

# Advanced Geometry

Mathematics

Grade(s) 9th - 12th, Duration 1 Year, 1 Credit  
Elective Course

## Course Overview

**GENERAL DESCRIPTION:** In this course the student will become familiar with the basic properties of geometric form. Inductive and deductive reasoning will be emphasized through proofs. Students will also study angle relationships, perpendicular and parallel lines and planes, congruent triangles, similar polygons, circles, arc angles, areas, and volumes. Coordinate geometry is introduced and emphasized.

**HOMEWORK OR READING NECESSARY:** Homework will be assigned daily.

**FORMAT:** Some class time will be allotted each day toward discussion of the previous day's assignment. This discussion will be followed by the presentation of new material and independent study.

**TESTS:** Assessments will be given upon the completion of each unit outcome.

## Scope And Sequence

Timeframe	Unit	Instructional Topics
9 Week(s)	Geometric Structure	<ol style="list-style-type: none"><li>1-1 Points, Lines and Planes</li><li>1-2 Linear Measure</li><li>1-3 Distance and Midpoints</li><li>1-4 Angle Measure</li><li>1-5 Angle Relationships</li><li>1-6 Two-Dimensional Figures</li><li>1-7 Three-Dimensional Figures</li><li>2-1 Inductive Reasoning and Conjecture</li><li>2-2 Logic</li><li>2-3 Conditional Statements</li><li>2-4 Deductive Reasoning</li><li>2-5 Postulates and Paragraph Proofs</li><li>2-6 Algebraic Proof</li><li>2-7 Segment Relationships</li><li>2-8 Proving Angle Relationships</li><li>3-1 Parallel Lines and Transversals</li><li>3-2 Angles and Parallel Lines</li><li>3-3 Slopes of Lines</li><li>3-4 Equations of Lines</li><li>3-5 Proving Lines Parallel</li><li>3-6 Perpendiculars and Distance</li></ol>
9 Week(s)	Congruence	<ol style="list-style-type: none"><li>4-1 Classifying Triangles</li><li>4-2 Angles of Triangles</li><li>4-3 Congruent Triangles</li><li>4-4 Proving Triangles Congruent - SSS and SAS</li><li>4-5 Proving Triangles Congruent - ASA and AAS</li><li>4-6 Isosceles and Equilateral Triangles</li><li>4-7 Congruence Transformations</li><li>5-1 Bisectors of Triangles</li><li>5-2 Medians and Altitudes of Triangles</li><li>5-3 Inequalities in One Triangle</li><li>5-5 The Triangle Inequality</li><li>5-6 Inequalities in Two Triangles</li><li>6-1 Angles of Polygons</li><li>6-2 Parallelograms</li><li>6-3 Tests for Parallelograms</li><li>6-4 Rectangles</li><li>6-5 Rhombi and Squares</li><li>6-6 Trapezoids and Kites</li></ol>

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9 Week(s)	Similarity	<ol style="list-style-type: none"><li>1. 7-1 Ratios and Proportions</li><li>2. 7-2 Similar Polygons</li><li>3. 7-3 Similar Triangles</li><li>4. 7-4 Parallel Lines and Proportional Parts</li><li>5. 7-5 Parts of Similar Triangles</li><li>6. 7-6 Similarity Transformations</li><li>7. 7-7 Scale Drawings and Models</li><li>8. 8-1 Geometric Mean</li><li>9. 8-2 The Pythagorean Theorem and its Converse</li><li>10. 8-3 Special Right Triangles</li><li>11. 8-4 Trig</li><li>12. 8-5 Angles of Elevation and Depression</li><li>13. 8-6 The Law of Sines and the Law of Cosines</li><li>14. 9-1 Reflections</li><li>15. 9-2 Translations</li><li>16. 9-3 Rotations</li><li>17. 9-4 Compositions of Transformations</li><li>18. 9-5 Symmetry</li><li>19. 9-6 Dilations</li></ol>
9 Week(s)	Measurement	<ol style="list-style-type: none"><li>1. 10-1 Circles and Circumference</li><li>2. 10-2 Measuring Angles and Arcs</li><li>3. 10-3 Arcs and Chords</li><li>4. 10-4 Inscribed Angles</li><li>5. 10-5 Tangents</li><li>6. 10-6 Secants, Tangents and Angle Measures</li><li>7. 10-7 Special Segments in a Circle</li><li>8. 10-8 Equations of Circles</li><li>9. 11-1 Areas of Parallelograms and Triangles</li><li>10. 11-2 Areas of Trapezoids, Rhombi and Kites</li><li>11. 11-3 Areas of Circles and Sectors</li><li>12. 11-4 Areas of Regular Polygons and Composite Figures</li><li>13. 11-5 Areas of Similar Figures</li><li>14. 12-1 Representations of Three-Dimensional Figures</li><li>15. 12-2 Surface Areas of Prisms and Cylinders</li><li>16. 12-3 Surface Areas of Pyramids and Cones</li><li>17. 12-4 Volumes of Prisms and Cylinders</li><li>18. 12-5 Volumes of Pyramids and Cones</li><li>19. 12-6 Surface Areas and Volumes of Spheres</li><li>20. 12-7 Spherical Geometry</li><li>21. 12-8 Congruent and Similar Solids</li><li>22. 13-1 Representing Sample Spaces</li><li>23. 13-2 Probability with Permutations and Combinations</li><li>24. 13-3 Geometric Probability</li><li>25. 13-4 Simulations</li><li>26. 13-5 Probabilities of Independent and Dependent Events</li><li>27. 13-6 Probabilities of Mutually Exclusive Events</li></ol>

## Materials and Resources

SUPPLIES: Each student will be charged a \$5 calculator rental fee, unless the student chooses to purchase the calculator required for the class.

## Prerequisites

PREREQUISITE: Student must have earned at least a B in Algebra in Middle School AND a minimum 240 MAP score.

## Course Details

**Unit:** Geometric Structure

**Duration:** 9 Week(s)

### Unit Overview

Tools of Geometry: Find distances between points and midpoints of line segments. Identify angle relationships. Find perimeters, areas, surface areas and volumes. (1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7)

Reasoning and Proof: Make conjectures and find counterexamples for statements. Use deductive reasoning to reach valid conclusion. Write proofs involving segments and angle theorems. (2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8)

Parallel and Perpendicular Lines: Identify and prove angle relationships that occur with parallel lines and a transversal. Use slope to analyze a line and to write its equation. Find the distance between a point and a line and between two parallel lines. (3-1, 3-2, 3-3, 3-4, 3-5, 3-6)

### Materials and Resources

Textbook  
Online Resources

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## Academic Vocabulary

### •Tools of Geometry

acute angle  
adjacent angles  
angle  
angle bisector  
area  
base  
between  
circumference  
collinear  
complementary angles  
concave  
cone  
congruent  
construction  
convex  
coplanar  
cylinder  
degree  
distance  
edge  
equiangular polygon  
equilateral polygon  
exterior  
face  
interior  
intersection  
line  
line segment  
linear pair  
midpoint  
n-gon  
obtuse angle  
opposite rays  
perimeter  
perpendicular  
plane  
Platonic solid  
point  
polygon  
polyhedron  
prism  
pyramid  
ray  
regular polygon  
regular polyhedron  
right angle  
segment  
bisector  
side  
space  
sphere  
supplementary angles  
surface area  
undefined term  
vertex  
vertex of a polygon  
vertical angles  
volume  
Reasoning and Proof  
algebraic proof  
axiom  
compound statement  
conclusion  
conditional statement  
conjecture  
conjunction

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contrapositive  
converse  
counterexample  
deductive argument  
deductive reasoning  
disjunction  
formal proof  
hypothesis  
if-then statement  
inductive reasoning  
informal proof  
inverse  
logically equivalent  
negation  
paragraph proof  
postulate  
proof  
related conditionals  
statement  
theorem  
truth table  
truth value  
two-column proof  
•Parallel and Perpendicular Lines  
alternate exterior angles  
alternate interior angles  
consecutive interior angles  
corresponding angles  
equidistant  
parallel lines  
parallel planes  
point-slope form  
rate of change  
skew lines  
slope  
slope-intercept form  
transversal

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## Summative Assessment

- Tools of Geometry Assessment
- Reasoning and Proof Assessment
- Parallel and Perpendicular Lines Assessment

**Topic:** 1-1 Points, Lines and Planes

**Duration:** 2 Day(s)

### Topic Overview

Identify and model points, lines and planes. Identify intersecting lines and planes.

### Learning Targets

Identify and model points, lines and planes. Identify intersecting lines and planes.

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**Topic:** 1-2 Linear Measure

**Duration:** 1 Day(s)

### Topic Overview

Measure segments. Calculate with measures.

### Learning Targets

Measure segments. Calculate with measures.

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**Topic:** 1-3 Distance and Midpoints

**Duration:** 2 Day(s)

### Topic Overview

Find the distance between two points. Find the midpoint of a segment.

### Learning Targets

Find the distance between two points. Find the midpoint of a segment.

---

**Topic:** 1-4 Angle Measure

**Duration:** 2 Day(s)

### Topic Overview

Measure and classify angles. Identify and use congruent angles and the bisector of an angle.

### Learning Targets

Measure and classify angles. Identify and use congruent angles and the bisector of an angle.

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**Topic:** 1-5 Angle Relationships

**Duration:** 2 Day(s)

### Topic Overview

Identify and use special pairs of angles. Identify perpendicular lines.

### Learning Targets

Identify and use special pairs of angles. Identify perpendicular lines.

---

**Topic:** 1-6 Two-Dimensional Figures

**Duration:** 2 Day(s)

### Topic Overview

Identify and name polygons. Find perimeter, circumference and area of two-dimensional figures.

### Learning Targets

Identify and name polygons. Find perimeter, circumference and area of two-dimensional figures.

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**Topic:** 1-7 Three-Dimensional Figures

**Duration:** 2 Day(s)

### Topic Overview

Identify and name three-dimensional figures. Find surface area and volume.

### Learning Targets

Identify and name three-dimensional figures. Find surface area and volume.

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**Topic:** 2-1 Inductive Reasoning and Conjecture **Duration:** 2 Day(s)

**Topic Overview**

Make conjectures based on inductive reasoning. Find counterexamples.

**Learning Targets**

Make conjectures based on inductive reasoning. Find counterexamples.

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**Topic:** 2-2 Logic **Duration:** 2 Day(s)

**Topic Overview**

Determine truth values of negations, conjunctions, and disjunctions, and represent them using Venn Diagrams. Find counterexamples.

**Topic:** 2-3 Conditional Statements **Duration:** 2 Day(s)

**Topic Overview**

Analyze statements in if-then form. Write the converse, inverse and contrapositive of if-then statements.

**Learning Targets**

Analyze statements in if-then form. Write the converse, inverse and contrapositive of if-then statements.

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**Topic:** 2-4 Deductive Reasoning **Duration:** 2 Day(s)

**Topic Overview**

Use the Law of Detachment. Use the Law of Syllogism.

**Learning Targets**

Use the Law of Detachment. Use the Law of Syllogism.

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**Topic:** 2-5 Postulates and Paragraph Proofs **Duration:** 1 Day(s)

**Topic Overview**

Identify and use basic postulates about points, lines and planes.

**Learning Targets**

Identify and use basic postulates about points, lines and planes.

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**Topic:** 2-6 Algebraic Proof **Duration:** 2 Day(s)

**Topic Overview**

use algebra to write two-column proofs. Use properties of inequality to write geometric proofs.

**Learning Targets**

use algebra to write two-column proofs. Use properties of inequality to write geometric proofs.

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**Topic:** 2-7 Segment Relationships **Duration:** 2 Day(s)

**Topic Overview**

Write proofs involving segment addition. Write proofs involving segment congruence.

**Learning Targets**

Write proofs involving segment addition. Write proofs involving segment congruence.

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**Topic:** 2-8 Proving Angle Relationships **Duration:** 2 Day(s)

**Topic Overview**

Write proofs involving supplementary and complementary angles. Write proofs involving congruent and right angles.

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## Learning Targets

Write proofs involving supplementary and complementary angles. Write proofs involving congruent and right angles.

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### Topic: 3-1 Parallel Lines and Transversals

Duration: 2 Day(s)

#### Topic Overview

Identify relationships between two lines or two planes. Name angle pairs formed by parallel lines and transversals.

#### Learning Targets

Identify relationships between two lines or two planes. Name angle pairs formed by parallel lines and transversals.

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### Topic: 3-2 Angles and Parallel Lines

Duration: 2 Day(s)

#### Topic Overview

Use theorems to determine the relationship between specific pairs of angles. Use algebra to find angle measurements.

#### Learning Targets

Use theorems to determine the relationship between specific pairs of angles. Use algebra to find angle measurements.

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### Topic: 3-3 Slopes of Lines

Duration: 2 Day(s)

#### Topic Overview

Find slopes of lines. Use slope to identify parallel and perpendicular lines.

#### Learning Targets

Find slopes of lines. Use slope to identify parallel and perpendicular lines.

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### Topic: 3-4 Equations of Lines

Duration: 2 Day(s)

#### Topic Overview

Write an equation of a line given information about the graph. Solve problems by writing equations.

#### Learning Targets

Write an equation of a line given information about the graph. Solve problems by writing equations.

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### Topic: 3-5 Proving Lines Parallel

Duration: 2 Day(s)

#### Topic Overview

Recognize angle pairs that occur with parallel lines. Prove that two lines are parallel.

#### Learning Targets

Recognize angle pairs that occur with parallel lines. Prove that two lines are parallel.

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### Topic: 3-6 Perpendiculars and Distance

Duration: 2 Day(s)

#### Topic Overview

Find the distance between a point and a line. Find the distance between parallel lines.

#### Learning Targets

Find the distance between a point and a line. Find the distance between parallel lines.

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## Unit: Congruence

Duration: 9 Week(s)

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## Unit Overview

**Congruent Triangles:** Apply special relationships about the interior and exterior angles of triangles. Identify corresponding parts of congruent triangles and prove triangles congruent. Learn about the special properties of isosceles and equilateral triangles. (4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7)

**Relationships in Triangles:** Learn about special segments and points related to triangles. Learn about relationships between the sides and angles of triangles. Learn to write indirect proofs. (5-1, 5-2, 5-3, 5-4, 5-5, 5-6)

**Quadrilaterals:** Find and use the sum of the measures of the interior and exterior angles of a polygon. Recognize and apply properties of quadrilaterals. Compare quadrilaterals. (6-1, 6-2, 6-3, 6-4, 6-5, 6-6)

## Materials and Resources

Textbook

Online Resources

## Academic Vocabulary

Congruent Triangles

acute triangles

auxiliary line

base angles

congruent transformation

congruent polygons

coordinate proof

corollary

corresponding parts

equiangular triangle

equilateral triangle

exterior angle

flow proof

included angle

included side

isosceles triangle

obtuse triangle

reflection

remote interior angles

right triangle

rotation

scalene triangle

translation

vertex angle

Relationships in Triangles

altitude

centroid

circumcenter

concurrent lines

incenter

indirect proof

indirect reasoning

median

orthocenter

perpendicular bisector

point of concurrency

proof by contradiction

Quadrilaterals

base

base angle

diagonal

isosceles trapezoid

kite

legs

midsegment of a trapezoid

parallelogram

rectangle

rhombus

square

trapezoid

## Summative Assessment

- Congruent Triangles Assessment
- Relationships in Triangles Assessment
- Quadrilaterals Assessment



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**Topic:** 4-1 Classifying Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Identify and classify triangles by angle measures and by side measures.

**Learning Targets**

Identify and classify triangles by angle measures and by side measures.

---

**Topic:** 4-2 Angles of Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Apply the Triangle Angle-Sum Theorem. Apply Exterior-Angle Theorem.

**Learning Targets**

Apply the Triangle Angle-Sum Theorem. Apply Exterior-Angle Theorem.

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**Topic:** 4-3 Congruent Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Name and use corresponding parts of congruent polygons. Prove triangles congruent using the definition of congruency.

**Learning Targets**

Name and use corresponding parts of congruent polygons. Prove triangles congruent using the definition of congruency.

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**Topic:** 4-4 Proving Triangles Congruent - SSS and SAS

**Duration:** 2 Day(s)

**Topic Overview**

Use the SSS Postulate and SAS Postulate to test for triangle congruence.

**Learning Targets**

Use the SSS Postulate and SAS Postulate to test for triangle congruence.

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**Topic:** 4-5 Proving Triangles Congruent - ASA and AAS

**Duration:** 2 Day(s)

**Topic Overview**

Use the ASA and AAS Postulates to test for congruence.

**Learning Targets**

Use the ASA and AAS Postulates to test for congruence.

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**Topic:** 4-6 Isosceles and Equilateral Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Use properties of isosceles and equilateral triangles.

**Learning Targets**

Use properties of isosceles and equilateral triangles.

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**Topic:** 4-7 Congruence Transformations

**Duration:** 2 Day(s)

**Topic Overview**

Identify reflections, translations and rotations. Verify congruence after a congruence transformation.

**Learning Targets**

Identify reflections, translations and rotations. Verify congruence after a congruence transformation.

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**Topic:** 5-1 Bisectors of Triangles

**Duration:** 2 Day(s)

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## Topic Overview

Identify and use perpendicular bisectors in triangles. Identify and use angle bisectors in triangles.

## Learning Targets

Identify and use perpendicular bisectors in triangles. Identify and use angle bisectors in triangles.

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**Topic:** 5-2 Medians and Altitudes of Triangles

**Duration:** 2 Day(s)

## Topic Overview

Identify and use medians and altitudes in triangles.

## Learning Targets

Identify and use medians and altitudes in triangles.

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**Topic:** 5-3 Inequalities in One Triangle

**Duration:** 2 Day(s)

## Topic Overview

Recognize and apply properties of inequalities to the measures of the angles of a triangle. Recognize and apply properties of inequalities to the relationships between the angles and sides of a triangle.

## Learning Targets

Recognize and apply properties of inequalities to the measures of the angles of a triangle. Recognize and apply properties of inequalities to the relationships between the angles and sides of a triangle.

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**Topic:** 5-5 The Triangle Inequality

**Duration:** 2 Day(s)

## Topic Overview

Use the Triangle Inequality Theorem to identify possible triangles. Prove triangle relationships using the Triangle Inequality Theorem.

## Learning Targets

Use the Triangle Inequality Theorem to identify possible triangles. Prove triangle relationships using the Triangle Inequality Theorem.

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**Topic:** 5-6 Inequalities in Two Triangles

**Duration:** 2 Day(s)

## Topic Overview

Apply the Hinge Theorem or its converse to make comparisons in two triangles. Prove triangle relationships using the Hinge Theorem or its converse.

## Learning Targets

Apply the Hinge Theorem or its converse to make comparisons in two triangles. Prove triangle relationships using the Hinge Theorem or its converse.

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**Topic:** 6-1 Angles of Polygons

**Duration:** 2 Day(s)

## Topic Overview

Find and use the sum of measures of the interior and exterior angles of a polygon.

## Learning Targets

Find and use the sum of measures of the interior and exterior angles of a polygon.

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**Topic:** 6-2 Parallelograms

**Duration:** 2 Day(s)

## Topic Overview

Recognize and apply properties of the sides and angles of parallelograms. Recognize and apply properties of the diagonals of parallelograms.

## Learning Targets

Recognize and apply properties of the sides and angles of parallelograms. Recognize and apply properties of the diagonals of parallelograms.

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**Topic:** 6-3 Tests for Parallelograms

**Duration:** 2 Day(s)

**Topic Overview**

Recognize the conditions that ensure a quadrilateral is a parallelogram. Prove that a set of points forms a parallelogram in the coordinate plane.

**Learning Targets**

Recognize the conditions that ensure a quadrilateral is a parallelogram. Prove that a set of points forms a parallelogram in the coordinate plane.

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**Topic:** 6-4 Rectangles

**Duration:** 2 Day(s)

**Topic Overview**

Recognize and apply properties of rectangles. Determine whether parallelograms are rectangles.

**Learning Targets**

Recognize and apply properties of rectangles. Determine whether parallelograms are rectangles.

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**Topic:** 6-5 Rhombi and Squares

**Duration:** 2 Day(s)

**Topic Overview**

Recognize and apply the properties of rhombi and squares. Determine whether quadrilaterals are rectangles, rhombi or squares.

**Learning Targets**

Recognize and apply the properties of rhombi and squares. Determine whether quadrilaterals are rectangles, rhombi or squares.

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**Topic:** 6-6 Trapezoids and Kites

**Duration:** 2 Day(s)

**Topic Overview**

Apply properties of trapezoids and kites.

**Learning Targets**

Apply properties of trapezoids and kites.

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**Unit:** Similarity

**Duration:** 9 Week(s)

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## Unit Overview

Proportion and Similarity: Identify similar polygons and use ratios and proportions to solve problems. Identify and apply similarity transformations. Use scale models and drawings to solve problems. (7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 7-7)

Right Triangles and Trigonometry: Use Pythagorean Theorem. Use properties of special right triangles. Use trigonometry to find missing measures of triangles. (8-1, 8-2, 8-3, 8-4, 8-5, 8-6)

Transformations and Symmetry: Name and draw figures that have been reflected, translated, rotated or dilated. Recognize and draw compositions of transformations. Identify symmetry in two- and three-dimensional figures. (9-1, 9-2, 9-3, 9-4, 9-5, 9-6)

## Materials and Resources

Textbook

Online resources

## Academic Vocabulary

Proportion and Similarity

cross products

dilation

enlargement

extremes

means

midsegment of a triangle

proportion

ratio

reduction

scale

scale drawing

scale factor

scale model

similar polygons

similarity transformation

Right Triangles and Trigonometry

angle of depression

angle of elevation

component form

cosine

direction

geometric mean

inverse cosine

inverse sine

inverse tangent

Law of Cosines

Law of Sines

magnitude

Pythagorean triple

resultant

sine standard position

tangent

trigonometric ratio

trigonometry

vector

Transformations and Symmetry

angle of rotation

axis symmetry

center of rotation

composition of transformations

glide reflection

line of reflection

line of symmetry

line symmetry

magnitude of symmetry

order of symmetry

plane symmetry

rotational symmetry

symmetry

translation vector

## Summative Assessment

- Proportion and Similarity Assessment
- Right Triangles and Trigonometry Assessment
- Transformations and Symmetry Assessment

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**Topic:** 7-1 Ratios and Proportions

**Duration:** 2 Day(s)

**Topic Overview**

Write ratios. Write and solve proportions.

**Learning Targets**

Write ratios. Write and solve proportions.

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**Topic:** 7-2 Similar Polygons

**Duration:** 2 Day(s)

**Topic Overview**

Use properties to identify similar polygons. Solve problems using the properties of similar polygons.

**Learning Targets**

Use properties to identify similar polygons. Solve problems using the properties of similar polygons.

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**Topic:** 7-3 Similar Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Identify similar triangles using the AA Similarity Postulate and the SSS and SAS Similarity Theorems. Use similar triangles to solve problems.

**Learning Targets**

Identify similar triangles using the AA Similarity Postulate and the SSS and SAS Similarity Theorems. Use similar triangles to solve problems.

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**Topic:** 7-4 Parallel Lines and Proportional Parts

**Duration:** 2 Day(s)

**Topic Overview**

Use proportional parts within triangles. Use proportional parts with parallel lines.

**Learning Targets**

Use proportional parts within triangles. Use proportional parts with parallel lines.

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**Topic:** 7-5 Parts of Similar Triangles

**Duration:** 2 Day(s)

**Topic Overview**

Recognize and use proportional relationships of corresponding angles, bisectors, altitudes, and medians of similar triangles. Use the Triangle Bisector Theorem.

**Learning Targets**

Recognize and use proportional relationships of corresponding angles, bisectors, altitudes, and medians of similar triangles. Use the Triangle Bisector Theorem.

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**Topic:** 7-6 Similarity Transformations

**Duration:** 2 Day(s)

**Topic Overview**

Identify similarity transformations. Verify similarity after a similarity transformation.

**Learning Targets**

Identify similarity transformations. Verify similarity after a similarity transformation.

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**Topic:** 7-7 Scale Drawings and Models

**Duration:** 2 Day(s)

**Topic Overview**

Interpret scale models. Use scale factors to solve problems.

**Learning Targets**

Interpret scale models. Use scale factors to solve problems.

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**Topic:** 8-1 Geometric Mean

**Duration:** 2 Day(s)

## Topic Overview

Find the geometric mean between two numbers. Solving problems involving relationships between parts of a right triangle and the altitude to its hypotenuse.

## Learning Targets

Find the geometric mean between two numbers. Solving problems involving relationships between parts of a right triangle and the altitude to its hypotenuse.

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**Topic:** 8-2 The Pythagorean Theorem and its Converse

**Duration:** 2 Day(s)

## Topic Overview

Use the Pythagorean Theorem and its Converse.

## Learning Targets

Use the Pythagorean Theorem and its Converse.

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**Topic:** 8-3 Special Right Triangles

**Duration:** 2 Day(s)

## Topic Overview

Use the properties of 45-45-90 and 30-60-90 triangles.

## Learning Targets

Use the properties of 45-45-90 and 30-60-90 triangles.

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**Topic:** 8-4 Trig

**Duration:** 2 Day(s)

## Topic Overview

Find trig ratios using right triangles. Use trig ratios to find angle measures in right triangles.

## Learning Targets

Find trig ratios using right triangles. Use trig ratios to find angle measures in right triangles.

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**Topic:** 8-5 Angles of Elevation and Depression

**Duration:** 2 Day(s)

## Topic Overview

Solve problems involving angles of elevation and depression. Use angles of elevation and depression to find the distance between the objects.

## Learning Targets

Solve problems involving angles of elevation and depression. Use angles of elevation and depression to find the distance between the objects.

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**Topic:** 8-6 The Law of Sines and the Law of Cosines

**Duration:** 2 Day(s)

## Topic Overview

Use the Law of Sines and the Law of Cosines to solve triangles.

## Learning Targets

Use the Law of Sines and the Law of Cosines to solve triangles.

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**Topic:** 9-1 Reflections

**Duration:** 2 Day(s)

## Topic Overview

Draw reflections. Draw reflections in the coordinate plane.

## Learning Targets

Draw reflections. Draw reflections in the coordinate plane.

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# Advanced Geometry

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Grade(s) 9th - 12th, Duration 1 Year, 1 Credit  
Elective Course

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**Topic: 9-2 Translations****Duration: 2 Day(s)****Topic Overview**

Draw translations. Draw translations in the coordinate plane.

**Learning Targets**

Draw translations. Draw translations in the coordinate plane.

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**Topic: 9-3 Rotations****Duration: 2 Day(s)****Topic Overview**

Draw rotations. Draw rotations in the coordinate plane.

**Learning Targets**

Draw rotations. Draw rotations in the coordinate plane.

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**Topic: 9-4 Compositions of Transformations****Duration: 2 Day(s)****Topic Overview**

Draw glide reflections and other compositions of isometries in the coordinate plane. Draw composition of reflections in parallel and intersecting lines.

**Learning Targets**

Draw glide reflections and other compositions of isometries in the coordinate plane. Draw composition of reflections in parallel and intersecting lines.

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**Topic: 9-5 Symmetry****Duration: 2 Day(s)****Topic Overview**

Identify line and rotational symmetries in two-dimensional figures. Identify plane and axis symmetries in three-dimensional figures.

**Learning Targets**

Identify line and rotational symmetries in two-dimensional figures. Identify plane and axis symmetries in three-dimensional figures.

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**Topic: 9-6 Dilations****Duration: 2 Day(s)****Topic Overview**

Draw dilations. Draw dilations in the coordinate plane.

**Learning Targets**

Draw dilations. Draw dilations in the coordinate plane.

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**Unit: Measurement****Duration: 9 Week(s)****Unit Overview**

Circles: Learn the relationships between central angles, arcs, and inscribed angles in a circle. Define and use secants and tangents. Use an equation to identify or describe a circle. (10-1, 10-2, 10-3, 10-4, 10-5, 10-6, 10-7, 10-8)

Area of Polygons and Circles: Find areas of polygons. Solve problems involving areas and sectors of circles. Find scale factors using similar figures. (11-1, 11-2, 11-3, 11-4, 11-5)

Extending Surface Area and Volume: Find lateral areas, surface areas, and volumes of various solid figures. Investigate Euclidean and spherical geometries. Use properties of similar solids. (12-1, 12-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-8)

Probability and Measurement: Represent sample spaces. Use permutations and combinations with probability. Find probabilities by using length and area. Find probabilities of compound events. (13-1, 13-2, 13-3, 13-4, 13-5, 13-6)

**Materials and Resources**

Textbook  
Online Resources

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## Academic Vocabulary

Circles  
adjacent arcs  
arc  
arc length  
center  
central angle  
chord  
chord segment  
circle  
circumference  
circumscribed  
common tangent  
compound locus  
concentric circles  
congruent arcs  
diameter  
external secant segment  
inscribed  
inscribed angle  
intercepted arc  
major arc  
minor arc  
pi  
point of tangency  
radius secant  
secant segment  
semicircle  
tangent  
Area of Polygons and Circles  
apothem  
base of a parallelogram  
base of a triangle  
center of a regular polygon  
central angle of a regular polygon  
composite figure  
height of a parallelogram  
height of a trapezoid  
height of a triangle  
radius of a regular polygon  
sector of a circle  
Extending Surface Area and Volume  
altitude  
axis  
base edges  
composite solid  
congruent solid  
cross section  
Euclidean geometry  
great circle  
isometric view  
lateral area  
lateral edge  
lateral face  
non-Euclidean geometry  
oblique cone  
oblique solid  
regular pyramid  
right cone  
right solid  
similar solids  
slant height  
spherical geometry  
topographic map  
Probability and Measurement  
circular permutation  
combination  
complement



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compound events  
conditional probability  
dependent events  
expected value  
factorial  
Fundamental Counting Principle  
geometric probability  
independent events  
mutually exclusive events  
permutation  
probability model  
probability tree  
random variable  
sample space  
simulation  
tree diagram

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## Summative Assessment

- Circles Assessment
- Area of Polygons and Circles Assessment
- Extending Surface Area and Volume Assessment
- Probability and Measurement Assessment

**Topic:** 10-1 Circles and Circumference

**Duration:** 2 Day(s)

### Topic Overview

Identify and use parts of circles. Solve problems involving the circumference of a circle.

### Learning Targets

Identify and use parts of circles. Solve problems involving the circumference of a circle.

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**Topic:** 10-2 Measuring Angles and Arcs

**Duration:** 2 Day(s)

### Topic Overview

Identify central angles, major arcs, minor arcs and semicircles and find their measures. Find arc lengths.

### Learning Targets

Identify central angles, major arcs, minor arcs and semicircles and find their measures. Find arc lengths.

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**Topic:** 10-3 Arcs and Chords

**Duration:** 2 Day(s)

### Topic Overview

Recognize and use relationships between arcs and chords. Recognize and use relationships between arcs, chords, and diameters.

### Learning Targets

Recognize and use relationships between arcs and chords. Recognize and use relationships between arcs, chords, and diameters.

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**Topic:** 10-4 Inscribed Angles

**Duration:** 2 Day(s)

### Topic Overview

Find measures of inscribed angles. Find measures of angles of inscribed polygons.

### Learning Targets

Find measures of inscribed angles. Find measures of angles of inscribed polygons.

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**Topic:** 10-5 Tangents

**Duration:** 2 Day(s)

### Topic Overview

Use properties of tangents. Solve problems involving circumscribed polygons.

### Learning Targets

Use properties of tangents. Solve problems involving circumscribed polygons.

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**Topic:** 10-6 Secants, Tangents and Angle Measures

**Duration:** 2 Day(s)

### Topic Overview

Find measures of angles formed by lines intersecting on or inside a circle. Find measure of angles formed by lines intersecting outside a circle.

### Learning Targets

Find measures of angles formed by lines intersecting on or inside a circle. Find measure of angles formed by lines intersecting outside a circle.

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**Topic:** 10-7 Special Segments in a Circle

**Duration:** 2 Day(s)

### Topic Overview

Find measures of segments that intersect in the interior of a circle. Find measures of segments that intersect in the exterior of a circle.

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## Learning Targets

Find measures of segments that intersect in the interior of a circle. Find measures of segments that intersect in the exterior of a circle.

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**Topic:** 10-8 Equations of Circles

**Duration:** 2 Day(s)

## Topic Overview

Write the equation of a circle and graph a circle on the coordinate plane.

## Learning Targets

Write the equation of a circle and graph a circle on the coordinate plane.

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**Topic:** 11-1 Areas of Parallelograms and Triangles

**Duration:** 2 Day(s)

## Topic Overview

Find perimeters and area of parallelograms and triangles.

## Learning Targets

Find perimeters and area of parallelograms and triangles.

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**Topic:** 11-2 Areas of Trapezoids, Rhombi and Kites

**Duration:** 2 Day(s)

## Topic Overview

Find area of trapezoids, rhombi and kites.

## Learning Targets

Find area of trapezoids, rhombi and kites.

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**Topic:** 11-3 Areas of Circles and Sectors

**Duration:** 2 Day(s)

## Topic Overview

Find area of circles and sectors of circles.

## Learning Targets

Find area of circles and sectors of circles.

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**Topic:** 11-4 Areas of Regular Polygons and Composite Figures

**Duration:** 2 Day(s)

## Topic Overview

Find areas of regular polygons and composite figures.

## Learning Targets

Find areas of regular polygons and composite figures.

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**Topic:** 11-5 Areas of Similar Figures

**Duration:** 2 Day(s)

## Topic Overview

Find areas of similar figures by using scale factors. Find scale factors or missing measures given the area of similar figures.

## Learning Targets

Find areas of similar figures by using scale factors. Find scale factors or missing measures given the area of similar figures.

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**Topic:** 12-1 Representations of Three-Dimensional Figures

**Duration:** 2 Day(s)

## Topic Overview

Draw isometric views of three-dimensional figures. Investigate cross sections of three-dimensional figures.

## Learning Targets

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Draw isometric views of three-dimensional figures. Investigate cross sections of three-dimensional figures.

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**Topic:** 12-2 Surface Areas of Prisms and Cylinders

**Duration:** 2 Day(s)

**Topic Overview**

Find lateral areas and surface areas of prisms and cylinders.

**Learning Targets**

Find lateral areas and surface areas of prisms and cylinders.

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**Topic:** 12-3 Surface Areas of Pyramids and Cones

**Duration:** 2 Day(s)

**Topic Overview**

Find the lateral areas and the surface areas of pyramids and cones.

**Learning Targets**

Find the lateral areas and the surface areas of pyramids and cones.

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**Topic:** 12-4 Volumes of Prisms and Cylinders

**Duration:** 2 Day(s)

**Topic Overview**

Find volumes of prisms and cylinders.

**Learning Targets**

Find volumes of prisms and cylinders.

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**Topic:** 12-5 Volumes of Pyramids and Cones

**Duration:** 2 Day(s)

**Topic Overview**

Find volumes of pyramids and cones.

**Learning Targets**

Find volumes of pyramids and cones.

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**Topic:** 12-6 Surface Areas and Volumes of Spheres

**Duration:** 2 Day(s)

**Topic Overview**

Find surface areas of spheres. Find volume of spheres.

**Learning Targets**

Find surface areas of spheres. Find volume of spheres.

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**Topic:** 12-7 Spherical Geometry

**Duration:** 2 Day(s)

**Topic Overview**

Describe sets of points on a sphere. Compare and contrast Euclidean and spherical geometries.

**Learning Targets**

Describe sets of points on a sphere. Compare and contrast Euclidean and spherical geometries.

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**Topic:** 12-8 Congruent and Similar Solids

**Duration:** 2 Day(s)

**Topic Overview**

Identify congruent or similar solids. Use properties of similar solids.

**Learning Targets**

Identify congruent or similar solids. Use properties of similar solids.

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**Topic:** 13-1 Representing Sample Spaces

**Duration:** 2 Day(s)

**Topic Overview**

Use lists, tables, and tree diagrams to represent sample spaces. Use the Fundamental Counting Principle to count outcomes.

**Learning Targets**

Use lists, tables, and tree diagrams to represent sample spaces. Use the Fundamental Counting Principle to count outcomes.

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**Topic:** 13-2 Probability with Permutations and Combinations

**Duration:** 2 Day(s)

**Topic Overview**

Use permutations and combinations with probability.

**Learning Targets**

Use permutations and combinations with probability.

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**Topic:** 13-3 Geometric Probability

**Duration:** 2 Day(s)

**Topic Overview**

Find probabilities by using length. Find probabilities by using area.

**Learning Targets**

Find probabilities by using length. Find probabilities by using area.

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**Topic:** 13-4 Simulations

**Duration:** 2 Day(s)

**Topic Overview**

Design simulations to estimate probabilities. Summarize data from simulations.

**Learning Targets**

Design simulations to estimate probabilities. Summarize data from simulations.

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**Topic:** 13-5 Probabilities of Independent and Dependent Events

**Duration:** 2 Day(s)

**Topic Overview**

Find probabilities of independent and dependent events. Find probabilities of events given the occurrence of other events.

**Learning Targets**

Find probabilities of independent and dependent events. Find probabilities of events given the occurrence of other events.

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**Topic:** 13-6 Probabilities of Mutually Exclusive Events

**Duration:** 2 Day(s)

**Topic Overview**

Find probabilities of events that are mutually exclusive and events that are not mutually exclusive. Find probabilities of complements.

**Learning Targets**

Find probabilities of events that are mutually exclusive and events that are not mutually exclusive. Find probabilities of complements.

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