

Geometry

Gyaanbhoomi Academic Curriculum

Course Description

This course provides a comprehensive study of Euclidean geometry, covering points, lines, planes, and figures in two and three dimensions. Students will develop critical thinking and deductive reasoning skills through logical arguments and the construction of formal proofs. Topics are explored from an algebraic and transformational perspective.

Topics Covered

Unit 1: Foundations of Geometry

- Points, Lines, Planes, and Angles
- Segment and Angle Addition Postulates
- Distance and Midpoint Formulas
- Basic Geometric Constructions

Unit 2: Logical Reasoning and Proof

- Inductive and Deductive Reasoning
- Conditional Statements (Converse, Inverse, Contrapositive)
- Algebraic and Geometric Proofs (Two-Column, Flow, Paragraph)
- Postulates, Axioms, and Theorems

Unit 3: Parallel and Perpendicular Lines

- Transversals and Angle Pair Relationships
- Proving Lines are Parallel
- Slopes of Parallel and Perpendicular Lines
- Writing Equations of Lines

Unit 4: Triangle Congruence

- Classifying Triangles by Sides and Angles
- Triangle Sum Theorem and Exterior Angle Theorem
- Congruence Postulates and Theorems: SSS, SAS, ASA, AAS, HL
- Congruent Parts of Congruent Triangles are Congruent (CPCTC)

Unit 5: Properties of Triangles

- Perpendicular Bisectors, Angle Bisectors, Medians, and Altitudes
- Points of Concurrency (Circumcenter, Incenter, Centroid, Orthocenter)
- The Triangle Inequality Theorem
- Isosceles and Equilateral Triangle Theorems

Unit 6: Similarity

- Ratios, Proportions, and Similar Polygons
- Proving Triangles Similar: AA, SSS, and SAS Similarity
- Triangle Proportionality Theorem
- Geometric Mean in Right Triangles

Unit 7: Right Triangles and Trigonometry

- The Pythagorean Theorem and its Converse
- Special Right Triangles ($45^\circ - 45^\circ - 90^\circ$ and $30^\circ - 60^\circ - 90^\circ$)
- Trigonometric Ratios: Sine, Cosine, Tangent (sin, cos, tan)
- Inverse Trigonometric Functions and Solving Right Triangles

Unit 8: Quadrilaterals and Other Polygons

- Properties of Parallelograms, Rectangles, Rhombi, Squares, and Trapezoids
- Angle Sum and Exterior Angle Theorems for Polygons
- Coordinate Geometry Proofs for Quadrilaterals

Unit 9: Circles

- Properties of Tangents, Chords, and Arcs
- Inscribed Angles and Inscribed Polygons
- Angle and Segment Relationships in Circles (Secants, Tangents)
- Standard Equation of a Circle: $(x - h)^2 + (y - k)^2 = r^2$

Unit 10: Area and Volume

- Area of Polygons, Circles, and Sectors
- Surface Area of Prisms, Cylinders, Pyramids, Cones, and Spheres
- Volume of Prisms, Cylinders, Pyramids, Cones, and Spheres
- Effects of changing dimensions on Perimeter, Area, and Volume

Unit 11: Transformations

- Reflections, Translations, Rotations, and Dilations
- Composition of Transformations and Symmetry
- Introduction to Vectors