Textbooks: Aligned with all Pakistan Text Board
Online Platforms: Brilliant.org
Fundamentals: https://bit.ly/Brilliant-ContestMath

Mathematics Syllabus

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1. Numbers and Algebra

Objectives:

- Develop fluency in working with fractions, roots, and algebraic expressions.
- Distinguish between different types of numbers (rational, irrational, whole, integers).
- Strengthen foundational algebra skills for higher mathematics.

1.1 Fractions

- Perform operations with fractions and mixed numbers.
- Simplify complex fractions.
- Convert between improper fractions and mixed numbers.

1.2 Squares and Square Roots

- Recognize perfect squares.
- Calculate square roots (exact and approximate).
- Simplify square root expressions.

1.3 Rational and Irrational Numbers

- Identify rational and irrational numbers.
- Perform operations with rational numbers.
- Understand decimal representations: terminating, repeating, and non-repeating.

1.4 Algebraic Expressions

- Simplify expressions using distributive property and like terms.
- Evaluate expressions for given values.

1.5 Equations and Inequalities

- Solve linear equations and inequalities.
- Represent inequalities on a number line.
- Solve absolute value inequalities.

1.6 Logarithms (Introductory)

- Understand the meaning and laws of logarithms.
- Convert between exponential and logarithmic forms.
- Solve simple logarithmic equations.

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2. Equations and Functions

Objectives:

- Apply algebraic methods to solve linear and quadratic problems.
- Develop the ability to represent relationships using functions and graphs.

2.1 Systems of Equations

- Solve systems using substitution and elimination.
- Apply systems of equations to real-life problems.

2.2 Linear Functions

- Understand slope and intercept.
- Graph linear functions.
- Apply linear equations to real-world situations.

2.3 Quadratic Equations

- Recognize the standard form of quadratic equations.
- Solve by factorization, completing the square, and quadratic formula.
- Apply quadratic equations to problem-solving contexts.

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3. Ratios, Proportions, and Combinatorics

Objectives:

- Strengthen problem-solving skills using ratios and proportions.
- Build basic probability and counting strategies.

3.1 Ratios and Proportions

- Solve ratio, rate, and proportion problems.

- Apply proportional reasoning in practical problems.

3.2 Counting and Probability

- Apply addition and multiplication principles of counting.
- Understand basic permutations and combinations.
- Calculate simple probabilities.

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4. Geometry

Objectives:

- Understand geometric properties of polygons, circles, and triangles.
- Apply geometric formulas to solve problems.
- Develop spatial reasoning skills through congruence and similarity.

4.1 Regular Polygons

- Recognize properties of polygons.
- Calculate interior and exterior angles.

4.2 Circles

- Calculate area and circumference.
- Solve problems involving arc length and sector area.

4.3 Composite Figures

- Find perimeter and area of combined figures.

4.4 Pythagorean Theorem

- Apply theorem to find unknown sides of right triangles.
- Solve practical applications of right triangles.

4.5 Congruence and Similarity

- Identify congruent and similar shapes.
- Apply scale factors and transformations.

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5. Measurement

Objectives:

- Apply measurement skills in 2D and 3D contexts.
- Solve real-world problems using volume and surface area.

5.1 Volume and Surface Area

- Calculate volume and surface area of prisms and cylinders.
- Solve problems with composite 3D figures.

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6. Coordinate Geometry

Objectives:

- Develop the ability to connect algebraic equations with geometric graphs.
- Apply coordinate methods to solve distance, midpoint, and line problems.

6.1 Basics

- Plot points on the Cartesian plane.
- Use distance and midpoint formulas.

6.2 Graphing Linear Equations

- Write the equation of a line from given conditions.
- Relate algebraic and graphical representations of lines.

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7. Matrices and Statistics

Objectives:

- Introduce matrices as a tool for organizing data and solving problems.
- Build statistical literacy for analyzing and interpreting data.

7.1 Matrices (Introductory)

- Identify types of matrices.
- Perform matrix operations (addition, subtraction, scalar multiplication).
- Apply matrices to simple problem-solving.

7.2 Statistics

- Collect, organize, and interpret data.
- Calculate mean, median, mode, and range.
- Represent data using bar graphs, histograms, and pie charts.

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8. Mathematical Reasoning and Problem Solving

Objectives:

- Strengthen logical reasoning and analytical thinking.
- Develop strategies to translate real-world problems into mathematical solutions.

8.1 Word Problems

- Translate real-life problems into mathematical models.
- Solve problems using algebraic and geometric approaches.

8.2 Logic and Patterns

- Identify patterns and sequences.
- Solve puzzles using logical reasoning techniques.