UDAAN

2026

Quadratic Equations

MATHS LECTURE-2

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Topics to be covered

#Gpk

A Solving quadratic equation by factorization method

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#Q. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also, find the other root.

A. 1, –3/2

B. –1, 3/2

C. –1, –3/2

D. 1, 3/2

$2x^2+kx-6=0$

$2(2)^2+k(2)-6=0$

$8+2k-6=0$

$2+2k=0$

$2k=-2$

$k=-1$

$2x^2-x-6=0$

$\alpha+\beta=-b/a$

$2+\beta=-\frac{-1}{2}$

$\beta=\frac{1}{2}-2$

$\beta=-3/2$

Solution of a Quadratic Equation by Factorization Method

$ax^2+bx+c=0$

① $x^2-9=0$

$x^2=9$

$x=\pm\sqrt{9}$

$x=3,-3$

② $x^2=8$

$x=\pm\sqrt{8}$

$x=2\sqrt{2},-2\sqrt{2}$

③ $x^2-3x=0$ → (Common)

$(x)(x-3)=0$

$x=0$

$x-3=0$

$x=0,3$

$x^2=3x$

$x=\pm\sqrt{3x}$

$x^2=3x$

$x\times x=3x$

$x=\frac{3x}{x}$

$x=3$

Q $x^2 - \frac{3}{2}x = 0$

$x\left(x - \frac{3}{2}\right) = 0$

$x = 0$

$x = 3/2$

#Q. Solve the following quadratic equations by factorization:

(i) $x^2 + 6x + 5 = 0$

Sum = 6, product = 5

5, 1

$x^2 + 5x + 1x + 5 = 0$

$x(x+5) + 1(x+5) = 0$

$(x+5)(x+1) = 0$

$x+5 = 0, \quad x+1 = 0$

$x = -5, \quad x = -1$

(ii) $8x^2 - 22x - 21 = 0$

Sum = −22, product = −168

−28, 6

$8x^2 - 28x + 6x - 21 = 0$

$4x(2x-7) + 3(2x-7) = 0$

$(2x-7)(4x+3) = 0$

$x = \frac{7}{2}, \quad -3/4$

2	168
2	84
2	42
3	21
7	7
	1

#Q. Find the roots of quadratic equation $2x^2 + x - 300 = 0$.

$2x^2 + x - 300 = 0$

Sum = 1, product = -600

25, 24

2 | 600
2 | 300
2 | 150
5 | 75
5 | 15
3 | 3
1

25, 24

$2x^2 + 25x - 24x - 300 = 0$

$x(2x + 25) - 12[2x + 25] = 0$

$(2x + 25)(x - 12) = 0$

$x = -25/2, \ x = 12$

A $30, \frac{2}{15}$

B $60, -\frac{2}{5}$

C $12, -\frac{25}{2}$

D None of these

general form.

#Q. If $(x + 4)(x - 4) = 9$, then the values of x are:

$x^2 - 4^2 = 9$

$x^2 - 16 = 9$

$x^2 = 25$

$x = \pm\sqrt{25}$

$x = 5, -5$

A ± 5

B $\pm\frac{1}{5}$

C $-\frac{1}{3}, \frac{1}{5}$

D ± 4

#Q. If α and β are roots of the equation $x^2 - 7x + 10 = 0$, find the quadratic equation whose roots are α^2 and β^2.

#Gpu

(open polynomials)

A $x^2 + 29x - 100 = 0$

B $x^2 - 29x + 100 = 0$

C **$x^2 - 56x - 100 = 0$**

D **$x^2 + 56x + 100 = 0$**

#Q. Solve the following quadratic equations by factorization:

(ii) $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

$S = 10, \quad P = 7\sqrt{3} \times \sqrt{3} = 21$

7, 3

$\sqrt{3} \times \sqrt{3}$

$\sqrt{3}$ | $\sqrt{3}$

$\sqrt{3}x^2 + 7x + 3x + 7\sqrt{3} = 0$

$x(\sqrt{3}x + 7) + \sqrt{3}\left[\frac{3x}{\sqrt{3}} + \frac{7\sqrt{3}}{\sqrt{3}}\right] = 0$

$x(\sqrt{3}x + 7) + \sqrt{3}\left[\sqrt{3}x + 7\right] = 0$

$(\sqrt{3}x + 7)(x + \sqrt{3}) = 0$

$\sqrt{3}x + 7 = 0, \quad x + \sqrt{3} = 0$

$x = -7/\sqrt{3}, \quad x = -\sqrt{3}$

→ $\sqrt{3}x + 7$

$2\left(\frac{\sqrt{3}x}{2} + \frac{7}{2}\right)$

→ $\sqrt{3}x + 7$

→ $\sqrt{3}\left[\frac{\sqrt{3}x}{\sqrt{3}} + \frac{7}{\sqrt{3}}\right]$

$\sqrt{3}\left[x + \frac{7}{\sqrt{3}}\right]$

#Q. Solve the following quadratic equations by factorization:

(i) $x^2 + 2\sqrt{2}x - 6 = 0$

$S = 2\sqrt{2}$, $P = -6$

$3\sqrt{2}, -\sqrt{2}$

$x^2 + 3\sqrt{2}x - \sqrt{2}x - 6 = 0$

$x(x + 3\sqrt{2}) - \sqrt{2}(x + 3\sqrt{2}) = 0$

$(x + 3\sqrt{2})(x - \sqrt{2}) = 0$

$x + 3\sqrt{2} = 0$

$x = -3\sqrt{2}$

$x - \sqrt{2} = 0$

$x = \sqrt{2}$

$-\sqrt{2}x - 6$

$-\sqrt{2}\left[\frac{-\sqrt{2}x}{-\sqrt{2}} + \frac{6}{-\sqrt{2}}\right]$

$-\sqrt{2}\left[x + \frac{6}{\sqrt{2}}\right]$

#Q. Find the roots of the quadratic equation $\sqrt{3}x^2 - 2x - \sqrt{3} = 0$.

#Gpu

#Q. $3\sqrt{5}x^2 + 25x - 10\sqrt{5} = 0$

Sum = 25 Product = $-10\sqrt{5} \times 3\sqrt{5}$

$= -30 \times 5$

$= -150$

15 × 10

30 | -5

#GPK

A $-2\sqrt{5}, \frac{\sqrt{5}}{3}$

B $2\sqrt{5}, +\frac{\sqrt{5}}{3}$

C $-5\sqrt{2}, \frac{3}{\sqrt{5}}$

D $5\sqrt{2}, \frac{3}{\sqrt{5}}$

#Q. $3x^2 - 2\sqrt{6}x + 2 = 0$

Sum = $-2\sqrt{6}$, product = 6

Sum main $\sqrt{}$ = root aajaye.

#Gpu

$-\sqrt{6}, \sqrt{6}$

A $1, \sqrt{\frac{2}{3}}$

B $\sqrt{\frac{3}{2}}, \sqrt{\frac{2}{3}}$

C $\sqrt{\frac{3}{2}}, \sqrt{\frac{3}{2}}$

D $\sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}$

#Q. Find the roots of the quadratic equation $x^2 - 3\sqrt{5}x + 10 = 0$.

A $-2\sqrt{5}, \sqrt{5}$

B $2\sqrt{5}, \sqrt{5}$

C $-2\sqrt{5}, -\sqrt{5}$

D $2\sqrt{5}, -\sqrt{5}$

$P = 10, \quad S = -3\sqrt{5}$

$-2\sqrt{5}, -\sqrt{5}$

$x^2 - 2\sqrt{5}x - \sqrt{5}x + 10 = 0$

$x(x - 2\sqrt{5}) - \sqrt{5}(x - 2\sqrt{5}) = 0$

$(x - 2\sqrt{5})(x - \sqrt{5}) = 0$

$x = 2\sqrt{5}, \quad x = \sqrt{5}$

#Q. Solve the following quadratic equation by factorization method:

(i) $\frac{x}{x+1}+\frac{x+1}{x}=\frac{34}{15}, x \neq 0, x \neq -1$

$$\frac{x^2+(x+1)^2}{(x+1)(x)}=\frac{34}{15}$$

$$\frac{x^2+x^2+1+2x}{x^2+x}=\frac{34}{15}$$

$$\frac{2x^2+2x+1}{x^2+x}=\frac{34}{15}$$

$$15(2x^2+2x+1)=34(x^2+x)$$

$$30x^2+30x+15=34x^2+34x$$

$$-4x^2-4x+15=0$$

$S=-4, \quad P=-60$

$-10, 6$

$$-4x^2-10x+6x+15=0$$

$$-2x(2x+5)+3(2x+5)=0$$

$$(2x+5)(-2x+3)=0$$

$x=-5/2, \quad x=-3/-2=3/2$

last question

#Q. Solve the following quadratic equation by factorization method:

(ii) $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

$$\frac{1(x-1)+2(x-2)}{(x-2)(x-1)}=\frac{6}{x}$$

$$\frac{x-1+2x-4}{x^2-x-2x+2}=\frac{6}{x}$$

$$\frac{3x-5}{x^2-3x+2}=\frac{6}{x}$$

$$x(3x-5)=6(x^2-3x+2)$$

$$3x^2-5x=6x^2-18x+12$$

$$0=3x^2-13x+12$$

$S=-13, P=36$

$-9, -4$

$$3x^2-13x+12=0$$

$$3x^2-9x-4x+12=0$$

$$3x(x-3)-4(x-3)=0$$

$$(3x-4)(x-3)=0$$

$x=4/3, 3$

#Q. Solve the quadratic equation $(x-1)^2 - 5(x-1) - 6 = 0$ #Gapu

#Q. Solve the following quadratic equations by factorization method:

#Help

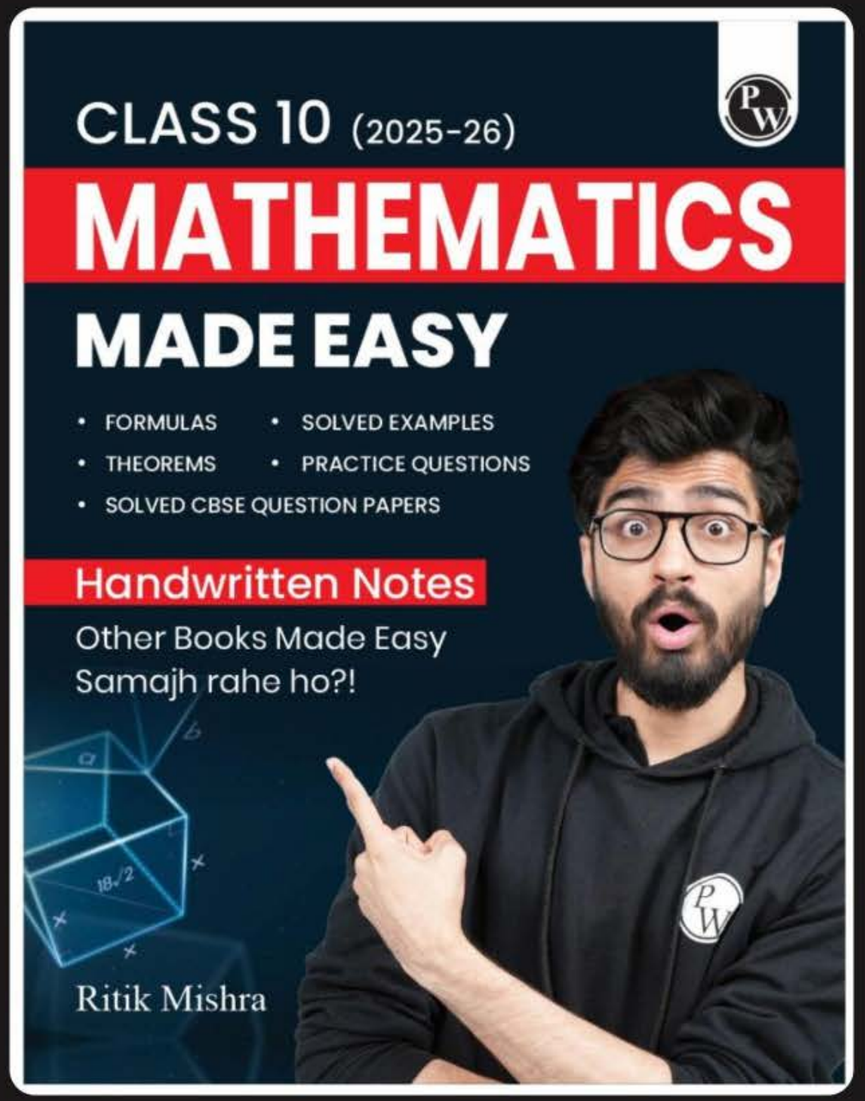
$$\frac{2x}{x-3}+\frac{1}{2x+3}+\frac{3x+9}{(x-3)(2x+3)}=0, x \neq 3; -\frac{3}{2}$$

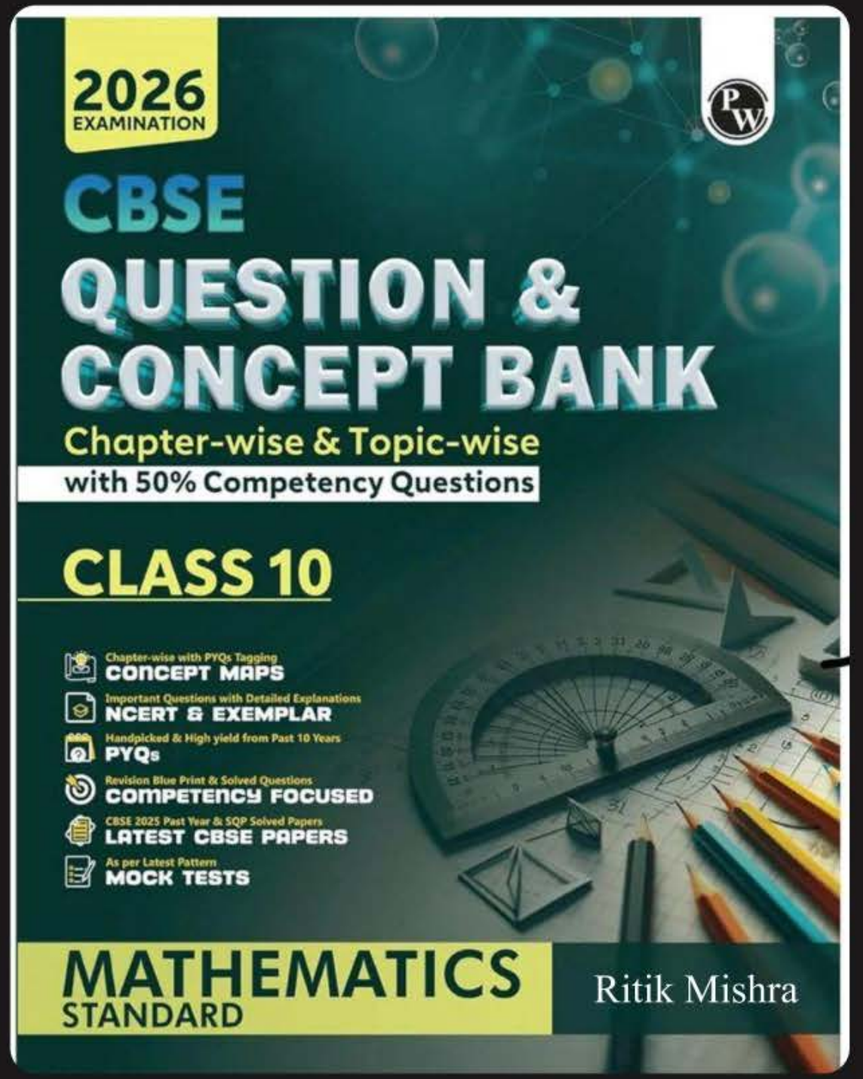
A –1

B 0

C 1

D 2





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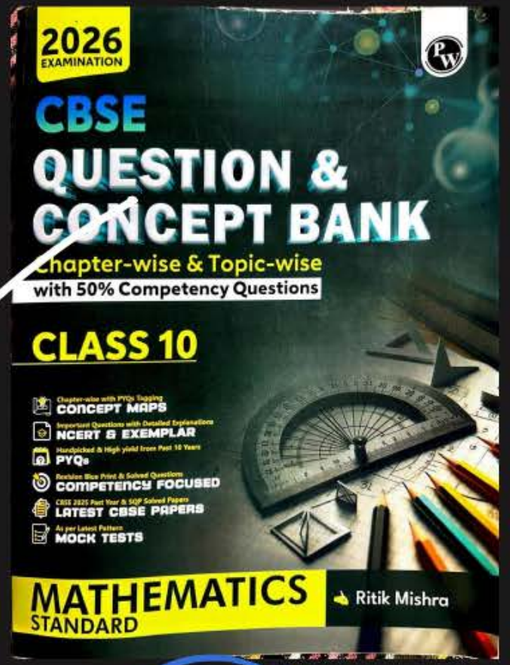


SYLLABUS ISSUED BY CBSE

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
II	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILITY	11
	Total	80

UNIT I: NUMBER SYSTEMS

1. REAL NUMBERS

Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}, \sqrt{3}$ and $\sqrt{5}$

UNIT II: ALGEBRA

1. POLYNOMIALS

Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials.

2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Pair of linear equations in two variables and graphical method of their solution, consistency/inconsistency.

Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution, by elimination. Simple situational problems.

3. QUADRATIC EQUATIONS

Standard form of a quadratic equation $ax^2 + bx + c = 0$, $(a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS

Motivation for studying Arithmetic Progression Derivation of the n^{th} term and sum of the first n terms of A.P. and their application in solving daily life problems.

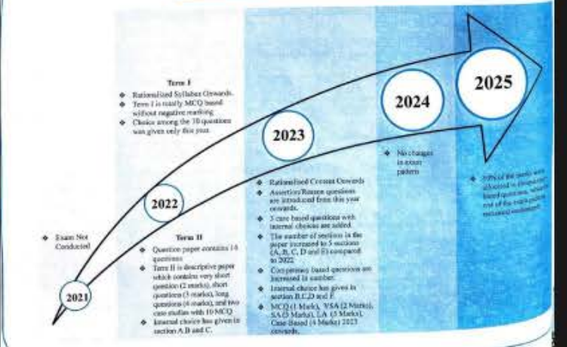
Chapter-wise Weightage and Trend Analysis of CBSE Past 6 Years' Papers

CHAPTERS	MATHEMATICS									
	2020		2021		2023		2024		2025	
	DL	ODL	DL	ODL	DL	ODL	DL	ODL	DL	ODL
Real Numbers	5	6	–	–	6	6	6	8	6	6
Polynomials	8	3	–	–	4	3	3	5	4	2
Pair of Linear Equations in Two Variables	4	8	–	–	5	4	6	6	6	6
Quadratic Equations	3	7	6	5	6	5	5	4	6	7
Arithmetic Progressions	8	5	4	5	5	6	6	5	4	5
Triangles	7	7	–	–	7	7	7	8	9	8
Coordinate Geometry	6	6	–	–	6	8	6	6	6	6
Introduction to Trigonometry	5	7	–	–	6	6	7	7	7	7
Some Applications of Trigonometry	7	5	7	7	6	6	5	5	5	5
Circles	4	4	6	6	8	8	8	7	6	7
Constructions (*Rationalised*)	4	4	3	3	–	–	–	–	–	–
Areas Related to Circles	2	5	–	–	5	4	5	–	4	4
Surface Areas and Volumes	8	9	6	6	5	6	5	10	6	6
Statistics	7	7	8	8	6	5	6	5	7	5
	4	4	–	–	5	6	5	6	4	6

Question Typology

YEAR	Objective Questions		Subjective Questions			
	MCQs	A/R	VSA	SA	LA	Case-Based type
2025	18	2	5	6	4	3
2024	18	2	5	6	4	3
2023	18	2	5	6	4	3
2022 (Term-II)			6	3	2	2
2022 (Term-I)	40					2
2021	Exam Not Conducted					

Evolving Trends in CBSE Exam Patterns



CBSE SOLVED PAPER 2025

Time allowed : 3 hours Maximum Mar

GENERAL INSTRUCTIONS:

Read the following instructions very carefully and strictly follow them:

(*i*) This question paper contains **38** questions. **All** questions are **compulsory**.

(*ii*) This question paper is divided into **five** Sections - **A, B, C, D** and **E**.

(*iii*) In **Section A**, Question numbers **1** to **18** are Multiple Choice Questions (MCQs) and question numbers **19** and **20** are A Reason based questions of **1** mark each.

(*iv*) In **Section B**, Question numbers **21** to **25** are Very Short Answer (VSA) type questions, carrying **2** marks each.

(*v*) In **Section C**, Question numbers **26** to **31** are Short Answer (SA) type questions, carrying **3** marks each.

(*vi*) In **Section D**, Question numbers **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.

(*vii*) In **Section E**, Question numbers **36** to **38** are **Case Study based** Questions carrying **4** marks each. Internal choice is pr **2** marks questions in each case study.

(*viii*) There is no overall choice. However, an internal choice has been provided in **2** questions in Section **B**, **2** questions in Se questions in Section **D** and **3** questions in Section **E**.

(*ix*) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

(*x*) Use of calculators is **NOT allowed**.

SECTION - A

This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.

1. ...r of a wh... The distance travelled by the wheel in 100 revolutions is: (Ap...
... m (c) 63 m (d) 136 m

g minor
f Marks)

30. (*a*) Prove that: $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2\operatorname{cosec} A$

Ans.

(a) $L.H.S = \sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}}$

$= \sqrt{\frac{\frac{1}{\cos A} - 1}{\frac{1}{\cos A} + 1}} + \sqrt{\frac{\frac{1}{\cos A} + 1}{\frac{1}{\cos A} - 1}}$

$= \sqrt{\frac{1 - \cos A}{1 + \cos A}} + \sqrt{\frac{1 + \cos A}{1 - \cos A}}$

$= \sqrt{\frac{(1 - \cos A)^2}{1 - \cos^2 A}} + \sqrt{\frac{(1 + \cos A)^2}{1 - \cos^2 A}}$

$= \frac{1 - \cos A}{\sin A} + \frac{1 + \cos A}{\sin A}$

$= \frac{1 - \cos A + 1 + \cos A}{\sin A} = \frac{2}{\sin A} = 2 \operatorname{cosec} A.$

(3 Marks)

OR

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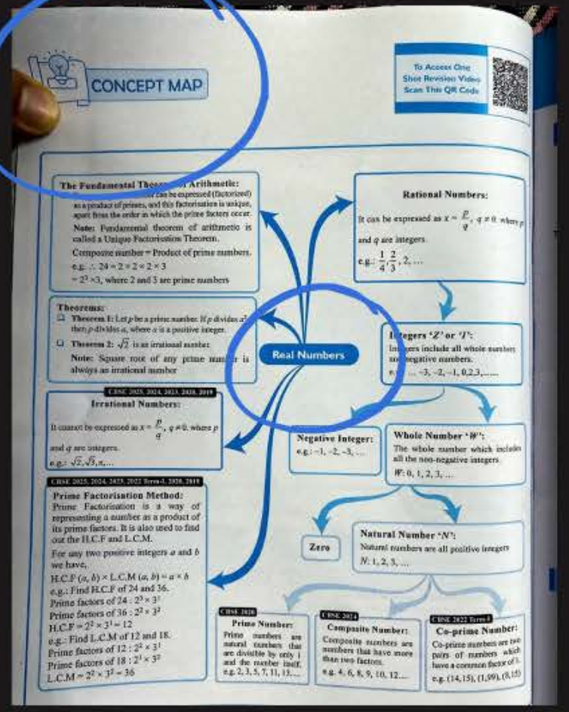

CONCEPT MAP

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The Fundamental Theorem of Arithmetic: ... can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

Note: Fundamental theorem of arithmetic is called a Unique Factorisation Theorem.

Composite number = Product of prime numbers.

e.g. ∴ $24 = 2 \times 2 \times 2 \times 3$

$= 2^3 \times 3$, where 2 and 3 are prime numbers

Theorems:

- **Theorem 1:** Let p be a prime number. If p divides a^2 then p divides a, where a is a positive integer.
- **Theorem 2:** $\sqrt{2}$ is an irrational number.

Note: Square root of any prime number is always an irrational number

Rational Numbers:

It can be expressed as $x = \frac{p}{q}$, $q \neq 0$, where p and q are integers.

e.g.: $\frac{1}{4}, \frac{2}{3}, 2, \ldots$

Real Numbers

Integers 'Z' or 'I':

Integers include all whole numbers and negative numbers.

e.g.: ..., −3, −2, −1, 0, 2, 3, ...

CBSE 2025, 2024, 2023, 2020, 2019

Irrational Numbers:

It cannot be expressed as $x = \frac{p}{q}$, $q \neq 0$, where p and q are integers.

e.g.: $\sqrt{2}, \sqrt{3}, \pi, \ldots$

Negative Integer:

e.g.: −1, −2, −3, ...

Whole Number 'W':

The whole number which includes all the non-negative integers.

W: 0, 1, 2, 3, ...

CBSE 2025, 2024, 2023, 2021 Term-I, 2020, 2019

Prime Factorisation Method:

Prime Factorisation is a way of representing a number as a product of its prime factors. It is also used to find out the H.C.F and L.C.M.

For any two positive integers a and b we have,

$H.C.F(a, b) \times L.C.M(a, b) = a \times b$

e.g.: Find H.C.F of 24 and 36.

Prime factors of $24 : 2^3 \times 3^1$

Prime factors of $36 : 2^2 \times 3^2$

$H.C.F = 2^2 \times 3^1 = 12$

e.g.: Find L.C.M of 12 and 18.

Prime factors of $12 : 2^2 \times 3^1$

Prime factors of $18 : 2^1 \times 3^2$

$L.C.M = 2^2 \times 3^2 = 36$

Zero

Natural Number 'N':

Natural numbers are all positive integers

N: 1, 2, 3, ...

CBSE 2020

Prime Number:

Prime numbers are natural numbers that are divisible by only 1 and the number itself.

e.g. 2, 3, 5, 7, 11, 13,...

CBSE 2021

Composite Number:

Composite numbers are numbers that have more than two factors.

e.g. 4, 6, 8, 9, 10, 12,...

CBSE 2022 Term-I

Co-prime Number:

Co-prime numbers are two pairs of numbers which have a common factor of 1.

e.g. (14, 15), (1, 99), (8, 15)

Short Answer Type Questions (2 or 3 M)

1. National Art convention got registrations from students from all parts of the country, of which 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same artform and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room? *(Cr)* **(CBSE SQP, 2023)**

Sol. Number of students in each group subject to the given condition = H.C.F (60, 84, 108) *(½ M)*

H.C.F (60, 84, 108) = 12 *(½ M)*

Number of groups in Music = $\frac{60}{12} = 5$ *(½ M)*

Number of groups in Dance = $\frac{84}{12} = 7$ *(½ M)*

COMPETENCY BASED SOLVED EXAMPLES

Multiple Choice Questions

1. The ratio of H.C.F to L.C.M of the least composite number and the least prime number is: *(Un)* **(CBSE DL, 2023)**

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

Sol. Least composite number = 4 = 2 × 2, least prime number = 2

H.C.F (4, 2) = 2

L.C.M. (4, 2) = 2 × 2 = 4

H.C.F (4, 2) : L.C.M (4, 2) = 2 : 4 = 1 : 2

Key Takeaways

Least composite number = 4 and the least prime number = 2

2. The least number that is divisible by all the natural numbers from 1 to 10 (both inclusive) is *(An)* **(NCERT Exemplar)**

(a) 10 (b) 100 (c) 504 (d) 2520

4. If the HCF (2520, 6600) = 40 and LCM (2520, 6600) = 252 × k, then the value of k is *(Un)* **(CBSE ODL, 2020)**

(a) 1650 (b) 1600 (c) 165 (d) 1625

Sol. We know that

LCM × HCF = product of the given numbers

$\Rightarrow 40 \times 252 \times k = 2520 \times 6600$

$\Rightarrow k = \frac{2520 \times 6600}{252 \times 40} = \frac{10 \times 660}{4}$

$\Rightarrow k = 10 \times 165 = 1650$

5. The L.C.M of smallest 2-digit number and smallest composite number is: *(Un)* **(CBSE ODL, 2020)**

(a) 12 (b) 4 (c) 20 (d) 40

Sol. The smallest 2-digit number = 10 and the smallest composite number = 4

∴ Prime factorisation of 10 = 2 × 5

Prime factorisation of $4 = 2 \times 2 = 2^2$

To find the L.C.M, we find the product of all the prime factors of 10 and 4 with their greatest exponent.

∴ L.C.M of 4, 10 is $2^2 \times 5$

was wrong, Hence $\sqrt{5}$ is an irrational number. *(1 M)*

Topper's Explanation (CBSE 2024)

Let us assume to the contrary that $\sqrt{5}$ is rational. Then it can be expressed in the form (a/b) where 'a' and 'b' are integers and co-primes. Also, $b \neq 0$.

So, $\sqrt{5} = \frac{a}{b}$

$\Rightarrow b\sqrt{5} = a$

On squaring both sides we get $(b\sqrt{5})^2 = (a)^2$

$\Rightarrow 5b^2 = a^2$

Since 5 divides a^2, then 5 divides a. (Since if 'p' a prime no. divides a^2, it surely divides a).

Now let $a = 5c$ (for any positive integer c).

Substituting, $5b^2 = a^2$

$\Rightarrow 5b^2 = (5c)^2$

$\Rightarrow 5b^2 = 25c^2$

$\Rightarrow b^2 = 5c^2$

Here since 5 divides b^2, we know that 5 divides b.

However this means that 'a' and 'b' have a common factor 5, apart from 1. This contradicts the fact that they are co-prime. This contradiction arose due to incorrect assumption e, that $\sqrt{5}$ a rational.

Hence, we conclude that $\sqrt{5}$ is irrational.

1562[illegible] leaving remainders 1, 2 and 3 respectively.

Mistakes 101 : What not to do!

Students often make mistakes in remainder value problems. To avoid errors, find differences between numbers and remainders, then apply the H.C.F concept.

11. If a and b are two co-prime numbers then a^3 and b^3 are

MISCELLANEOUS EXERCISE

Multiple Choice Questions (1 M)

1. $\sqrt{n}$ is a natural number such that $n > 1$.

Which of these can DEFINITELY be expressed as a product of primes? **(CBSE CFPQ, 2023)**

(i) $\sqrt{n}$ (ii) n (iii) $\frac{\sqrt{n}}{2}$

(a) only (ii)

(b) only (i) and (ii)

(c) all (i), (ii) and (iii)

(d) cannot be determined without knowing n

2. Emily is preparing for a mathematics competition and is given the following information about composite numbers. She needs to analyse these statements to determine their correctness.

Statement I: If n is a composite number, then $\sqrt{n}$ is always rational.

Statement II: A composite number can always be expressed as the product of two or more prime numbers.

Statement III: The square root of a composite number is not necessarily an integer.

Which of the following statements is true? (Select all that apply.)

(a) Only statement I is true.

(b) Only statements I and II are true.

(c) Only statements II and III are true.

(d) All three statements are true.

3. In a formula racing competition, the time taken by two

5. Find the largest number which will divide 398, 436 and 542 and leave 7, 11 and 15 as remainders, respectively.

(a) 17 (b) 16 (c) 20 (d) 19

6. Let p and q be two natural numbers such that $p > q$. When p is divided by q, the remainder is r. **(CBSE CFPQ, 2023)**

(i) r CANNOT be $(p - q)$.

(ii) r CAN either be q or $(p - q)$.

(iii) r is DEFINITELY less than q.

Which of the above statements is/are true?

(a) only (ii)

(b) only (iii)

(c) only (i) and (iii)

(d) cannot be determined without knowing the values of p, q and r

7. Two runners P and Q stop after 3 hrs and 5 hrs respectively while running. After ab hours (where ab is a two digit number) both of them will pause together for the first time, if they started running at the same time. Find the value of $a + b$.

(a) 5 (b) 6 (c) 8 (d) 7

8. The sum of exponents of prime factors in the prime-factorisation of 196 is: **(CBSE ODL, 2020)**

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

Assertion and Reason (1 M)

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

(a) Both Assertion (A) and Reason (R) are true, and Reason (R)

(CBSE SQP, 2024)

Subjective Questions

Very Short Answer Type Questions (1 or 2 M)

1. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers. (CBSE ODL, 2024)
2. During a chemical experiment, two solutions need to be added together in such a way that the total volume of the mixture is a rational number. If one solution has a volume of $\sqrt{3}$ liters and the other has a volume of $\sqrt{12}$ liters, prove that the mixture cannot have a rational volume.
3. A forester wants to plant 66 apple trees, 88 banana trees and 110 mango trees in equal rows (in terms of number of trees). Also, he wants to make distinct roots of the trees (only one

Long Answer Type Questions (4 or 5 M)

1. Show that $\frac{3+\sqrt{7}}{5}$ is an irrational number, given that $\sqrt{7}$ is irrational. (CBSE DL, 2019)
2. Rahul and Priya are working on a math project about prime factorization. They decide to create a game where they choose a number and then find its prime factors. Rahul chooses the number 2520, and Priya chooses 3960. They want to find out which number has more prime factors and calculate the HCF and LCM of these two numbers.
   (*i*) Help Rahul and Priya find the prime factorization of their chosen numbers.
   (*ii*) Determine which number has more prime factors.
   (*iii*) Calculate the HCF and LCM of 2520 and 3960 using their prime factorization.
   (*iv*) If they were to find a number between 2520 and 3960 that has exactly 20 factors, how would they approach this problem?
3. You are designing a sculpture with a critical measurement of $3+2\sqrt{5}$ meters. A colleague argues that this measurement can be simplified to a rational number. To ensure the accuracy of your design, prove that $3+2\sqrt{5}$ is irrational.

Case Based Questions

Case Based-I: A seminar is being conducted by an Educational Organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and

(*v*) 108 can be expressed as a pr
(*a*) $2^3 \times 3^2$ (*b*) $2^3 \times 3^3$

Case Based-II: The principal of a personal hygiene to students from charge is asked to arrange all stud 84 students in 8th grade, 63 in 9th

Based on the given information, ar
(*i*) What is the minimum numb from the same grade must s
(*ii*) If 4 students from 8th grade 10th grade are absent due t number of rows required t keeping students from the s
(*iii*) The principal decides to inc well. What is the minimum all students if those from th

OR

If the hall has 20 seats per maintain one empty seat be students including 7th gra

MOCK TEST PAPER-2

wed : 3 hours — Maximum Marks : 80

INSTRUCTIONS:

llowing instructions carefully and follow them:

uestion paper contains 38 questions. All questions are compulsory.

on paper is divided into FIVE sections – Section A, B, C, D and E.

tion A – question number 1 to 18 are multiple choice questions (MCQs) and question number 19 and 20 are Assertion-n based questions of 1 mark each.

tion B – question number 21 to 25 are Very Short Answer (VSA) type questions of 2 Marks each.

tion C – question number 26 to 31 are Short Answer (SA) type questions carrying 3 marks each.

tion D – question number 32 to 35 are Long Answer (LA) type questions carrying 5 marks each.

tion E – question number 36 to 38 are case based integrated units of assessment questions carrying 4 marks each. Internal is provided in 2 marks question in each case-study.

e no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Se tions in Section D and 3 questions in Section E.

eat figures wherever required. Take π = 22/7 wherever required if not stated.

calculators is NOT allowed.

Subjective Questions

Very Short Answer Type Questions (1 or 2 M)

1. **If H.C.F (336, 54) = 6, find L.C.M (336, 54).**
   (*Ap*) (CBSE ODL, 2019)

Sol. Given, H.C.F (336, 54) = 6

we know,

L.C.M × H.C.F = Ist number × IInd number (½ *M*)

$L.C.M \times 6 = 336 \times 54$

$\Rightarrow L.C.M = \frac{336 \times 54}{6} = 336 \times 9$

$\Rightarrow L.C.M = 3024$ (½ *M*)

Short Answer Type Questions (2 or 3 M)

1. Grow More Plantations have two rectangular fields of the same width but different [2] lengths. They are required to plant 84 trees in the smaller field and 231 trees in the larger field. In both fields, the trees will be planted in the same number of rows but in different numbers of columns.
   (*i*) What is the most number of rows that can be planted in this arrangement? Show your work.
   (*ii*) If the trees are planted in the number of rows obtained in part (*i*), how many columns will each field have?
   (CBSE CFPQ, 2023)
2. Prove that $\sqrt{2}$ is an irrational number.
   (CBSE DL, 2019 | CBSE SQP, 2023)

HINTS & EXPLANATIONS

Multiple Choice Questions

1. (*b*) (i) $\sqrt{n}$: If n is not a perfect square, then $\sqrt{n}$ will be an irrational number, and it cannot be expressed as a product of primes. If n is a perfect square, then $\sqrt{n}$ can be expressed as a product of primes.
   (ii) n : n can definitely be expressed as a product of primes using its prime factorization.
   (iii) $\frac{\sqrt{n}}{2}$: Similar to (i), if n is not a perfect square, $\sqrt{n}$ is irrational, and dividing it by 2 doesn't change its irrational nature. If n is a perfect square, then $\sqrt{n}$ can be expressed as a product of primes, and dividing by 2 is straightforward.
   Considering the possibilities for *n*, the only option that is always true is (*b*) only (i) and (ii). So, the correct answer is (*b*).
2. (*c*) **Statement I:** False. The square root of every composite number is not always rational. For example, $n = 45$ is a composite number, but $\sqrt{45} = 3\sqrt{5}$, which is irrational.

5. (*a*) We have to find the largest number that will divide 398, 436 and 5[illegible] leaving the remainder 7, 11 and 15 respectively. Hence, we need to find the H.C.F of three numbers (398 – 7), (436 – 11) and (542 – 15).
   Hence, 398 – 7 = 391
   436 – 11 = 425
   542 – 15 = 527
   Now, the H.C.F (391, 425, 527) = 17
   ∴ The largest number is 17
6. (*b*) (i) *r* CANNOT be $(p-q)$:
   - This statement is incorrect. In fact, *r* can indeed be equal to $(p-q)$. The remainder *r* is the value left over after dividing *p* by *q*, and $(p-q)$ is a valid value for *r*.

   (ii) *r* CAN either be *q* or $(p-q)$:
   - This statement is false. The remainder *r* is always less than the divisor *q*, so it cannot be equal to *q*. It can take values from 0 to $(q-1)$, but *q* itself is not a possible value. Therefore, statement (ii) is not correct.

   (iii) *r* is DEFINITELY less than *q*:
   - This statement is true. By definition, the remainder *r* is always less than the divisor *q* in the division $p = qn + r$.


WORK HARD
DREAM BIG
NEVER GIVE UP

Thank You