

Independent School District of Boise City

Accelerated Geometry

District Course #0823

Course Description

Open to: Grades 9, One Year Course

Prerequisite: Accelerated Algebra and Instructor/counselor approval

Content: Students study solid geometry and solving more difficult geometric problems as well as studying coordinate geometry.

Adopted Materials

Title: Geometry: for Enjoyment and Challenge

Edition: 1991

Publisher: McDougal, Littell & Company

ISBN: 0-86609-965-4

Course Scope

Unit 1	Introduction to Geometry	2 weeks
Unit 2	Basic Concepts and Proofs	3 weeks
Unit 3	Congruent Triangles	3 weeks
Unit 4	Lines in the Plane	3 weeks
Unit 5	Parallel Lines and Quadrilaterals	4 weeks
Unit 6	Lines and Planes in Space (optional)	1 week
Unit 7	Polygons	2 weeks
Unit 8	Similar Polygons	2 weeks
Unit 9	Pythagorean Theorem	4 weeks
Unit 10	Circles	3 weeks
Unit 11	Area	3 weeks
Unit 12	Surface Area and Volume	3 weeks
Unit 13	Coordinate Geometry	2 weeks

Unit 1	Introduction to Geometry	2 weeks
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Instructional Objective		Standard Reference	
0823.01 Understand and apply basic geometric concepts.		G.4.1.1, G.4.3.1, G.4.2.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Apply basic terminology and notation (points, lines, planes, rays, angles, segments, vertex, union, intersection and triangle).	pp. 3-6	EOC, TMA
02	Find lengths of segments.	p.9	EOC, TMA
03	Find the measure of angles.	pp. 9-12	EOC, TMA
04	Classify angles by their measure.	p. 11	EOC, TMA
05	Apply congruence to angles and segments.	p. 12	EOC, TMA
06	Recognize co linearity and betweenness.	p. 18	EOC, TMA

07	Interpret geometric diagrams.	p. 19	EOC, TMA
08	Apply the triangle inequality.	p. 19	EOC, TMA
09	Write simple two column proofs.	p. 23	EOC, TMA
10	Identify bisectors and trisectors of segments and angles.	pp. 28-30	EOC, TMA
11	Write a paragraph proof.	pp. 36-37	EOC, TMA
12	Understand elements of deductive structure.	pp. 39-41	EOC, TMA
13	Write and apply statements of logic (conditionals, negations, converses, inverses, contra positives and the chain rule).	pp. 44-46	EOC, TMA
14	Solve basic probability problems.	pp. 49-50	EOC, TMA

Unit 2	Basic Concepts and Proofs	3 weeks
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Instructional Objective		Standard Reference	
0823.02 Apply vocabulary and understand the foundations for proof.		G.4.4.1, G.4.2.1, G.4.1.2.G.3.2.1, G.4.1.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Apply perpendicularity to lines, rays and segments.	pp. 61-63	EOC, TMA
02	Recognize and compute angle supplements and complements.	pp. 66-68	EOC, TMA
03	Develop a framework from which to draw conclusions.	pp. 72-73	EOC, TMA
04	Prove angles are congruent.	pp. 76-78	EOC, TMA
05	Apply the addition property to segments and angles.	pp. 82-84	EOC, TMA
06	Apply the multiplication property to segments and angles.	pp. 89-91	EOC, TMA
07	Apply the transitive/substitution property to angles and segments.	pp. 95-97	EOC, TMA
08	Recognize opposite rays and vertical angles.	pp. 100-101	EOC, TMA

Unit 3	Congruent Triangles	3 weeks
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Instructional Objective		Standard Reference	
0823.03 Prove triangles and their corresponding parts congruent.		G.4.1.2, G.4.1.3, G.2.2.2	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Understand congruent figures and their corresponding parts.	pp. 111-113	EOC, TMA
02	Prove triangles congruent (SSS, SAS, ASA, HL).	pp. 115-119, 156-158	EOC, TMA
03	Apply the principle of CPCTC.	pp. 125	EOC, TMA
04	Identify medians and altitudes of triangles.	pp. 131-133	EOC, TMA

05	Use overlapping triangles in proofs.	pp. 138-139	EOC, TMA
06	Classify triangles by their angle measure and side length.	pp. 142-143	EOC, TMA

Unit 4	Lines in the plane	3 weeks
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Instructional Objective		Standard Reference	
0823.04 Determine the relationship between lines in a plane and the angles they form.		G.4.2.1, G.3.2.1, G.2.2.2., G.3.1.1,	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Apply the midpoint formula.	pp. 170	EOC, TMA
02	Prove that angles are right angles.	pp. 180-181	EOC, TMA
03	Apply the relationship between equidistance and perpendicularity.	pp. 184-186	EOC, TMA
04	Identify the relationship between the angles formed by two parallel lines and a transversal.	pp. 192-195	EOC, TMA
05	Determine if lines are parallel or perpendicular by their slopes.	pp. 198-200	EOC, TMA

Unit 5	Parallel lines and Quadrilaterals	4 weeks
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Instructional Objective		Standard Reference	
0823.05 Prove lines parallel and specificity of a quadrilateral.		G.4.1.3, G.2.2.2	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Write indirect proof.	p. 212	EOC, TMA
02	Prove that lines are parallel.	pp. 216-218	EOC, TMA
03	Identify and apply the relationships of the angles formed by two parallel lines and a transversal.	pp. 224-227	EOC, TMA
04	Define quadrilaterals.	p. 236	EOC, TMA
05	Identify properties of quadrilaterals.	pp. 241-242	EOC, TMA
06	Prove that a four- sided figure is a specific quadrilateral.	p. 249, 255-256	EOC, TMA

Unit 6	Lines and planes in space.	1 week
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Instructional Objective		Standard Reference	
0823.06 Understand the relationships between lines and planes of a given plane.		G.2.2.2, G.3.1.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Understand basic concepts of lines and planes in three dimensional spaces.	pp. 269-271	EOC, TMA
02	Determine if lines and planes are perpendicular.	pp. 276-277	EOC, TMA

03	Determine the relationship between planes.	pp. 282-283	EOC, TMA
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Unit 7	Polygons	2 weeks
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Instructional Objective		Standard Reference	
0823.07 Calculate the number of sides and angle measures for a specific polygon.		G.2.2.2	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Apply triangle application theorems.	pp. 295-296, 302	EOC, TMA
02	Calculate the side and or angle measures in a polygon.	pp. 307-308, 314-315	EOC, TMA

Unit 8	Similar Polygons	2 weeks
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Instructional Objective		Standard Reference	
0823.08 Determine lengths and angle measures in similar triangles.		G.4.1.3, G.4.1.2	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Apply ratios and proportions to solve problems.	pp. 325-328	EOC, TMA
02	Identify the characteristics of similar figures.	pp. 332-334	EOC, TMA
03	Prove triangles similar (AA,SSS, SAS)	pp. 339-340	EOC, TMA
04	Determine congruencies and proportions in similar triangles.	pp. 345-346, 351-352	EOC, TMA

Unit 9	Pythagorean Theorem	4 weeks
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Instructional Objective		Standard Reference	
823.09 Solve right triangle problems using the Pythagorean Theorem or the quadratic formula.		, G.1.3.1, G.2.2.2, G.4.1.4, G.2.2.2	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Simplify radical expressions.	p. 368	EOC, TMA
02	Solve quadratic equations.	p. 368	EOC, TMA
03	Solve problems involving circles.	pp. 370-371	EOC, TMA
04	Attempt the geometric mean problems.	pp. 377-378	EOC, TMA
05	Identify properties of quadrilaterals.	pp. 241-242	EOC, TMA
06	Solve problems by applying the Pythagorean Theorem and its converse.	pp. 384-386, 398-399, 413-414	EOC, TMA
07	Compute the lengths of segments in the coordinate plane.	pp. 392-394	EOC, TMA
08	Solve special right triangles.	pp. 405-406	EOC, TMA
09	Apply the trigonometric ratios to right triangle.	pp. 418-419, 423	EOC, TMA

Unit 10	Circles	3 weeks
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Instructional Objective		Standard Reference	
0823.10 Solve problems involving circles.		G.2.2.1, G.2.2.2, G.1.3.1, G.1.1.1, G.4.1.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Solve problems involving chords, radii, and diameters.	pp. 439-441	EOC, TMA
02	Apply the relationships of segments on a circle.	pp. 446. 459-462, 493-494	EOC, TMA
03	Apply the relationships of angles and arcs on a circle.	pp. 450-453, 468-472, 479-480, 499-500	EOC, TMA
04	Apply the characteristics of inscribed and circumscribed polygons.	pp. 486-488	EOC, TMA

Unit 11	Area	3 weeks
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Instructional Objective		Standard Reference	
0823.11 Calculate the areas of two dimensional shapes.		G.2.2.1, G.2.2.2, G.4.1.2, G.2.1.1, G.1.1.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Calculate the areas of polygons.	pp. 512, 516-517, 523-524, 528, 531-532, 550-551	EOC, TMA
02	Calculate the areas of circles, sectors and segments.	pp. 537-538	EOC, TMA
03	Find and interpret the ratios of the areas of similar figures.	pp. 543-544	EOC, TMA

Unit 12	Surface Area and Volume	3 weeks
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Instructional Objective		Standard Reference	
823.12 Calculate the surface area and volume of three dimensional shapes.		G.2.2.1, G.2.2.2, G.4.1.1, G.1.1.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Find the surface area of a three dimensional shape.	pp. 561-562, 565, 570-571	EOC, TMA
02	Find the volume of a three dimensional shape.	pp. 575-577, 583-584, 589	EOC, TMA

Unit 13	Coordinate Geometry	2 weeks
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Instructional Objective		Standard Reference	
0823.13 Solve problems using coordinate geometry.		G.3.1.1, G.2.2.2, G.3.2.1, G.4.2.1	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Graphing lines and circles.	pp. 605-607, 638	EOC, TMA
02	Write equations of lines.	pp. 610-612, 638	EOC, TMA
03	Solve systems of equations.	pp. 618, 636, 638	EOC, TMA
04	Graph inequalities.	pp. 622-624, 638	EOC, TMA
05	Three dimensional graphing.	pp. 626-628, 638	EOC, TMA
06	Write the equation of a circle.	pp. 633-634, 638	EOC, TMA

**IDAHO CONTENT STANDARDS
GEOMETRY
MATHEMATICS**

Students are expected to know content and apply skills from Algebra I and prior math courses.

Mathematical reasoning and problem solving processes will be incorporated throughout all mathematics standards. When solving problems, students should think ahead about a strategy, form conjectures, test ideas with special cases, try different approaches, check for errors and reasonableness of solutions as a regular part of routine work, and devise independent ways to verify results. Students will demonstrate knowledge and communicate mathematical thinking through words, numbers, symbols, charts, graphs, tables, diagrams, and models.

Maintenance Concepts should have been taught previously and are important foundational concepts that will be applied in this course. Continued facility with and understanding of the Maintenance Concepts is essential for success in the objectives for this course.

Objectives provide the focus for this course. They will be taught using a variety of methods and applications so that students attain a deep understanding of these concepts and are able to apply them to solve contextual situations.

Skill Statements are provided when appropriate for clarity and direction to achieve each objective. Students need to demonstrate proficiency in these skills upon completion of this course.

The appropriate use of technological tools is encouraged to assist students in the formation and testing of conjectures, creating graphs and data displays, and determining and assessing lines of best fit for data.

Standard 1: Number and Operation

Maintenance Concepts for Standard 1

- Use ratios, including π , and proportions to solve problems.
- Classify real numbers as rational or irrational.
- Distinguish between exact and approximate values of irrational numbers.
- Approximate the location of an irrational number on a number line.
- Use appropriate methods to estimate answers and know if they are reasonable.
- Select a suitable method of computing from mental mathematics, paper and pencil, calculators, or computers.
- Simplify square roots containing radicands which are not perfect squares.
- Find exact and approximate values for square roots.

Goal 1.1: Understand numbers, ways of representing numbers, relationships among numbers, and number system.

Objective(s): By the end of Geometry, the student will be able to:

G.1.1.1 Understand the meanings of real numbers.

Skill Statements:

- a. Define and explain the meaning of π .
- b. Recognize π as an irrational number.
- c. Use 3.14 and/or $\frac{22}{7}$ as an approximation for π .

Goal 1.2: Understand meanings of operations and how they relate to one another.

No objectives at this course level.

Goal 1.3: Compute fluently and make reasonable estimates.

Objective(s): By the end of Geometry, the student will be able to:

G.1.3.1 Judge the reasonableness of numerical computations and their results.

Skill Statements:

- a. Use appropriate methods to estimate answers and know if they are reasonable.
- b. Simplify expressions in terms of π .

<u>Suggested Vocabulary and Symbols</u>

π , radical, irrational

Standard 2: Concepts and Principles of Measurement

Maintenance Concepts for Standard 2

- Understand both metric and customary systems of measurement.
- Understand relationships among units and convert from one unit to another.
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.
- Use appropriate methods and units to estimate measurements.
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.
- Select and use formulas to determine the circumference and area of circles, perimeters and areas of triangles and quadrilaterals.
- Develop strategies to determine the areas of irregular shapes.
- Solve problems involving scale factors, rates, ratios, and proportions.

Goal 2.1: Understand measurable attributes of objects and the units, systems, and processes of measurement.

Objective(s): By the end of Geometry, the student will be able to:

G.2.1.1 Select appropriate units for problems involving measurement.

Skill Statement:

- a. Determine appropriate units for distance, angle measure, area, and volume.
- b. Judge the effects of scale factors on length, area, and volume.

Goal 2.2: Apply appropriate techniques, tools, and formulas to determine measurements.

Objective(s): By the end of Geometry, the student will be able to:

G.2.2.1 Understand and use formulas to calculate the perimeter, circumference, area, surface area, and volume of geometric figures.

Skill Statements:

- a. Determine the circumference, area, and area of a sector of a circle.
- b. Determine the perimeter and area of triangles, parallelograms, and other regular polygons.
- c. Determine the surface area and volume of prisms, cylinders, pyramids, cones, and spheres.

G.2.2.2 Understand and apply definitions, theorems, corollaries, and postulates to determine measurement.

Skill Statements:

- a. Apply the segment addition postulate to determine lengths of segments.
- b. Apply the angle addition postulate to determine the measures of angles.
- c. Determine the measures of angles in relation to adjacent, complementary, supplementary, vertical, linear pairs, and the special angle pairs formed by parallel lines and transversals.
- d. Understand and apply the Pythagorean Theorem for problem solving.
- e. Determine the lengths and measures of arcs of a circle.
- f. Determine the lengths of segments and measure of angles formed by radii, chords, secants, and tangents of circles.
- g. Determine the measures of inscribed and central angles and their corresponding intercept arcs.
- h. Determine the sums of the interior and exterior angles of a polygon.
- i. Determine the measure of each interior and exterior angle of a regular polygon.

Suggested Vocabulary and Symbols

apothem, base of a polygon, cone, circumference, cylinder, diameter, face, lateral area, prism, pyramid, regular polygon, radii, semicircle, sphere, altitude, arc length, axioms, postulates, central angle, chord, common tangent, consecutive interior angles or same side interior angles, corollary, diagonal, exterior angle, interior angle, hemisphere, hypotenuse, inscribed angle, intercepted arc, legs of a right triangle, legs of a trapezoid, linear pair, segment notation, major arc, minor arc, point of tangency, Pythagorean triple, Pythagorean Theorem, secant line, tangent line, secant segment, sector of a circle, vertex

Standard 3: Concepts and Language of Algebra and Functions

Maintenance Concepts for Standard 3

- Define and interpret relations and functions numerically, graphically, and algebraically.
- Write equations and inequalities to represent data.
- Solve multi-step linear equations and inequalities.
- Add, subtract, and multiply polynomials.
- Divide a polynomial by a monomial.
- Factor polynomials including using greatest common factor.
- Write the equation or inequality in slope-intercept, point-slope, and standard form.
- Graph linear equations.
- Interpret the solution in light of the context.
- Evaluate the equation or inequality for a given value.
- Create a table of values.
- Find and interpret the slope (rate of change) and intercepts in relation to the context.
- Solve linear systems of equations and inequalities involving two variables using multiple strategies.

Goal 3.1: Understand patterns, relations, and functions.

Objective(s): By the end of Geometry, the student will be able to:

- G.3.1.1 Describe the graphs of linear functions and discuss their appearances in terms of the basic concepts of intercepts and rate of change.

Skill Statements:

- a. Given the equation of a line, determine the slopes of the lines parallel and perpendicular to the given line.
- b. Given the equation of a line, graph the lines parallel and perpendicular to it through a given point.

Goal 3.2: Represent and analyze mathematical situations and structures using algebraic symbols.

Objective(s): By the end of Geometry, the student will be able to:

G.3.2.1 Represent linear patterns and relationships with an equation.

Skill Statements:

- a. Write equations of parallel and perpendicular lines.

Goal 3.3: Use mathematical models to represent and understand quantitative relationships.

No objectives at this course level.

Goal 3.4: Analyze change in various contexts.

No objectives at this course level.

Standard 4: Concepts and Principles of Geometry

Maintenance Concepts for Standard 4

- Know and apply algebraic properties (commutative, associative, distributive, inverse, identity, multiplicative property of zero, properties of equality).
- Develop proportional relationships to solve problems.
- Describe and classify relationships among types of one-, two-, and three-dimensional geometric figures using their defining properties.
- Draw and measure various angles and shapes using appropriate tools.

Goal 4.1 Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Objective(s): By the end of Geometry, the student will be able to:

G.4.1.1 Analyze properties and determine attributes of two- and three-dimensional objects.

Skill Statements:

- a. Apply the fundamental concepts, properties, and relationships among points, lines, rays, planes, and angles.
- b. Use accepted geometric notation for lines, planes, segments, rays, angles, similarity and congruence.
- c. Identify and determine relationships in adjacent, complementary, supplementary, and vertical angles, and in linear pairs.
- d. Identify and use the special angle pairs formed by parallel lines and a transversal.
- e. Identify the parts of a circle including radius, diameter, major/minor arcs, chords, secants and tangents.
- f. Classify angles by their measure (acute, right, obtuse, straight).

- g. Classify triangles by side and angle (acute, right, obtuse, scalene, isosceles, equilateral, equiangular).
- h. Classify quadrilaterals by their attributes (parallelograms, trapezoids, rectangles, rhombi, squares).
- i. Classify polygons by sides and concavity.

G.4.1.2 Explore congruence and similarity among classes of two dimensional objects and solve problems involving them.

Skill Statements:

- a. Identify and apply congruency and similarity in two-dimensional figures.
- b. Identify the scale factor between two similar figures and use it to find missing lengths.
- c. Solve problems involving geometric mean.

G.4.1.3 Establish the validity of geometric conjectures.

Skill Statements:

- a. Construct logical arguments, form conjectures, judge their validity, and give counterexamples to disprove statements.
- b. Informally or formally prove lines are parallel or perpendicular using special angle pair theorems.
- c. Informally or formally prove triangles are congruent using SSS, SAS, ASA and AAS.

Students should see the power of deductive proof in establishing the validity of general results from given conditions. Students should explore ideas, develop conjectures, and test counterexamples in order to effectively produce and present logical arguments with emphasis on careful explanation of the reasoning, rather than on the form of proof used (e.g., paragraph proof or two-column proof).

G.4.1.4 Apply trigonometric relationships to determine lengths and angle measures.

Skill Statements:

- a. Identify and apply special right triangle relationships (30-60-90 and 45-45-90) to determine the lengths of the sides of a triangle.
- b. Relate similarity of right triangles to the trigonometric functions.
- c. Identify sine, cosine and tangent ratios in right triangles and use them to model contextual problems.

Goal 4.2 Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Objective(s): By the end of Geometry, the student will be able to:

G.4.2.1 Use Cartesian coordinates to analyze geometric situations.

Skill Statements:

- a. Determine the midpoint of a segment in the coordinate plane.
- b. Given two endpoints of a segment in a coordinate plane, determine the length of the segment using the distance formula.

Goal 4.3: Apply transformations and use symmetry to analyze mathematical situations.

Objective(s): By the end of Geometry, the student will be able to:

G.4.3.1 Understand and represent translations, reflections, dilations, and rotations of objects in the plane.

Skill Statement:

- a. Use transformational geometry to rotate, translate, dilate, and reflect two-dimensional figures.

Goal 4.4: Use visualization, spatial reasoning, and geometric models to solve problems.

Objective(s): By the end of Geometry, the student will be able to:

G.4.4.1 Draw and construct representations of two dimensional geometric objects using a variety of tools.

Skill Statement:

- a. Identify and construct medians, altitudes, angle bisectors, and perpendicular bisectors using straightedge and compass.

Suggested Vocabulary and Symbols

acute triangle, adjacent angles, adjacent sides, alternate interior, alternate exterior angles, angle bisector, angle of elevation, angle of depression, axioms, postulates, base angles of an isosceles triangle, base angles of an isosceles trapezoid, bisect, collinear, compass, concave polygon, concentric circles, conclusion, hypothesis, conditional statement, congruent, conjecture, consecutive interior angles or same side interior angles, construction, convex polygon, coplanar, corollary, corresponding angles, cosine, sine, tangent, diagonal, dilation, distance formula, exterior angle, interior angle, geometric mean, image, inductive and deductive reasoning, inscribed polygon, legs of an isosceles triangle, line of reflection, perpendicular, segment notation, major arc, minor arc, median of a triangle, midpoint, midpoint formula, midsegment of a trapezoid, net, parallel, perpendicular bisector, pre-image, reflection, rotation, scale factor, scalene triangle, similar, skew, special right triangles, transformation, translation, transversal, trigonometric ratio, two-column proof, vertex

Standard 5: Data Analysis, Probability, and Statistics

No objectives at this course level.