

ACCELERATED GEOMETRY

This course is designed to learn properties of geometric figures, to enhance problem-solving abilities and to develop logical thinking and reasoning skills. The course will emphasize formal proofs and applications of algebraic skills developed in previous courses.

Content Strands :

Geometry and Measurement
Functions and Algebra

Process Strands :

Problem-solving, Reasoning, and Proof
Communications, Representations and Connections

MAJOR STEMS:

Introduction
Angles and Lines
Polygons and Lines
Algebraic Proofs
Formal Proofs
Congruent Triangles
Geometric Inequalities
Parallel Lines
Quadrilaterals
Similarity
Right Triangles
Trigonometry
Circles
Area
Three Dimensional Figures

ACCELERATED GEOMETRY COURSE COMPETENCIES

1. Uses properties of angle relationships
2. Creates formal proofs
3. Applies the concepts of congruence

4. Applies concepts of similarity
5. Solves problems using perimeter, circumference or area
6. Solves problems using surface area or volume
7. Uses theorems or geometric properties to solve problems
8. Solves problems on and off the coordinate plane
9. Analyzes patterns in data
10. Demonstrates conceptual understanding of equality by solving linear equations and by solving problems involving systems of linear equations

ACCELERATED GEOMETRY COURSE PROCESS SKILLS

1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content.
2. Students will use mathematical reasoning and proof.
3. Students will communicate their understanding of mathematics.
4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement – Stem 1

Introduction

Topics	Induction and deduction; union and intersection; logic problems; postulates & theorems; absolute value and distance
Competencies	1. Analyzes patterns in data
Knowledge/Skills	Use induction and deduction to solve number patterns and logic problems Understand the connections between definitions, postulates and theorems in a mathematical system Recognize the use of intersection and union of sets in the context of geometric definitions Review the concept of absolute value and apply

	<p>the concept to distance</p> <p>Understand the initial postulates and theorems such as the Distance Postulate, Ruler Postulate and Point-Plotting Theorem</p> <p>Solve verbal logic problems using a grid</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement –Stem 2

Angles and Lines

Topics	Postulates and theorems involving types of angles, and triangles; types of lines
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane 10. Demonstrates conceptual understanding of equality by solving linear equations and by solving problems involving systems of linear equations
Knowledge/Skills	<p>Understand postulates involving angles such as Angle Measurement Postulate, Angle Construction Postulate and Angle Addition Postulate</p> <p>Define basic terms, such as angle, triangle, vertical angles, linear pairs, adjacent angles, supplementary and complementary angles and angle bisectors</p> <p>Use definitions for parallel, perpendicular and skew lines</p> <p>Classify angles by sides and by angles</p> <p>Use a protractor to measure and construct angles</p> <p>Add and subtract the measures of angles using degrees, minutes and seconds</p>

	Use algebra to solve problems involving angle relationships and diagrams
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 3	
Polygons and Lines	
Topics	Conditional statements; vocabulary for polygons; types of polygons; basic vocabulary for circles; altitudes & medians
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane 9. Analyzes patterns in data
Knowledge/Skills	<p>Understand postulates involving angles such as Angle Measurement Postulate, Angle Construction Postulate and Angle Addition Postulate</p> <p>Define basic terms, such as angle, triangle, vertical angles, linear pairs, adjacent angles, supplementary and complementary angles and angle bisectors</p> <p>Use definitions for parallel, perpendicular and skew lines</p> <p>Classify angles by sides and by angles</p> <p>Use a protractor to measure and construct angles</p> <p>Add and subtract the measures of angles using degrees, minutes and seconds</p> <p>Use algebra to solve problems involving angle relationships and diagrams</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content.

	<ol style="list-style-type: none"> 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.
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Geometry and Measurement Stem 4
Algebraic Proofs

Topics	Using algebraic properties in proofs; review of factoring; review of equations of lines
Competencies	<ol style="list-style-type: none"> 2. Creates formal proofs 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane 9. Analyzes patterns in data
Knowledge/Skills	<p>Review factoring techniques and solving linear systems with two variables</p> <p>Recognize and name properties in an algebraic context, such as commutative, distributive, addition property of equations, properties of one and of zero</p> <p>Use reflexive, symmetric and transitive properties and the concept of an equivalence relation</p> <p>Given an algebraic proof, provide a reason for each step</p> <p>Use algebraic examples to begin formal two-column proofs</p> <p>Review the forms $Ax+By=C$, $y=mx+b$, and point-slope form for the equations of lines</p>
Process Skills	<ol style="list-style-type: none"> 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and

	develop mathematical connections.
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Geometry and Measurement Stem 5
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Formal Proofs

Topics	Proofs related to angles; writing equations for medians & altitudes; review of distance & slope
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proofs 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane 10. Demonstrates conceptual understanding of equality by solving linear equations and by solving problems involving systems of linear equations
Knowledge/Skills	<p>Use geometric diagrams in the context of formal two-column proofs</p> <p>Apply reasons such as betweenness of points, angle addition postulate, linear pairs in the context of formal two-column proofs</p> <p>Prove theorems related to the congruency of angles</p> <p>Prove theorems related to supplementary and complementary angles</p> <p>Review the concepts of distance and slope</p> <p>Write the equations for medians and altitudes of triangles</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 6

Congruent Triangles

Topics	Proving triangles congruent; isosceles triangle theorems; tessellations
Competencies	<ol style="list-style-type: none">1. Uses properties of angle relationships2. Creates formal proofs3. Applies the concepts of congruence7. Uses theorems or geometric properties to solve problems8. Solves problems on and off the coordinate plane
Knowledge/Skills	<p>Apply Side-Side-Side (SSS), Side-Angle-Side(SAS), Angle-Side-Angle (ASA), Angle-Angle-Side (AAS) for triangle congruency</p> <p>Apply Hypotenuse-Angle(HA), Leg-Angle(LA), Leg-Leg(LL), Hypotenuse-Leg(HL) for right triangle congruency</p> <p>Apply the concept of congruency to tessellations and mosaics</p> <p>Prove triangles are congruent using the above reasons</p> <p>Prove that parts of congruent triangles are congruent</p> <p>Use congruent triangles to prove the isosceles triangle theorems</p> <p>Prove that overlapping triangles are congruent</p> <p>Prove that triangles are congruent using multiples pairs of triangles</p> <p>Study tessellations and mosaics</p>
Process Skills	<ol style="list-style-type: none">1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content.2. Students will use mathematical reasoning and proof.3. Students will communicate their understanding of mathematics.4. Students will recognize, explore, and develop mathematical connections.

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Geometry and Measurement Stem 7

Geometric Inequalities

Topics	Auxiliary lines; indirect proofs; triangles & inequality relationships
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proofs 3. Applies the concepts of congruence 7. Uses theorems or geometric properties to solve problems
Knowledge/Skills	<p>Prove appropriate theorems using an indirect proof</p> <p>Know the difference between existence (at least) and uniqueness (at most)</p> <p>Understand indirect proofs of theorems involving existence and uniqueness</p> <p>Use auxiliary lines in proofs and justify doing so with an appropriate reason</p> <p>Apply theorems involving inequalities, such as Triangle Inequality Theorem, Hinge Theorem and its converse, and the longest side in a triangle is opposite the largest angle</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 8

Parallel Lines

Topics	Theorems proving lines are parallel; theorems using parallel lines
Competencies	<ol style="list-style-type: none">1. Uses properties of angle relationships2. Creates formal proofs3. Applies the concepts of congruence7. Uses theorems or geometric properties to solve problems
Knowledge/Skills	Apply the definitions of transversal, alternate interior angles, alternate exterior angles, corresponding angles, same-side interior angles, same-side exterior angles Apply theorems proving that lines are parallel and their converses Use algebra to solve problems involving angles created by parallel or perpendicular lines Use the parallel line theorems to find measures of angles in a complex diagram
Process Skills	<ol style="list-style-type: none">1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content.2. Students will use mathematical reasoning and proof.3. Students will communicate their understanding of mathematics.

Geometry and Measurement Stem 9**Quadrilaterals**

Topics	Properties for all types of quadrilaterals; algebraic applications
Competencies	<ol style="list-style-type: none">2. Creates formal proofs

	<p>3. Applies the concepts of congruence</p> <p>7. Uses theorems or geometric properties to solve problems</p> <p>10. Demonstrates conceptual understanding of equality by solving linear equations and by solving problems involving systems of linear equations</p>
Knowledge/Skills	<p>Use the definitions of quadrilaterals to prove basic theorems</p> <p>Prove and apply theorems that cause a quadrilateral to be a parallelogram</p> <p>Apply the properties of parallelograms, rectangles, rhombi and squares</p> <p>Apply the properties of trapezoids and isosceles trapezoids</p> <p>Solve diagram problems using algebraic skills including systems of equations and quadratic equations</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 10

Similarity

Topics	Ratio & proportions; definition & theorems for similarity;
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proofs 4. Applies concepts of similarity 5. Solves problems using perimeter, circumference or area

	8. Solves problems on and off the coordinate plane
Knowledge/Skills	<p>Simplify ratios and solve algebraic proportions</p> <p>Use the definition of similarity to compute the lengths of sides of similar figures</p> <p>Apply theorems stating that if two triangles are similar, then their perimeters, altitudes, medians and angle bisectors have the same scale factor</p> <p>Prove triangles similar using Angle-Angle (AA~), Side-Side-Side (SSS~), Side-Angle-Side (SAS~)</p> <p>Use algebra to solve verbal and diagram problems based on similarity</p> <p>Perform operations with square roots.</p> <p>Create a scale drawing of a kitchen</p>
Process Skills	<ol style="list-style-type: none"> 2. Students will communicate their understanding of mathematics. 3. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 11

Right Triangles

Topics	Geometric mean theorems; Pythagorean theorem; special triangles; reflections
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proofs 4. Applies concepts of similarity 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane
Knowledge/Skills	<p>Apply the geometric mean theorems involving the altitude to the hypotenuse of a right triangle</p> <p>Prove the Pythagorean Theorem using the geometric mean theorems</p>

	<p>Use the Pythagorean Theorem to solve problems involving right triangles, squares, rectangles, equilateral triangles, rhombi, trapezoids and three dimensional figures</p> <p>Use the special triangle relationships for 30-60-90 triangles, 45-45-90 triangles and 3-4-5 triangles to quickly compute the lengths of sides</p> <p>Use the properties of line reflections</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 12

Trigonometry

Topics	Using trig ratios to find missing sides or angles; basic trig identities
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 4. Applies concepts of similarity 7. Uses theorems or geometric properties to solve problems
Knowledge/Skills	<p>Apply the definitions for sine, cosine and tangent ratios to right triangles</p> <p>Solve simple trigonometric equations using a table and using a calculator</p> <p>Find the indicated sides or angles in right triangles using trig</p> <p>Prove and apply basic trig identities</p> <p>Use trig ratios to solve verbal and diagram</p>

	problems
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 13

Circles

Topics	Arcs & angles measures; segment relationships; graphing circles; equations for circles
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proof 5. Solves problems using perimeter, circumference 7. Uses theorems or geometric properties to solve problems 8. Solves problems on and off the coordinate plane
Knowledge/Skills	<p>Apply theorems which relate angle measure to arc measure</p> <p>Apply theorems which relate chords, secants, arc measure and angle measure</p> <p>Apply theorems which relate the lengths of chords, tangents and secants</p> <p>Graph circles and write the equations of circles in standard form</p> <p>Write the equation for a circle containing three given points</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content.

	<ol style="list-style-type: none"> 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.
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Geometry and Measurement Stem 14
Area

Topics	Finding area for polygons & circles; rotations & translations
Competencies	<ol style="list-style-type: none"> 1. Uses properties of angle relationships 2. Creates formal proofs 4. Applies concepts of similarity 5. Solves problems using perimeter, circumference or area 7. Uses theorems or geometric properties to solve problems
Knowledge/Skills	<p>Apply area formulas for squares, triangles, rectangles, rhombi, kites, trapezoids, parallelograms and circles</p> <p>Solve area problems using the special triangle ratios</p> <p>Use area to solve consumer related problems and probability problems</p> <p>Compute area of regular polygons using the apothem and trigonometry</p> <p>Find the length of arcs, area of sectors and area of segments of circles</p> <p>Solve verbal problems which relate perimeter and area for similar figures</p> <p>Use the properties of rotations and translations</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly

	<p>complex mathematical content.</p> <ol style="list-style-type: none"> 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 4. Students will recognize, explore, and develop mathematical connections.

Geometry and Measurement Stem 15

Three Dimensional Figures

Topics	Finding lateral area & total surface area; finding volume ; consumer applications
Competencies	<ol style="list-style-type: none"> 2. Creates formal proofs 4. Applies concepts of similarity 5. Solves problems using perimeter, circumference or area 6. Solves problems using surface area or volume 7. Uses theorems or geometric properties to solve problems
Knowledge/Skills	<p>Compute lateral area, total surface area and volume for cubes and prisms</p> <p>Compute area and volume for pyramids, cylinders, cones and spheres</p> <p>Solve verbal consumer problems using area and volume</p> <p>Calculate the area of cross sections of pyramids</p>
Process Skills	<ol style="list-style-type: none"> 1. Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their

	<p>understanding of mathematics.</p> <p>4. Students will recognize, explore, and develop mathematical connections.</p>
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