Mathematics

ORIGINAL STUDY COMPANION
PADIKAM
CLASS 12 | SCIENCE / COMMERCE
Mathematics
CBSE / NCERT core lessons | Academic year 2026-27
13 chapter lessons
Quick explanations, core points, exam practice and chapter-specific notation in one consistent format.
Padikam explanations are independently written. Official textbooks are used as the coverage map, chapter sequence and terminology reference.

Contents
01 Relations and Functions 08 Applications of Integrals
02 Inverse Trigonometric Functions 09 Differential Equations
03 Matrices 10 Vector Algebra
04 Determinants 11 Three-dimensional Geometry
05 Continuity and Differentiability 12 Linear Programming
06 Applications of Derivatives 13 Probability
07 Integrals
Study rhythm
Read the quick explanation, recall the core points aloud, then answer the prompts without looking back. Use the official textbook links for full prescribed readings, activities and diagrams.
Textbook and verification links
1. https://cbseacademic.nic.in/web_material/CurriculumMain27/SecPart2/Maths_SecP2_2026-27.pdf
2. https://ncert.nic.in/textbook.php
3. https://ncert.nic.in/textbook.php?lemh1=0-6
4. https://ncert.nic.in/textbook.php?lemh2=0-7
5. https://cbseacademic.nic.in/curriculum_2027.html

CHAPTER 01
Relations and Functions
Quick understanding
Relations classify links between set elements, while functions assign each input exactly one output.
Core points Check your learning
Test reflexive, symmetric and transitive properties Explain the central idea of Relations and separately. Functions in your own words.
One-one concerns repeated outputs; onto concerns Apply one idea from Relations and coverage of the codomain. Functions to a textbook-style example or source.
Afunction has an inverse exactly when it is bijective.
Equation and notation
$(f \circ g)(x) = f(g(x))$
$f^{-1}(f(x)) = x$
SYMBOLS AND UNITS
f, g: functions x: element of the relevant domain

∘: composition operator f^{-1}: inverse function; not reciprocal
One-line recall Test reflexive, symmetric and transitive properties separately.
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CHAPTER 02
Inverse Trigonometric Functions
Quick understanding
Inverse trigonometric functions use restricted domains so each input has one principal-value output.
Core points Check your learning
Always state the principal-value range. Explain the central idea of Inverse
Trigonometric Functions in your own
Use identities only after checking domains and signs.
words.
Graphs are reflections of restricted trigonometric
Apply one idea from Inverse
graphs in y = x.
Trigonometric Functions to a textbook-
style example or source.
Equation and notation
$\sin^{-1}x + \cos^{-1}x = \pi/2$
$\tan^{-1}x + \cot^{-1}x = \pi/2$
SYMBOLS AND UNITS
x: real input in the permitted domain π: angle of a half-turn (rad)
Inverse-function values are angles, usually in radians
One-line recall Always state the principal-value range.
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CHAPTER 03
Matrices
Quick understanding
Matrices organise rectangular data and support transformations and systems of equations through
rule-based operations.
Core points Check your learning
Matrix multiplication is generally not commutative. Explain the central idea of Matrices in
your own words.
Transpose reverses rows and columns.
Apply one idea from Matrices to a
An inverse exists only for a nonsingular square
textbook-style example or source.
matrix.
Equation and notation
$(AB)^T = B^T A^T$
$AA^{-1} = A^{-1}A = I$
SYMBOLS AND UNITS
A, B: compatible matrices ^{T}: transpose
A^{-1}: inverse of A I: identity matrix
One-line recall Matrix multiplication is generally not commutative.
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CHAPTER 04
Determinants
Quick understanding
Adeterminant is a scalar attached to a square matrix that detects invertibility and supports area and
equation solving.
Core points Check your learning

Row or column operations change determinants in Explain the central idea of Determinants
predictable ways. in your own words.
A zero determinant means the matrix is singular. Apply one idea from Determinants to a
textbook-style example or source.
Cofactors and the adjoint construct the inverse.
Equation and notation
$A^{-1} = \text{adj}(A) / |A|$, when $|A| \neq 0$
Area of triangle = $\frac{1}{2}|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)|$
SYMBOLS AND UNITS
$|A|$: determinant of matrix A adj(A): adjoint of A
x_i, y_i: coordinates in the chosen length unit
One-line recall Row or column operations change determinants in predictable ways.

CHAPTER 05
Continuity and Differentiability
Quick understanding
Continuity matches limiting and actual values; differentiability gives a locally defined rate of change.
Core points Check your learning
Differentiability implies continuity at an interior point. Explain the central idea of Continuity and
Differentiability in your own words.
Use chain, product and quotient rules systematically.
Apply one idea from Continuity and
Implicit and logarithmic differentiation simplify difficult
Differentiability to a textbook-style
forms.
example or source.
Equation and notation
f is continuous at a if $\lim(x\to a) f(x) = f(a)$
$d/dx[f(g(x))] = f'(g(x))g'(x)$
$d/dx(e^x) = e^x$
SYMBOLS AND UNITS
x, a: real variables f, g: functions
f′: derivative with respect to x
One-line recall Differentiability implies continuity at an interior point.

CHAPTER 06
Applications of Derivatives
Quick understanding
Derivatives answer questions about rate, slope, monotonicity, tangency and optimum values.
Core points Check your learning
The sign of f prime determines increasing or Explain the central idea of Applications of
decreasing intervals. Derivatives in your own words.
Critical points require classification, not automatic Apply one idea from Applications of
labelling. Derivatives to a textbook-style example
or source.
Related-rate problems must keep units and time
dependence clear.
Equation and notation
Slope of tangent = dy/dx
Slope of normal = -1 / (dy/dx)
At an interior extremum, f′(x) = 0 is a necessary condition
SYMBOLS AND UNITS
x, y: variables in the problem units dy/dx: rate of y with respect to x

f′(x): first derivative
One-line recall The sign of f prime determines increasing or decreasing intervals.
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CHAPTER 07
Integrals
Quick understanding
Integration reverses differentiation and also accumulates continuously varying quantities.
Core points Check your learning
An indefinite integral represents a family of Explain the central idea of Integrals in
antiderivatives. your own words.
Substitution, partial fractions and integration by parts Apply one idea from Integrals to a
match different structures. textbook-style example or source.
Adefinite integral is a number with limits and obeys
useful symmetry properties.
Equation and notation
$\int f(x)\,dx = F(x) + C$, where $F'(x)=f(x)$
$\int u\,dv = uv - \int v\,du$
$\int_a^b f(x)dx = F(b)-F(a)$
SYMBOLS AND UNITS
x: variable of integration C: arbitrary constant
a, b: lower and upper limits u, v: differentiable expressions
One-line recall An indefinite integral represents a family of antiderivatives.
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CHAPTER 08
Applications of Integrals
Quick understanding
Definite integrals calculate areas by summing thin strips while respecting which curve lies above or to
the right.
Core points Check your learning
Sketch the region before choosing limits. Explain the central idea of Applications of
Integrals in your own words.
Split the interval if curves cross.
Apply one idea from Applications of
Area is non-negative even when a signed integral is
Integrals to a textbook-style example or
negative.
source.
Equation and notation
Area = $\int_a^b$ [upper curve - lower curve] dx
Area = $\int_c^d$ [right curve - left curve] dy
SYMBOLS AND UNITS
a, b: x-limits c, d: y-limits
Area uses the square of the coordinate length unit
One-line recall Sketch the region before choosing limits.
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CHAPTER 09
Differential Equations
Quick understanding
Adifferential equation relates an unknown function to its derivatives, and a solution satisfies that
relation over an interval.
Core points Check your learning
Order is the highest derivative present. Explain the central idea of Differential

Equations in your own words.
General solutions contain arbitrary constants;
particular solutions satisfy given conditions. Apply one idea from Differential
Equations to a textbook-style example or
Variable-separable and linear forms use different
source.
standard methods.
Equation and notation
dy/dx = g(x)h(y) ⇒ ∫dy/h(y) = ∫g(x)dx
dy/dx + Py = Q
Integrating factor = e^(∫P dx)
SYMBOLS AND UNITS
x: independent variable y: dependent variable
P, Q: functions of x C: integration constant
One-line recall Order is the highest derivative present.
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CHAPTER 10
Vector Algebra
Quick understanding
Vectors combine magnitude and direction and support geometric calculations through components and products.
Core points Check your learning
The dot product measures parallel alignment. Explain the central idea of Vector
Algebra in your own words.
The cross product produces a perpendicular vector.
Apply one idea from Vector Algebra to a
Resolve vectors in a common basis before
textbook-style example or source.
operating.
Equation and notation
a · b = |a||b| cos θ
|a × b| = |a||b| sin θ
Projection of a on b = (a·b)/|b|
SYMBOLS AND UNITS
a, b: vectors |a|, |b|: vector magnitudes
θ: angle between vectors
One-line recall The dot product measures parallel alignment.
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CHAPTER 11
Three-dimensional Geometry
Quick understanding
Lines in space are described by a point and direction, and their relationships follow vector geometry.
Core points Check your learning
Direction ratios need not be unit values. Explain the central idea of Three-
dimensional Geometry in your own
Skew lines are neither parallel nor intersecting.
words.
Shortest distance follows a projection on a common
Apply one idea from Three-dimensional
perpendicular.
Geometry to a textbook-style example or
source.
Equation and notation

Line: $r = a + \lambda b$
$\cos\theta = (b_1 \cdot b_2)/(|b_1||b_2|)$
Distance between skew lines = $|(a_2-a_1)\cdot(b_1\times b_2)| / |b_1\times b_2|$
SYMBOLS AND UNITS
r: position vector a, a_1, a_2: fixed position vectors
b, b_1, b_2: direction vectors λ: real parameter
θ: angle between lines
One-line recall Direction ratios need not be unit values.
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CHAPTER 12
Linear Programming
Quick understanding
Linear programming optimises a linear objective over a feasible region defined by linear constraints.
Core points Check your learning
Translate every verbal restriction into an inequality. Explain the central idea of Linear Programming in your own words.
The feasible region is the common solution set.
Apply one idea from Linear Programming
For a bounded polygonal region, test the objective at
to a textbook-style example or source.
corner points.
Equation and notation
Optimise $Z = ax + by$
Subject to $a_ix + b_iy \le, =, \text{or} \ge c_i$
SYMBOLS AND UNITS
x, y: decision variables Z: objective value
a, b, a_i, b_i, c_i: given constants
One-line recall Translate every verbal restriction into an inequality.
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CHAPTER 13
Probability
Quick understanding
Conditional probability updates chance using available information and leads to multiplication, Bayes and random-variable models.
Core points Check your learning
Independence is stronger than mutual exclusivity. Explain the central idea of Probability in your own words.
Bayes theorem reverses a conditional probability
using prior information. Apply one idea from Probability to a
textbook-style example or source.
Aprobability distribution assigns non-negative
probabilities summing to one.
Equation and notation
$P(A|B) = P(A\cap B) / P(B)$
$P(A\cap B) = P(A|B)P(B)$
$P(A_i|B) = P(A_i)P(B|A_i) / \Sigma P(A_j)P(B|A_j)$
For binomial X: $P(X=r) = {}^nC_r p^r q^{n-r}$
SYMBOLS AND UNITS
A, B, A_i: events P: probability, dimensionless
n: number of trials r: successes
p: success probability q = 1-p
One-line recall Independence is stronger than mutual exclusivity.
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