HARFORD COUNTY PUBLIC SCHOOLS

GRADE 8 GEOMETRY CURRICULUM

CLICK HERE for the Maryland College and Career Ready Standards for Geometry.

Unit 1: Review of Quadratics

Primary Resource: *Algebra I*, Module 4, Topics A, B, and C, EngageNY.

Enduring Understandings

- Relationships can be described, and generalizations made, for mathematical situations that have numbers of objects that repeat in predictable ways.
- Any number, measure, numerical expression, algebraic expression, or equation can be represented in an infinite number of ways that have the same value.

Essential Questions

- How are the properties of algebraic expressions used to simplify polynomials?
- What do the factors of a quadratic equation reveal about its properties?
- When finding the roots of quadratic equation, how does one decide between graphing, factoring, completing the square and the Quadratic Formula?
- How can real world situations be modeled by quadratic functions to help solve problems?

Lesson Title	Lesson Overview	Standards
The Extended Distributive Property	Students will use the Distributive Property to multiply a monomial by a polynomial and understand that factoring reverses the multiplication process. Students will use polynomial expressions as side lengths of polygons and find area by multiplying. Students will recognize patterns and formulate shortcuts for writing the expanded form of binomials whose expanded form is a perfect square of the difference of perfect squares. Students will develop an understanding that factoring reverses the multiplication process as they find the linear factors of basic, factorable quadratic trinomials.	A.APR.A.1

Factoring Polynomials	Students will solve increasingly complex one-variable equations, some of which need algebraic manipulation, including factoring as a first step and using the Zero Product Property. Students will use appropriate and efficient strategies to find solutions to basic quadratic equations. Students will interpret the verbal description of a problem and its solutions in context and then justify the solutions using algebraic reasoning. Students will interpret word problems to create equations in one variable and solve them (i.e., determine the solution set) using factoring and the Zero Product Property.	A.APR.A.1 A.SSE.B.3a A.REI.B.4b
The Quadratic Formula	Students will use the Quadratic Formula to solve quadratic equations that cannot be easily factored. Students will understand that the discriminant can be used to determine whether a quadratic equation has one, two, or no real solutions. Students will write the quadratic function described verbally in a given context.	A.CED.A.1 A.CED.A.2 A.REI.B.4a A.REI.B.4b

Unit 2: The Language of Geometry: Angles, Arcs, Lines and Logic

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Two- and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.
- Objects in space can be oriented in an infinite number of ways and an object's location in space can be described quantitatively.

Essential Questions

- What are the building blocks of geometry?
- How do we use the building blocks of geometry?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Insert Lesson: Review of Basic Geometric Concepts	The students classify objects as one-, two- or three- dimensional. The students will create definitions for objects based on their attributes.	G.CO.A.1
Betweenness and Distance	Students will define lines, line segments, rays, and opposite rays and how to denote them. Students will use ratios between parts of a segment to determine lengths.	G.GPE.B.4 G.GPE.B.6 G.CO.A.1
Using a Dynamic Geometry System Polygons	Students will determine if three side lengths can form a triangle. Given two side lengths, students will identify possible lengths of the third side of triangle.	G.CO.A.1
The Midpoint of a Segment and a Good Definition for Circles	Students will learn about midpoints of line segments. Some examples of problems to focus on include: Students will copy a line segment and construct an equilateral triangle given one side of the triangle. Students will justify the steps used in constructions using the definition of a circle.	G.GPE.B.4 G.GPE.B.6 G.CO.A.1 G.CO.D.12 G.CO.D.13

What are Arcs and Angles and What are Their Measures?	Students will classify arcs and angles and find the measure of an arc based on the central angle.	G.CO.A.1 G.C.A.2
Special Types of Angles	Students will learn about special angles and how these are related.	G.CO.A.1 7.G.B.5
Algebra Properties Used in Geometry Justifying Conclusions	Students will use theorems to justify conclusions in proofs. Students will complete two column and paragraph proofs.	G.GPE.B.6 G.CO.A.1 7.G.B.5
Parallel Lines	Students will learn about the relationship between the slopes of parallel lines and write an equation for a line that is parallel through a given point not on the line.	G.GPE.B.4 G.GPE.B.5 G.CO.A.1
Perpendicular Lines	Students will learn about the relationship between the slopes of perpendicular lines and write an equation for a line that is perpendicular to a given line through a given point not on the line.	G.GPE.B.4 G.GPE.B.5 G.CO.A.1
The Perpendicular Bisector	Students will learn what a perpendicular bisector is and how to construct the perpendicular bisector. Students will construct a Voronoi Diagram.	G.GPE.B.5

Unit 3: Transformations

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Objects in space can be transformed in an infinite number of ways, and those transformations can be described and analyzed mathematically.

Essential Questions

- How does a transformation affect a figure?
- How do congruence transformations and size transformations differ?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Size Transformations	Students will apply a size transformation to a figure in the coordinate plane. Students will find the center of dilation and the scale factor of similar figures in the coordinate plane.	G.SRT.A.1 G.SRT.A.1.a G.SRT.A.1.b G.SRT.A.2 G.CO.A.2 7.G.A.1 8.G.A.3
Reflecting Points and Figures	Students will reflect points and figures using both the definition of reflection and other reflection tools. Students will understand that the line of reflection is the perpendicular bisector of the line connecting a preimage and image and how the Figure Transformation Theorem relates to reflecting a figure.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3

Rotations	Students will rotate figures about the origin.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3
Reflections on Coordinate Plane	Students will reflect figures in the coordinate plane. Students will reflect images over axes, vertical and horizontal lines (examples: $y = 5$, $x = -2$), and the lines $y = x$ and $y = -x$.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3
Reflections Over Parallel Lines	Students will develop a definition for translation based on reflections over parallel lines. Students will identify parallel lines given equations in both standard form and slope-intercept form.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3

Composing Reflections over Intersecting Lines	Students will develop a definition for rotation based upon the definition of reflecting an image over an intersecting line.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3
Translations as Vectors	Students will perform transformations using vectors and vectors in the coordinate plane. These will include composites of reflections and vectors.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3
Rotating Points in the Coordinate Plane	Students will rotate figures in the coordinate plane, including rotations centered outside the origin. Students will name the properties preserved when rotations take place. Students will complete a composite of transformations in the coordinate plane and identify possible composite transformations that map a preimage onto an image.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5 8.G.A.1 8.G.A.2 8.G.A.3
What is an Isometry?	Students will develop a definition for a glide-reflection based on reflecting an image over intersecting lines.	G.CO.A.2 G.CO.A.3 G.CO.A.4 G.CO.A.5

Unit 4: Proofs Using Congruence

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Objects in space can be transformed in an infinite number of ways, and those transformations can be described and analyzed mathematically.

Essential Questions

- How can we prove that figures are congruent?
- How can we use the building blocks of geometry to extend our knowledge?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
When are Figures Congruent?	Students will recognize that two figures are congruent when the image is the result of the preimage after an isometry.	G.CO.B.6 8.G.A.2
Corresponding Parts of Congruent Figures	Students will apply the CPCF Theorem to determine congruent parts. Students will determine the corresponding parts based on how the congruent figures are identified.	G.CO.B.6 8.G.A.2
One-Step Congruence Proofs	Students will write simple proofs about congruence.	G.CO.B.6 G.CO.C.9 G.CO.C.10 8.G.A.2 8.G.A.5
Proofs Using Transitivity	Students will examine the relationship between alternate interior and exterior angles and will know how to derive the parallel lines theorem.	G.CO.B.6 G.CO.C.9 G.CO.C.10 8.G.A.2 8.G.A.5

Proofs Using Reflections	Students will complete proofs about congruence. Students will find lengths using properties of the perpendicular bisector.	G.CO.C.9 G.CO.D.12
Auxiliary Figures and Uniqueness	Students will discuss the idea of uniqueness and auxiliary figures to help understand the construction for a parallel line.	G.CO.C.9 8.G.A.5
Sums of Angles Measures in Polygons	Students will derive a formula for calculating the sum of the angles in a polygon based on what they already know about the sum of the angles in triangles. Students will calculate the sum of the exterior angles of any polygon.	

Unit 5: Polygons and Symmetry

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Two- and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.
- Objects in space can be oriented in an infinite number of ways and an object's location in space can be described quantitatively.

Essential Questions

- How are congruence transformations and polygons related?
- How are special polygons created?
- How are polygons classified?
- How are polygons related?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Reflection Symmetry, Isosceles Triangles	Students will explore a formal definition of symmetry and apply that definition to describe symmetry in segments, angles, and circles. Students will extend their knowledge of isosceles triangles. Students will explore the Isosceles Triangle Base Angles Theorem as well as the Converse of the Isosceles Triangle Base Angles Theorem and be able to explain the difference. Students will apply the Unequal Sides Theorem and Unequal Angles Theorem and explain the relationships between angles and sides.	G.CO.C.10
Angles Inscribed in Circles	Students will identify inscribed angles and their measures in relationship to arcs and central angles. Students will apply the concept of Thales' Theorem in circles to find missing angles and arcs.	G.C.A.2 G.CO.C.10
Types of Quadrilaterals	Students will identify quadrilaterals and describe how they are related based on the hierarchy.	G.CO.C.10 G.CO.C.11

Properties of Kites	Students will explore the Kite Symmetry Theorem, the Kite Diagonal Theorem, and the Rhombus Diagonal Theorem. Students will use these theorems to find missing sides and angles in a kite or rhombus.	G.CO.C.10 G.CO.C.11
Properties of Trapezoids	Students will explore the Trapezoid Angle Theorem, the Isosceles Trapezoid Symmetry Theorem, the Isosceles Trapezoid Theorem, and the Rectangle Symmetry Theorem. Students will use these theorems to find missing sides and angles of trapezoids, isosceles trapezoids, and rectangles.	G.CO.C.10 G.CO.C.11
Rotation Symmetry	Students will draw lines of symmetry in a regular figure, identify the center of rotation, and determine the number of folds of rotation. Students will be able to identify the smallest magnitude that will map a figure onto itself. Based on the number of sides of a regular polygon, students will know how many symmetry lines are considered diagonals. Students will construct a square and a regular hexagon.	G.CO.A.3
Regular Polygons	Students will learn the Regular Polygon Sum Theorem and determine the measure of interior angles within regular polygons. Students will construct a square and a regular hexagon.	G.C.A.2 G.CO.C.10 G.CO.C.11 G.CO.D.13

Unit 6: Applications of Congruent Triangles and Similarity

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Objects in space can be transformed in an infinite number of ways, and those transformations can be described and analyzed mathematically.

Essential Questions

- How can we prove figures are congruent?
- How can we prove figures are similar?
- How can we use the building blocks of geometry to extend our knowledge?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Triangle Congruence Theorems	Students will focus on the triangle congruence theorems. Students will make connections between the congruence transformations from previous units and the triangle congruence theorems.	G.CO.B.8
Using Triangle Congruence Theorems	Students will apply previously studied theorems to prove that parts of triangles are congruent. Students will complete multi-step triangle congruence proofs.	G.CO.B.7 G.CO.B.8 G.CO.C.9 G.CO.C.10
Overlapping Triangles	Students use the theorems from previous sections of the book and apply them to prove that parts of overlapping triangles are congruent. Students will complete multi-step triangle congruence proofs involving overlapping triangles.	G.CO.B.7 G.CO.B.8 G.CO.C.9 G.CO.C.10
The SsA and HL Congruence Theorems	Students will determine when the SsA and HL Congruence Theorems can be applied and use them to prove triangles are congruent.	G.CO.B.7 G.CO.B.8 G.CO.C.9 G.CO.C.10

Properties of Parallelograms Sufficient Conditions for Parallelograms	Students will examine sufficient conditions for a parallelogram. Students will prove the sufficient conditions using triangle congruence proofs.	G.CO.B.8 G.CO.C.9 G.CO.C.10
Diagonals of Quadrilaterals	Students will examine how the diagonals of the different quadrilaterals are related. Students will use the properties of diagonals to classify quadrilaterals.	G.CO.C.11 G.GPE.B.6
Similar Figures	Students will learn about similar figures: what they are, as well as properties that are preserved under a size change. Students will need to be able to determine the center of a size change on the coordinate plane.	G.SRT.A.1 G.SRT.A.1.a G.SRT.A.1.b G.SRT.A.2 7.RP.A.2
The Fundamental Theorem of Similarity	Students will compare surface areas and volumes of similar figures by utilizing the ratio of similitude. Given surface areas or volumes of similar shapes, students will calculate the ratio of similitude.	G.SRT.A.1 G.SRT.A.2 G.SRT.B.5 7.RP.A.2
The SSS Similarity Theorem	Students will explore the SSS Similarity Theorem and use it to prove that two figures are similar.	G.SRT.A.1 G.SRT.A.1.a G.SRT.A.1.b G.SRT.A.2 G.SRT.A.3 G.SRT.B.4

The AA and SAS Triangle Similarity Theorems	Students will use the AA and SAS Similarity Theorems in proofs. Students will determine which congruence theorems have a related similarity theorem and why. Students will prove that all circles are similar.	G.C.A.1 G.SRT.A.1 G.SRT.A.1.a G.SRT.A.1.b G.SRT.A.2 G.SRT.A.3 G.SRT.B.4 G.SRT.B.5

Unit 7: Lengths and Areas

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Some attributes of objects are measurable and can be quantified using unit amounts.
- The Pythagorean Relationship can be represented algebraically, geometrically, and can be verified through measurement.

Essential Questions

- How can we calculate the area and perimeter of a figure?
- How is the Pythagorean Theorem useful to us?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Fundamental Properties of Area	Students will derive the formulas for area of figures using the area model algebraically.	G.GPE.B.7
Areas of Triangles	Students will calculate the area of triangles.	G.GPE.B.7 G.MG.A.1 G.MG.A.2 6.G.A.1
Areas of Quadrilaterals	Students will calculate the area of quadrilaterals.	G.GPE.B.7 G.MG.A.1 G.MG.A.2 6.G.A.1
The Pythagorean Theorem	Students will revisit and apply the Pythagorean Theorem.	G.MG.A.1 G.SRT.B.4 G.SRT.C.8 8.G.B.6

Special Right Triangles	Students will determine exact measures of the sides of 45-45-90 and 30-60-90 triangles.	G.MG.A.1 G.SRT.B.4 G.SRT.C.8 8.G.B.6
Special Right Triangles	Students will use the apothem to calculate the area of a regular polygon.	G.MG.A.1 G.SRT.B.4 G.SRT.C.8 8.G.B.6
Arc Length and Circumference	Students will derive the formula for the circumference of a circle and apply the formula to a variety of situations. Students will determine the length of an arc using central angles.	G.GMD.A.1 G.MG.A.1 7.G.B.4
The Area of a Circle	Students will derive the formula for the area of a circle. Students will determine the area of a sector using central angles.	G.C.B.5 G.GMD.A.1 G.MG.A.1 G.MG.A.2 7.G.B.4 6.G.A.1

Unit 8: Similar Triangles and Trigonometry

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Relationships can be described, and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.

Essential Questions

- How do the relationships between the sides and angles in right triangles create the rules for trigonometry?
- How can right triangles trigonometry be applied to real world contexts?
- How can similarity be used to determine unknown quantities?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
The Side-Splitting Theorem	Students will prove that a line parallel to one side of a triangle divides the other two proportionally. Students will also prove the converse. Students will understand when the Side-Splitting Theorem is applicable and when it is not.	G.SRT.B.4 G.SRT.C.6
The Angle Bisector Theorem	Students will find the length of sides in triangles using the Angle Bisector Theorem	G.SRT.C.6
Geometric Means in Right Triangles	Students will use the Right-Triangle Altitude Theorem to determine the missing lengths of single or multiple segments in a right triangle.	G.SRT.C.6
The Tangent of an Angle	Students will calculate and apply the tangent of an angle.	G.SRT.C.6 G.SRT.C.8
The Sine and Cosine Ratios	Students will calculate and apply the sine and cosine of an angle.	G.SRT.C.6 G.SRT.C.7 G.SRT.C.8

Unit 9: Indirect Proofs and Coordinate Proofs

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Two- and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.
- Some attributes of objects are measurable and can be quantified using unit amounts.

Essential Questions

- How is the Pythagorean Theorem useful to us?
- How can we prove that figures are specific quadrilaterals?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Lesson Overview	Standards
Proofs with Coordinates	Students will use properties of slope and properties of quadrilaterals in coordinate proofs.	G.CO.C.11 G.GPE.B.4 6.G.A.3
The Pythagorean Distance Formula	Students will derive the distance formula from the Pythagorean Theorem.	G.CO.C.11 G.GPE.B.4 G.GPE.B.7 6.G.A.3
Equations for Circles	Students will derive the formula for a circle using the Distance Formula.	G.GPE.A.1 G.GPE.B.4
Equations for Circles	Based on given information, students must be able to write the equation of circle, graph it, and identify at least four points that lie on the circle. Students must also rewrite a given equation that represents a circle into the form $(x-h)^2+(y-k)^2=r^2$ by completing the square and factoring perfect square trinomials.	G.GPE.A.1 G.GPE.B.4 G.GPE.B.7

Equations for Circles	Students will use both the standard and expanded form equations of a circle.	G.GPE.A.1 G.GPE.B.4 G.GPE.B.7
Means and Midpoints	Students will use the midpoint formula to write an equation that describes a perpendicular bisector. Students will use the midpoint formula to find the center of a circle.	G.CO.C.10 G.GPE.B.4
Theorems Involving Midpoints	Students will derive the midsegment of a Triangle and Trapezoid Theorem and find missing segment lengths based on midsegments and medial triangles. Students will prove that the medians of a triangle are concurrent.	G.CO.C.10 G.GPE.B.4 6.G.A.3

Unit 10: Three-Dimensional Figures and Formulas for Volume

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Two-and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.
- Some attributes of objects are measurable and can be quantified using unit amounts.

Essential Questions

- How is surface area different than volume?
- How does the shape of its figure determine its surface area or volume?
- How can real-world situations be modeled by geometric figures to help solve problems?

Lesson Title	Overview and Teacher Resources	Standards
Prisms and Cylinders Pyramids and Cones	Students will study the attributes of prisms, pyramids, cylinders, and cones including the number of faces, vertices, and edges. Based on the information, students must be able to provide the most specific name possible for these figures. Students will apply the Pythagorean Theorem to identify missing information within a figure such as the height or the slant height. Include problems with both right and oblique solids.	G.MG.A.1 G.MG.A.3
Spheres and Sections Making Polyhedral and Other Surfaces	Students will provide 2-dimentional representations for 3-dimentsional figures. Students will identify what 3-dimensional figure is created when a given 2-diemsional figure is rotated 360° about a given point.	G.MG.A.1 G.MG.A.3 6.G.A.2
Surface Areas of Prisms and Cylinders	Students will calculate both the lateral area and the surface area of prisms and cylinders. Students will draw nets and use nets to find lateral/surface area.	G.MG.A.1 G.MG.A.2 G.MG.A.3 6.G.A.4 7.G.B.6 8.G.C.9

Surface Areas of Pyramids and Cones	Students will calculate both the lateral area and surface area of pyramids and cones. Given lateral area or surface area, students will solve for missing information.	G.MG.A.1 G.MG.A.2 G.MG.A.3 6.G.A.4 7.G.B.6 8.G.C.9
Fundamental Properties of Volume	Students will determine the volume of a rectangular prism. Students will connect volume to density.	6.G.A.2 7.G.B.6
Multiplication, Area and Volume	Students will connect algebra and geometry wile calculating the area and volume of figures using side lengths that are algebraic expressions.	6.G.A.1 6.G.A.2 7.G.B.6
Volume of Prisms and Cylinders	Students will apply Cavalieri's Principle in real world contexts. Students will calculate the volume of prisms and cylinders. Given the volume of prisms or cylinders, students will solve for missing information.	G.MG.A.1 G.MG.A.2 G.MG.A.3 G.GMD.A.1 G.GMD.B4 7.G.B.6 8.G.C.9
Volumes of Pyramids and Cones	Students will calculate the volume of pyramids and cones.	G.MG.A.1 G.MG.A.2 G.MG.A.3 G.GMD.A.1 G.GMD.B4 7.G.B.6 8.G.C.9

Volume of a Sphere	Students will calculate the volume of spheres and hemispheres.	G.MG.A.1 G.MG.A.2 G.MG.A.3 G.GMD.A.3 G.GMD.B4 8.G.C.9
Surface Area of Spheres	Students will calculate the surface area of spheres and hemispheres, including other polyhedra that are a composite of spheres, prisms, and cones.	G.MG.A.1 G.MG.A.2 G.MG.A.3 6.G.A.4

Unit 11: Further Work with Circles

Primary Resource: *Geometry*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Some attributes of objects are measurable and can be quantified using unit amounts.

Essential Questions

- What is the relationship between secants, chords, tangents, and the angles that they form?
- How can real-world situations be modeled by circles to help solve problems?

Lesson Title	Overview and Teacher Resources	Standards
Chord Length and Arc Measure	Students will calculate the length of a chord by using special right triangles from lesson 8.7 and trigonometric ratios.	G.C.A.2 G.C.A.3
Angles Formed by Chords or Secants	Students will explore the relationship between angles and secants and chords.	G.C.A.2 G.C.A.3
Tangents to Circles and Spheres	Students will explore the relationship between the radius of a circle and tangent.	G.C.A.2 G.C.A.3
Angles formed by Triangles and a General Theorem	Students will explore the relationship between tangents and angles. Students will determine that the sum of the angles formed by two tangents and its first intercepted arc equals 180 degrees.	G.C.A.2 G.C.A.3
Inscribed and Circumscribed Circles	Students will construct inscribed circles and circumscribe figures using perpendicular lines.	G.C.A.2 G.C.A.3 G.CO.D.13
Lengths of Chords Secants and Tangents	Students will calculate the length of chords, secants, and tangents.	G.C.A.2 G.C.A.3

Unit 12: Powers

Primary Resource: *Advanced Algebra*, 3rd Ed., University of Chicago School Mathematics.

Enduring Understandings

- Mathematical rules (relations) can be used to assign numbers of one set to members of another set. A special rule (function) assigns each member of one set to a unique member of the other set.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- What properties does a power function have?
- What do the parameters in the general form of a power function represent?
- How do changes in the parameters in the general form of a power function affect the key features of the graph?
- What techniques are used to solve an equation involving a power function?
- In what context is a power function an appropriate model?
- How can real-world situations be modeled by power functions to help solve problems?

Lesson Title	Lesson Overview	Standards
Power Functions	Students will examine key features of power functions, including domain, range, intercepts, symmetry, even or odd functions, rate of change over a given interval, and maximum or minimum value.	A.CED.A.1 F.BF.B.3 F.LE.A.2
Properties of Powers Negative Integer Exponents	Students will evaluate expressions including positive and negative exponents. Students will memorize the perfect squares of integers up to 20^2, perfect cubes of integers up to 10^3, integer powers of two up to 2^7, integer powers of three up to 3^5, and 10^n such that $-9 \leq n \leq 9$, where n is an integer.	A.SSE.B.3 N.RN.A.1
Compound Interest	Students will calculate basic compound interest.	A.CED.A.1 F.LE.A.2

Geometric Sequences	Students will describe geometric sequences explicitly and recursively.	F.BF.A.1a F.BF.A.2 F.LE.A.2
n^{th} Roots	Students will evaluate and solve real-world problems that can be modeled by expressions with n^{th} roots.	A.REI.A.2 A.SSE.B.3 N.RN.A.1 N.RN.A.2
Positive Rational Exponents	Students will apply properties of powers to include positive rational exponents.	A.CED.A.1 F.BF.B.3 F.LE.A.2
Negative Rational Exponents	Students will apply properties of powers to include negative rational exponents.	A.CED.A.1 F.BF.B.3 F.LE.A.2