Equation, satisfies, natural numbers, whole numbers, integers, positive, negative, collection, rational numbers, operations, closure, property, subtraction, multiplication, division, product, solution, commutative, commutativity, associative, associativity, identity, additive identity, multiplicative identity, reciprocal, distributivity, distributive property, defined, undefined, remarks, expression, compute, add, subtract, multiply,

verify, calculate, revisit, observe, explore, concept, verify, simplify, denominator, numerator, mean, countless, between, property table, expression, order, brackets, parentheses, evaluate, closed, not closed, applicable, holds true, general rule, LCM, discuss, think, distributivity, rational form, intermediate, calculation, simplified, common denominator, compare, check, formulate

8th, Maths (1)	Rational Numbers	
Formula / Property	**Expression**	**Condition**
Closure Property (Addition)	$a + b = b + a$	$a, b \in$ Rational Numbers
Closure Property (Subtraction)	$a - b =$ Rational Number	$a, b \in$ Rational Numbers
Closure Property (Multiplication)	$a \times b =$ Rational Number	$a, b \in$ Rational Numbers
Closure Property (Division)	$a \div b =$ Rational Number	$b \neq 0$
Commutative Property (Addition)	$a + b = b + a$	$a, b \in$ Rational Numbers
Commutative Property (Multiplication)	$a \times b = b \times a$	$a, b \in$ Rational Numbers
Associative Property (Addition)	$a + (b + c) = (a + b) + c$	$a, b, c \in$ Rational Numbers
Associative Property (Multiplication)	$a \times (b \times c) = (a \times b) \times c$	$a, b, c \in$ Rational Numbers
Additive Identity	$a + 0 = a$	$a \in$ Rational Numbers
Multiplicative Identity	$a \times 1 = a$	$a \in$ Rational Numbers
Distributive Property over Addition	$a \times (b + c) = a \times b + a \times c$	$a, b, c \in$ Rational Numbers
Distributive Property over Subtraction	$a \times (b - c) = a \times b - a \times c$	$a, b, c \in$ Rational Numbers
Mean of Two Rational Numbers	$(a + b)/2$	$a, b \in$ Rational Numbers

algebraic, expressions, equations, variables, equality, expression, power, restrict, balanced, transposing, mathematical, operations, denominators, simplified, combining, occasionally, suitable, utility, diverse, applications, perimeters, combination, currency, simplify, brackets, required, multiplying, solution, LCM (least common multiple), checking, reducing, equality, involving, rearranging, fraction, simplified, transposed, expressions.

8th, Maths (2	Linear Equations in One Variable
Formula / Step	**Expression**
Linear Equation Form	$ax + b = c$
Transposing constant	$ax = c - b$
Solving for variable	$x = (c - b)/a$
Equation with variable on both sides	$ax + b = dx + e$
Move variables to one side	$ax - dx = e - b$
Solving for variable	$x = (e - b)/(a - d)$
Clear fractions by LCM	Multiply both sides by LCM of denominators
Equation with brackets	$a(bx + c) = d$
Expand brackets	$abx + ac = d$
Equation with decimals	$0.25(4f – 3) = 0.05(10f – 9)$
Simplify both sides	Perform all arithmetic and combine like terms
Check solution	Substitute value of x into original equation

Understanding Quadrilaterals

quadrilateral, polygon, simple curve, simple closed curve, plane surface, line segment, side, vertex, convex polygon, concave polygon, regular polygon, irregular polygon, trapezium, isosceles trapezium, kite, parallelogram, rhombus, rectangle, square, diagonal, interior angle, exterior angle, opposite sides, adjacent sides, opposite angles, adjacent angles, supplementary angles, congruent triangles, ASA congruency, SSS congruency, SAS congruency, transversal, interior opposite angles, bisect, perpendicular bisector, mid-point, perimeter, right angle, folding symmetry, rotation symmetry, equal diagonals, unequal diagonals, angle bisector, set-square, instrument box, n-gon, regular hexagon, regular octagon, regular 20-gon, complete turn, visual verification, geometric construction, paper folding.

8th, Maths (3)

Understanding Quadrilaterals

Concept	Formula or Property
Sum of Exterior Angles of any polygon	360°
Each exterior angle of a regular polygon	360° / number of sides
Each interior angle of a regular polygon	180° - Exterior Angle
Number of sides from given exterior angle	360° / Exterior Angle
Number of sides from given interior angle	360° / (180° - Interior Angle)
Perimeter of parallelogram	2 × (Length + Breadth)
Property of Parallelogram	Opposite sides and angles are equal, Diagonals bisect each other
Angles in Parallelogram	Adjacent angles are supplementary
Diagonals in Parallelogram	Diagonals bisect each other
Diagonals in Rhombus	Perpendicular bisectors of each other
Diagonals in Rectangle	Equal in length and bisect each other
Diagonals in Square	Equal, bisect each other, and are perpendicular

information, interpretation, pictograph, bar graph, proportional, simultaneously, deteriorated, performance, sector, proportion, expenditure, percentage, surveyed, flavours, appropriate, representation, statistics, observations, frequency, outcomes, experiment, randomly, probability, equally, tally, fraction, spinner, meteorological, predictions, uniformly, circular, convenient, angle, protractor, segments, preferred, graphical, analysis, central, statistics, pie chart, organise, meaningful, infer, likelihood, identical, observation, characteristics, trends, shuffled, systematically, distribution, denote, symmetrical, calculation, estimation, assumption, approximate, experimenter, inference

8th, Maths (4)	Data Handling	
Topic	**Formula**	**Explanation**
Pie Chart	Central Angle = (Category Value / Total Value) × 360°	Used to find the angle of each sector in a pie chart.
Probability	Probability of an event = (Number of favourable outcomes) / (Total number of outcomes)	Used when all outcomes are equally likely.
Proportion in Circle Graph	Fraction of circle = (Number of hours/activity value) / (Total hours/whole value)	Used to calculate fraction of whole represented in pie chart.
Scale in Pictograph	1 symbol = X units	Used to interpret symbols in a pictograph.
Comparison in Bar Graph	Height $\propto$ Value	Height of each bar is proportional to the value it represents.

Square number, perfect square, square root, triangular number, odd numbers, even numbers, unit digit rule, Pythagorean triplet, prime factorisation, long division method, repeated subtraction, square root symbol, square area, Pythagoras theorem, difference of squares, estimating square roots, decimal bar placement, LCM based square, not perfect square, successive squares pattern, consecutive odd numbers.

8th, Maths (5) Squares and Square Roots

Formula Name	Expression
Area of a square	side × side = side²
Perfect square number	$m = n^2$ (where m, n are natural numbers)
Number between two square numbers	$(n + 1)^2 - n^2 = 2n + 1$
Sum of first n odd numbers	$1 + 3 + 5 + ... + (2n - 1) = n^2$
Square of number ending in 5	$(10a + 5)^2 = 100a(a + 1) + 25$
Product of (a - 1) and (a + 1)	$(a - 1)(a + 1) = a^2 - 1$
Pythagorean triplet formula	$2m, m^2 - 1, m^2 + 1$ (for $m > 1$)
Square root as inverse of square	If $a^2 = b$, then $\sqrt{b} = a$
Finding square root using prime factors	Group primes in pairs, take one from each pair
Square root by repeated subtraction	Subtract successive odd numbers till you reach 0
Estimate digits in square root	If n-digit number: root has n/2 digits (even) or (n+1)/2 (odd)
Square of (a + b)	$(a + b)^2 = a^2 + 2ab + b^2$
Diagonal of square	$\sqrt{(side^2 + side^2)} = side\sqrt{2}$
Number of non-square numbers between n^2 and $(n+1)^2$	2n
Square root of decimal	Put bar on digits in pairs and apply division method

geniuses, mathematician, expressed, dimensions, geometry, obtained, consecutive, pattern, factorisation, consecutive, prime, factor, multiplication, multiplication, triplets, smallest, multiplied, quotient, cuboids, operation, inverse, denote, inference, method, digits, perfect, symbol, reprint, discussed, interesting, observed,

Ramanujan, Hardy, smallest, volume, product, breadth, height, appears, integer, appears, appears, factorisation, appearing, concluding, observe, individual, grouping, concluding, bracketed, cuboid, determine, original, expression, expressed

8th, Maths (6)

Cubes and Cube Roots

Topic	Formula
Cube of a Number	$n^3 = n \times n \times n$
Cube Root	$\sqrt[3]{x} = y$, if $y^3 = x$
Cube of 2-digit Numbers	Can have 3 to 7 digits
Cubes from 1 to 10	$1^3 = 1$, $2^3 = 8$, ..., $10^3 = 1000$
Cubes from 11 to 20	$11^3 = 1331$, ..., $20^3 = 8000$
Consecutive Odd Numbers	Sum of n consecutive odd numbers = n^3
Pattern Formula 1	$n^3 - (n-1)^3 = 1 + n \times (n-1) \times 3$
Perfect Cube Test	All prime factors must appear in multiples of 3
Cube Root by Prime Factorisation	Group identical prime factors in triples
Volume of Cuboid	$V = l \times b \times h$
Perfect Cube by Multiplication	Multiply by missing primes to complete triplets
Perfect Cube by Division	Divide by extra primes to retain triplets
Cube Root Identity	$\sqrt[3]{(a^3 \times b^3 \times c^3)} = a \times b \times c$
Examples	E.g., $\sqrt[3]{3375} = \sqrt[3]{(3^3 \times 5^3)} = 15$

ratios, percentages, unitary method, quantity, transportation, expenses, estimation, discount, marked price, sale price, reduction, promote, value added tax, VAT, goods, services, GST, levied, supply, sales tax, principal, interest, per annum, borrowed, compounded, annually, simple interest, compound interest, amount, formula, deduction, increase, decrease, depreciation, population, bacteria, appreciation, estimation, inclusive, overhead expenses, cost price, selling price, percentage, approximation, calculation, survey, distributed, refreshed, compounded annually, alternate method, deduction, total cost, derived formula, direct formula, taxable amount, inclusive price, mathematical expression, logical steps, financial planning, real-life application, recurring value, growth rate, depreciation rate.

8th, Maths (7)	Comparing Quantities
Topic	**Formula**
Ratio	Ratio = a : b = a/b
Percentage	Percentage = (Part/Whole) × 100
Discount	Discount = Marked Price - Sale Price
Discount %	Discount % = (Discount / Marked Price) × 100
Sale Price	Sale Price = Marked Price - Discount
Sale Price (with %)	Sale Price = Marked Price × (1 - Discount %/100)
Marked Price	Marked Price = Sale Price / (1 - Discount %/100)
Sales Tax	Sales Tax = (Sales Tax % × Selling Price) / 100
Total Bill with Tax	Total Bill = Selling Price + Sales Tax
GST	GST = GST % × Price / 100
Original Price (including GST)	Original Price = Price including GST / (1 + GST %/100)
Simple Interest	SI = (Principal × Rate × Time) / 100
Compound Interest	CI = A - P
Amount (CI)	A = P × (1 + R/100)^n
Population Growth	Population = Present Population × (1 + Growth Rate/100)^Years
Depreciation	Value = Present Value × (1 - Depreciation Rate/100)^Years
Overhead Expenses	Cost Price = Buying Price + Overhead Expenses
Percentage Change	Percentage Change = ((New Value - Original Value) / Original Value) × 100

algebraic, expressions, identities, subtraction, coefficient, inverse, polynomial, monomial, binomial, trinomial, distributive, commutative, associative, exponent, multiplication, rectangle, breadth, variable, constant, evaluation, simplify, terms, dimensions, rectangular, product, quantity, principal, interest, volume, systematically, algebraically, coefficient, calculation, expression, negative, power, additive, notation, simplify, subtraction, similarly, separately, non-zero, observation, situations, multiplication, distributive, combination, factors, associative, representation, terminology, resultant, simplification, individually, combining, multiplication, trinomial, multiplying, simplification, evaluation, distributive, coefficient, commutative, identity.

8th, Maths (8)	Algebraic Expressions and Identities	
Concept	**Rule/Method**	**Formula Example**
Addition of Algebraic Expressions	Combine like terms	$7x^2 - 4x + 5 + 9x - 10 = 7x^2 + 5x - 5$
Subtraction of Algebraic Expressions	Additive inverse and combine	$7x^2 - 4xy + 8y^2 + 5x - 3y - (5x^2 - 4y^2 + 6y - 3) = 2x^2 - 4xy + 12y^2 + 5x - 9y + 3$
Multiplying Monomials	Multiply coefficients and add powers	$5x \times 4x^2 = 20x^3$
Multiplying Monomials (multiple)	Multiply all terms sequentially	$2x \times 5y \times 7z = 70xyz$
Volume of Rectangular Box	l × b × h	$2ax \times 3by \times 5cz = 30abcxyz$
Area of Rectangle	l × b	$3x \times 5y = 15xy$
Monomial × Binomial	Distributive Law	$3x \times (5y + 2) = 15xy + 6x$
Monomial × Trinomial	Distributive Law	$3p \times (4p^2 + 5p + 7) = 12p^3 + 15p^2 + 21p$
Binomial × Binomial	Distributive Law with simplification	$(x - 4)(2x + 3) = 2x^2 - 5x - 12$
Binomial × Trinomial	Distributive Law with simplification	$(a + b)(2a - 3b + c) = 2a^2 - ab - 3b^2 + 4bc - ac$
Expression Evaluation	Substitute and simplify	$x(x - 3) + 2$ for $x = 1 \rightarrow 0$
Simplifying Polynomial Products	Combine like terms	$4y(3y^2 + 5y - 7) + 2(y^3 - 4y^2 + 5) = 14y^3 + 12y^2 - 28y + 10$

perimeter, trapezium, polygon, diagonal, perpendiculars, trapezium-shaped, quadrilateral, dimensions, rhombus, altitude, hexagon, congruent, cylindrical, cuboidal, net (of a cube), lateral, rectangular, circumference, right circular cylinder, identical, volume, capacity, cubical, perpendicular, expression, deduce, approximation, rectangular strip, solid, measurement, almirah, unit cubes, godown, overlapping, base area, capacity, plaster, reservoir.

8th, Maths (9)	Mensuration
Concept	**Formula**
Area of a trapezium	$\frac{1}{2} \times h \times (a + b)$
Area of a rhombus (using diagonals)	$\frac{1}{2} \times d1 \times d2$
Area of a rhombus (using base and height)	base × height
Area of a rectangle	length × breadth
Area of a triangle	$\frac{1}{2} \times$ base × height
Total surface area of a cuboid	$2(lb + bh + hl)$
Lateral surface area of a cuboid	$2h(l + b)$
Total surface area of a cube	$6l^2$
Lateral surface area of a cube	$4l^2$
Total surface area of a cylinder	$2\pi r(r + h)$
Lateral surface area (curved) of a cylinder	$2\pi rh$
Area of two circular bases of cylinder	$2\pi r^2$
Volume of a cuboid	$l \times b \times h$
Volume of a cube	l^3
Volume of a cylinder	$\pi r^2 h$
Volume of reservoir	Base Area × Height
Capacity in litres	Volume in $cm^3 \div 1000$
Perimeter of base of cuboid	$2(l + b)$
Surface area from net of cuboid	Sum of area of all six faces
Height from volume and base area	Volume ÷ Base Area

Exponent, powers, base, index, standard form, usual form, multiplicative inverse, exponential form, expanded form, notation, negative exponent, non-zero integer, positive exponent, natural number, laws of exponents, reciprocal, simplification, scientific notation, comparison, large number, small number, diameter, mass, thickness, radius, red blood cell, plant cell, propellant, solar eclipse, coulomb, micron, bacteria, evaluate, simplify, convert, subtract, multiply, divide, expression, stacked, expanded notation.

8th, Maths (10)

Exponents and Powers

Formula	Result
a^m × a^n	a^(m+n)
a^m ÷ a^n	a^(m–n)
(a^m)^n	a^(m×n)
a^0	1 (if a ≠ 0)
a^(-m)	1 / a^m (if a ≠ 0)
(a × b)^m	a^m × b^m
(a / b)^m	a^m / b^m (if b ≠ 0)
Standard form of small number	a × 10^(-n)
Standard form of large number	a × 10^n
Multiplicative Inverse of a^m	a^(-m) = 1 / a^m
(a^m)^n	a^(m×n)
(a × b)^m	(a^m) × (b^m)
(a / b)^m	(a^m) / (b^m)

proportion, variation, corresponding, consumption, constant, proportional, ingredients, simultaneously, quantities, inversely, directly, miniature, representation, approximate, intervals, scale, observed, situations, predetermined, relationship, calculate, rectangular, proportionality, estimation, expenditure, assumption, multiplicative, reciprocal, formulation, comparison, distribution, enlarged, measurement, assumptions, mathematical, equations, uniformly, miniature, transformation, consecutive, horizontal, vertical, alternate, estimation, requirement, configurations, quantity, variables, tabulate, spontaneously, simultaneously, measurable, inversely, enlarge, uniformly, duration, fixed, altitude, assumption.

8th, Maths (11)

Direct and Inverse Proportions

Topic	Formula
Direct Proportion	x/y = k (constant)
Direct Proportion	x1/x2 = y1/y2
Direct Proportion	x = ky
Inverse Proportion	x * y = k (constant)
Inverse Proportion	x1 * y1 = x2 * y2
Inverse Proportion	x1/x2 = y2/y1
Simple Interest	SI = (P × R × T) / 100
Compound Interest	CI = P(1 + R/100)^T - P
Map Scale	Map Distance / Actual Distance = 1 / Scale
Perimeter of Square	P = 4 × L
Area of Square	A = L × L
Speed, Time, Distance	Distance = Speed × Time
Angle between spokes	Angle = 360° / Number of spokes

factors, prime, irreducible, algebraic, expressions, common, distributive, identity, regrouping, coefficient, polynomial, monomial, trinomial, identity, numerical, variable, systematic, inverse, quotient, remainder, dividend, divisor, cancellation, applicable, factorisation, rearrangement, comparison, negative, perfect, squares, cancellation, denominator, numerator, operations, simplification, applicable, trial, observation, terms, multiplication, cancellation.

8th, Maths (12)

Factorisation

Formula Type	Formula
Algebraic Identity	$(a + b)^2 = a^2 + 2ab + b^2$
Algebraic Identity	$(a - b)^2 = a^2 - 2ab + b^2$
Algebraic Identity	$(a + b)(a - b) = a^2 - b^2$
Algebraic Identity	$(x + a)(x + b) = x^2 + (a + b)x + ab$
Factorisation Method	Common Factor: $ab + ac = a(b + c)$
Factorisation Method	Regrouping: $ax + ay + bx + by = (a + b)x + (a + b)y = (a + b)(x + y)$
Division Rule	$(a \times b) \div a = b$
Division Rule	$(ax + bx) \div x = a + b$
Factorising Quadratics	$x^2 + px + q = (x + a)(x + b)$, where $a + b = p$ and $ab = q$
Special Case	$m^4 - 256 = (m - 4)(m + 4)(m^2 + 16)$
Division of Polynomials	Dividend = Divisor × Quotient
General Division Rule	Dividend = Divisor × Quotient + Remainder

graphical, representation, numerical, continuously, temperature, horizontal, vertical, coordinate, segment, steadily, consistent, reliable, comparison, variable, independent, dependent, illustrative, estimate, corresponding, approximate, laboratory, measurable, measurable, deposited, investment, population, manufacturing, forecast, difference, experimental, suburban, merchant, situation, variation, origin, perimeter, determine, directly, distance, approximate, visual, interpret, observation, electricity, consumption, principal, interest, deposited, constant, relation, mathematical, regularly, proportion, data, table, axis, square, unbroken.

8th, Maths (13)

Introduction to Graphs

Concept	Formula	Description
Temperature Difference	$\Delta T = T2 - T1$	Change in temperature over time
Speed	Speed = Distance / Time	Used in distance-time graphs
Distance	Distance = Speed × Time	Used when speed is constant
Simple Interest	SI = (P × R × T) / 100	Where P is Principal, R is Rate (%), T is Time
Perimeter of a Square	P = 4 × side	Used in graph of side vs. perimeter
Area of a Square	$A = side^2$	Used in graph of side vs. area
Linear Relationship	$y = mx + c$	Straight line equation (used for direct variation graphs)
Direct Variation	$y \propto x$ or $y = kx$	Used when one quantity increases with the other