SCERT Kerala · Class 10 · Mathematics

Mathematics Part 1

PADIKAM
MATHEMATICS
PART I
Complete Study Notes | Standard X | English Medium
SCERT Kerala 2025 syllabus coverage
Original explanations, revision tools, exam focus and practice

PADIKAM | CLASS 10 MATHEMATICS - PART I
Contents
Seven chapters build algebraic, geometric, probabilistic and trigonometric reasoning through formulas and worked methods.
Chapter 1 | Arithmetic Sequences
Chapter 2 | Circles and Angles
Chapter 3 | Arithmetic Sequences and Algebra
Chapter 4 | Mathematics of Chance
Chapter 5 | Second Degree Equations
Chapter 6 | Trigonometry
Chapter 7 | Coordinates
How to use this book
• Read the chapter mission first to understand the learning target.
• Study the core notes and pause at every table, formula or process map.
• Use the exam focus list for last-minute revision.
• Answer the practice questions without looking back, then revise weak areas.
Official textbook links
SCERT Kerala Class 10 PART I
SCERT Kerala Standard 10 textbook catalogue

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CHAPTER 1
Arithmetic Sequences
Chapter mission: recognise arithmetic sequences and calculate terms, differences and sums.
Pattern and notation
• An arithmetic sequence has a constant difference d between consecutive terms. The first term is a and the nth term is a .
n
• To test a sequence, subtract consecutive terms in the same order. A constant result confirms it is arithmetic.
Nth term
• Here a is the first term, d is common difference and n is the term number.
• Use the formula to find distant terms or to solve backwards for a, d or n.
a = a + (n - 1)d
n
Sum
• S is the sum of the first n terms and l is the nth or last term included.
n
• The second form is convenient when first and last terms are known.
S = n/2 [2a + (n - 1)d]
n
S = n/2 (a + l)

n
Problem method
• Translate the situation into a, d and n.
• Check whether the question asks for one term or a total.
• For an unknown term number, solve the resulting linear equation and verify n is a suitable positive integer.
Exam focus
• Write the general formula before substitution.
• Do not confuse a with S .
n n
• Adecreasing sequence has negative d.
Practice
1. Find the 25th term of 7, 11, 15, ...
2. Find the sum of the first 30 terms of 3, 8, 13, ...
3. Which term of 5, 9, 13, ... is 101?

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CHAPTER 2
Circles and Angles
Chapter mission: use angle relationships in circles to prove results and solve geometric problems.
Central and inscribed angles
• The angle subtended by an arc at the centre is twice the angle subtended by the same arc at any point on the remaining circle.
• Angles standing on the same chord in the same segment are equal.
• An angle in a semicircle is 90° because the corresponding central angle is 180°.
∠AOC = 2∠ABC (same arc AC)
Cyclic quadrilaterals
• Aquadrilateral is cyclic when all four vertices lie on a circle.
• Opposite angles of a cyclic quadrilateral are supplementary.
• An exterior angle of a cyclic quadrilateral equals the interior opposite angle.
∠A+ ∠C = 180°, ∠B + ∠D = 180°
Proof strategy
• Mark the chord or arc shared by the angles.
• Add radii to create isosceles triangles when central angles are involved.
• State the theorem used at each step; diagrams support reasoning but are not themselves proof.
Exam focus
• Always identify the same chord or arc.
• Use exact angle language: centre, circumference, same segment.
• Do not assume a quadrilateral is cyclic without a stated or proven condition.
Practice
1. Prove that angles in the same segment are equal.
2. One angle of a cyclic quadrilateral is 112°. Find its opposite angle.
3. Explain why an angle in a semicircle is right.

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CHAPTER 3
Arithmetic Sequences and Algebra
Chapter mission: represent arithmetic patterns algebraically and solve problems involving terms and sums.
Algebraic form
• Every arithmetic sequence has a linear nth term: a = dn + (a - d). Conversely, a sequence defined by a linear
n
expression in n is arithmetic.
• Differences reveal the coefficient of n in the nth-term expression.
Sums and quadratic patterns
• Since S adds n terms whose average changes linearly, S is generally a quadratic expression in n.

n n

• A difference table helps connect quadratic sum patterns with arithmetic term patterns.

a = S - S

n n n-1

Equations from sequences

• Use two known terms to form simultaneous equations for a and d.

• When a sum is given, substitute in the sum formula and solve the resulting equation for n.

• Check solutions against sequence conditions and reject impossible term numbers.

Useful integer ideas

• Odd numbers form 1,3,5,... and their first n terms sum to n .

• Multiples and remainder classes can be modelled by arithmetic sequences.

• An arithmetic mean between x and y is (x+y)/2; several equally spaced means share one common difference.

Exam focus

• Move fluently between nth term and sum.

• Explain why a formula generates an arithmetic sequence.

• Check integer and positivity conditions on n.

Practice

1. Find the sequence whose 5th term is 18 and 12th term is 46.

2. If S = 3n + 2n, find a .

n n

3. Insert four arithmetic means between 6 and 36.

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CHAPTER 4

Mathematics of Chance

Chapter mission: calculate probabilities by counting equally likely outcomes and interpret chance correctly.

Probability model

• The sample space contains all possible outcomes. An event is a selected set of outcomes.

• Probability lies from 0 to 1. Impossible events have 0 and certain events have 1.

P(E) = number of favourable outcomes / total number of equally likely outcomes

Complement and combinations

• The complement is often easier to count, especially for 'at least one' questions.

• Use organised lists, tables or tree diagrams to avoid missing or repeating outcomes.

P(not E) = 1 - P(E)

Experimental probability

• Relative frequency = event occurrences / number of trials.

• With many fair trials, relative frequency often approaches theoretical probability, but short runs can vary.

• Probability predicts long-run patterns, not a guaranteed next result.

Fairness

• Outcomes must be equally likely before using simple counting directly.

• A game is fair only when its probabilities and rewards give no systematic advantage after accounting for payoff.

Exam focus

• Write the sample space clearly.

• Use the complement for 'at least one'.

• Do not claim past independent results change the next probability.

Practice

1. Find the probability that the sum of two dice is 8.

2. A bag has 5 red, 3 blue and 2 green balls. Find P(not blue).

3. Design and justify a fair spinner game.

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CHAPTER 5

Second Degree Equations

Chapter mission: solve quadratic equations and connect roots, graphs and practical situations.

Quadratic form

• First arrange all terms on one side and simplify.

• Factorisation is fastest when the expression splits into simple linear factors.

$ax + bx + c = 0, a \neq 0$

Completing the square and formula

• Completing the square transforms a quadratic into (x-p) =q.

• The quadratic formula works for every quadratic equation with real or complex roots.

$x = (-b \pm \sqrt{(b - 4ac)}) / 2a$

Discriminant

D = b2 - 4ac Nature of real roots

D > 0 two distinct real roots

D = 0 one repeated real root

D < 0 no real roots

Roots and coefficients

• These relations can build an equation from roots or check a solution.

• In word problems, define the variable, form the equation, solve and reject roots that violate the context.

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

$\alpha\beta = c/a$

Exam focus

• Identify a, b and c with their signs.

• Show both ± branches when taking a square root.

• Check roots in the original equation or situation.

Practice

1. Solve $2x - 7x + 3 = 0$.

2. Find the nature of roots of $3x + 2x + 5 = 0$.

3. Form a quadratic equation with roots 4 and -3.

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CHAPTER 6

Trigonometry

Chapter mission: use trigonometric ratios to calculate sides, angles, heights and distances.

Right-triangle ratios

• Opposite and adjacent depend on the chosen angle θ; hypotenuse is always opposite the right angle.

• Draw and label the triangle before choosing a ratio.

$\sin \theta$ = opposite/hypotenuse

$\cos \theta$ = adjacent/hypotenuse

$\tan \theta$ = opposite/adjacent = $\sin \theta / \cos \theta$

Standard values

θ	sin θ	cos θ	tan θ
0°	0	1	0
30°	1/2	√3/2	1/√3
45°	1/√2	1/√2	1
60°	√3/2	1/2	√3
90°	1	0	not defined

Identities and complementary angles

2 2

$\sin \theta + \cos \theta = 1$

$\sin(90° - \theta) = \cos \theta$

cos(90° - θ) = sin θ

Heights and distances

• Angle of elevation is measured upward from a horizontal line; angle of depression downward.

• Include observer height when the line of sight begins above ground.

• Keep calculator mode in degrees and round only at the final step unless instructed.

Exam focus

• Label opposite/adjacent for the stated angle.

• Memorise exact standard values.

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• Include a clear sketch for application problems.

Practice

1. A pole casts a 10 m shadow when the elevation of the sun is 45°. Find its height.

2. Prove tan θ = sin θ/cos θ.

3. Find sin 60° cos 30° + cos 60° sin 30°.

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CHAPTER 7

Coordinates

Chapter mission: use coordinate geometry to calculate distance, midpoint, division and area.

Coordinate plane

• A point is written (x,y). Quadrant signs are (+,+), (-,+), (-,-), (+,-) in order.

• Horizontal changes affect x; vertical changes affect y.

Distance and midpoint

$$AB = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$$

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Section formula

• The weight attached to one endpoint uses the opposite segment's ratio; test with a midpoint to catch reversal.

$$\text{Point dividing AB internally in ratio } m:n = \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right)$$

Area and collinearity

• Three points are collinear when the calculated triangle area is zero.

• Absolute value ensures area is non-negative regardless of vertex order.

$$\text{Area of triangle} = \frac{1}{2}\left|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right|$$

Exam focus

• Keep ordered pairs and signs exact.

• Use brackets before squaring differences.

• State square units for area.

Practice

1. Find the distance between (-2,3) and (4,-5).

2. Find the point dividing (1,2) and (7,8) in ratio 2:1.

3. Test whether (0,0), (2,3), (4,6) are collinear.

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Final Revision Checklist

• I can distinguish nth-term and sum formulas.

• I can justify circle-angle results.

• I can count probability outcomes systematically.

• I can solve and interpret quadratics.

• I can use trigonometry and coordinates with correct diagrams and signs.

Padikam Learning Content

Prepared as an independent learning companion using the SCERT textbook only as the syllabus and notation reference.