Indiana Mathematics

Geometry: Grades 9, 10, 11, 12

Adopted 2023

Mathematics Process Standards

1. **Make sense of problems and persevere in solving them.** HS.PS.1
2. **Reason abstractly and quantitatively.** HS.PS.2
3. **Construct viable arguments and critique the reasoning of others.** HS.PS.3
4. **Model with mathematics.** HS.PS.4
5. **Use appropriate tools strategically.** HS.PS.5
6. **Attend to precision.** HS.PS.6
7. **Look for and make use of structure.** HS.PS.7
8. **Look for and express regularity in repeated reasoning.** HS.PS.8

Skip to main content

Geometry Foundations

GF. Students apply the logic of geometric proofs, including in core concepts related to angles and lines. G.GF

1. Describe the structure of and relationships within an axiomatic system (undefined terms, definitions, axioms and postulates, methods of reasoning, and theorems) and explain differences among supporting evidence, counterexamples, and actual proofs. G.GF.1
2. State, use, and examine the validity of the converse, inverse, and contrapositive of conditional ("if – then") and bi-conditional ("if and only if") statements. G.GF.2
3. Develop geometric proofs, including those involving coordinate geometry, using two-column, paragraph, and flow chart formats. G.GF.3
4. Prove, construct, and apply theorems about parallel and perpendicular lines, parallel lines and transversals, vertical angles, and perpendicular bisectors. G.GF.4
5. Determine if a pair of lines are parallel, perpendicular, or neither by comparing the slopes in coordinate graphs and equations. G.GF.5
6. Use tools to explain and justify the process to construct congruent segments and angles, angle bisectors, perpendicular bisectors, altitudes, medians, parallel and perpendicular lines, and parallel lines and transversals. G.GF.6
7. Develop the distance formula using the Pythagorean Theorem. Find the lengths and midpoints of line segments in the two-dimensional coordinate system. G.GF.7

Triangles

T. Students solve real-world and mathematical problems involving triangles, including proofs of theorems and definitions of trigonometric ratios. G.T

1. Prove and apply theorems about triangles, including: G.T.1
   a. Interior angles of a triangle sum to 180° G.T.1.A
   b. The Isosceles Triangle Theorem and its converse G.T.1.B
   c. The Pythagorean Theorem G.T.1.C
   d. The segment joining midpoints of two sides of a triangle is parallel to the third side and half the length G.T.1.D
   e. A line parallel to one side of a triangle divides the other two proportionally, and its converse G.T.1.E
   f. The Angle Bisector Theorem G.T.1.F
   g. Triangle inequality G.T.1.G
   h. Inequality in one triangle G.T.1.H
   i. Hinge Theorem and its converse G.T.1.I
2. Prove and apply criteria for triangle congruence (ASA, SAS, AAS, SSS, and HL) from the definition of congruence in terms of rigid motions. G.T.2
3. Use the definition of similarity in terms of similarity transformations to determine if two given triangles are similar. Explore and develop the meaning of similarity for triangles. G.T.3

Skip to main content

4. Use congruent and similar triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles. G.T.4
5. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. G.T.5
6. Use trigonometric ratios (sine, cosine, tangent, and their inverses) and the Pythagorean Theorem to solve real-world and mathematical problems involving right triangles. G.T.6
7. Use the relationship between the sides of special right triangles (30° - 60° and 45° - 45°) to solve real-world and other mathematical problems. G.T.7

Quadrilaterals & Other Polygons

QP. Students solve real-world and mathematical problems involving regular and irregular polygons, including proofs of theorems. G.QP

1. Prove and apply theorems about parallelograms, including those involving angles, diagonals, and sides. G.QP.1
2. Prove that given quadrilaterals are parallelograms, rhombuses, rectangles, squares, kites, or trapezoids. Include coordinate proofs of quadrilaterals in the coordinate plane. G.QP.2
3. Develop and use formulas to find measures of interior and exterior angles of polygons. G.QP.3
4. Compute perimeters and areas of regular and irregular polygons to solve real-world and other mathematical problems. G.QP.4

Circles

CI. Students solve real-world and mathematical problems involving circles. G.CI

1. Define, identify, and use relationships among the following: radius, diameter, arc, measure of an arc, chord, secant, tangent, congruent circles, and concentric circles. G.CI.1
2. Explore and use relationships among inscribed angles, radii, and chords, including the following: G.CI.2
   a. The relationship that exists between central, inscribed, and circumscribed angles; G.CI.2.A
   b. Inscribed angles on a diameter are right angles; and G.CI.2.B
   c. The radius of a circle is perpendicular to a tangent where the radius intersects the circle. G.CI.2.C
3. Solve real-world and other mathematical problems that involve finding measures of circumference, areas of circles and sectors, and arc lengths and related angles (central, inscribed, and intersections of secants and tangents). G.CI.3

Transformations & Th So

TS. Students solve real-world and mathematical problems involving transformations of figures and three-dimensional solids. G.TS

Skip to main content

1. Use geometric descriptions of rigid motions to transform figures and to predict and describe the results of translations, reflections and rotations on a given figure. Describe a motion or series of motions that will show two shapes are congruent. G.TS.1
2. Verify experimentally the properties of dilations given by a center and a scale factor. Understand the dilation of a line segment is longer or shorter in the ratio given by the scale factor. G.TS.2
3. Explore properties of congruent and similar solids, including prisms, regular pyramids, cylinders, cones, and spheres, and use them to solve problems. G.TS.3
4. Solve real-world and other mathematical problems involving volume and surface area of prisms, cylinders, cones, spheres, and pyramids, including problems that involve composite solids and algebraic expressions. G.TS.4
5. Apply geometric methods to create and solve design problems. G.TS.5