Algebra 1 and Geometric Reasoning Honors

Grade(s):	☐ K ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☐ 8	☑ 9 ☐ 10 ☐ 11 ☐ 12 ☐ Other __________
Discipline/Course:	**Discipline:** Mathematics **Course:** Algebra I and Geometric Reasoning Honors		
Course Title:	Algebra 1 and Geometric Reasoning H		
Prerequisite(s):	Successful completion of Pre-Algebra 8 with an A or higher or teacher recommendation		
Course Description: *Program of Studies*	Algebra I and Geometric Reasoning Honors is an accelerated course for students with a strong mathematical background in pre-algebra skills. This is the first course in a two-year sequence in which students study algebra, advanced algebra topics, and geometry. Algebra 1 topics include: equations, inequalities, functions, linear functions, systems of linear equations and inequalities, exponents and polynomials, factoring, and quadratic functions. Geometry topics include geometric properties, congruence, similarity, and measurement in two- and three-dimensions. A major emphasis of the geometry units in this course is algebraic applications in geometric contexts. This is a fast-paced course that will build on students' understanding, arithmetic, and algebraic fluency developed in the lower grades. This course is for students with a strong mathematical background in algebraic and geometric skills. At the completion of this course, students will continue with Algebra II and Geometric Reasoning Honors. After the two-year course sequence, students are positioned to take Precalculus. Honors-level courses are similar to College Preparatory courses by design, yet they require students to explore topics and concepts more deeply and have a strong mathematical procedure and skill, and		

	fluency that exceeds grade-level expectations. Students in Honors classes are expected to manipulate, create, and solve expressions and equations without significant scaffolding, and at a much quicker pace. Students should also be capable of attending to precise details, which increases the reliability of mathematical results and minimizes miscommunication of mathematical explanations. The expectations for skill demonstration, content mastery, and work habits are above grade level.
Course Essential Questions:	● How is thinking algebraically different from thinking arithmetically? ● How is mathematics used to measure, model, and calculate change? ● How can we communicate mathematical ideas clearly and effectively? ● How can we generalize relationships using algebraic equations and expressions from specific cases? ● How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ● How can we use representations of functions graphically, numerically, symbolically, and verbally to quantify and compare situations, events, and phenomena? ● How can mathematics be used to provide models of data and physical phenomena to help us describe, interpret, and make predictions? ● How does the choice of method, tool, or representation affect the efficiency and reliability of problem-solving? ● Why do we classify shapes, and how do their properties help us solve problems? ● How do geometric transformations inform how we use figures?
Course Enduring Understandings:	● Algebraic reasoning allows us to represent, analyze, and explain patterns and relationships in real-world contexts, extending beyond basic arithmetic computation. ● Change in real-world situations can be measured, represented, and predicted using algebraic expressions, equations, tables, graphs, and functions. ● Algebra provides tools to move from particular examples to general rules by representing relationships with variables, expressions, and equations. ● Identifying mathematical patterns reveals structure in data and natural phenomena, which can be modeled to make meaningful predictions and solve problems.

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Multiple representations of functions (verbal, numerical, graphical, symbolic) allow us to compare and analyze relationships effectively.
Quantities change in predictable ways that can be modeled, analyzed, and interpreted using linear and quadratic relationships.
While there are multiple ways to analyze or solve a problem, selecting appropriate representations, strategies, and tools leads to more efficient, accurate, and reliable conclusions.
Change in real-world situations can be measured, represented, and predicted using geometric properties, algebraic expressions, equations, tables, graphs, and functions.
Identifying mathematical patterns reveals structure in data and natural phenomena, which can be modeled to make meaningful predictions and solve problems.
While there are multiple ways to analyze or solve a problem, selecting appropriate representations, strategies, and tools leads to more efficient, accurate, and reliable conclusions.
Mathematics can be used to solve problems outside of the mathematics classroom.
Mathematics is built on reason and justification.
Reasoning allows us to make conjectures and to prove conjectures.
Classifying helps us to build networks of mathematical ideas.

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<tr><td>Duration:
Credit:</td><td>☐ Semester
☑ Full-Year</td><td>☐ 0.5 Credit (s)
☑ 1.0 Credit(s)
☐ 1.5 Credit(s)
☐ N/A</td></tr>
<tr><td>Course Materials/Resources:</td><td colspan="2">enVision Algebra 1, enVision Geometry, Savvas Learning Company
College Board Pre-AP Algebra I, Geometry</td></tr>
<tr><td>FPS Course Academic Expectation(s):</td><td colspan="2">☑ Exploring and Understanding (EU)
☐ Synthesizing and Evaluating (SE)
☐ Creating and Constructing (CC)</td></tr>
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	☑ Conveying Ideas (CI) ☐ Collaborating Strategically (CS) ☐ Using Communication Tools (UCT)
Unit Overview	**Unit 1:** Solving Equations and Inequalities (~ 4 weeks) **Unit 2:** Linear Functions (~4 weeks) **Unit 3:** Polynomial Expressions (~ 5 weeks) **Unit 4:** Quadratic Functions and Equations (~ 5 weeks) **Unit 5**: Introduction to Geometry (~ 4 weeks) **Unit 6:** Congruence (~6 weeks) **Unit 7**: Similarity (~4 weeks) **Unit 8:** Measurement in Two- and Three- Dimensions (~ 4 weeks)

Unit Number and Title:	**Unit 1 -** Solving Equations and Inequalities
Duration:	~4 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	By grade 8, students have learned to solve linear equations in one variable. Unit 1 builds on students' middle-grade understanding of equations and inequalities, extending their skills to solve multi-step equations, inequalities, and equations with variables on both sides. Students apply properties of equality and inequality to justify each step in their solutions. They solve linear equations in one variable, literal equations and formulas, absolute value equations, one-variable inequalities, compound inequalities, and absolute value inequalities. Students also learn to represent solutions graphically on a number line, developing both fluency in solving equations and inequalities and a deeper understanding of how these concepts model real-world situations. Students analyze and interpret descriptions of lines, identify key components such as slope and y-intercept, write equations in slope-intercept, point-slope, and standard form, and algebraically transform an equation from one form to another The unit also addresses horizontal and vertical lines and extends to writing equations of parallel and perpendicular lines, supporting fluency in writing, interpreting, and translating among forms of linear equations.
Learning Goals	
Standard(s):	

Reason quantitatively and use units to solve problems.	
N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.

	N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	Create equations that describe numbers or relationships
	A-CED.1[1] Create equations and inequalities in one variable and use them to solve equations. . *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
	A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scale
	A-CED.3 Represent constraints by equations or inequalities and by systems of equations and/or inequalities and interpret solutions as variable and nonviable options in a modeling context.
	A-CED.4 Arrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R
	Understand solving equations as a process of reasoning and explain the reasoning
	A-REI.1 Explain each step in solving a simple equation as follows from the equality of numbers assured at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
	Solve equations and inequalities in one variable
	A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	Use properties of rational and irrational numbers

	N.RN.3 — Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. [1]In Algebra I, tasks are limited to linear and quadratic equations with integer exponents.
Essential Question(s):	● How can the same algebraic reasoning used to solve a simple equation be applied to rearrange literal equations and formulas to highlight a quantity of interest? ● How are equations and inequalities used to represent constraints in a real-world modeling context, and how do the resulting solutions determine viable and nonviable options? ● How does the nature of an inequality (linear, compound, absolute value) affect the solution set, and how is that solution set best represented graphically on a number line? ● When solving absolute value equations, how does the definition of absolute value lead to solutions that are either two-part, one-part, or none? ● Why is it useful to have different forms of linear equations (slope-intercept, point-slope, standard), and how does each form reveal a different aspect of the linear relationship? ● How is the graph of a linear equation in the coordinate plane fundamentally connected to the set of all its solutions? ● How do the characteristics of parallel and perpendicular lines—specifically their slopes—extend our understanding of linear functions in the coordinate plane?
Enduring Understanding(s):	● There is often an optimal method of manipulating equations and inequalities to solve a mathematical problem; however, other methods, which may not be as efficient, can still provide insight into the problem. ● Linear equations can be used to solve mathematical and contextual problems. You can solve a linear equation by using the properties of equality. ● Literal equations are equations with two or more variables. They are solved by rewriting the equation to highlight the variable of interest. ● The solution to an inequality in one variable is solved by using the properties of inequalities. ● A compound inequality is a combination of two or more inequalities used to describe multiple

	constraints. ● The solution to an absolute value equation either has two solutions, one positive and one negative, or if there is no value of x that makes the absolute value equation true, then it has no solution. ● The solution to an absolute value inequality is a compound inequality that uses OR or AND
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Equation types ○ equations in one-variable ■ equations with variables on both sides of the equation ○ equations involving absolute value ○ literal equations and formulas ● Inequality types ○ inequalities in one-variable ○ compound inequalities (using "AND" and "OR") ○ inequalities involving absolute value ○ solution sets ■ single solution, no solution, infinitely many solutions, and a range of solutions ■ graphing solution sets ● Interval notation ● Linear relationships ○ constant rate of change ● Forms of linear equations ○ slope-intercept form ○ point-slope form ○ standard form ● Key components of a linear function ○ x-intercept ○ y-intercept (constant term) ○ slope (rate of change)

	● Special lines ○ equations of horizontal and vertical lines ○ equations of parallel and perpendicular lines **Skills:** (Students will be able to…) ● create and solve absolute value equations and inequalities in one variable. ● interpret a constant, variable, factor, term, or the solution in a context. ● determine the conditions under which the equation has no solution, a unique solution, or infinitely many solutions. ● explain and justify each step in solving an equation using the properties of equality. ● solve equations with several variables for one variable of interest, and learn how this is applied to formulas in other subjects. ● create and use linear inequalities in one variable, including compound inequalities, to solve problems in a variety of contexts. ● create and solve absolute value inequalities. ● describe the solution set of two inequalities joined by either "and" or "or" and graph the solution set on a number line. ● identify and create linear inequalities in one variable to model constraints or conditions on two quantities ● interpret solutions of equations and inequalities in a modeling context to determine viable and nonviable options. ● write the solution to an inequality using interval notation. ● define appropriate units and quantities for descriptive modeling and ensure the consistent use and interpretation of units throughout problem-solving. ● write linear equations in slope-intercept, point-slope, and standard form given a graph, a description, or two input-output pairs (points). ● use properties of equality to rewrite a linear equation from one form (e.g., standard) into another form (e.g., slope-intercept). ● make connections between a table, an algebraic representation, or a graph of a linear function not in context.

	• there are many ways to algebraically represent a linear function, and each form reveals different aspects of the function. • write and graph the equations for horizontal and vertical lines. • write the equation of a line that is parallel or perpendicular to a given line and passes through a specific point.

Unit Number and Title:	**Unit 2** - Linear Functions
Duration:	~ 4 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	In Unit 2, students deepen their understanding of linear relationships and equations. Building on middle grades work defining, evaluating, and comparing functions to model relationships between quantities, this unit introduces function notation, domain, and range, and their use in modeling and solving real-world problems. Students develop an understanding that a function assigns exactly one output to each input and learn to distinguish between discrete and continuous functions. They explore multiple representations of functions, including algebraic, graphical, numeric, and verbal, and use function notation to evaluate and interpret functions in context. The unit reviews linear functions, focusing on how to write, graph, and transform them and how to model situations using tables and graphs. Students analyze patterns in data and interpret slopes and intercepts in context, building fluency with linear equations and recognizing their role as foundational tools for higher mathematics. In middle grades, students solved linear systems in two variables. Students explore multiple methods for solving systems and learn to identify which method is most efficient in a given context. They master the solution of linear equations. Students apply systems of linear equations and inequalities to model real-world situations with multiple constraints, including problems where an optimal solution is desired.
Learning Goals	
Standard(s):	

Create equations that describe numbers or relationships	
A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scale
A-CED.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a

	modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
Interpret linear models	
S-ID.7	Interpret the slope (rate of change) and intercept (constant term) of a linear model in the context of data.
Understand the concept of a function and use function notation	
F-IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
F-IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Interpret functions that arise in applications in terms of the context.	
F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function
F-IF.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table over a specified interval). Estimate the rate of change from a graph

	Analyze functions using different representations	
	F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
		a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
		b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
	Build new functions from existing functions	
	F-BF.3	Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *kf(x), f(kx)*, and *f(x + k)* for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
	Reason quantitatively and use units to solve problems	
	N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.
	Summarize, represent, and interpret data on two categorical and quantitative variables	
	S-ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
		a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use the given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*
		c. Fit a linear function for a scatter plot that suggests a linear association

	Interpret linear models	
	S-ID.7	Interpret the slope (rate of change) and intercept (constant term) of a linear model in the context of data.
	Solve systems of equations	
	A-REI.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
	A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
	Represent and solve equations and inequalities graphically	
	A-REI.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
	A-REI.11[1]	Explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
	A-REI.12	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Essential Question(s):	● What defines a function, and how do different representations (algebraic, graphical, numeric, verbal) help us understand its behavior? ● How can linear functions be used to model situations and solve problems involving constant rates of change? ● How do the slope (rate of change) and the intercept (constant term) of a linear model translate and provide meaning within the context of the data being modeled? ● Does each element of the domain correspond to exactly one element in the range? ● How can data be analyzed using scatterplots and trend lines to determine whether a linear model is appropriate? ● Given a system of linear equations, how can one strategically and efficiently choose the most appropriate solution method—graphing, substitution, or elimination—based on the equations' structure? ● How are systems of linear equations and inequalities used to model real-world situations with multiple constraints, and how can these models be used to find an optimal solution (where one is desired)?
Enduring Understanding(s):	● When a linear equation is written in slope-intercept form, $y=mx+b$, m is the slope, and the line intersects the y-axis at $(0,b)$, so the y-intercept is b. ● The point-slope form of a linear equation is used to write the equation of a line using the slope and any point on the line. ● The standard form of a linear equation helps identify the x- and y-intercepts. These are used to thraph the line and to aid in understanding constraints within a context. ● The equations of lines can be used to help identify whether lines are parallel or perpendicular. Parallel lines have the same slope but different x- or y-intercepts; perpendicular lines have slopes that are negative reciprocals. ● A linear relationship has a constant rate of change, which can be visualized as the slope of the associated graph. ● A function assigns exactly one output to each input, and can be represented in multiple ways to reveal its behavior and context. ● Identify or create a linear function to model a relationship between two quantities.

	- For a linear function that represents a context, interpret the meaning of an input/output pair, constant, variable, factor, or term based on the context, including situations where seeing structure provides an advantage. - Interpret the graph of a linear function in a context. - Make connections between a table, an algebraic representation, or a graph of a linear function in context. - Linear functions model additive change, and their slope and intercepts describe key aspects of the relationship. - Mathematical models are approximations, and their usefulness depends on how well they represent the given situation. - Scatterplots and trend lines help identify patterns in data and determine whether a linear model appropriately represents a relationship. - Data can be organized, displayed, and modeled to reveal patterns and support predictions about real-world situations. - For a linear function that represents a context, given an input value, find and interpret the output value using the given representation, or given an output value, find and interpret the input value using the given representation, if it exists. - Write the rule for a linear function given two input/output pairs or one input/output pair and the rate of change. - Evaluate a linear function given an input value, or find the input value for a corresponding output
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) - Relations and functions - domain and range - one-to-one correspondence - discrete and continuous functions - linear and nonlinear functions - function notation - Graphs of functions

	○ graphs of absolute value functions ○ sketching graphs from verbal descriptions ● Representations of functions: algebraic, graphical, numeric, and verbal description ● Scatterplots ○ positive/negative association ○ linear/nonlinear association ○ trend line ● Solutions to systems of linear equations ○ exactly one solution (intersecting lines) ○ infinitely many solutions (the same line) ○ no solution (parallel lines) ● Solution methods for systems of equations ○ substitution ○ elimination ○ graphical estimation ● Solutions methods to systems of inequalities ○ half-plane ○ noundaries ○ intersection of half-planes ● Modeling a system of linear equations or inequalities ○ constraints ○ viable and non-viable options in context **Skills:** (Students will be able to…) ● analyze a linear model to interpret the meaning of the slope and the y-intercept within the context of the data. ● interpret parts of a linear expression (like terms, factors, coefficients) in the context of the problem. ● understand that a relation is a function if each element of a domain is assigned exactly one element in the range.

	● recognize whether a relation is a function using one-to-one correspondence. ● identifying the domain and range of a discrete function. ● write and evaluate linear functions using function notation. ● graph a linear function and relate the domain of a function to its graph. ● interpret key features of the graph of a linear function and use them to write the function that the graph represents. ● create and analyze bivariate data using scatter plots ● calculate the trend line for a set of data ● create systems of linear equations and inequalities to model real-world situations with multiple constraints. ● solve systems of linear equations accurately using both the substitution and elimination methods. ● graph a system of linear equations to find the solution and estimate solutions approximately where appropriate. ● determine the number of solutions to a system (one, none, or infinitely many) both algebraically and graphically. ● graph a system of linear inequalities and identify the intersection of the corresponding half-planes as the solution set. ● interpret the solutions to a system of equations or the feasible region of a system of inequalities within a modeling context (e.g., maximizing/minimizing a quantity or identifying valid choices). ● determine the most efficient solution method (graphing, substitution, or elimination) based on the structure of a given system.

Unit Number and Title:	**Unit 3** - Exponents and Polynomial Expressions
Duration:	~ 5 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	Students will first master the properties of rational exponents and use them to rewrite radical expressions and solve equations. This unit extends students' knowledge of algebraic expressions into the domain of polynomials. The focus is twofold: first, on the operations of polynomials (addition, subtraction, and multiplication), recognizing that the set of polynomials is closed under these operations, similar to integers. Second, the unit delves deeply into factoring techniques, starting with the Greatest Common Factor (GCF) and progressing to factoring quadratic trinomials (both a=1 and $a \neq 1$) and special patterns like the Difference of Two Squares and Perfect-Square Trinomials. By the end of the unit, students will have the procedural fluency to manipulate polynomial expressions and the conceptual understanding of how factoring reverses the multiplication process.

Learning Goals

Standard(s):

Extend the properties of exponents to rational exponents	
N-RN.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.
N-RN.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents
Perform arithmetic operations on polynomials	

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	A-APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (e.g, multiply two binomials, or a binomial with a trinomial)
	Interpret the structure of expressions	
	A-SSE.1	Interpret expressions that represent a quantity in terms of its context.
		a. Interpret parts of an expression, such as terms, factors, and coefficients.
		b. Interpret complicated expressions by viewing one or more of their parts as a single entity
	A-SSE.2	Use the structure of an expression to identify ways to rewrite it. For example, see $\left(x^4 - y^4\right)$as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Essential Question(s):	● How can the properties of integer exponents be extended and applied to rational exponents and radicals? ● In what ways are polynomials like integers, and how does this analogy help us understand the operations of addition, subtraction, and multiplication of polynomial expressions? ● Why is identifying the structure of a polynomial (terms, coefficients, degrees, and number of terms) the essential first step in choosing an efficient strategy to simplify, multiply, or factor? ● How does multiplying polynomials using the Distributive Property and area models help explain the structure of the resulting expression? ● How does the process of factoring an expression directly reverse the multiplication process, and how does this enable us to solve related problems? ● How can we use the Greatest Common Factor (GCF) to rewrite polynomials and reveal important features of the expression? ● How does recognizing special patterns, such as a difference of squares and perfect-square trinomials, improve efficiency and accuracy when factoring? ● How can polynomial expressions and factoring be used to model and solve real-world situations involving area, volume, and constraints?
Enduring Understanding(s):	● The properties of exponents, including rational exponents, provide a consistent framework for simplifying expressions and solving equations. Radicals can be equivalently expressed using rational exponents. ● Polynomials are closed under the operations of addition, subtraction, and multiplication, meaning the result of these operations is always another polynomial. ● Polynomials are added and subtracted by combining like terms. ● Polynomials are multiplied using the Distributive Property or visual tools like area models, and the degree of the product is the sum of the degrees of the factors. ● The Greatest Common Factor (GCF) of a polynomial's terms is used to reverse the Distributive Property and write the polynomial in factored form. ● The factors of quadratic trinomials of the form $x^2 + bx + c$ are found by identifying two integers whose product equals c and whose sum equals b. ● The factors of quadratic trinomials of the form $ax^2 + bx + c$ can be factored by grouping,

	where bx is rewritten using two terms whose coefficients have a product equal to ac and a sum equal to b. ● Recognizing patterns like a perfect square trinomial $a^2 \pm 2ab + b^2$ or a difference of two squares $(a^2 - b^2)$ simplifies the factoring process.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Exponent properties ○ integer Exponents ○ rational exponents ○ Pythagorean Theorem ○ powers of a power property ○ product of powers property ○ quotient of powers property ● Radical expressions ○ cube root ○ square root ■ radical ■ radicand ○ product property of square roots ● Polynomial terminology ○ monomial ○ polynomial ○ term ○ coefficient ○ degree of a polynomial ● Adding and subtracting polynomials ● Multiplying polynomials ● Like terms ● Factoring polynomials

- Binomial and trinomial factoring
    - greatest common factor
    - quadratic trinomials (both a=1 and
    - $a \neq 1$)
    - factoring special patterns
    - perfect square trinomial
    - difference of two squares $(a^2 - b^2)$
- Area models

Skills: (Students will be able to…)

- apply the properties of integer exponents to simplify expressions involving rational exponents and rewrite radical expressions using rational exponents.
- multiply radical expressions and write a radical expression to model or represent a real-world problem.
- identify monomials and polynomials, and determine the degree of a polynomial.
- fluently add and subtract polynomials by combining like terms.
- multiply polynomials by applying the Distributive Property and by using tables or area models.
- find the greatest common factor (GCF) of a polynomial's terms and factor the polynomial completely using the GCF.
- factor quadratic trinomials in the form $ax^2 + bx + c$, $a = 1$, by finding factor pairs of c that sum to b.
- factor quadratic trinomials in the form $ax^2 + bx + c$, $a \neq 1$, by finding factor pairs of c that sum to b.
- factor binomials and trinomials using the special patterns for the difference of two squares and the perfect-square trinomial
- interpret the terms, factors, and coefficients of a polynomial expression in a given context.
- use polynomial multiplication and factoring to model and solve real-world problems involving area and volume.

Unit Number and Title:	**Unit 4** - Quadratic Equations and Functions
Duration:	~ 5 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	This comprehensive unit introduces and explores the quadratic function and its related equations, integrating it with previous knowledge of linear and exponential functions. The unit begins with the parent function, $y = x^2$. where students master identifying key features (vertex, axis of symmetry, intercepts) and analyzing the effect of the leading coefficient on the graph's width and direction. The unit then transitions to solving quadratic equations using a variety of methods, including graphs, tables, factoring, and taking square roots. The unit progresses to the quadratic formula, where students use the discriminant to determine the number and type of solutions. A major focus is placed on modeling real-world situations, specifically those involving area and vertical motion. Throughout the unit, students explore multiple evaluation methods to identify the most efficient strategy for a given context.
Learning Goals	
Standard(s):	

Perform arithmetic operations on polynomials	
A-APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (e.g, multiply two binomials, or a binomial with a trinomial)

	Understand the relationship between zeros and factors of polynomials	
	A-APR.3	Identify zeros of polynomials where suitable factorizations are available, and use zeros to construct a rough graph of the function defined by the polynomial.
	Interpret the structure of expressions	
	A-SSE.1	Interpret expressions that represent a quantity in terms of its context.
	Write expressions in equivalent forms to solve problems	
	A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
		a. Factor a quadratic expression to reveal the zeros of the function it defines.
		b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
	Understand the relationship between zeros and factors of a polynomial	
	A-CED.1	Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
	A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
	Solve equations and inequalities in one variable	
	A-REI.4	Solve quadratic equations in one variable.

		a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
		b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
	Solve systems of equations	
	A-REI.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
	Interpret functions that arise in applications in terms of context	
	F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
		a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
	F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
		a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
	F-IF.9	Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

<table>
<tr><td></td><td>
<table>
<tr><td colspan="2">Building Functions</td></tr>
<tr><td>F-BF.1</td><td>Write a function that models a relationship between two quantities.</td></tr>
<tr><td colspan="2">Building new functions from existing functions</td></tr>
<tr><td>F-BF.3</td><td>Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</td></tr>
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<tr><td>Essential Question(s):</td><td>

How do the key features of a quadratic function determine the shape and position of its graph?
How are quadratic functions and equations used to model and optimize real-world situations (such as area and vertical motion)?
How does the structure of a quadratic equation determine the most efficient method for finding its solution(s)?
How can multiple representations (algebraic, graphical, numerical, and contextual) be used to interpret and compare quadratic relationships?

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<tr><td>Enduring Understanding(s):</td><td>

Quadratic functions are transformations of the parent function $y = x^2$ and their graphs (parabolas) are defined by a vertex, axis of symmetry, direction, and width of opening.
The structure of a quadratic expression reveals important features of the function, including its zeros, maximum or minimum value, and symmetry.
Quadratic relationships are useful for modeling situations involving area, optimization, and parabolic motion.
Different forms of a quadratic function (standard, factored, and vertex) highlight different information and support different problem-solving strategies.

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</table>

	● Quadratic equations can be solved using multiple strategies, and the most efficient method depends on the form of the equation and the context of the problem.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Key features of a quadratic function ○ axis of symmetry ○ vertex ○ zeroes, roots, x-intercepts ● Quadratic functions ○ graph ○ table of values ○ description ○ algebraic representation ● Graphs of quadratic equations ○ factored form ○ vertex form ● Models of quadratic functions ● Square Roots ● Quadratic formula ● Discriminant and number of roots ● Quadratic equations given data or a graph ○ vertex form ○ root form **Skills:** (Students will be able to…) ● identify a quadratic function presented in different forms and recognize key characteristics. ● solve quadratic equations by using the Zero Product Property. ● solve basic quadratic equations, including word problems. ● writing quadratic functions in various forms

	• solve Quadratic equations using square roots • solve Quadratic equations using the quadratic formula. • understand and simplify square roots, and understand the concept of irrational numbers and operations with irrational and rational numbers. • understanding the discriminant provides insight into the number of real roots in a quadratic equation. • interpret word problems to create quadratic equations. • rewrite quadratic expressions given in standard form into completed-square form. • solve quadratic equations by completing the square. • understand and explore the key features of the graph of a quadratic function. • use the factored form of a quadratic equation to construct a graph and use the graph to construct a quadratic equation. • graph quadratic equations in the standard form $f(x) = ax^2 + bx + c$ • graph quadratic equations in the vertex form, $f(x) = a(x - h)^2 + k$. • graph quadratic equations in factored form, $f(x) = a(x - p)(x - q)$ • interpret quadratic functions from graphs and tables. • write the quadratic function based on the given information. • write quadratic functions given the roots.

Unit Number and Title:	**Unit 5 - Foundations of Geometry and Measurement**
Duration:	~ 4 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	This unit introduces students to the basic objects of geometry and the tools used to explore these objects throughout the remainder of the course. The basic objects students investigate in this unit include lines, rays, segments, and angles. These figures serve as the building blocks of more complex objects that students explore in later units. Students continue to expand their understanding of measurement by developing techniques for quantifying and comparing the attributes of geometric objects. The tools they use to analyze objects may include straightedges, compasses, rulers, protractors, dynamic geometry software, and the coordinate plane. Throughout the course, specific learning objectives require students to prove geometric concepts. Students' use of proofs is a means of communicating reasoning. The format of a student's proof is not as important as their ability to justify a mathematical claim or provide a counterexample disproving one. They should develop an understanding that a mathematical proof establishes the truth of a statement by combining previously developed truths into a logically consistent argument.
Learning Goals	
Standard(s):	

Experiment with transformations in the plane.	
G-CO.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
Prove geometric theorems	

	G-CO.9	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints*.
	G-CO.10	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point*.
	G-CO.11	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
	Make geometric constructions.	
	G-CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line*.
	Use coordinates to prove simple geometric theorems algebraically	
	G-GPE.4	Use coordinates to prove simple geometric theorems algebraically
	G-GPE.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

	G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. **Apply geometric concepts in modeling situations** **G-MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Essential Question(s):	● How do geometric relationships and measurements help us to solve problems and make sense of our world? ● How do parallel lines, transversals, and related angles model the physical world? ● How do triangles, their sides, angles, and special segments model the physical world?
Enduring Understanding(s):	● A formal mathematical argument establishes new truths by logically combining previously known facts. ● Measuring features of geometric figures is the process of assigning numeric values to attributes of the figures, which allows the attributes to be compared. ● Pairs of lines in a plane that never intersect or that intersect at right angles have special geometric and algebraic properties.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● Undefined terms ○ point ○ line ○ plane ● Defined terms

	○ segment ○ ray ○ opposite rays ○ angle ● Angle bisector ● Construction ● Midpoint formula ● Distance formula ● Parallel lines and angle relationships ○ transversals ○ angle pair relationships ○ linear pair ○ supplementary angles ○ vertical angles ○ adjacent angles ○ alternate interior angles ○ alternate exterior angles ● Angles in triangles and parallel lines ○ interior angle theorem ○ angle addition postulate ● Slopes of parallel and perpendicular lines ● Triangle inequality theorem **Skills:** (Students will be able to…) ● use the addition postulates ● construct copies of segments, angles, and bisectors of angles ● apply construction to solve problems ● identify congruent segments and angles ● use the midpoint formula to find the midpoint of a segment on a coordinate plane ● use the distance formula to find the length of a segment on the coordinate plane

	- use reasoning to identify patterns, make a conjecture, and prove theorems - use theorems to find the measures of angles formed by parallel lines and a transversal - use the sum of the angle measures in a triangle to solve problems - compare slopes on a coordinate plane to determine if lines are parallel or perpendicular - determine whether a figure can make a triangle given three sides - know and directly apply relevant theorems, such as the: a. triangle angle sum theorem. b. vertical angle theorem and the relationship of angles formed when a transversal cuts parallel lines. - determine which statements may be required to prove certain relationships or to satisfy a given theorem.

Unit Number and Title:	**Unit 6 - Congruence**
Duration:	~ 6 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions—translations, reflections, and rotations—and have strategically applied a rigid motion to informally show that two triangles are congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. This unit formalizes the concept of congruence and symmetry of planar objects by identifying the essential components of rigid motion transformations. Students make conjectures and construct viable arguments to prove theorems— using a variety of formats—and solve problems about triangles. Students will use congruence of lines and angles to analyze and prove the congruence of triangles given congruent angles and sides. Students will use their knowledge of algebra to solve equations based on congruence relationships, including multivariable and polynomial expressions. This will allow students to apply their knowledge of systems of equations and solving quadratic equations in a geometric context.
Learning Goals	
Standard(s):	

Experiment with transformations in the plane	
G-CO.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

G-CO.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G-CO.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segment
G-CO.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
Understand congruence in terms of rigid motions.	
G-CO.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
G-CO.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G-CO.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
Prove geometric theorems	
G-CO.9	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints*.

G-CO.10	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
Make geometric constructions.	
G-CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
Prove theorems involving similarity	
G-SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Essential Question(s):	• How do transformations provide a way of studying figures? • What relationship between sides and angles of triangles can be used to prove triangles congruent? • How does the geometric principle of congruence in triangles apply to the real world?
Enduring Understanding(s):	• Reflections are rigid motions across a line of reflection. • A translation is a rigid motion that moves all points of the preimage the same distance in the same direction. • Rotation is a rigid motion described by its center of rotation and the angle of rotation. • A composition of rigid motions can be represented by a combination of at least two of the following: translation, reflection, or glide reflection.

	- A figure that can be mapped onto itself is a rigid motion. - Figures that have the same size and shape are congruent. - If a rigid motion or composition of rigid motions can map one figure onto another, then the figures are congruent. - There is a set of criteria for proving triangles congruent, depending on the information provided. - Congruent figures have equal corresponding angle measures and equal distances between corresponding pairs of points. - If two triangles are congruent, then all their corresponding sides and angles are congruent. - A rigid motion transformation preserves both the distance between pairs of points and the angle measures
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) - Image - Pre-image - Composition of rigid motions - Rigid Transformations - reflection - line of Reflection - glide reflection - translation - rotation - angle of rotation - center of rotation - Symmetry - point symmetry - reflectional symmetry - rotational symmetry - Triangles congruency: SSS, SAS, ASA, AAS, and HL - Congruent parts of congruent triangles are congruent (CPCTC)

	- Special segments - midsegment - altitude - median - angle bisector - Geometric measurement on coordiante plane - Distance formula - Midpoint formula - Slope **Skills:** (Students will be able to…) - identify the rule for a reflection given both an image and its preimage, and draw reflected images. - translate figures, write translations, and find images of translation - compose rigid motions and prove that all translations are the composition of two reflections - write rotations and find the images of rotation - compose rigid motions including rotation, translation, and reflection. - compose rigid motions that will map one figure in the coordinate plate to another. - transform a figure in the coordinate plane, given a rule. - identify the types of symmetry a figure has. - using Rigid Motion (Transformations) to Demonstrate Congruence - relate congruence to rigid motions - demonstrate that two figures are congruent by using one or more rigid motions to map one onto the other. - use properties and theorems of isosceles and equilateral triangles to solve problems. - identify congruent triangles using triangle properties - prove triangles congruent by identifying their corresponding parts - use perpendicular bisectors to solve the problem - use angle bisectors to solve problems - find the point of concurrency of the altitudes of the triangles and medians of the triangles.

	• use angle measures of a triangle to compare the side lengths of a triangle • analyze triangles using special segments and centers. • determine which statements may be required to prove certain relationships or to satisfy a given theorem. • use concepts and theorems relating to the congruence of triangles to solve problems

Unit Number and Title:	**Unit 7** – Similarity
Duration:	~ 4 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, make sense of and persevere in solving similarity problems, and apply similarity to right triangles to prove the Pythagorean Theorem.
Standards	

Experiment with transformations in the plane	
G-CO.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G-CO.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
Make geometric constructions.	
G-CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic

	geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line*.
Understand similarity in terms of similarity transformations	
G-SRT.1	Verify experimentally the properties of dilations given by a center and a scale factor:
	a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
	b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G-SRT.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides
G-SRT.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
Prove theorems involving similarity.	
G-SRT.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

	G-SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Essential Question(s):	● How is similarity used to measure indirectly and explore comparable objects? ● How do triangles, their sides, angles, and special segments model the physical world? ● How do transformations provide a way of studying figures?
Enduring Understanding(s):	● Transformations are functions that can affect the measurements of a geometric figure. ● Similar figures have equal corresponding angle measurements, and the distances between corresponding pairs of points are proportional.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Using non-rigid motion (Dilations) ● Scale factor ● Similar polygons ● Triangle similarity: AA, SSS, SAS ● Proportionality theorems ● Pythagorean theorem **Skills:** (Students will be able to…) ● apply knowledge that changing by a scale factor of k changes all lengths by a factor of k, but angle measures remain unchanged ● determine which statements may be required to prove certain relationships or to satisfy a given theorem. ● use concepts and theorems relating to the similarity of triangles to solve problems

Unit Number and Title:	**Unit 8** - Measurement in Two- and Three- Dimensions
Duration:	~ 4 weeks
Resource(s):	enVision Algebra 1 College Board Pre-AP Algebra
Unit Overview:	Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area, and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line. They reason abstractly and quantitatively to model problems using volume formulas. Students also compare the effect of a scale factor on length, area, and volume for various shapes. Students visualize, with the aid of appropriate software tools, changes to a three-dimensional model by exploring the consequences of varying parameters in the model.
Standards	

Explain volume formulas and use them to solve problems.	
G-GMD.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*.
G-GMD.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Visualize relationships between two-dimensional and three-dimensional objects.	
G-GMD.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

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<tr><td colspan="2">Apply geometric concepts in modeling situations.</td></tr>
<tr><td>G-MG.1</td><td>Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).</td></tr>
<tr><td>G-MG.2</td><td>Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).</td></tr>
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<td>Essential Question(s):</td>
<td>

How do geometric relationships and measurements help us to solve problems and make sense of our world?
How do the calculations and concepts of area and volume relate to two and three-dimensional objects?
How does changing the scale factor of a figure affect the surface area and volume of the figure?

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<td>Enduring Understanding(s):</td>
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The area of a figure depends on its height and its cross-sectional widths.
The volume of a solid depends on its height and its cross-sectional areas.
The geometry of a sphere is completely determined by its radius
Changing by a scale factor of k changes all lengths by a factor of k, changes all areas by a factor of k^2, and changes all volumes by a factor of k^3 .

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<td>Learning Goal(s):
Students will know and will be able to use their learning to:
(Content/ Skills)</td>
<td>
Content: (Students will know:)

Cavalieri’s Principle
Cross sections
Volume of prisms, cylinders, cones, pyramids, spheres, similar solids, and composite solids
Surface area of prisms, cylinders, cones, pyramids, spheres, similar solids, and composite solids

Skills: (Students will be able to…)

solve real-world and mathematical problems about the surface area or volume of a geometric

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	figure or an object that can be modeled by a geometric figure using given information such as length, area, surface area, or volume. ● visualize cross sections as a means to understand area and volume. ● calculate the area, surface area, and/or volume of a solid that has been affected by a scale factor. ● demonstrate procedural fluency by selecting the correct: ○ area formula and correctly calculating a specified value. ○ surface area or volume formula, and correctly calculating a specified value.