real numbers, irrational numbers, Euclid's division algorithm, Fundamental Theorem of Arithmetic, divisibility, remainder, prime factorisation, composite number, product of primes, unique factorisation, ascending order, powers of primes, conjecture, Carl Friedrich Gauss, Disquisitiones Arithmeticae, uniqueness, terminating decimal, non-terminating repeating, natural number, HCF (Highest Common Factor), LCM (Least Common Multiple), common factors, greatest power, smallest power, contradiction, proof by contradiction, coprime, divisible, theorem, assumption, decimal expansion, rational number, irrational number, quotient, contradiction, circular path, common multiple, integers, prime number, non-zero rational, terminating decimal, non-terminating decimal, proof, factor tree.

10th, Maths (1)

Real Numbers

Topic	Formula
Euclid's Division Lemma	$a = bq + r$, where $0 \leq r < b$
HCF and LCM	$HCF(a, b) \times LCM(a, b) = a \times b$
Fundamental Theorem of Arithmetic	Every composite number can be expressed as a product of primes uniquely (apart from the order)
Prime Factorisation (Example)	$32760 = 2^3 \times 3^2 \times 5 \times 7 \times 13$
HCF (Example)	$HCF(6, 20) = 2$
LCM (Example)	$LCM(6, 20) = 2^2 \times 3 \times 5 = 60$
HCF and LCM of Three Numbers	$HCF(6, 72, 120) = 2 \times 3 = 6$
LCM of Three Numbers	$LCM(6, 72, 120) = 2^3 \times 3^2 \times 5 = 360$
HCF × LCM for Three Numbers	$HCF(p, q, r) \times LCM(p, q, r) \neq p \times q \times r$
LCM of Three Numbers (General)	$LCM(p, q, r) = [HCF(p,q) \times HCF(q,r) \times HCF(p,r)] \div HCF(p,q,r)$
HCF of Three Numbers (General)	$HCF(p, q, r) = [LCM(p,q) \times LCM(q,r) \times LCM(p,r)] \div LCM(p,q,r)$

approximate, mathematical, modelling, equivalent, interpret, validating, unreachable, estimating, pollutants, assumptions, manageable, representative, simplification, techniques, proportion, formulation, graphical, probabilities, accuracy, forecasting, interdisciplinary, optimum, impractical, simulation, strategies, pattern, behaviour, instalment, deferred, marketing, strategy, comparison, principal, frequency, biased, disguised, currency, validation, estimate, predict, outcome, modeller, effective, financial, evaluator, scenario, ornithologist, aerial, photograph, environmental, census, forecasting, extrapolate, elections, constituency, campaign, exit-polls.

10th, Maths (2)	Polynomials	
Context	**Formula**	**Example**
Fish estimation (proportion method)	Marked in second sample / Total second sample = Total marked / Total population	5/50 = 20/N ⇒ N = (20×50)/5 = 200
Simple Interest (used in instalment example)	Interest = (Principal × Rate × Time) / 100	Interest = (1790 × r × 1) / (100 × 12)
Probability of event	P(E) = Number of favourable outcomes / Total number of outcomes	P(sum=7) = 6/36 = 1/6
Rate of Interest from difference in instalment and principal	r = (Interest × 1200) / Total Principal used for time period	r = (20 × 1200) / 1790 = 13.14%
Fibonacci Sequence (Rabbit population example)	F(n) = F(n–1) + F(n–2), with F(0)=1, F(1)=1	F(2) = 1 + 1 = 2, F(3) = 2 + 1 = 3, ...
Mean of repeated estimates (for validation)	Mean = (Estimate1 + Estimate2 + ... + EstimateN) / N	Mean = (195 + 205 + 200) / 3 = 200

linear equations, variables, represent, graphical, consistent, inconsistent, dependent, coincident, intersect, unique solution, infinitely many solutions, parallel, substitute, substitution method, eliminate, elimination method, coefficients, algebraic, equations, algebraically, solution, verification, geometrical representation, digit, numerator, denominator, perimeter, dimensions, fixed charge, ratio, savings, expenditure, statement, false statement, true statement, expanded notation, supplementary angles, fixed charge, reverse digits, non-integral coordinates, coinciding lines, reversing digits, precondition, simplification, substitution, tabulation, pair of lines, determine, intersection, simultaneous, expenditure ratio, multiple, contradiction, equivalent, verification, plotted, graphical method, substitution method, elimination method, algebraic method, intersecting lines, coincident lines, inconsistent equations, consistent equations, algebraic representation, infinite solutions, no solution.

10th, Maths (3)	Pair of Linear Equations in Two Variables
Formula / Condition	**Description**
y = (1/2)x	Relationship between number of rides and games played
3x + 4y = 20	Cost equation for rides and games
a1/a2 ≠ b1/b2	Lines intersect; unique solution (consistent)
a1/a2 = b1/b2 ≠ c1/c2	Lines are parallel; no solution (inconsistent)
a1/a2 = b1/b2 = c1/c2	Lines are coincident; infinite solutions (dependent and consistent)
x = (value)	Solved variable using substitution or elimination
Substitution method	Solve one equation for one variable, substitute into the other
Elimination method	Multiply equations to equalize a coefficient and eliminate one variable
x = 10a + b, reversed = 10b + a	Number formation and reversal
x + y = s, x - y = d	System of linear equations with sum and difference
Graphical solution = point of intersection	Graphical interpretation of solution

quadratic, polynomial, equate, geometrical, terminology, explicit, derived, completing, cottage, industry, representation, factorisation, standard, degree, descending, scenario, mathematically, simplify, determine, factorising, discriminant, distinct, coincident, situation, algebraic, roots, real-life, applications, consecutive, altitude, hypotenuse, Pythagoras, erect, diametrically, opposite,

boundary, rectangular, perimeter, observe, uniformly, possibilities, verification, equation, root, zeroes, splitting, linear, repeated, possibilities, rearranged, non-quadratic, product, solution, observe, derivation, formula, possible, boundary, positive, negative, quadratic formula, no real roots, zero of polynomial, geometrical method

10th, Maths (4)	Quadratic Equations
Topic	**Formula**
Standard Form	$ax^2 + bx + c = 0$
Roots by Factorisation	Factor $ax^2 + bx + c$ into $(px + q)(rx + s) = 0$, then solve each factor
Quadratic Formula	$x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$
Discriminant	$D = b^2 - 4ac$
Nature of Roots	$D > 0 \Rightarrow$ Two distinct real roots
Nature of Roots	$D = 0 \Rightarrow$ Two equal real roots
Nature of Roots	$D < 0 \Rightarrow$ No real roots
Area of Rectangle	Area = length × breadth
Product of Two Numbers	Let numbers be x and y, then $x \times y$ = product
Sum of Two Numbers	$x + y$ = sum
Pythagoras Theorem	$\text{Hypotenuse}^2 = \text{Base}^2 + \text{Height}^2$
Roots from Factors	If $(x - \alpha)(x - \beta) = 0$, then roots are $x = \alpha, \beta$
Zero of Polynomial	If $f(\alpha) = 0$, then α is a zero of polynomial $f(x)$

arithmetic, progression, increment, respectively, uniformly, maturity, investment, consecutive, preceding, succeeding, multiplication, pattern, difference, general, finite, infinite, obtain, subtracting, consecutive, instance, reverse, represent, difference, determine, verify, denote, equivalent, assumption, semicircles, tread, penalty, contractor, uniformly, consistently, exercise, ascertain, formula, interest, compound, sequence, application, alternative, admissible, manufacturer, academic, performance, successive, arrangement, ascending, descending, conceptual, approximate, distinguish, sufficient, assumption, totality, ultimate, justification, interpretation

10th, Maths (5)	Arithmetic Progressions	
Topic	**Formula**	**Description**
nth Term of an AP	$a_n = a + (n - 1)\cdot d$	nth term of an AP with first term a and common difference d
General Form of an AP	a, a + d, a + 2d, a + 3d, ...	General sequence of an AP
Common Difference	$d = a_{k+1} - a_k$	Common difference found from consecutive terms
Sum of First n Terms (Sn)	$S_n = (n / 2) \cdot [2a + (n - 1)\cdot d]$	Sum of first n terms of an AP
Sum of First n Terms (using last term)	$S_n = (n / 2) \cdot (a + l)$	Sum of first n terms when last term l is known
Arithmetic Mean	b = (a + c) / 2	If a, b, c are in AP, b is the arithmetic mean
Sum of first n natural numbers	$S_n = n(n + 1) / 2$	Sum of first n natural numbers
Check if a value is a term in AP	$a_n = a + (n - 1)\cdot d$	Solve for n to check if a_n is part of the AP
Find number of terms (n)	n = [(l - a)/d] + 1	Used to find number of terms given last term l, first term a, and common difference d

congruent, similar, monument, inclination, enlargement, magnification, corresponding, proportional, quadrilateral, representative, polygon, equiangular, proportionality, vertically, alternate, converse, bisectors, similarity, isosceles, trapezium, diagonal, intersect, criterion, medians, hypotenuse, adjacent, segment,

conventional, criteria, construction, indirectly, photogrammetry, inclinations, correspondence, proportionality, similarity, proportion, sufficient, insufficient, observation, reduction, enlargement, verification, similarity criterion, proportionally, application.

10th, Maths (6)	Triangles
Topic	**Formula**
Similarity of Triangles	If $\Delta ABC \sim \Delta DEF$, then $AB/DE = BC/EF = AC/DF$
Basic Proportionality Theorem (Thales)	If $DE \parallel BC$, then $AD/DB = AE/EC$
Converse of Basic Proportionality Theorem	If $AD/DB = AE/EC$, then $DE \parallel BC$
Criteria of Similar Triangles (AAA)	If $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$, then $\Delta ABC \sim \Delta DEF$
Criteria of Similar Triangles (AA)	If two angles of ΔABC = two angles of ΔDEF, then $\Delta ABC \sim \Delta DEF$
Criteria of Similar Triangles (SSS)	If $AB/DE = BC/EF = AC/DF$, then $\Delta ABC \sim \Delta DEF$
Criteria of Similar Triangles (SAS)	If $\angle A = \angle D$ and $AB/DE = AC/DF$, then $\Delta ABC \sim \Delta DEF$
Right Triangle Similarity (RHS)	If in two right triangles, hypotenuse and one side are proportional, then triangles are similar
Pythagoras Theorem	In right ΔABC, if $\angle B = 90°$, then $AC^2 = AB^2 + BC^2$
Converse of Pythagoras Theorem	If $AC^2 = AB^2 + BC^2$, then $\angle B = 90°$
Area of Similar Triangles	If $\Delta 1 \sim \Delta 2$, then $\text{Area}(\Delta 1)/\text{Area}(\Delta 2) = (\text{side1}/\text{side2})^2$

coordinate, geometry, axes, abscissa, ordinate, linear equation, parabola, navigation, seismology, distance formula, Pythagoras theorem, quadrant, perpendicular, converse, collinear, equidistant, bisector, midpoint, internally, externally, segment, trisection, diameter, intersection, abscissa, ordinate, ratio, vertices,

parallelogram, diagonal, bisect, isosceles, trisection, symmetry, algebraic, graphical, similarity criterion, proportionality, algebra, origin, substitution, section formula, derived, internally divided, midpoint formula, algebraic method, coordinate plane, perpendicular bisector, collinear points.

10th, Maths (7)	Coordinate Geometry
Formula Name	**Formula**
Distance between two points	$PQ = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$
Distance from a point to origin	$OP = \sqrt{(x^2 + y^2)}$
Midpoint of a line segment	$\text{Midpoint} = ((x_1 + x_2)/2, (y_1 + y_2)/2)$
Section formula (internal division)	$P = ((m_1x_2 + m_2x_1)/(m_1 + m_2), (m_1y_2 + m_2y_1)/(m_1 + m_2))$
Section formula (k:1 form)	$P = ((kx_2 + x_1)/(k + 1), (ky_2 + y_1)/(k + 1))$
Checking collinearity using distance	If AB + BC = AC, then A, B, C are collinear
Equation of perpendicular bisector (example)	x - y = constant (derived based on equidistant condition)
Using midpoint of diagonals in a parallelogram	Midpoint of AC = Midpoint of BD
Area of rhombus using diagonals	$\text{Area} = (1/2) \times d_1 \times d_2$

trigonometry, imagined, balcony, altitude, measuring, techniques, derived, relationships, earliest, astronomers, technologically, advanced, Engineering, Physical, restricted, identities, opposite, adjacent, hypotenuse, abbreviation, reciprocal, complementary, interpretation, perpendicular, similarity, proportional, convention, notation, value, determine, theorem, evaluate, identity, calculated, equilateral, construction, alternatively, coincides, approximate, undefined, expressions, determine, simplify, substitution, inverse, acute, equation, true, variables, involving, converted, observation, conveniently, justified, separately, abbreviation, reasoning, construction, ratio, variation, verified

10th, Maths (8) Introduction to Trigonometry

Formula	Expression	Formula	Expression
sin A	Opposite side / Hypotenuse	tan 30°	$1/\sqrt{3}$
cos A	Adjacent side / Hypotenuse	sin 45°	$1/\sqrt{2}$
tan A	Opposite side / Adjacent side	cos 45°	$1/\sqrt{2}$
cosec A	1 / sin A = Hypotenuse / Opposite side	tan 45°	1
sec A	1 / cos A = Hypotenuse / Adjacent side	sin 60°	$\sqrt{3}/2$
cot A	1 / tan A = Adjacent side / Opposite side	cos 60°	1/2
tan A	sin A / cos A	tan 60°	$\sqrt{3}$
cot A	cos A / sin A	sin 90°	1
$\sin^2 A + \cos^2 A$	1	cos 90°	0
$1 + \tan^2 A$	$\sec^2 A$	tan 90°	Not defined
$\cot^2 A + 1$	$\text{cosec}^2 A$	cos A	$\sqrt{(1 - \sin^2 A)}$
sin 0°	0	sec A	$1 / \sqrt{(1 - \sin^2 A)}$
cos 0°	1	tan A	$\sin A / \sqrt{(1 - \sin^2 A)}$
tan 0°	0	sin 2A	2 sin A cos A
sin 30°	1/2	cos 2A	$\cos^2 A - \sin^2 A$
cos 30°	$\sqrt{3}/2$	sec A (1 - sin A)(sec A + tan A)	1
	(cosec A - cot A)/(cosec A + cot A)		(1 - cos A)/(1 + cos A)

trigonometry, elevation, depression, observer, horizontal, transversal, parallel, alternate, inclined, hypotenuse, approximate, measurement, situation, determine, electrician, pedestal, chimney, transmission, flagstaff, distance, shadow, altitude, calculation, observation, height, triangle, right-angled, hoisted, vertically, multi-storeyed, representing, inclination, increases, decreases, temporarily, assumption, respectively, approaching, determining, constructed, assumed, interval, summary

10th, Maths (9)

Some Applications of Trigogometry

Concept	Formula
Trigonometric Ratios	tan(θ) = Opposite / Adjacent
Trigonometric Ratios	cot(θ) = Adjacent / Opposite
Trigonometric Ratios	sin(θ) = Opposite / Hypotenuse
Trigonometric Ratios	cos(θ) = Adjacent / Hypotenuse
Height Calculation	Height = tan(θ) × Distance from base
Height from Eye-Level	Total Height = Height from triangle + Observer's eye level
Ladder Length	Ladder = Height / sin(θ)
Distance from Base	Distance = Height / tan(θ)
Shadow-Based Height	Height = Shadow × tan(θ)
Width of River (Composite)	Width = AD + DB = h/tan(30°) + h
Building Height with Depression	PC = PD + DC
Angle of Elevation with Multiple Triangles	Use tan(θ) for each triangle and solve system of equations

tangent, secant, intersect, perpendicular, coincide, gradually, external, internal, activity, theorem, bisector, radius, diameter, concentric, corresponding, perpendicularity, mathematical, common point, point of contact, isosceles triangle, right triangle, parallel, subtended, supplementary, quadrilateral, circumscribe, configuration, inclined, observation, measure, equidistant, proof, construction, justification, lengths, segment, deduced, chord, bisected, contact point, perpendicular bisector, angle bisector, geometrical, similarity, similarity criteria, RHS (Right angle-Hypotenuse-Side), CPCT (Corresponding Parts of Congruent Triangles), validate

10th, Maths (10)	Circles
Formula Name	**Formula**
Pythagoras Theorem	$OQ^2 = OP^2 + PQ^2$
Length of Tangent from External Point	$\text{Length} = \sqrt{(OQ^2 - r^2)}$
Equal Tangents Theorem	$PQ = PR$
Angle between Radius and Tangent	$\angle(\text{Radius, Tangent}) = 90°$
Angle between Two Tangents	$\angle PTQ = 2 \times \angle OPQ$
Bisected Chord in Concentric Circles	AP = PB if chord touches inner circle and is perpendicular from centre
Length of Tangent using Triangle Similarity	$TP/PO = RP/RO$
Chord Bisected by Perpendicular Radius	If radius $\perp$ chord, then it bisects the chord
Supplementary Angles in Circumscribed Quadrilateral	$\angle A + \angle C = \angle B + \angle D = 180°$

Sector, Segment, Circular region, Enclosed, Corresponding arc, Chord, Minor sector, Major sector, Minor segment, Major segment, Unitary method, Degree measure, Subtends, Radius, Congruence, Mid-point, Approximate, Quadrant, Circumference, Alternative method, Brooch, Diameter, Umbrella ribs, Wipers, Lighthouse, Submarine rocks, Sector angle, Designs, Cost per cm^2, Tick the correct answer, Swept area, Grazing area, Silver wire, Consecutive, Assumption, Corresponding triangl

10th, Maths (11)	Areas Related to Circles	
Formula Name	**Formula**	**Description**
Area of a Sector	$\text{Area} = (\theta / 360) \times \pi \times r^2$	θ is the angle in degrees, r is the radius of the circle
Length of an Arc	$\text{Length} = (\theta / 360) \times 2\pi r$	θ is the angle in degrees, r is the radius of the circle
Area of a Segment	Area = Area of Sector – Area of Triangle	Triangle formed by joining the ends of the arc to the centre
Area of Major Sector	$\text{Area} = \pi r^2$ – Area of Minor Sector	Area of circle minus the minor sector area
Area of Major Segment	$\text{Area} = \pi r^2$ – Area of Minor Segment	Area of circle minus the minor segment area

cuboid, cone, cylinder, sphere, combinations, hemisphere, capacity, surmounted, depression, conveniently, approximate, determine, slant height, dimensional, circumscribe, hemisphere, constituent, disappeared, machinery, circumscribing, apparent, reduce, capacity, scooping, mounted, decorative,

radius, calculate, circumscribes, inverted, gulab jamun, syrup, depression, pen stand, vessel, brim, flow out, cavity, surmounted, mass, approximately, spherical, neck, volume, summary, basic solids, hemispherical, dimension, circumscribing

10th, Maths (12)	Surface Areas and Volumes
Topic	**Formula**
Surface Area	TSA of new solid = CSA of hemisphere + CSA of cylinder + CSA of other hemisphere
Surface Area	TSA of toy = CSA of hemisphere + CSA of cone
Surface Area	CSA of hemisphere = $2\pi r^2$
Surface Area	CSA of cone = πrl
Surface Area	TSA of cube = $6a^2$
Surface Area	Surface area of block = TSA of cube - base area of hemisphere + CSA of hemisphere
Surface Area	CSA of cylinder = $2\pi rh$
Surface Area	Total surface area of bird-bath = CSA of cylinder + CSA of hemisphere = $2\pi r(h + r)$
Surface Area	Area to be painted orange = $\pi rl + \pi r^2 - \pi r'^2$
Surface Area	Area to be painted yellow = $2\pi r'h' + \pi r'^2$
Volume	Volume of solid = Volume of cone + Volume of hemisphere
Volume	Volume of cuboid = $l \times b \times h$
Volume	Volume of cylinder = $\pi r^2 h$
Volume	Volume of cone = $(1/3)\pi r^2 h$
Volume	Volume of hemisphere = $(2/3)\pi r^3$
Volume	Volume of cylinder with hemisphere ends = $\pi r^2 h + (4/3)\pi r^3$
Volume	Actual capacity = Apparent capacity - Volume of hemisphere
Volume	Apparent capacity = $\pi r^2 h$
Volume	Volume of circumscribing cylinder = $\pi r^2 h$

classification, ungrouped, frequency distributions, pictorially, histograms, polygons, numerical representatives, measures of central tendency, cumulative frequency, cumulative frequency distribution, ogives, observations, respectively, summation, condensed, class-intervals, mid-point, class mark, representative, deviation, tedious, assumed mean, step-deviation method, approximations, simplification, modal class,

succeeding, preceding, empirical relationship, cumulative frequency table, ascending order, distribution, productivity, multimodal, approximate, summarised, concentration, interval, divisor, standard, centering, interpretation, inequality, appropriate, continuous classes, typical, unequal, scale, descending, grouped, skewed, extremes

10th, Maths (13)	Statistics
Concept	**Formula**
Mean (Direct Method)	$\bar{x} = \Sigma(fi * xi) / \Sigma fi$
Mean (Assumed Mean Method)	$\bar{x} = a + (\Sigma fi * di) / \Sigma fi$, where $di = xi - a$
Mean (Step-Deviation Method)	$\bar{x} = a + h * (\Sigma fi * ui) / \Sigma fi$, where $ui = (xi - a) / h$
Mode (For Grouped Data)	$Mode = l + [(f1 - f0) / (2f1 - f0 - f2)] * h$
Median (For Grouped Data)	$Median = l + [(n/2 - cf) / f] * h$
Class Mark (xi)	xi = (Upper limit + Lower limit) / 2
Cumulative Frequency	Sum of all frequencies up to the current class
Empirical Relationship	3 * Median = Mode + 2 * Mean

formidable, symmetrical, unbiased, interference, equally likely, fair die, empirical, empirical probability, trials, unfeasible, assumptions, theoretical probability, classical probability, outcomes favourable, denominator, numerator, complementary events, impossible event, sure event, elementary event, deck, shuffled, spades, hearts, diamonds, clubs, face cards, analytical, Theorie Analytique des Probabilités, phenomenon, launching, sociology, genetics, physics, impossible, certain, number line, favourable area, theoretical model, empirical model, face cards, region, experimental, empirical interpretation, acceptable, defective, identical, short way, rectangle, circular region, complementary, assumption, infinite outcomes, infinitely many, ratio of areas, simulation, rectangular region, diameter, probability distribution

10th, Maths (14)	Probability
Formula	Type
P(E) = Number of trials in which the event happened / Total number of trials	Empirical Probability
P(E) = Number of outcomes favourable to E / Number of all possible outcomes	Theoretical Probability
P(E) + P(not E) = 1	Complementary Events
P(not E) = 1 – P(E)	Complementary Events
0 ≤ P(E) ≤ 1	Range of Probability
P(E) = Favourable Area / Total Area	Geometrical Probability
P(E) = Favourable Distance / Total Distance	Geometrical Probability (Line Segment)