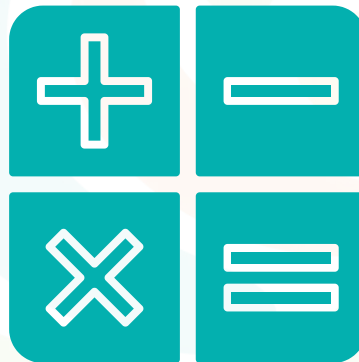




BRAINIACS OLYMPIAD

MATHEMATICS SYLLABUS



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MATHEMATICS SYLLABUS (GRADES 3-4)

Number Operations

- Addition, subtraction, multiplication, and division of numbers up to 10,000.
- Understanding place value and number properties.
- Rounding numbers to the nearest 10, 100, or 1,000.

Fractions

- Addition, subtraction, multiplication, and division of fractions.
- Understanding equivalent fractions.
- Simplifying fractions.
- Comparing and ordering fractions.

Divisibility and Prime Numbers

- Rules of divisibility by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13.
- Identifying prime and composite numbers.
- Finding factors and multiples of numbers.
- Prime factorization.

Measurement

- Understanding systems of measurement (length, area, volume, mass, and time).
- Converting between different units of measurement.
- Solving problems involving units of measurement in real-life contexts.

Geometry

- Recognizing and classifying geometric figures (e.g., triangles, quadrilaterals, circles, etc.).
- Understanding properties of shapes (sides, angles, and symmetry).
- Parallel and perpendicular lines.
- Area and perimeter of rectangles.
- Introduction to the area of other basic geometric shapes

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MATHEMATICS SYLLABUS (GRADES 3-4)

Mathematical Logic

- Using logical reasoning to solve mathematical puzzles.
- Understanding statements that are true or false.
- Applying logical thinking in problem-solving contexts.

Data Interpretation

- Reading and interpreting bar graphs.
- Understanding and creating Venn diagrams.
- Solving problems using data presented in different formats (tables, charts, graphs).

Word Problems

- Solving word problems involving addition, subtraction, multiplication, and division.
- Applying mathematical concepts to real-life scenarios.
- Multi-step word problems.

Patterns and Sequences

- Recognizing and continuing patterns in sequences.
- Identifying arithmetic and geometric sequences.
- Understanding number patterns and finding missing elements.

Time and Calendar

- Reading time on analog and digital clocks.
- Understanding AM and PM.
- Calculating elapsed time.
- Understanding days, weeks, months, and years



This is the end of the syllabus for Grades 3-4
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MATHEMATICS SYLLABUS (GRADES 5-6)

NUMBERS AND ARITHMETIC

Arithmetic Operations:

- Addition, subtraction, multiplication, and division with whole numbers.
- Operations with decimals, fractions, mixed fractions, and improper fractions.
- Order of operations (using parentheses).
- Factors and Multiples:
- Understanding factors, multiples, and divisibility rules.
- Identifying prime and composite numbers.
- Greatest Common Divisor (GCD) and Least Common Multiple (LCM).

Percentage:

- Converting between fractions, decimals, and percentages.
- Solving simple percentage problems (e.g., finding percentages, increasing or decreasing a quantity by a percentage).

ALGEBRA AND EQUATIONS

Linear Equations:

- Solving simple one-step linear equations.
- Understanding and using variables in equations.
- Applying linear equations to solve word problems.

Simple Interest Calculations:

- Understanding the concept of interest.
- Calculating simple interest using the formula $I = \frac{P \times R \times T}{100}$, where P is the principal amount, R is the rate, and T is the time period.

GEOMETRY

Properties of Geometric Figures:

- Understanding properties of squares, rectangles, triangles, parallelograms, and trapeziums.
- Identifying sides, angles, and diagonals

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MATHEMATICS SYLLABUS (GRADES 5-6)

Angles:

- Identifying and measuring acute, right, and obtuse angles.
- Understanding complementary and supplementary angles.
- Perimeter and Area:
 - Calculating the perimeter of polygons.
 - Finding the area of triangles, squares, rectangles, parallelograms, and trapeziums.

Volume:

- Calculating the volume of cubes and cuboids using the formula ,
where l , w , and h are the length, width, and height, respectively.
- Line of Symmetry:
 - Identifying lines of symmetry in various shapes.
 - Understanding symmetry in regular polygons.

MEASUREMENT AND SIMPLE STATISTICS

Measurement:

- Understanding different units of measurement for length, volume, and mass.
- Converting between different units of measurement.

Simple Statistics:

- Calculating and interpreting mean, median, and mode.
- Reading data from charts, graphs, and tables.
- Understanding range as a measure of data variability.

RATIOS AND PROPORTIONS

Understanding Ratios:

- Solving problems involving ratios.
- Using ratios to compare quantities.

Proportions:

- Solving simple proportions.
- Applying proportions to solve real-life problems.
- Problem Solving and Logical Thinking

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PROBLEM SOLVING AND LOGICAL THINKING

Word Problems:

- Translating word problems into mathematical expressions or equations.
- Solving multi-step word problems using arithmetic and basic algebra.
- Pattern Recognition and Logical Reasoning:
 - Identifying patterns and sequences in numbers.
 - Using logical reasoning to solve math puzzles.

Category 1 (Grades 3-4) all topic



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MATHEMATICS SYLLABUS (GRADES 7-8)

NUMBERS AND ALGEBRA

Advanced Topics in Fractions:

- Operations with fractions and mixed numbers.
- Simplifying complex fractions.
- Conversion between improper fractions and mixed numbers.

Squares and Square Roots:

- Understanding perfect squares.
- Calculating square roots (exact and approximate).
- Simplifying square roots.

Rational and Irrational Numbers:

- Identifying rational and irrational numbers.
- Operations involving rational numbers.
- Understanding decimal representations (terminating, repeating, and non-repeating).

Simple Algebraic Expressions:

- Simplifying expressions using the distributive property and combining like terms.
- Evaluating expressions for given variable values.

Equalities and Inequalities:

- Solving linear equalities and inequalities.
- Graphing inequalities on a number line.
- Understanding absolute value inequalities.

EQUATION AND FUNCTIONS

System of Equations:

- Solving systems of linear equations using substitution and elimination methods.
- Application of systems in word problems

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MATHEMATICS SYLLABUS (GRADES 7-8)

Linear Functions:

- Understanding slope and intercept.
- Graphing linear functions.
- Solving real-life problems using linear equations and graphs.

RATIOS, PROPORTIONS, AND COMBINATORICS

Ratio and Proportion:

- Solving problems involving ratios, rates, and proportions.
- Applying proportions to real-world problems.

Simple Combinatorics and Probability:

- Basic counting principles (addition and multiplication rules).
- Introduction to permutations and combinations.
- Basic probability concepts and calculations.

GEOMETRY

Regular Polygons:

- Properties and characteristics of regular polygons.
- Calculating interior and exterior angles.

Area and Circumference of a Circle:

- Using formulas to calculate the area and circumference of circles.
- Solving problems involving arc length and sector area.

Area and Perimeter of Composite Figures:

- Calculating the area and perimeter of shapes composed of multiple geometric figures.

Pythagorean Theorem:

- Applying the Pythagorean theorem to find the length of a side in a right triangle.
- Solving real-world problems using the Pythagorean theorem.

Congruence and Similarity:

- Understanding the properties of congruent and similar shapes.
- Solving problems involving scale factors and transformations

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MATHEMATICS SYLLABUS (GRADES 7-8)

MEASUREMENT

Volume and Surface Area:

- Calculating the volume and surface area of prisms and cylinders.
- Solving problems involving composite three-dimensional figures.

COORDINATE GEOMETRY

Basic Concepts:

- Plotting points on the Cartesian plane.
- Understanding the distance between two points and the midpoint formula.

Graphing Linear Equations:

- Finding the equation of a line given two points or a point and a slope.
- Understanding the relationship between graphical and algebraic representations of lines.

MATHEMATICAL REASONING AND PROBLEM SOLVING

Solving Word Problems:

- Translating word problems into mathematical expressions or equations.
- Using algebraic and geometric approaches to solve complex problems.

Logical Reasoning and Pattern Recognition:

- Identifying patterns and sequences.
- Solving puzzles using logical reasoning techniques.

Category 3 (Grades 5-6) all topic



This is the end of the syllabus for Grades 7-8
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MATHEMATICS SYLLABUS (GRADES 9–10)

NUMBER THEORY AND ALGEBRA

Real Numbers:

- Understanding the properties of real numbers.
- Operations with real numbers, including rational and irrational numbers.
- Absolute values and properties of square roots.

Advanced Topics in Exponentiation:

- Properties and rules of exponents.
- Negative and fractional exponents.
- Simplifying exponential expressions.

Polynomials:

- Addition, subtraction, multiplication, and division of polynomials.
- Factoring techniques and solving polynomial equations.
- Understanding the relationship between roots and coefficients.

Quadratic Functions:

- Graphing quadratic functions and identifying key features (vertex, axis of symmetry, intercepts).
- Solving quadratic equations using factoring, completing the square, and the quadratic formula.
- Applications of quadratic functions in problem-solving.

LOGARITHMS AND EXPONENTIALS

Logarithms:

- Definition and basic properties of logarithms.
- Converting between exponential and logarithmic forms.
- Solving simple logarithmic equations.

Exponential Functions:

- Graphing exponential functions.
- Understanding exponential growth and decay

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MATHEMATICS SYLLABUS (GRADES 9–10)

GEOMETRY

Coordinate Geometry:

- Plotting points and graphing lines on the Cartesian plane.
- Slope, midpoint, and distance formulas.
- Equations of lines, circles, and other conic sections.

Properties of Circles:

- Understanding chords, tangents, and secants.
- Arc lengths and sector areas.
- Angle properties and theorems related to circles.

Volume and Surface Area:

- Calculating the volume and surface area of pyramids, cones, and spheres.
- Solving problems involving composite three-dimensional shapes.

Law of Sines and Cosines:

- Applying the law of sines and cosines to solve triangle problems.
- Using these laws in non-right triangles and real-life applications.

STATISTICS AND PROBABILITY

Mean, Median, and Mode:

- Calculating measures of central tendency.
- Interpreting data using these measures.
- Understanding how outliers affect these measures.

Probability Basics:

- Simple probability concepts.
- Complementary events and independent events.
- Basic combinatorics applied to probability problems.

FUNCTIONS AND GRAPH INTERPRETATION

Graph Interpretation:

- Reading and interpreting graphs of various functions (linear, quadratic, exponential).
- Understanding asymptotes, intercepts, and behavior of graphs

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MATHEMATICS SYLLABUS (GRADES 9–10)

Function Properties:

- Understanding domain, range, and inverse functions.
- Graph transformations (shifting, stretching, and reflecting).

PROBLEM SOLVING AND MATHEMATICAL REASONING

Solving Word Problems:

- Translating real-world problems into mathematical equations.
- Using algebraic and geometric approaches to solve problems.

Logical Reasoning and Pattern Recognition:

- Solving puzzles and logical problems.
- Identifying patterns and sequences.

ADDITIONAL TOPICS

Sequences and Series:

- Understanding arithmetic and geometric sequences.
- Finding the sum of finite arithmetic and geometric series.

Inequalities:

- Solving linear and quadratic inequalities.
- Graphical representation of inequalities.

Category 3 (Grades 7-8) all topics



This is the end of the syllabus for Grades 9-10
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MATHEMATICS SYLLABUS (GRADES 11–12)

ADVANCED ALGEBRA

Advanced Topics in Algebra:

- Polynomial equations and inequalities.
- Rational expressions and functions.
- Techniques for solving higher-degree equations.

Remainder and Factor Theorems:

- Understanding and applying the remainder theorem.
- Using the factor theorem to factorize polynomials.
- Solving polynomial equations using these theorems.

Non-Linear Equations:

- Solving quadratic, cubic, and higher-degree equations.
- Understanding the nature of roots (real, complex, equal, etc.).
- Application of the quadratic formula and Vietasformulas.

INEQUALITIES AND MATHEMATICAL ANALYSIS

Advanced Topics in Inequalities:

- Absolute value inequalities.
- Systems of inequalities.
- Summation of Series:
- Arithmetic and geometric series.

Summation techniques for more complex series.

- Using sigma notation and properties of summation.

LOGARITHMS AND EXPONENTIALS

Advanced Topics in Logarithms:

- Properties and laws of logarithms.
- Solving logarithmic and exponential equations.
- Applications in growth and decay problems.

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MATHEMATICS SYLLABUS (GRADES 11–12)

BINOMIAL THEOREM

Application of the Binomial Theorem:

- Expanding expressions using the binomial theorem.
- Finding specific terms in a binomial expansion.
- Applications in combinatorics and algebra

COMBINATORICS AND PROBABILITY

Advanced Topics in Combinatorics:

- Permutations and combinations.
- Pigeonhole principle and inclusion-exclusion principle.
- Advanced counting techniques.

Advanced Probability:

- Conditional probability and Bayes theorem.
- Probability distributions (basic concepts).
- Solving complex probability problems.

GEOMETRY AND TRIGONOMETRY

Advanced Topics in Coordinate Geometry:

- Equations of lines, circles, ellipses, parabolas, and hyperbolas.
- Solving geometric problems using coordinate methods.
- Loci and geometric transformations.

Advanced Topics in Trigonometry:

- Solving trigonometric equations.
- Using identities and formulas (sum, difference, double-angle, angle).
- Trigonometric applications in geometry.

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ADDITIONAL TOPICS

Functions and Graphing:

- Understanding different types of functions (linear, quadratic, polynomial, trigonometric, exponential, logarithmic).
- Analyzing graphs of functions and their transformations.

Basic Calculus (Introductory Level):

- Understanding limits and continuity.
- Differentiation and simple applications.
- **Category 4 (Grades 9-10) all topics**



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