Indiana Mathematics Content Connectors

Geometry

Geometry Foundations 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. (E) G.GF.1

- a Define geometric terms including point, line, plane, skew, parallel lines, parallel planes, perpendicular lines, and perpendicular planes. Be able to draw and label pictures involving the vocabulary. (E) G.GF.1A

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

- a State the converse, inverse, and contrapositive of a real-world conditional ("if-then") statement. (E) G.GF.2A

3 Develop geometric proofs, including those involving coordinate geometry, using two-column, paragraph, and flow chart formats. G.GF.3

- a Organize two-column geometric proofs given the statements and reasons to create a logical flow of arguments. G.GF.3A

4 Prove, construct, and apply theorems about parallel and perpendicular lines, parallel lines and transversals, vertical angles, and perpendicular bisectors. (E) G.GF.4

- a Apply theorems about parallel lines and transversals to name and label angle relationships including: vertical angles, corresponding angles, alternate interior angles, alternate exterior angles, and consecutive angles. Apply theorems about perpendicular bisectors. G.GF.4A

5 Determine if a pair of lines are parallel, perpendicular, or neither by comparing the slopes in coordinate graphs and equations. (E) G.GF.5

- a Determine if a pair of lines are parallel, perpendicular, or neither by comparing the slopes in coordinate graphs and equations in the form y = mx+b. (E) G.GF.5A

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

- a Use tools to construct congruent segments, midpoints, perpendicular bisectors, and congruent angles. G.GF.6A

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)evelop the distance formula using the Pythagorean Theorem. Find the lengths and midpoints of line segments in the two-dimensional coordinate system.

(E) G.GF.7

a Find lengths and midpoints of line segments in the two-dimensional coordinate system using distance and midpoint formulas. (E) G.GF.7A

Triangles T

1 **Prove and apply theorems about triangles, including: a. Interior angles of a triangle sum to 180° b. The Isosceles Triangle Theorem and its converse c. The Pythagorean Theorem d. The segment joining midpoints of two sides of a triangle is parallel to the third side and half the length e. A line parallel to one side of a triangle divides the other two proportionally, and its converse f. The Angle Bisector Theorem g. Triangle inequality h. Inequality in one triangle i. Hinge Theorem and its converse (E)** G.T.1

a Apply theorems about triangles, including: a. Interior angles of a triangle sum to 180^0 b. The Isosceles Triangle Theorem c. The Pythagorean Theorem d. The Midsegment Theorem G.T.1A

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2 **Prove and apply criteria for triangle congruence (ASA, SAS, AAS, SSS, and HL) from the definition of congruence in terms of rigid motions. (E)** G.T.2

a Determine which side or angle is "included" between the given angles or sides of a triangle. Prove triangle congruence using SSS, SAS, and ASA by naming which corresponding sides and angles of a triangle are congruent based on given information. G.T.2A

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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

a Use the definition of similarity to determine if two given triangles are similar. (E) G.T.3A

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4 **Use congruent and similar triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles. (E)** G.T.4

a Use congruent triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles. (E) G.T.4A

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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

a Label the parts of a right triangle identifying the hypotenuse, the opposite, and the adjacent side given an angle of reference. Identify the trigonometric ratio needed to solve problems involving right triangles based on given information. (E) G.T.5A

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6 **Use trigonometric ratios (sine, cosine, tangent, and their inverses) and the Pythagorean Theorem to solve real-world and mathematical problems involving right triangles. (E)** G.T.6

a Use trigonometric ratios (sine, cosine, and tangent) and the Pythagorean Theorem to solve real-world and mathematical problems involving right triangles. G.T.6A

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7 **Use the relationship between the sides of special right triangles (30° - 60° and 45° - 45°) to solve real-world and other mathematical problems. (E)** G.T.7

a Find the length of the third side of a special right triangle given the length of the other two sides using the relationship between the sides of 30° - 60° - 90° and 45° - 45° - 90° triangles. G.T.7A

Quadrilaterals & Other Polygons QP

1 **Prove and apply theorems about parallelograms, including those involving angles, diagonals, and sides. (E)** G.QP.1

a Apply theorems about parallelograms including those involving angles, diagonals, and sides. G.QP.1A

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

a Prove that given quadrilaterals are parallelograms, rectangles, or squares. G.QP.2A

3 **Develop and use formulas to find measures of interior and exterior angles of polygons.** G.QP.3

a Use formulas to find measures of interior and exterior angles of regular polygons. G.QP.3A

4 **Compute perimeters and areas of regular and irregular polygons to solve real-world and other mathematical problems. (E)** G.QP.4

a Find the perimeter and area of regular polygons given the formula and labeled diagram. (E) G.QP.4A

Circles 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

a Define and label parts of a circle including: radius, diameter, arc, and chord. (E) G.CI.1A

2 **Explore and use relationships among inscribed angles, radii, and chords, including the following: a. The relationship that exists between central, inscribed, and circumscribed angles; b. Inscribed angles on a diameter are right angles; and c. The radius of a circle is perpendicular to a tangent where the radius intersects the circle.** G.CI.2

a Explore and use relationships among radii, chords, and sectors to include the following: a. Draw/label a central angle and find the relationship between the angle and intercepted arc; and b. Draw/label an inscribed angle and find the relationship between the angle and intercepted arc. G.CI.2A

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). (E)** G.CI.3

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a Solve real-world and mathematical problems involving circumference and area of a circle. (E) G.CI.3A

Transformations & Three-Dimensional Solids TS

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. (E)** G.TS.1

a Describe the results of translations, reflections, and rotations. (E) G.TS.1A

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

a Describe a dilation as an enlargement or reduction, then calculate the scale factor. G.TS.2A

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

a Describe solids as congruent and similar solids, including prisms, regular pyramids, cylinders, cones, and spheres. G.TS.3A

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. (E)** G.TS.4

a Solve real-world and other mathematical problems involving volume of prisms when provided the formula. Solve problems involving surface area of prisms, cylinders, and pyramids, when given the net of the solid. (E) G.TS.4A

5 **Apply geometric methods to create and solve design problems. (E)** G.TS.5

a Design and draw 3D models of prisms, pyramids, cylinders, and/or cones. G.TS.5A