ are irrational.

Exam Tips and PYQ Pattern

- A 2-mark question on HCF/LCM by prime factorisation is almost certain – always show the factor tree.

- The 3-mark proof “prove √p is irrational” comes nearly every year; learn the five-line template.
- Write “a and b are coprime” clearly – examiners look for it.
- For word problems, decide HCF or LCM first (see the table above).
- Do not use HCF × LCM = product for three numbers.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 10 Mathematics textbook and the rationalised CBSE syllabus for 2026-27.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What is the Fundamental Theorem of Arithmetic?

Every composite number can be written as a product of primes, and this factorisation is unique apart from the order of the factors.

Is Euclid’s division lemma in the 2026-27 syllabus?

No. It was removed in the rationalised syllabus; HCF and LCM are now found by prime factorisation.

Conclusion

Master prime factorisation and the irrationality proof template, and Real Numbers becomes one of the easiest scoring chapters in Class 10 Maths. Practise the solved examples and MCQs here, then save the free PDF for quick revision.

More Notes: Class 10 Maths Chapter 2: Polynomials notes | All Class 10 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 10 Maths textbook, Mathematics (Reprint 2026-27), and the CBSE syllabus for the 2026-27 session. Last checked on 16 November 2026.